

1

Adam Yagelski

Faculty sponsor: Erika Barthelmess

Department: Biology

Small Mammals In Fragmented Habitats: A Review And Synthesis

Human modification of habitat has been defined as one of the major contributing factors in the global extinction crisis. The process of reducing once continuous habitat into a constellation of smaller patches or blocks has deleterious behavioral, demographic, and genetic consequences on the flora and fauna inhabiting the resulting fragmented habitat space. Although the effects of habitat fragmentation have been investigated for a variety of taxa and species, a large literature on small mammals has emerged for a variety of reasons. Many studies have used small mammals because of the ease of working with them, their important ecological position, and to investigate species-specific effects. Here, we review and synthesize this literature on small mammals, which are defined as those families of rats, mice, and shrews smaller than squirrels, but excluding bats. Recent reviews of the literature have shown that, to date, research in this area has yielded uneven and inconclusive results regarding the effects of habitat fragmentation. In particular, issues of scale in the design of ecological experiments have been raised. Habitat fragmentation has been identified as a landscape-level process, but few studies investigate its effects at this scale. Most studies are focused at the patch and edge scales. Experimental design, too, remains inadequate. These and other factors confound the ability to make explicit links between a landscape-level process and effects at the individual, population, and community levels. We show that a more sophisticated incorporation and conceptualization of issues of scale holds the potential to make reliable conclusions as to the effects of habitat fragmentation on small mammals and mechanisms responsible.

2

Erin Woodward

Faculty sponsor: Dr. Brad Baldwin

Department: Biology

Low End Conductivity Tolerances Of The Round Goby Neogobius Melanostomus

The round goby, originally from the Baltic and Caspian Seas, is an invasive species inhabiting the Great Lakes and the St. Lawrence River. The goby has already negatively impacted many aquatic ecosystems including the destruction of native fish populations and loon mortalities. Understanding the goby's physiological limits is crucial to stopping the spread because an estimation of the potential geographic distribution can be made. Low end conductivity, an estimate of dissolved ions in the water, tolerances of the round goby are unknown. I am currently testing these tolerances with four different experimental trials of conductivities equal to North Country lakes and rivers. Each trial has three replicates and two fish per replicate. Breaths per minute and loss of equilibrium are the stress variables being measured and compared. Each trial had three replicates and two fish per replicate. Breaths per minute and loss of equilibrium are the stress variables being measured and compared. Preliminary analysis of the results shows that there is no significant difference in respiration rate vs. the different conductivities of test waters. However, loss of equilibrium and mortality at the different conductivities has shown that the round goby cannot tolerate conductivities of approximately 35 uS and below, similar to the conductivities

of Cranberry Lake. Upon completion of the experiments and data analysis I hope to be able to produce a close estimation of the low end conductivity tolerance of the round goby. This will in turn be used to help predict the potential spread of the round goby into inland lakes and rivers of New York and elsewhere.

3

William Wilson

Faculty sponsor: Christopher Monz

Department: Environmental Studies

*Attitudes And Perceptions Of Wilderness:
A Comparison Of Adirondack Skiers And Snowmobilers*

The six million acre Adirondack Park of Northern New York is world renowned for its outstanding winter outdoor recreation opportunities. A study was conducted to examine two important winter recreation activities which have and continue to increase in popularity, snowmobiling and cross-country skiing. The study was performed as an effort to assess the participant's attitudes and perceptions of wilderness. Participants were surveyed (N=126) in five distinct locations within the Park. A modified version of the New Environmental Paradigm Scale, oriented toward wilderness protection concepts, was used. Scale reliability was assessed using Cronbach's Alpha and when including twelve of the original fifteen items was found to be acceptable (Alpha= 0.87). This scale allowed for a comparison to be made of wilderness protection attitudes between the two participant groups. On a four point Likert scale, skiers (M= 1.67) appeared to be stronger supporters of wilderness protection than snowmobilers (M = 2.17, t = -5.61, p < .001). Perceptions of wilderness were assessed by asking participants to rate a series of six photographs, ranging from somewhat developed to pristine landscapes. Analysis of scaled results from this assessment revealed that skiers (M= 1.44) perceived less developed landscapes as wilderness while snowmobilers often included more developed landscapes as wilderness (M = 1.26, t = 6.55, p < .001).

4

Miles Waniga

Faculty sponsor: Brad Baldwin

Department: Biology

*Predicting The Spread And Impacts Of The Newly Invasive Species
Dreissena polymorpha In Black Lake, NY*

Abstract: Zebra mussels (*Dreissena polymorpha*) are a relatively new invasive species to the waters of North America. The mussels are native to the Caspian Sea and of Eastern Europe; they were introduced to North America in the mid-1980's by a cargo ship which discharged its ballast waters in Lake St. Clair. Zebra mussels are benthic filter feeders that consume phytoplankton and small zooplankton and thus they have altered aquatic ecosystems and increased water clarity. Black Lake is a commercially important fishing lake near Canton, which became invaded by zebra mussels within the past couple of years. Most zebra mussels are in the juvenile stage, which can filter phytoplankton from the water column at a rate of 0.1L/hr. Zebra mussels have colonized many hard substrates in several of the main basins of the Lake. I have modeled the potential filtration rates of these mussels on lake phytoplankton based on actual data collected in Oneida Lake, NY. My filtration model estimates that the current zebra mussel population in

the lake can clear phytoplankton from 46% of the lake volume per day. Projections of mussels populations at year 4 and at year 10 of the invasion suggest that these filter feeders will easily filter 100% of the lake per day in the future. Based on this model, *D. polymorpha* will most likely have a large negative impact on the aquatic ecosystem of

Black Lake. However at this time the model is not yet complete. When zooplankton are added to this model, we will see that the lakes volume can be cleared at a higher percentage per day. However when we add phytoplankton reproduction to this model we will likely see that the filtration impacts will be more modest.

5

Brenna Waibel

Faculty sponsor: Brian Watson

Department: Physics

Recovering Repressed Memories

During five months of recovered memory therapy Katrina Fairlie alleged 18 men, including her father Jim Fairlie, of sexually abusing her, as well as claiming that she saw her father murder a girl. Due to the severity of such claims, and the uncertainty of their validity, recovering repressed memories through hypnosis is a controversial topic. The recovered memories have even been used in multiple court cases as credible evidence. In this study I examine the truth of these recovered memories. I also explain how hypnosis works and how these memories are recovered. I look into some specific court cases, such as the Katrina Fairlie case, in which recovered memory has played an important role. I then examine whether or not these cases should be taken seriously based on scientific studies and facts about recovering repressed memories. I conclude that there is serious doubt as to the truth of these memories.

6

Nathan Vogan

Faculty sponsor: Stephen Robinson

Department: Geology

Palynological Investigation Of Massawepie Mire, Gale, NY, As A Climate Proxy For The Holocene St. Lawrence Lowlands And Adirondack Highlands

Reconstruction of the paleoclimate of the St. Lawrence Lowlands following deglaciation (~10,000 yr BP), is exacerbated through multiple impacts on climate patterns due to atmospheric circulation, local water bodies, and regional geology. Certainly some of the more reliable proxy records of such changes are peatbogs because they are able to preserve the pollen of different plant taxa that are very selective in both their moisture and temperature tolerances. Massawepie Mire is a 900 acre ombrotrophic bog in northern New York. This bog is an important pollen climate proxy for the St. Lawrence Lowlands for the middle to late Holocene (5370 years BP). A 290 cm core was retrieved in 50 cm increments using a Russian style peat corer. This core was then sub-sampled for pollen analysis and loss on ignition (LOI). Arboreal pollen counts show that the region around Massawepie Mire was characterized by three distinct climatic zones: 1) a cool, dry period dominated by *Picea* and *Pinus*; 2) a warmer moister period dominated by a *Tsuga*-mixed hardwood forest; and 3) a period of temperature moderation (summer cooling and

winter warming) resulting in *Picea* resurgence and preservation of less cold tolerant taxa (*Carya* and *Corylus*). These patterns are very similar to climatic conditions in Southern Quebec and neighboring sites in the St. Lawrence Lowlands. Low nonarboreal pollen counts indicate that initiation of peatland growth at Massawepie Mire was initiated in highly forested conditions, and has had significant regional canopy cover throughout its history.

7

John Thorne-Thomsen

Faculty sponsor: Dr Brian Watson

Department: Physics

Bogus Heavy Elements

In June of 1999, a team of researchers led by Ken Gregoritch from Lawrence Berkeley National Laboratory (LBNL) claimed to have found two new elements. These elements, numbers 116 and 118 on the periodic table were the heaviest that had been found. Then in July 2001, after teams of researchers all over the world failed to confirm these findings, LBNL formally retracted the claim of discovery. Soon after, LBNL formally investigated one of the paper's authors, Victor Ninov, for violating their academic integrity policy. LBNL concluded that Ninov fabricated some of the data to yield his results. Ninov was fired. I will argue that Ninov did in fact fabricate his data and was therefore justifiably fired.

8

Stephanie St. Joseph

Faculty sponsor: Thomas C. Greene

Department: Psychology

The Effects Of Color On Creativity

The importance of color is demonstrated in daily life in innumerable ways. Surprisingly, few previous studies have demonstrated significant replicable effects of environmental color on any of a variety of measures. This study investigated measures of creativity in hopes that they would be more sensitive in demonstrating the effects of color. The 52 introductory psychology student participants performed a variety of creative tasks that were presented superimposed over different colored backgrounds on a computer display. The timed tasks included Guilford's Alternative Uses Task, the Remote Associates Test, and a task requiring participants to generate alternative descriptions for ambiguous drawings called "doodles." Because of the number of dependent variables, a conservative alpha level was set to determine significance. Mean differences between the four treatment hues and an achromatic silver background were calculated for the four primary dependent variables. It appeared that participants generated fewer responses to the Guilford's Alternative Uses Task in the light blue condition and primary colors increased the number of creative responses to the doodles.

9

Trisha Smrecak

Faculty sponsor: Mark Erickson

Department: Geology

Comparison Of Missouri Valle Hell Creek Formation (Late Cretaceous) Fossil Floras With Megafloral Zones Of The Willison Basin, North Dakota

Collection and analysis of 317 fossil plant specimens in the southeastern portion of the Hell Creek Formation in North Dakota has allowed preliminary comparison of Missouri Valley megafloral fossil assemblages in the western Williston Basin. Collections were made at the Stumpf Site in Morton Co., North Dakota. Fossil leaves from the Stumpf Site were collected stratigraphically between 7 and 13 meters above the top of the Breien Member. Work to date indicates the presence of multiple *Marmarthia* spp., as well as ? *Fokieniopsis* sp., *Metasequoia occidentalis*, "*Vitis*" *stantoni*, *Glyptostrobus* sp., morphotype HC90 of Johnson (2002), and FH66 and FH22 of Peppe (2003). An abundance of "*Vitis*" *stantoni* were collected, but numerous samples of *Glyptostrobus* and *Metasequoia* were present, as well. Poor collecting conditions made quantitative analysis of the flora impossible. Both long- and short-ranging taxa were included, but some species such as "*Vitis*" *stantoni* (HCIIa-IIb), morphotype HC90 (HCIIb), morphotype FH66 (FHI & HCIII), and a lobed *Marmarthia* sp. (HCI) are rather restricted in their zonation. Comparisons of flora in this study with floral zones already established in the region demonstrate no consistency of zone assignment for the eastern-most Hell Creek flora. In this study, flora from HCIIa, HCIIb, HCIIIa, HCIIIb, HCIII, FUI, (Johnson and Hickey, 1990; Johnson, 1992) and FHI (Peppe, 2003) have been found. This supports the suggestion by Peppe and Erickson (2004) that ecological control of Hell Creek plant distribution, mitigated by the proximity of the Fox Hills coastal habitat, influenced plant distributions geographically, and therefore stratigraphically, as well, in the Late Maastrichtian Williston Basin.

10

Douglas Smith, A.J. Bergeron and Pat Curran

Faculty sponsor: Dr. Joseph Erlichman

Department: Neuroscience

Development Of A Rat Model To Study Panic Attacks

Panic attacks and anxiety disorders affect over 19 million patients in the United States alone. A panic attack is an intense rush of fear that occurs without warning in response to both external and endogenous cues. Anxiety medications are currently one of the five most widely prescribed drugs in the United States. Increasing blood levels of carbon dioxide (CO_2) induces panic attacks in most panic prone individuals. Moreover, the incidence of panic during CO_2 rebreathing is one the best prognostic indicators of future panic attacks in patients. Unfortunately, there currently are no animal models that have been developed to study the neural basis of CO_2 -induced panic attacks. Therefore, the purpose of this study is to examine the affects of carbon dioxide (CO_2) on anxiety behavior in rats using the open field test. Each rat underwent three compressed air and three CO_2 trials. The trials were randomized to reduce order effects and the rat's total distance traveled (cm) and mean velocity (cm/s) were tracked continuously in the open field arena and recorded using software (Ethovision; $n = 6$). The results showed a statistically significant decrease in total distance traveled and mean velocity during CO_2 exposure as compared to the room air control trials. Our findings show that elevated CO_2 induces anxiety in rats thus providing us with a model to begin to study specific regions of the brain involved in anxiogenesis.

11

Evan Slater

Faculty sponsor: Sharon Hannigan and Alan Searleman

Department: Psychology

Schematic Activation Influences Accuracy And Confidence In A Visual Change Detection Task

This study examined the effects of attention on participants' confidence and overall accuracy in a visual change detection task. Employing a within-subjects design, 46 participants attended to either a featural level (counting the number of objects that contained either of two colors) or a semantic level (generating a name to describe the theme of the objects) when viewing a photographed set of 10 to 13 semantically related objects. An initial photograph was shown for 5 seconds as participants completed either the color count or theme generation task. Then a blank slide was shown for 4 seconds, followed by a second photograph for 25 seconds in which a change may have been made. This second photograph either contained no changes, or there was the addition of one object that was either semantically or non-semantically related to the original object set, or there was a color change to one of the objects in the photograph. The results indicated that participants were more likely to claim to have noticed a semantically related or unrelated addition of an object than either a color change or no change. A Task by Type of Change interaction showed that participants were more confident about non-semantically related additions during the theme generation task, but were more confident seeing color changes during the color count task. When asked to identify the specific change observed, participants were most accurate in detecting non-semantically related additions. As predicted, this increased accuracy was most evident during the theme generation task.

12

Emilia Seibert

Faculty sponsor: Lorraine Olendzenski

Department: Biology

Multiple Antibiotic Resistant Bacteria From Lettuce, Alfalfa Sprouts, Raw Milk, Turkey And Beef: Occurrence Of Plasmid Bourne Resistance

Antibiotic resistance in bacteria can originate from random genetic mutations that occur in the DNA of a bacterial cell, altering the organism's sensitivity to common drugs. Additionally, horizontal transfer of plasmids allows bacteria to exchange genes coding for antibiotic drug resistance, rapidly spreading resistance throughout populations. Modern agricultural practices are thought to contribute to the spread of antibiotic resistance in commonly occurring bacteria. Farmers feed antibiotics to cattle to increase growth rate which in turn affects the milk excreted, the meat produced, and the vegetables grown using manure as fertilizer. In this study, bacterial colonies from raw milk, ground meat, alfalfa sprouts and lettuce were grown in the presence of commonly used antibiotics. These antibiotics included tetracycline, streptomycin, kanamycin, chloramphenicol, and ampicillin. Numerous bacterial colonies exhibiting multiple antibiotic resistance were obtained and eighteen showing unique colony morphology and resistance patterns were isolated. These were screened for the presence of plasmids using a Wizard Plus SV Miniprep Plasmid DNA Purification System to extract putative plasmid DNA and comparing the extracts by agarose gel electrophoresis. At least one isolate from raw milk yielded plasmid DNA bands of approximately 5000 bp and 300 bp. Further characterization of these plasmids is underway to ascertain their role in antibiotic resistance of the isolates.

13

David Schryver

Faculty sponsor: Dr. Karin Bodensteiner

Department: Biology

Development Of A System For The In Vitro Culture Of Rat Ovarian Follicles

Surrounding each ovarian follicle is a protein layer called the basement membrane (BM). This membrane is composed primarily of the proteins collagen IV, laminin, and fibronectin. The BM serves not only as a protective layer, but also provides structural rigidity, holding the follicle together. Thus, the BM is necessary for normal growth and development of follicles in vivo and in vitro. The purpose of this research was to develop a practical method for the in vitro culture of these ovarian follicles. Follicles were microdissected in an enzymatic solution containing 5mL DMEM, 0.03g Collagenase and 0.02g BSA. Follicles were then embedded in 0.75% agarose and fixed in 4% paraformaldehyde either directly after isolation, or after one, two, or three days in culture. Culture media was either a serum supplemented medium (Regular control media) or a FSH supplemented medium (FSH media @ 2.857iu/ml). During the culture period, follicular growth for both media was recorded and basic structural changes of the follicles were noted. After the culture period, follicles were stained using fluorescent probes specific for BM proteins, and imaged with the confocal microscope. Substantial increases in the amount of collagen IV, laminin, and fibronectin were seen in as little as 3 days, in the FSH culture media. This indicates a morphological change in the BM in response to the FSH culture media.

14

Gabe Sataloff

Faculty sponsor: Brad Baldwin

Department: Biology

A Comparison Of Clearance Rates Of *Crassostrea Virginia* And *Crassostrea Ariakensis* Spat: Can A Non-Native Species Of Oyster Fill The Same Niche As A Native Species In The Chesapeake Bay?

The eastern oyster (*Crassostrea virginica*) is an integral part of the Chesapeake Bay, both ecologically and economically. Population declines have led to scientists investigating the possibility of introducing the Asian Oyster (*Crassostrea ariakensis*). This study compared clearance rates, or the rate of filtering phytoplankton out of the water column, of juveniles from both species to see if the *C. ariakensis* could possibly fill the ecological niche of *C. virginica*. Feeding trials were conducted with individuals from both species placed in individual beakers, and fed the phytoplankton *Isochrysis* sp. in concentrations of 1×10^5 mL. Clearance rates per individual did not yield significant results between species (t-test, $p=0.977$), and so the juveniles of both species feed at the same rates, and thus provide similar benefits from their feeding.

15

John Rupp and Jordan Davis

Faculty sponsor: Stephen Robinson

Department: Geology

Subsurface Investigation Of The Internal Architecture Of Massawepie Esker-Mire Complex, Gale, New York

The retreat of the Laurentide Ice Sheet from the Adirondack Highlands of northern New York approximately 12,500 yr. B.P. led to the development of a landscape marked by glaciofluvial landforms such as kames, outwash, kettles and eskers. The Gale, New York study site (44° 15'N, 74°38'W) contains a prominent esker approximately 30 m high that trends northeast/southwest for 12 km. A 364 ha ombrotrophic peatland underlain by outwash lies adjacent to the esker along a portion of its length. Ground Penetrating Radar (GPR) surveys were conducted on the esker and peatland areas, as well as at the contact between these landforms in an attempt to establish possible linkages between their environmental, developmental and topographic settings. Using 50 and 100 MHz antennas, the esker profiles yielded a signal penetration of approximately 20 m through primarily sand. Interpreted facies showed reflector beds of variable continuity indicative of both turbulent and laminar flow, chute and pool structures, erosional unconformities, random boulder distribution and diagenetic failure planes. On the peatland, the surveys were successful in mapping internal structure and development of the peat, and delineation of a relatively flat basal outwash unit dated at 5,600 yr. B.P. at approximately 3 m depth. The basal unit consists of medium to coarse grained sand, with discrete portions of the bed raised 2 m above the high amplitude basal reflectors suggesting possible channelization. The preliminary interpretation of a channelized base suggests that there is a link between the esker and peatland. The sinuous form of the infilled subglacial network suggests that the rise in the peatland base may be a remnant of an esker branch. This smaller remnant branch bounded by shallow stagnant ice depressions could create a landscape that would encourage peatland development. The peatland currently has three different floral zones showing different levels of wetland maturation possibly reflective of the basal topography.

16

Kristen Ross

Faculty sponsor: Dr. David Hornung

Department: Biology

Olfactory Recognition In Canines

To assess the nature of olfactory cues canines use in identifying humans, a retriever was trained to recognize a target's scent. After smelling 3 boxes containing T-shirts impregnated with human scent, the dog would exhibit a sit/stay response on recognition of the target. The distracter scents were from humans not related to the target. After reaching a 95% identification criterion, probe trials were conducted in which the scents from the target's relatives or from humans who bathed in the target's soap were used in place of the target's smell. Probe trails were inserted into a testing session about 20% of the time; the other 80% were target recognition trials. Responses to probe trials were never rewarded. Although the dog did not give the recognition response above baseline for any of the target's family members, she gave the recognition response more often when some but not all non-related humans used the target's soap. To determine if added smells could reduce target identification, a T-shirt was collected after the target used a different soap. The dog did not recognize the target with this new added smell, but did identify the target after the target again used the original soap. Since genetic similarities did not produce identification confusions, these results support the hypothesis it may be relatively easy for the dog to separate humans based on smells related to genetically controlled metabolic factors. Contrarily, added smells like those from bath soap can produce identification confusions at least

with this testing paradigm.

17

Megan Roppolo

Faculty sponsor: Neil Law

Department: Chemistry

Expanding Versatility: Design, Synthesis, And Characterization Of New Metallacrowns

Metallacrowns are novel class of inorganic compounds with great potential.¹ One Intriguing attributes of metallacrowns include the structurally mimicry of porphyrins or crown ethers, but with a greater number of metal ions at the core of the molecule. Metallacrowns generally have central repeating ring similar to the well-known crown ethers (-C-C-O-) of (-M-N-O-), where M is a metal ion, and N and O are supplied by a hydroxamate bearing ligand. Five repeats forms a 15-metallacrown-5 structure (15-membered ring with five metal ions, 15-MC-5) with a metal ion bound in the middle of the ring. For a 15-MC-5, this metal ion is usually a lanthanide element. The various metallacrown features may be manipulated by metal ion size, ligand shape and flexibility, or numbers of coordination sites. Thus, these structures could form the basis for new and industrially useful catalysts or materials. To date, a limited palette of ligands and metal ions has been explored in creating metallacrowns. The most frequently utilized metal ions have been copper and nickel, often in 15-MC-5 complexes. This project is designed to expand the 15-MC-5 architecture to other metal ions such as cobalt, manganese, and iron. Toward this end, a new ligand, N,N'-bis(2-methylpyridyl)glycine hydroxamic acid (bpgha) has been designed, synthesized and characterized. Results will be reported for the ligand and the results of metallacrown syntheses with this new ligand.

18

Chris Reilly

Faculty sponsor: Brian Watson

Department: Physics

Weight Loss: Is Hypnosis the Answer?

The validity of hypnosis as a useful technique in medicine and therapy has always been a controversial subject. This analysis looks at the power of post-hypnotic suggestion on the conscious mind. In this study I examine the power of the hypnotic suggestion, as well as the long-term potential of the post-hypnotic suggestion. Hypnotism is based on achieving an extreme state of focus, characterized by a feeling of relaxation, where suggestions of conduct can be placed. It is important to say that these suggestions cannot override the values of a person. To test the power of the hypnotic experience the research will focus on the use of hypnosis in weight loss. For the purposes of this study the people in this study have already expressed a desire to reduce their weight.

In a study conducted by Cochrane and Friesen in 1986, they found that moderate weight loss could be achieved using hypnosis without the aids of behavioral modification or control. However, the world of hypnosis is littered with claims of great success using only audiotapes alone. Without a doubt hypnosis is attempting to tap into the multi-billion dollar obsession that is weight loss. Are these people selling false dreams or do the studies back up the claims of long-term weight loss?

19

Megan Reeve

Faculty sponsor: Catherine Jahncke

Department: Physics

Energy Transfer In The Pole Vault

The purpose of this study was to examine energy transfer in the track and field event called the pole vault. St. Lawrence athletes were videotaped during several vaults, and position as a function of time data was extracted using the Videopoint software system. Weights were assigned to each body part whose motion was traced throughout the jump in order to find the path of the center of mass. The motion of the center of mass was used to calculate the kinetic and potential energy of the jumper as a function of time. The pole energy was analyzed as if the pole were an elastic spring. The results of this energy analysis will be presented.

20

Rachel Putman

Faculty sponsor: Michael Temkin

Department: Biochemistry

Postnatal Ontogeny Of The Rat Brainstem: A Comparison Of Rostral And Caudal Development And Differentiation

During the development of the vertebrate brain, regions develop at different rates and become specialized for specific functions. In the mammalian brainstem, several sites have been shown to be important in regulating how individuals breathe. In my research, I examined rates of development in the rostral and caudal regions of the brainstem and tested for specialization by measuring the concentrations of proteins that are produced by specific cell types. Quantitative immunoblots were used to measure the relative amounts of three proteins: sodium bicarbonate cotransporter 1 (NBC1), glial fibrillary acidic protein (GFAP) and neuronal nuclear protein (NEUN) in the rostral and caudal portions of brainstems from 4, 11, 22 and 35 day old rats. In the quantitative immunoblot protocol, total protein was separated according to molecular weight on 7.5% acrylamide gels and transferred to membranes. After exposing the membranes to an antibody specific to one of the proteins of interest, a chemiluminescent detection method was used to visualize the presence of antibodies on the membrane. The resulting bands were quantified using Image J software. GFAP and NEUN concentrations indicate the proliferation and specialization of two major cell lines in the brain, astrocytes and neurons. The concentration of NBC1 indicates the production of an important pH regulatory protein.

21

Meredith Pridgen

Faculty sponsor: Alan Searleman and Sharon Hannigan

Department: Psychology

Exploring Change Detection Ability And Confidence Of Decisions

The literature has consistently shown large errors in the ability to notice changes from one image to

another, a phenomenon known as change blindness. The present study investigated how the configuration of a group of stimuli could influence the identification of different types of changes and the confidence that participants had in their decisions. Using a within-subjects design, 52 people viewed a series of 10 stimulus sets of slides. Each stimulus set consisted of a first slide that contained either a randomly configured or symmetrical grouping of 6 to 8 squares and circles that were colored either red or blue for a period of 5 seconds. Following a 2 second blank slide, the first slide in the set was shown again for 20 seconds with either the addition of a square or circle, a deletion of a square or circle, a color change of a square or circle, a shape change (circle to square or square to circle), or no change at all. The results showed that participants were more likely to claim a change had occurred when stimuli were presented in a random array. Moreover, in the conditions in which additions and deletions were made, the participants were significantly more likely to claim to have noticed that a change occurred - and were significantly more confident that this change occurred - compared to the color change, shape change, or no change conditions. When asked to specify what actually changed, participants were significantly better at detecting additions compared with deletions.

22

Monica Phillips

Faculty sponsor: Dr. Erika Barthelmess

Department: Biology

Examining The Effectiveness Of Bioelectrical Impedance Analysis (BIA) To Determine Body Condition In The North American Porcupine (*Erethizon dorsatum*)

Estimation of body composition of wild animals produces important information regarding body condition of individuals. Unfortunately, there are few suitable field techniques that are nondestructive, unbiased, precise and quick to perform. Bioelectrical impedance analysis (BIA) has been proven as a suitable technique for determining body composition of moose (*Alces alces*), bears (*Ursus* sp.), wombats (*Vombatus* sp.), seals (*Smilacina* sp.) and ground squirrels (*Spermophilus beldingi*). I investigated the suitability of using BIA to measure body condition in the North American Porcupine (*Erethizon dorsatum*).

Bioelectrical impedance analysis is species specific and therefore must be calibrated. I calibrated the method of BIA by performing an ether extraction on seven individual "pest" porcupines. The data from BIA and ether extractions will enable us to derive a predictive model of total body fat in the North American Porcupine. I am predicting that BIA will be an accurate method for estimating body fat of the North American Porcupine. Once the effectiveness of BIA for the North American Porcupine has been determined, we will be able to study the North American Porcupine in greater detail in its natural habitat. For example, we will be able to observe the seasonal changes in the body fat of the North American Porcupine due to its over wintering tactics.

23

Audrey Paule

Faculty sponsor: Aswini Pai

Department: Biology

The Importance Of Tropical Field Margins As Reservoirs Of Plant Diversity In Small-Scale Agricultural Landscapes

Field margins in traditional tropical agroecosystems strive to preserve biodiversity in human-dominated landscapes. Visually distinct field margins separate small multicropped agricultural plots from adjacent forest areas in the dry deciduous ecosystems of Northern Thailand. We hypothesized that the angiosperm community in tropical field margins would be comparable to that of adjacent forest areas though multicropped fields would be depauperate in plant species. Vegetation was sampled in forests, fields and field margins at three sites in Chiang Dao, Thailand using circular equidistant plots along transects of 160 m in length. Preliminary data analysis shows that margin and forest areas had the highest number of species (108 and 93 species, respectively) whereas field areas had 84 species. Measures of species richness and diversity for both tree and shrub species (H' Forest = 3.37, H' Field margin = 3.58) were comparable in forests (H' Tree = 2.26, H' Shrubs = 2.91) and field margins (H' Tree = 2.48, H' Shrubs = 3.06) though distinct from the multicropped fields (H' Tree = 0.50, H' Shrubs = 1.54). Principal component analysis based on species presence absence data further indicated considerable overlap of species composition of forest and field margin communities. However there is a significant difference ($F = 9.06$, $p < 0.0001$) between field margins and forests in Importance Values derived for tree as well as shrub species indicating a difference in species population structures. Our results suggest that human selection plays an important role in maintaining and defining biodiversity in field margin areas.

24

Terran Palmer-Angell

Faculty sponsor: Sharon Hannigan

Department: Psychology

Exploring The Relationship Between Meditative Ability And Tennis Team Seed: Does Eastern Meditative Practice Enhance Athletic Performance?

Sport psychology has a rich tradition of inviting Eastern thought into its understanding of athletic behavior in both practice and competition (e.g., Huang & Lynch, 1994). This productive connection flourishes in part because of striking similarities between meditation states described by Buddhist practitioners and flow states described by athletes. The current project, an extension of previous research (Palmer-Angell, 2003; 2004), investigated the relationship between meditative ability and tennis success as measured by team seed. While engaged in tasks demanding increased or decreased physiological arousal or relaxed focus, 10 male and 10 female St. Lawrence University tennis players' physiological states (i.e. heart rate, heart rate variance, skin conductance levels) were recorded using biofeedback technology. Analyses are currently underway to determine whether or not a correlation exists between meditative ability and tennis team seed. Should the data reflect a relationship, additional information obtained through player profiles and interviews may allow us to understand further the nature of meditative ability in the tennis environment. The results of this preliminary research will inform the direction of future work on the application of meditative states to the pursuit of flow states in sport.

25

Connor O'Loughlin

Faculty sponsor: Dr. Brian Watson

Department: Physics

Alfred Wegner And Continental Drift

In 1912 the theory of continental drift was created by Alfred Wegner to describe evidence that had been collected on many different continents. This papers purpose is to understand the theory in order to determine how much affect his theory did have on geological thought. Continental Drift is a theory that is not used today but the general ideas behind it are closely related to plate tectonics, which was created to explain the vast movements of continental and oceanic plates on the asthenosphere. The evidence collected at the time points to movements that could not be explained and sparked an international controversy lasting more than 50 years. The geological history of continental drift will be summarized and examined to reveal its shortcomings and how the theory of plate tectonic is applied today. Thus, this paper will talk about the content of the theory; the evidence that the theory used; and problems with the theory that could not be explained by any current geological methods at the time. The evidence in his theory, although logical and vast, was partially refuted by the international geological community because parts of his theory could not be supported at the time. The theory of continental drift will be examined in depth to identify what science is, and how a scientist uses data to create a scenario which apply today.

26

Tora Olafsen

Faculty sponsor: Sharon Hannigan

Department: Psychology

Cerebral Localization Of Language: A Review Of Recent Literature On Bilingual Aphasics And Normals

This paper reviews studies investigating the cerebral localization of first (L1) and second (L2) languages in bilinguals (i.e., people fluent in two languages). I first introduce the reader to "language neuroanatomy" essential to an understanding of the research described in later sections (i.e., aural-oral circuit and associated brain areas). I then present the empirical findings, which, as a first approximation, sort nicely into two "neurolinguistic eras", namely, before and after the advent of neuroimaging technologies (e.g., PET, fMRI, etc.). Before neuroimaging, the question of how two or more languages are organized in the brain was largely explored by analyzing differential patterns of L1 and L2 recovery in bilingual aphasics (i.e., people who lost some aspect of language due to brain damage). Post neuroimaging, landmark PET and fMRI studies on normal bilinguals have revealed, for each language, the brain structures involved in various levels of language processing (i.e., word, sentence, story, etc.). Taken collectively, the findings indicate that in the bilingual brain both languages are supported by specific perisylvian temporal and parietal cortices (i.e., Wernicke's area, supramarginal and angular gyri, etc.), areas critical to language comprehension (e.g., semantic processing). In contrast, there is considerably less representational overlap between languages within left frontal cortex, a region known to support speech programming and execution. It is conceivable this pattern of results is due to relatively large variation among natural languages with regard to their surface (i.e., syntactic and phonological rules) - but not to their deep (i.e., underlying semantic representation) - structure.

27

Matthew Norton

Faculty sponsor: Michael Schuckers

Department: Mathematics, Computer Science and Statistics

Generalized Wilson Confidence Interval

Here we are interested in exploring further the Wilson confidence intervals(CI). In particular the aim is to develop Wilson intervals for random variables that have variances which are a quadratic function of the mean of the random variable, $\theta = E[X]$. Example of this type of random variable include the Poisson, Binomial, Beta-binomial. Having derived a Wilson CI for the generic case, say $V[X] = a + b\theta + c\theta^2$, then we will compare how this new interval performs relative to standard CI approaches using Monte Carlo simulation. Particular interest will be paid to more commonly used distributions such as the Poisson and Gamma.

28

Christopher Nichols

Faculty sponsor: Stephen Robinson

Department: *Geology*

Geo-Thermal Model Of Lake Effect On Permafrost

Permafrost is ground that remains frozen for at least two years. Lakes tend to have basal temperatures above 0°C, even in northern regions, and thus may influence the presence or absence of sub-lake permafrost. In the case of large lakes, their thermal influence may be enough to prevent the formation of permafrost. Using the finite element modeling software Temp/W, I was able to create a model to simulate permafrost and lake interaction in Norman Wells, Canada. The program uses inputs of climate conditions, soil thermal properties, water content of the ground, and the buffer-zone factor to determine subsurface ground thermal conditions over time. The reason for looking at this effect is that loss of permafrost can have large impacts, such as shifting in the ground causing damage to infrastructure, and the release of natural gas trapped below the permafrost. The conditions in Norman Wells are a mean annual air temperature of -5.5° C, with a high thermal conductivity and low water content due to the silt and shale in the area. The model shows a depth of 150m of permafrost, and the lakes were kept at a constant 6.6m deep. It took a lake 60m wide to break through the 150m of permafrost and the thermal impact of the lake is felt far beyond its shoreline.

29

Jared Newell

Faculty sponsor: Diane Burns, John Bursnall

Department: *Geology*

GIS Applications In Monitoring Mountain Pine Beetle Infestations And Populations - San Isabel National Forest, Colorado

The mountain pine beetle (*Dendroctonus ponderosae*) is causing severe problems throughout the Rocky Mountain region of western North America. Millions of trees are infested and killed off each year, posing significant threats in the form of increased wildfire activity, as well as economic losses in the timber industry. This project is based upon research conducted under the auspices of the Rocky Mountain Research Station in Ft. Collins, CO. I collected data concerning mountain pine beetle populations and severity of infestations in the southern San Isabel National Forest in Colorado during the summer of 2004. Mountain pine beetle populations were gathered by placing beetle traps baited with pheromones throughout the extent of the forest. Population counts collected from the traps was then put into a

Geographic Information System (GIS), in an attempt to determine spatial distributions. GIS layers were used from the Rocky Mountain Research Station's database as well as downloaded from other sources, and the trap counts were applied to this data. Forest stand maps were used in identifying areas susceptible to mountain pine beetle infestation, and spatial interpolation and density functions were used in a GIS and applied to the forest stand data. From the analysis and models created, the Sangre de Cristo mountain range proved to have the highest populations of mountain pine beetle within the San Isabel National Forest. The Wet Mountain range to the east was identified as being an area at risk for a significant mountain pine beetle outbreak, given the timing of recent infestations and the presence of suitable forest habitat.

30

Eric Morgan

Faculty sponsor: Brian Watson

Department: Physics

Benveniste's Infamous 'Water Memory' Experiment

In this project I plan to examine research completed in 1988, by a group led by Dr. Jacques Benveniste, which maintained that water has memory. The controversial research claimed, "a solution of antibodies appeared to evoke a reaction from certain white blood cells and change their ability to hold a stain even after the antibody solution had undergone 120 tenfold dilutions (Science News: 7/2/88, p.6)." It seems preposterous to believe that after so many dilutions the solution could still have traces of antibodies. Still, the research was published by the world-renowned scientific journal Nature. Similar research conducted in a few other well-respected laboratories supported Benveniste's claim. Using medicines in extreme dilutions is a basic principle of homeopathic medicine. The study of homeopathic medicine has repeatedly been shunned by the scientific community and this study, without a doubt, had its fair share of critics. After much skepticism, Nature sent three of its researchers, Walter Stewart, John Maddox, and James Randi, to run a double-blind test in Benveniste's lab. The results were unclear, some producing positive results and others producing negative results. In the end the experiments were held to have distinctive marks of pseudoscience, which resulted in its rejection by the majority of the scientific community. Nevertheless, there are many people who believe in the practice of homeopathic medicine and there are still some scientists who believe Benveniste's experiments are valid. I intend to analyze all the information related to Benveniste's "water memory" experiment and provide an account of what really happened.

31

Megan Merrihew

Faculty sponsor: David Hornung

Department: Biology

Effects Of Odors On The Exercise Performance Of Subjects At Different Training Levels

This study evaluated the effect of the odors sandalwood and lavender on the exercise performance of varsity collegiate athletes compared to the performance seen in subjects not currently participating in a varsity sport. During a test session, subjects were instructed to peddle as fast as they could for 20 or 30 minutes on a stationary bike. While being tested, subjects were exposed to the smell of sandalwood,

lavender, or to an odorless control. Each experimental condition (sandalwood, lavender, odorless control) was repeated 3 times for a total of 9 trials per subject. The subject's heart rate, speed, and distance traveled were recorded every 2 minutes. In athletes, while both odors had an effect, exposure to lavender was associated with the greatest increase in speed compared to the odorless control, but this effect was only seen in the first 6 minutes of exercise. Additionally, exposure to both odors increased heart rate during the last 6 minutes of exercise. Subjects not currently participating in a varsity sport experienced the greatest increase in speed with sandalwood exposure, but this effect was not seen until the last 6 minutes of exercise. Lastly, in a subgroup of these subjects, sandalwood was associated with an increase in heart rate between twenty and thirty minutes of exercise. So, although these data demonstrate that exposure to sandalwood and lavender increases performance in a maximal effort exercise in all subjects, the timing of the effect seems to vary depending on the odor and the training level of the subject.

32

Audrey Merriam

Faculty sponsor: Dr. Mike Temkin

Department: Biology

Expression Of Anion Exchanges And Monocarboxylate Transporter Genes During Postnatal Development Of The Rat Brainstem

In the mammalian brainstem, there are a number of CO_2 -sensitive respiratory centers, such as the nucleus tractus solitarius (NTS) and the retrotrapezoid nucleus (RTN), that are important in the regulation of respiration. The activity of CO_2 -sensitive respiratory centers may be dependent on the regulation of extracellular pH by astrocytes. Astrocytes are known to express four types of transporter proteins that may directly affect extracellular pH levels. These transporters include sodium hydrogen exchangers (NHEs), sodium bicarbonate cotransporters (NBCs), sodium dependent chloride bicarbonate exchangers (NDCBEs) and sodium independent chloride bicarbonate exchangers or anion exchangers (AEs). In addition to these transporters, astrocytes also contain monocarboxylate (MCTs) which can affect pH inside and outside of the cell. The objectives of my investigation were to determine the expression of the anion exchanger (AE1, AE2 and AE3) and monocarboxylate transporter (MCT1 and MCAT2) genes in the NTS and RTN during development of the rat brainstem from 5 days to 36 days after birth. The results of my work indicated that a new in situ protocol needed to be developed to increase probe specificity as well as the signal to noise ratio in signal detection. Based on my work, I recommended that probes used for in situ hybridization should be longer in length and labeled with more than one fluorescent dye molecule. Once cells can be marked correctly with astrocyte and neuron specific probes then in situ hybridization can be used to investigate the expression of pH regulatory genes.

33

Patrick Joseph McLaughlin

Faculty sponsor: Brad Baldwin

Department: Biology

Assessment Of Nassau Grouper Population And Potential Spawning Aggregation On San Salvador, Bahamas

The Nassau grouper (*Epinephelus striatus*) is an important fishery species whose well documented

decline in waters of the tropical western Atlantic has aroused considerable efforts to establish sustainable population densities. Restoration efforts rely in part upon conserving essential microhabitat for juvenile populations of *E. striatus*. We assessed the importance of a mangrove nursery lagoon on San Salvador (S.S.), Bahamas, and discovered the presence of a juvenile *E. striatus* population (N=86). Based upon known microhabitat usage, we designed artificial reefs in an experiment that found significant preference for arrangements of 4-cinderblock "apartments" over other structures tested. The data suggests juvenile *E. striatus* are abundant in this lagoon and may benefit from increased availability of artificial reefs.

We believe there is also an undocumented spawning aggregation along S.S. which deserves protective status. Evidence for a S.S. spawning aggregation is based upon comparisons between S.S.'s shelf characteristics (shape, depth, orientation) and those of three other known aggregations. Inter-island current information suggests that during spawning periods, S.S. could disperse *E. striatus* eggs and larvae westward to seed regions such as Long Island, Great Exuma, Cat Island and others in the Great Bahama Bank. Collectively, such evidence supports our suggestion and design of a marine reserve on S.S. that encompasses the juvenile habitat and potential spawning site(s) for conservation. Additionally, a S.S. marine reserve will provide a relatively undisturbed habitat for local populations of other commercial species (Queen Conch, Spiny Lobster) whose larvae may also seed surrounding islands.

34

Petya Madzharova

Faculty sponsor: Robin Lock

Department: Mathematics

Time Series Analysis Of Music

Mathematics and music have always been very closely related to each other. In this project, we are going to discuss some of the mathematical and statistical characteristics of music using techniques from time series analysis. Applying time series analysis to music can be used to understand the composition of a musical piece, to forecast where the melody would go or make a prediction about how a song would end based on the structure of the tune. Using the sheet music of different songs, we first construct a table of the pitches and lengths of the notes of the melody. We will use the statistical program R, and its add-on musical package tuneR, and will see how time series analysis can be applied to this transcription. In particular, we will look at the time series and autocorrelation plots and compare the plots of different kinds of music - for example jazz vs. pop music. Also, we will observe the differences, if any, between music transcribed from its sheet music and a transcription obtained from the actual recording of the same song.

35

Jaime Lyon

Faculty sponsor: Catherine Crosby-Currie

Department: Psychology

Judicial Decision Making Regarding Expression Of Children'S Preference In Contested Custody Cases: A Jurisdictional Comparison

Although every jurisdiction in the United States allows judges to consider the preferences of children in

decisions regarding custody, how judges are to solicit those preferences and how much weight they are to give to them varies widely among jurisdictions. Previous research has explored how judges solicit and use a child's preference, but only one study has compared judges in different jurisdictions (Crosby-Currie, 1996), which involved only two jurisdictions. In addition, little empirical research has explored the relative impact of legislation on judge's decision making and none in the area of custody decisions. The present study investigated the attitudes and experiences of family court judges from 11 states regarding children's involvement in custody decision making through an on-line survey. States were selected based on three continua relevant to children's involvement: requirements for a preliminary showing of age and/or maturity before ascertaining a child's preference; the amount of weight to be afforded to the child's preference; and the extent of due process protections (i.e., legal processes that protect an individual's rights) afforded to parents. Differences in the laws regarding these issues were hypothesized to relate to how judges approached custody cases. One hundred and twenty-six judges responded to the survey. Jurisdictional analyses revealed partial support for the hypothesis. Judges with less discretion regarding the weight afforded to children's wishes reported being guided more by statutory law. Similarly, jurisdictions with less discretion regarding due process protections were significantly more likely to record and allow counsel to be present at the child's interview.

36

Nicole Lopez

Faculty sponsor: Michael Schuckers

Department: Mathematics

Analysis Of Biometric Authentication Match Scores

Biometric authentication has recently received a good deal of attention as a way to bind an individual and their information, often secure information. Until recently there has been little publicly available data to assess the performance of such biometric authentication devices. Recently, the National Institute for Standards and Technology released the Biometric Score Set Release 1 (BSSR1). This data includes matching scores for both those who are enrolled in the system and those who are not. Here we present an analysis of the BSSR1 to assess the change in performance of these device over time. In particular we are interested in whether or not the error rates for these devices change over time and whether or those differences are significant.

37

Erin Lloyd

Faculty sponsor: Dr. Wallace

Department: Psychology

Linking Videogame Play And Adolescent Invulnerability To Risky Behaviors In Adolescence

Adolescent egocentrism is a feeling of uniqueness that is formed with the onset of adolescence, and from this the imaginary audience and the personal fable are constructed (Elkind, 1967). David Elkind's theory of adolescent egocentrism may be a valuable tool for examining risky behaviors in adolescence. In particular, the personal fable includes a sense of invulnerability that can be applied to adolescent's decision making about risky behaviors (Moore & Parson, 2000). In addition, media sources could help account for the individual variations in the sense of invulnerability, particularly videogame play. Because

children playing videogames are active participants rather than observers; they may be at increased risk to thinking they are invulnerable (Anderson et. al., 2003). The current research examines adolescent risk taking behavior and correlates it to time spent playing videogames and the perception of invulnerability. With parental consent, 84 male and female participants from the fifth and eighth grades in two northern New York public schools completed a packet that included a risky activity questionnaire, a videogame survey and the Adolescent Invulnerability Scale (Lapsley, 2001). It was predicted that increased time spent playing video games will be linked with an increase in the adolescent's sense of invulnerability which. The combination is predicted to be associated with an increased likelihood of engaging in risky activities.

38

Jennifer Kurasz

Faculty sponsor: Joe Erlichman

Department: Neuroscience

The Ventilatory Effects Of Impaired Astrocytic-Neuronal Lactate Shuttle In The Rat

Recent studies suggest neurons may support most of their metabolism via the oxidation of extracellular lactate derived from astroglia. Lactate and other energy-rich substrates produced by astrocytes are transported into the extracellular space by the monocarboxylate transporter, MCT1. Neurons are capable of transporting carboxylate fuels into the cell via MCT2. The large flux of lactate between these two cellular compartments suggests that lactate could have a substantial effect on extracellular pH (pHo) if astrocytic efflux or neuronal uptake were altered. To test this hypothesis, we placed push-pull cannulae in the retrotrapezoid nucleus (RTN) of 12 rats and examined the ventilatory effects of artificial cerebral spinal fluid alone (aCSF) versus aCSF plus the MCT inhibitor, 4-hydroxycinnamate (4-Cinn; 100uM), during graded hypercapnia. Although 4-Cinn inhibits both MCT isoforms, MCT2 is more potently inhibited with 100uM 4-Cinn than MCT1. In 8/9 rats, 4-Cinn perfusion in the RTN approximately doubled expired minute ventilation (VE) across all levels of CO₂ tested (room air-8%). The increase in VE was the result of both an increase in tidal volume and frequency of breathing. These findings suggest that impaired neuronal uptake of lactate by MCT2 can lead to a rapid decrease in pHo and subsequently increase ventilation as a result of activation of central respiratory chemoreceptors. This work was supported by NIH HL71001.

39

Gregory Kruper

Faculty sponsor: Michael Temkin

Department: Biochemistry

Cell Specific Expression Of GFAP, NFL, And NBC-1 In The Postnatal Development Of The RTN And NTS In Rats

Glial cells in CO₂ sensory centers in the brainstem may mediate respiratory responses by regulating extracellular pH through the activity of the sodium bicarbonate transporter 1 protein (NBC-1). NBC-1 expression has been hypothesized to differ within respiratory centers of the brainstem. The architecture of the brainstem and results of physiological studies suggest that NBC-1 may be expressed more in the retrotrapezoid nucleus (RTN) than in the nucleus tractus solitarius (NTS). To study the developmental expression of NBC-1 in the brainstem, an in situ hybridization protocol was used to identify cells producing GFAP (a glial marker), NFL (a neuronal marker), and NBC-1mRNAs. A variety of different

procedures, including changes in the tissue fixative, application of the probes, amount of probe applied, and thickness of tissue section, were used in developing the in situ hybridization protocol. Confocal microscopy was used to determine the distribution of labeled probes within sections of the brainstem.

40

Kimberly Kernan

Faculty sponsor: Dr. Thomas C. Greene

Department: Psychology

Defining Sense Of Place On A College Campus: An Ideographic Analysis Of Physical Characteristics And Subjective Experiences

Sense of place is an important phenomenological concept that is poorly documented empirically. To understand this experiential phenomenon among college students and how place relationships change over time, this study examined the role of objective physical characteristics (canopy, quadrangles, parking lots, gardens, athletic fields, and plazas) and subjective experiences of familiarity and ownership of a space. Ninety-two St. Lawrence University students participated in this cross-sectional study by color-coding three base maps of the college campus for 1) pleasantness, 2) territory, and 3) favorite places. The maps were digitized using a GIS program and statistically analyzed, which resulted in the construction of raster maps. Broadly, regression analysis demonstrated that landscape pleasantness could be predicted from measure of landscape character. More importantly, a seldom used ideographic analysis was used to capture each individual participant's idiosyncratic preference profile. Cluster analysis revealed similarities between individuals' policies for combining environmental attributes in establishing favorite places. Although many buildings and landscape districts received similar judgments, some buildings (ex. Student Center) were clearly differentially preferred by first-year and sophomore students compared to juniors and seniors. Residual analysis revealed those instances in which the regression formula was or was not successful in predicting judgment of pleasantness and favorite place based on the coded landscape character, pleasantness, and territory maps.

41

Justin Keller

Faculty sponsor: Dr. Watson

Department: Physics

Bohm trajectories in quantum chaotic systems

Bohmian mechanics is an alternative representation of quantum mechanics in which particle trajectories exist even at the microscopic level. This is contrary to the orthodox interpretation where one can make only probabilistic statements about a particle's position at each instant. Bohm's theory introduces a "quantum potential" which guides particles in a classical way. We will demonstrate a few such trajectories calculated for the two-dimensional harmonic oscillator potential, with an emphasis on their role as a potential tool for analyzing systems that exhibit chaotic behavior at the macroscopic level.

42

Ben Høglund

Faculty sponsor: Dr. Brad Baldwin

Department: Biology

The Effect Of Sand Deposition On Atlantic Salmon Eggs And Juveniles

Fisheries scientists from NYDEC have suggested that populations of developing Atlantic salmon (*Salmo solar*), may be affected by winter road sand that deposits into streams. The sand is carried into streams and rivers where it potentially covers the developing salmon eggs or sac-fry. My lab research has been measuring the survival and development of salmon that were subjected to four different treatment levels of sand that was added to 350 ml beakers containing eggs or sac-fry (0g, 5g, 20g and 35g). Preliminary results have shown 100% survival for all treatments after one week of sand application, except for 46% survival for salmon subjected to 35g sand. By week 2 the survivorship in controls was 73%, 40% for 5g, 93% for 20g and 13% for 35g. In another experiment I subjected only sac fry to each of the four treatments. The results showed 100% survivorship for all treatments except for the 35g treatment where only 80% of the fry survived. A third experiment is in progress to determine the ability of fry to unbury themselves from different amounts of sand. This information could be used to help with the future placement of hatchery raised salmon or trout into rivers and it could also provide information on the potentially harmful effect road sanding has on our local aquatic fish communities.

43**Kevyn Hill**

Faculty sponsor: Lorraine Olendzenski

Department: Biology

Wolbachia Endosymbiont Diversity In Insects And Arthropods

Wolbachia is a commonly found bacterium in the reproductive tissue of arthropods species. Transmitted maternally thorough cytoplasmic inheritance, the bacteria can cause parthenogenesis, feminization, and reproductive incompatibility. Research on Wolbachia and its genome may lead to greater understanding of basic reproduction and sex determination in insects. Infection of arthropods by Wolbachia could also offer a more effective and environmentally safe method of pest control. It is thought that Wolbachia infects between 20% and 75% of all arthropods, as well as nematodes and crustaceans. This study seeks to identify the presence of Wolbachia in various species of arthropods including termites, wasps, beetles, and ants by using a PCR based screening method. DNA from insects collected and preserved in 95% ethanol was extracted using an Invitrogen Easy DNA extraction protocol. Primers specific for the 16SRNA genes of Wolbachia (WolbF and WolbR3) were used in PCR amplification to screen for the presence of Wolbachia in each species. Infected jewel wasp (*Nasonia vitripennis*), a well characterized host of Wolbachia, was used as a positive control and were compared to *Nasonia vitripennis* available from Ward's Natural Science Establishment. Termites collected from a variety of sites worldwide as well as locally occurring insects were also screened.

44**Mary Hever**

Faculty sponsor: Lorraine Olendzenski

Department: Biology

The Effects Of N And P Presence On The Symbiosis Of Anabaena azollae and azolla

Azolla is a small aquatic fern that exists in a permanent symbiosis with a cyanobacterium called Anabaena azollae. It has previously been shown that Hoagland's Solution is a good growing medium for Azolla as well as IRRI medium. It has also been shown that high phosphorous levels can cause the disappearance of the symbiont Anabaena azollae. Based on this prior research the presence nitrogen and phosphorous in the Hoagland's medium was tested to observe the effect on the symbiosis. The Azolla plants were grown in 4.0L of an "Algae Grow" medium for 10 days. The plants were then equally separated into 15 bowls (diameter = 10.5cm). Three replicates of five different medias were tested: Algae Grow, Hoagland's, Hoagland's without nitrogen, Hoagland's without phosphorous, and Hoagland's without nitrogen and phosphorous. The Azolla grew for a period of 4 weeks and growth was documented with digital photos. The presence of Anabaena and heterocysts was determined by examining "squash" slides of dorsal leaves. After a period of 20 days there was a noticeable decline in the number of Anabaena azollae and heterocysts in the Azolla grown in the Hoagland's with no phosphorous and the Hoagland's with no phosphorous or nitrogen. After a period of 5 more days the Anabaena azollae were no longer present in the plants grown in Hoagland's without phosphorous and nitrogen.

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Hilary Hartson

Faculty sponsor: Michael Schuckers

Department: Mathematics, Computer Science and Statistics

Sequential Analysis

In this talk we discuss Wald's theory of sequential testing as it applies to testing of proportions. Sequential testing differs from traditional hypothesis testing in that it allows for three possible conclusions to be drawn after a subset of samples have been drawn. These three are: reject the null hypothesis, accept the null hypothesis, and continue testing. We derive the appropriate tests for comparing a proportion against a one-sided alternative and we present Monte Carlo simulation results of these tests.

46

Christine Granato & Jackie Donovan

Faculty sponsor: Karin Bodensteiner

Department: Biology

The Effect Of Hormones On Spatial Cognition And The Hippocampus In Pregnant Hooded Long-Evans Rats

To survive, oocytes must associate with cells from the surrounding ovarian tissue. Maintenance of and

47

Emily Gotta

Faculty sponsor: Lorraine Olendzenski

Department: Biology

Microbial Communities Associated With Rock Varnish: Sequence Analysis Of Eukaryotic 18srrna Genes Amplified From Rock Varnish From Baker, CA

Rock varnish, also known as desert varnish, is a coating composed of clays, oxides, hydroxides, manganese and iron, found on the surface of rocks in many deserts. There has long been a debate over whether rock varnish is formed by inorganic or biogenic processes. One hypothesis is that microcolonial fungi contribute to the formation of rock varnish. In this study, the eukaryotic community associated with rock varnish is being examined using a PCR based approach. This project involves analysis of sequences obtained from previous work by Randall Perry (University of Washington) and Lorraine Olendzenski. Desert varnish was collected from coated rocks in Baker, California by grinding rock surfaces. Samples were extracted, amplified and sequenced at the Josephine Bay Paul Center, Woods Hole, MA. Two rock dust samples from different sites were subjected to physical DNA extraction using the Qbiogene Fast DNA extraction kit and a Bead Beater DNA extraction shaker. PCR amplified bands were obtained from DNA extractions using eukaryotic specific primers for 18SrRNA genes. Amplified products were prepared for sequencing by cloning into the Invitrogen TA plasmid. Sequence analysis performed at St. Lawrence University shows that the sequences obtained correspond to ascomycete fungi. Alignments of partial sequences with close relatives in the GenBank database were created using ClustalW. Phylogenetic analyses using the Neighbor Joining distance method were obtained to characterize the 18SrRNA clones. Future work will involve a comparison of the rock varnish community profile with the microbial community amplified from nearby soil samples.

48

Melissa Glotzbecker

Faculty sponsor: Kathryn Potoczak

Department: Psychology

The Effect Of The Tone Of Feedback On Performance

This study examined the impact of tone of feedback on verbal and motor performance. Fifty-six Introductory Psychology students were tested on two sets of tasks in a between-subjects design in which feedback of one of three tones (positive, negative, or neutral) was administered via audio cassette. There was also a no-feedback control condition. In addition, the self-efficacy in relation to each task was recorded by each participant. Results show that with the second motor task there was a significant difference in the rating of self-efficacy in participants in the no feedback condition to those in the neutral feedback condition and the negative feedback condition. Otherwise, there were no significant differences found with regard to performance due to tone of feedback in the experimental conditions, which does not provide support for the hypothesis that feedback type has a bearing on performance.

49

Louise Gava

Faculty Advisor: Brian Watson

Department: Physics

Interspecies Communication: It's Up To Our Interpretation

Koko the gorilla, famous for her use of over 1,000 signs, and Rico the Border Collie, famous for his ability

to understand the words for 200 toys, are smarter than the average bear and other mammals. Primates are human's closest ancestors and dogs are man's best friend; do these connections have anything to do with our ability to communicate with them? I investigated claims of interspecies communication between primates and humans as well as between dogs and humans. I separated communication into three categories; verbal language, gestures (which included sign language and body cues), and telepathy. It is argued that the essence of language is syntax and that without the expression of proper syntax it is assumed the language is not really understood. It is also the general conception that verbal language has two parts, comprehension and production. To determine if other species can communicate with humans it must be decided if animals that can comprehend but not produce human language are really using the language. It must also be questioned if understanding words, but not using them in sentences (application of syntax), shows the use of language. Much interpretation is involved in answering the question of interspecies communication. Two examples of this interpretation include how I chose to answer the previous questions, as well as how researchers interpret the signs and other responses by their test animals. I give evidence to support interspecies communication; however, this communication between humans and primates and humans and dogs is not via human language. Although Koko and Rico are more than cute furry mammals and they can communicate with their trainers, it is a misinterpretation on the part of humans to consider this communication an understanding of human language.

50

Marina Funtik

Faculty sponsor: Lorraine Olendzenski

Department: Biochemistry

The Effect Of Sodium Fluoride (NaF) On Coaggregation In Oral Bacteria In Vitro Using Fluorescence In Situ Hybridization (FISH), Confocal Microscopy And A Flow-Cell Model

This study focuses on the coaggregation of the caries-producing bacteria that dwell in human supragingival dental plaque and the role of fluoride in the possible disruption of their coaggregation. Dental plaque is a complex biofilm and is comprised of more than 500 bacterial species that normally live in the human oral cavity. Coaggregation involves the attachment of genetically distinct bacteria to one another, facilitated by recognition between complementary lectin-binding sites on their cell surfaces. These bacterial interactions are presumed to play an important role in the bacterial co-adherence and their colonization to the host surfaces, namely tooth enamel. Two coaggregation partners that live in the human oral cavity were investigated: *Streptococcus gordonii* (DL1) and *Actinomyces naeslundii* (MG1). We implemented a previously described flowcell model to closely mimic the growth conditions in the human oral cavity to allow biofilm formation. Confocal microscopy of Fluorescence In Situ Hybridization (FISH), using a streptococci-specific oligonucleotide probe (E72) and a nonspecific nucleotide dye (Draq5), allows high magnification imaging of coaggregation in the presence of saliva as a sole nutrient source. The bacterial cultures were allowed to coaggregate within the flowcell in the presence of sodium fluoride (NaF). Low NaF concentrations are not as effective as EDTA in disrupting the biofilm. However, our study demonstrates that a 2% solution of NaF, found in most decay-preventing fluoride gels, completely halts bacterial growth. Further study in vivo is needed to evaluate NaF effectiveness in disruption of dental plaque.

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Ronak Desai

Faculty sponsor: Loraina Ghiraldi
Department: Neuroscience

Effects Of Oxytocin On Social Recognition In Male Rats

Oxytocin has been shown to facilitate social recognition of conspecifics in rodent models. In this experiment, social recognition of a stimulus juvenile (25-35 days of age) was tested in adult (60-90 days of age) Sprague-Dawley male rats injected with oxytocin (either 1.5ng*kg or 10ng*kg) or placebo (9% physiological saline). To assess recognition, a juvenile male or female rat was introduced into the home cage of the subject for a 5-minute Pre-test session. Following a subcutaneous injection and a 25-minute delay, the same juvenile was then reintroduced for a second 5-minute Post-test session. During each test session, the number and duration of investigations (e.g., sniffing and licking) of different areas of the juvenile's body were recorded. As expected, there was a significant reduction in social investigations across all subjects at Post-test in comparison to Pre-test. In addition, the sex of the stimulus juvenile produced no effect. Contrary to expectations, oxytocin-treated subjects did not significantly differ in the total number of investigations displayed when compared to controls. These results are surprising in light of previous research. However, compared to Pre-test scores, there was a marginally significant decrease in the number of Post-test investigations of the juveniles' head and torso areas by the oxytocin-treated subjects ($p = .06$ and $p = .08$, respectively). Forthcoming analyses on the duration of social investigations may yet uncover and clarify the influences of oxytocin on social recognition.

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Tracey Damon

Faculty sponsor: Joseph Erlichman
Department: Neuroscience

The Ventilatory Effects Of Impaired Astrocytic-Neuronal Lactate Shuttle In The Rat

Recent studies suggest neurons may support most of their metabolism via the oxidation of extracellular lactate derived from astroglia. Lactate and other energy-rich substrates produced by astrocytes are transported into the extracellular space by the monocarboxylate transporter, MCT1. Neurons are capable of transporting carboxylate fuels into the cell via MCT2. The large flux of lactate between these two cellular compartments suggests that lactate could have a substantial effect on extracellular pH (pH_o) if astrocytic efflux or neuronal uptake were altered. To test this hypothesis, we placed push-pull cannulae in the retrotrapezoid nucleus (RTN) of 12 rats and examined the ventilatory effects of artificial cerebral spinal fluid alone (aCSF) versus aCSF plus the MCT inhibitor, 4-hydroxycinnamate (4-Cinn; 100uM), during graded hypercapnia. Although 4-Cinn inhibits both MCT isoforms, MCT2 is more potently inhibited with 100uM 4-Cinn than MCT1. In 8/9 rats, 4-Cinn perfusion in the RTN approximately doubled expired minute ventilation (VE) across all levels of CO_2 tested (room air-8%). The increase in VE was the result of both an increase in tidal volume and frequency of breathing. These findings suggest that impaired neuronal uptake of lactate by MCT2 can lead to a rapid decrease in pH_o and subsequently increase ventilation as a result of activation of central respiratory chemoreceptors. This work was supported by NIH HL71001.

53

Alyson Courtemanch

Faculty sponsor: Erika Barthelmess

Department: Biology

Spatial And Temporal Land Cover Changes In A Pastoral Rangeland In Southern Kenya

Pastoralism (raising and herding livestock) is widely regarded as the form of human land use that is most compatible with wildlife. Throughout East Africa, the traditional way of life of pastoralism is still widely practiced. However, land privatization, urbanization, and a growing human population, has led to shrinking communal pastoral rangelands, resulting in overgrazing, desertification, and abandonment in some areas. Using satellite imagery from 1970-2000, I examined landscape-level changes on the Shompole Group Ranch, a communally owned Maasai pastoral rangeland in southern Kenya. I hypothesized that percent and distribution of land cover would remain constant or decrease over time in intensively and moderately grazed areas of the group ranch. Using three satellite images from 1973, 1986/87, and 2000, I classified the land cover of the Shompole Group Ranch using an unsupervised classification and compared land cover percent and distribution over the 30-year time period. Additionally, I conducted on-site ground-truthing in the form of vegetation surveys at the Shompole Group Ranch during January 2005. Preliminary results indicate that percent land cover remained the same or decreased in continually grazed areas from 1970-2000. Unlike some other areas in East Africa, this study suggests that livestock grazing pressure on the Shompole Group Ranch is not high enough to cause adverse impacts on the landscape-scale.

54

Tim Chapp

Faculty sponsor: Samantha Glazier

Department: Chemistry

Synthesis, Characterization And DNA Intercalation Of Ru(Bpy)₂(Dcbpy)

DNA is a complex biological molecule that influences everything from one's hair color to the likelihood of getting cancer. As such, compounds that have the ability to identify specific regions of DNA or alter the functionality of DNA in a specific way are useful to study. Molecules that intercalate have the ability to weave in portions of their structure between the base pairs of DNA.¹ Once a molecule is bound to DNA in this way, both the structure and function of DNA are altered. From a medicinal standpoint, understanding site specific intercalation will increase the understanding of how to develop pharmaceuticals that require binding to DNA to inhibit harmful replication, for example, the growth of cancerous cells.² Ruthenium polypyridyl complexes are water soluble, luminescent, and stable making them easy to work with and attractive candidates as possible intercalators. The goal of our research is to synthesize, characterize and study the intercalation properties of Ru(bpy)₂(dcbpy). By adding the 3,3'-dicarboxy-2,2'-bipyridine (dcbpy) ligand we hope to make comparisons between the characteristic properties of Ru(bpy)₃ and Ru(bpy)₂(dcbpy). We have found that Ru(bpy)₂(dcbpy), when compared to Ru(bpy)₃, shows a reduction in quantum yield (λ_{em}), extinction coefficient (ε), and its Stern Volmer (K_{sv}) constant when quenched by potassium ferricyanide. However, unlike Ru(bpy)₃, Ru(bpy)₂(dcbpy) shows good binding affinity to DNA. Further work is required to determine the binding mechanism of Ru(bpy)₂(dcbpy).

¹ Erkkila, K. E.; Odom, D. T.; Barton, J. K. *Chem. Rev.* 1999, 99, 2777-2795.

² Wilhelmsson, L. M.; Westerlund, F.; Lincoln, P.; Norden, B. J. *Am. Chem. Soc.* 2002, 124, 12092-12093.

55

Elizabeth Chadwick

Faculty sponsor: Dr. James Wallace

Department: Psychology

Probability Judgments And The Risky Decisions Children Make

What is the relationship between the understanding of probability and risky decision making? In the present study, 48 boys and girls from the 5th grade and 8th grades were shown a series of 18 cards, each with two different mixtures of blue and white marbles glued to them. The students were asked to decide from which side they would want to choose, if the mixtures were hidden and if they were trying to pick either a blue or a white marble in a blind draw. Their choices, or probability judgments, were intended to reveal their understanding of proportions and chance. In a second task, children were able to make risky decisions in a gambling game. They could chose to win a small, but fixed number of prizes or take a chance in a blind draw either to gain a large number of prizes or to lose prizes. There were nine trials of this game and the number of their risky decisions was the dependent measure. The proportions of prizes were altered so that on three of the trials, it was an advantage to take a risk, on three trials it was a disadvantage, and on three trials the expected value of their decision was equivalent. Performance on the two tasks will be compared and analyzed to investigate the hypothesis that children who do worse on the probability judgment game will make riskier judgments on the gambling game, especially when it was disadvantageous to do so.

56**Joanne Cavallerano**

Faculty sponsor: J.M. Erickson

Department: Geology

Growth Of The Dead Creek Distributary Of The Missisquoi River, Lake Champlain, Vermont, Between 1950 And 2003

This study has determined expansion rates of the Dead Creek Distributary of the Missisquoi River in the northeastern portion of Lake Champlain, Franklin County, Vermont. The modern development of Dead Creek Distributary can be traced to its reactivation by levee breach during the flood of November 1927. Fillon (1969) found that between 1927 and 1969 Dead Creek lengthened its distributary by 1000 feet (305 meters). This delta system is controlled by local precipitation, flooding events, upstream erosion, and anthropogenic changes. Digital aerial photography digitized in a GIS provided the foundation for determining progradation of the Missisquoi delta. Five sets of aerial photographs from the 1960s to present day depict distinct geomorphic changes to the distributaries in Missisquoi Bay. Our study also employs USGS water resource data and NOAA precipitation and lake level data to evaluate changes in discharge of the Missisquoi River, and precipitation over the past 50 years. Currently, sedimentation within the bay has shifted from the pre-existing bird-foot delta north of Hog Island to the Dead Creek Distributary. Changes to the distributary in the past fifty years include a greater than fifty percent increase of sedimentation, with an estimated 8,000 m² of surface area added to the delta lobe per year. Channel length has increased significantly from 1962 to 2003, growing approximately 760.8 meters (18.8 m/y). Furthermore, a well-developed channel and levee system has started to form on the surface of the Dead Creek Delta. Our results suggest changes within the Missisquoi River drainage basin have significantly impacted the Dead Creek Distributary.

57

Samuel Casella

Faculty sponsor: Karin Bodensteiner

Department: Biology

Immunohistochemical Localization of Basement Membrane Proteins in Rat Ovarian Follicles

To survive, oocytes must associate with cells from the surrounding ovarian tissue. Maintenance of follicular integrity is achieved, at least in part, via secretion of a basement membrane (BM) containing collagen IV, laminin, and fibronectin. The BM is involved in cellular proliferation and differentiation and is essential for normal follicular development. Knowledge of basement membrane protein expression during normal follicular growth is essential for the development of a system able to sustain these cells in vitro. Ovarian sections from 4, 7, 23, and >50 day old rats were stained for Laminin, Fibronectin, or Collagen type IV. Draq-5 was used to label nuclei. The slides were visualized using confocal microscopy. Fibronectin, collagen IV, and laminin were present in the basement membrane of ovarian follicles from primordial to early tertiary stages of follicular development in rats at the pre-pubertal, pubertal, and mature stages of development. These techniques can now be used to monitor the maintenance and/or repair of the BM in enzymatically isolated follicles cultured in vitro. Development of a culture system that allows for completion of follicular growth and oocyte maturation in vitro would have profound implications for the in vitro fertilization and embryo transfer industries.

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Ben Carr

Faculty sponsor: Dr. Watson

Department: Physics

Bible Codes: Divine Insight or Human Mistake?

"George W. Bush High Priest" or "son of Satan?" For many years scholars have looked for predictions of the future embedded in code in the Torah. Until recently these attempts had come to naught, but with the aid of computers and their ability to examine equidistant letter sequences, new messages were discovered. Or were they? Equidistant letter sequences are found by picking a starting letter and a number in a given text, then counting over from the first letter the number of spaces chosen and pick out that letter. Continue until you find a message. These code sequences have been used to show both the messages "Bush is a son of Satan" and "George W. Bush, high priest" hidden in the Torah. Supporters claim statistics can be used to prove the messages are not purely random, while critics claim the messages are purely random. In this paper I will examine the arguments given by the supporters with a focus on their procedure and data interpretations. An objective examination shows no evidence that the messages are intentionally placed in the Torah.

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Matthew Burton-Kelly

Faculty sponsor: J. Mark Erickson

Department: Geology

An Analysis Of Multiple Trackways Of Protichnites Owen, 1852, From The Potsdam Sandstone (Late

Cambrian)

Late Cambrian arthropod trackways from the Potsdam Sandstone have been known since the 1850's. A site in northern New York is an outcrop of fine-grained, quartz-rich, rippled, micro-laminated Potsdam Sandstone. A similar site near Kingston, Ontario, has been described as the first evidence of land animals. Our study area includes evidence of microbial mat growth on the original surface on which the trackways were produced. Ripple marks presumably underlay and therefore were generated prior to the microbial mat. Preservation of these trackways is variable over the outcrop and is indicative of a high intertidal or low supratidal environment with microbial growth. At least eleven distinctive trackways of multi-legged telson-bearing individuals are present with a roughly bimodal size distribution (widths of 11.6 cm, 6.5 cm, 10 cm and 7.2 cm). A disturbance at the intersection of trackways 1 and 2 has been interpreted to show the earliest evidence of invertebrate mating activity (Erickson, 2004). Trackway 1 (11.6 cm wide) consists of repeated series of seven pairs of imprints arranged in a chevron pattern. The organism was traveling in the direction of the convergence of the chevron pattern. The trackways are consistent in number of imprints per series (leg number?) and stride lengths with members of the original descriptions of *Protichnites* Owen, 1852, although a tridactyl condition can not be recognized on any digit. Variable preservation probably resulted from varying thickness of the microbial mat and/or varying water depth or wind and wave action in an intertidal pool.

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Chad Burbank, Jasper Burch, Chelsea Byrnes, Amy Gardiner, Allison Hartnett, Elisabeth Henry, Eloise Hilarides, Chelsea Lemke, Sara Merrihew, Jessica Mott, Kimberly Parker, Karlin Revoir, Darcie Robinson, Sheila Rodriguez, Chelsea Sauve, April Spearance, Alexa Unser, Melinda Zocco
Faculty sponsor: Jonathan Gottschall
Department: Psychology

The Beauty Double Standard In World Folk Tales

It is commonly argued that western societies place greater emphasis on female physical attractiveness than on male physical attractiveness, and that this is a product of social conditioning in western societies (e.g., Wolf 1992). This is the hypothesis we call "the beauty double standard". However, until now, very little cross-cultural research has been conducted to determine whether or not this double standard is particular to western societies or whether it exists cross-culturally. Through a multiple-coder content analysis of 98 culturally diverse collections of folk tales we attempt to: 1) get a sense for the cross-cultural prevalence of the beauty double standard, and 2) test the "nurture assumption" about the origins of the double standard in western societies. The principal finding is that, without exception across the dozens of culture areas examined, female beauty is emphasized more than male beauty. When corrections are made for imbalances between male and female characters, there are 4-5 times more references to female physical attractiveness in the collections.

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Amy Gardiner
Faculty sponsor: Jim Wallace
Department: Psychology

Children's Prioritization Of Costs And Benefits In Risk Decisions Across Age And Risk Proneness

Individual differences in risk-taking behavior are obvious among children, and an intriguing perspective from which to look at these differences is cost-benefit analysis. How do different children assess the same risky situations and how do their assessments lead some to take many risks while others rarely take any? A tenable answer to this question describes differences in children's prioritization of costs and benefits while making risky decisions. Perhaps those children who are inclined to take risks pay most of their attention to benefits, greatly ignoring costs, while the inverse is true for those with slighter risk-taking tendencies. This study was designed to measure risk-proneness and cost-benefit prioritization during risky decision making. A total of 72 children participated, eight males and eight females from each of four grades: kindergarten, first, second, and third. All children attended Banford Elementary School in Canton, NY at the time of the study. Participants played two games in which they had opportunities to win and lose prizes. One game measured each child's degree of risk-taking and another measured how each prioritized costs and benefits when faced with the possibility of taking a risk or playing it safe. Additionally, the children's teachers filled out a questionnaire, rating each child on his or her likelihood to show certain risky behaviors. Analyses will be done to determine how age and risk-proneness are related to cost-benefit prioritization. We predict that a high degree of risk-taking will be positively correlated with prioritization of benefits over costs, and that younger children will take more risks and prioritize benefits over costs more so than older children.

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Liana Boop, Lance Branch, Daniel DeLorme, Mackenzie Ewing, John Forrette, Jared Fostveit, Erica Guralnick, Julia Jones, Sarah MacFarland, Maia Moyer, Kevin O'Connor, Spencer Paige, Ann Sargent, Linnea Smolentzov, Michael Stafford, Adam Tapply, Lindsey Taylor, Sammie-Jo Therrien
Faculty sponsor: Jonathan Gottschall
Department: Psychology

Romantic Love: Western Invention Or Human Universal

Much humanities and social science research assumes that romantic love is a western "social construction." In spite of its enduring popularity and persistence, the social constructivist view has not gone unchallenged. The strongest objection comes from a series of theorists who base their analyses on evolutionary principles, and who contend that romantic love is part of a universal human repertoire. In other words, it is not something that people experience in only the Western hemisphere, or in those countries where the West has exerted profound cultural influence, but an emotion that we can expect to find in any culture. In 1992, the anthropologists William Jankowiak and Ted Fischer tested this idea by examining a sample of 166 societies in the ethnographic record. They found evidence of romantic love in no less than 147, or 88.5 per cent, of these societies. The present study describes the first attempt to replicate Jankowiak and Fischer's ethnographic study within the sphere of fictional narrative. Using their basic definition of romantic love we performed an empirical computer-driven keywords-in-context (KWIC) analysis of a broad range of folk-tales from around the world. References to romantic love were found in 68% of the collections analyzed and in all cultural groups. Moreover, references were most frequently encountered not in western collections, but in collections of Indian (Asian), Japanese, and North West Coast Indian folk tales. Our results are inconsistent with the strong social constructivist argument that romantic love is a western invention and consistent with the evolutionary hypothesis.

63

Andrew Boyer

Faculty sponsor: Joseph Erlichman

Department: Neuroscience

Optical Mapping Of Voltage Changes In Cells Involved In Respiratory Control In Medullary Brain Slice

Potentiometric probes provide a powerful method for studying the distribution of cellular activity in small populations of cells simultaneously. Using epifluorescence microscopy coupled with a cooled CCD camera we studied CO_2 /pH sensitive regions of the medulla involved in central respiratory control by loading brain slices with the voltage sensitive dye Di-8-ANEPPS (DIA). DIA is a dual-excitation dye that has an improved S/N ratio, normalizes for differences in dye loading, tissue thickness and photobleaching. Membrane potential changed in all cells tested during exposure to hypercapnic acidosis. In chemosensitive sites (intermediate reticular nucleus, IR; locus coeruleus, LC; and retrotrapezoid nucleus, RTN) cells depolarized an average of 11.2 mV (IR; n=30), 8.9 mV (LC; n=67) and 9.2 mV (RTN; n=26), respectively. In contrast, in non-chemosensitive sites (spinotrigeminal tract, SPT; Gigantocellularis, G) some cells depolarized 8.8 mV (SPT; n=73) and 3.6 mV (G; n = 77) while others hyperpolarized -6.4 mV (SPT;n=27) and -2.1 mV (G; n=23). The addition of high Mg^{++} /low Ca^{++} solutions to block synaptic transmission reduced the magnitude of the voltage responses to CO_2 . These findings suggest that Di-8-ANEPPS may be a useful tool for studying CO_2 sensitivity in the brainstem that could be coupled with the measurement of other fluorescent ion indicators such as pH and Ca^{++} . [Supported by NIH HL71001 and HL56683].

64**John Beal**

Faculty sponsor: Brad Baldwin

Department: Biology

Road Salt Accumulation In North Country Waters

The excessive road salt application in the North Country and Adirondacks is an important safety measure during the icy winter conditions. Many of the beautiful Adirondack and North Country lakes are highly developed with surrounding houses and roads. Many of these roads are salted on a regular basis during the winter months. Some of these lakes may be at more of a risk than others depending on characteristics such as depth, size, and number of inflow/outflow streams. By looking at these characteristics and surrounding roads I was able to choose six lakes to measure salt concentrations. The lakes chosen include Mirror Lake, Lake Placid, Cranberry Lake, Oseetah Lake (Near Saranac Lake), Raquette pond (Near Tupper Lake), and Star Lake. Winter measurements of dissolved chloride ions showed that x lakes had concentrations above 100 mg/L, similar to the high values that colleagues at Clarkson University (Dr. Tom Langen) have measured for the Cascade lakes, near Keene Valley, I will repeat these measurements during and after spring melt to see if levels change. I am also in the process of creating a list, with the use of GIS, of approximately 15 lakes in the North Country and Adirondacks that are potentially at risk of high chloride levels. This could help the New York Department of Transportation to be aware of the road salt problem areas and to possibly look for alternate methods of deicing in these areas.

65**Molly Baker**

Faculty sponsor: Loraina Ghiraldi
Department: Psychology

Effects Of Environmental Enrichment On Social Behaviors In Male Mice

This study was designed to investigate the effects of social and physical enrichment on social behaviors in male CD-1 mice. 32 juveniles (24-30 days of age) and 32 adults (59-65 days of age) were randomly assigned to individual or paired housing in either a physically enriched cage (containing a nestlet and a 3-hole PVC joint) or a standard cage. After 7 weeks, each subject was tested for social behaviors toward an unfamiliar male conspecific in a neutral cage. During a 10 minute test, the number of aggressive behaviors (lunges and attacks) and investigatory behaviors (sniffing and licking) were recorded. Chi square analyses revealed that more individually housed animals, regardless of age or physical environment, displayed aggression in comparison to paired subjects ($p < .05$). ANOVA revealed that individually housed animals displayed significantly more aggression than paired subjects. With respect to social investigations, ANOVA revealed a significant interaction between age and social environment. Specifically, paired juveniles showed more investigations than individually housed juveniles. Interestingly, the opposite occurred in adults, such that paired adults showed less social investigations than those individually housed. The developmental implications for these results warrant further investigation. In general, the social environment affected social behaviors more than the physical environment. Contrary to hypotheses, physical environment produced no significant effects on social behaviors in either age group. This was unexpected in light of previous studies.

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Tricia Bacon

Faculty sponsor: Jim Wallace
Department: Psychology

Video Games And Risky Behavior: Is Locus Of Control A Mediator?

Can locus of control serve as a link between video game play and risky behavior? Villani (2001) found that the primary effects of media exposure are increased violent and aggressive behavior as well as a significant increase in risky behaviors. Singleton and Hovden (1987) found that locus of control, significantly "explained traditional and stable differences between sexes on attitudes and behavior related to risk". A total of 84 fifth and eighth grade students (34 males and 50 females) from Massena Central and Corinth Central High Schools participated in the study. Each participant completed three questionnaires: (1) a measure of the level of video game play in the past month, (2) the Nowicki-Strickland locus of control questionnaire, measuring the degree to which people perceive an outcome of their behavior to be contingent of their own behavior, skill, or abilities (Nowicki & Strickland, 1973), and (3) the students' estimate of their participation level in socially encouraged and discouraged risky behaviors. It was predicted that as the participation level in video game playing increased, the general tendency to attribute outcomes to internal factors such as skill and ability would also increase. In turn, as people believe that their abilities or personal characteristics are responsible for successful outcomes, they were predicted to be more likely to engage in risky activities. Data analyses will determine if video game playing and locus of control combine to predict risk taking.

Travis Aubry

Faculty sponsor: Mark Erickson

Department: *Geology*

Statistical Analysis Of Unionoid (Bivalve) Mussel Populations With Emphasis On Local Geology As Conditional Restraint For Specific Genus

There are nineteen Unionoid (Bivalve) Mussel species that are native to the St. Lawrence valley's water systems. By evaluating and graphically representing these species populations in the Grass, Oswegatchie, Raquette, and St. Regis rivers conclusions entailing their specific environments can be constructed. These environments create conditions that allow or disallow certain species of mussels to be active in some or all of these waterways. From the creation of survivorship curves, growth rates and dendrograms relating to the occurrence of one genus with another or one locality with another creates a algorithm whereby followed concludes what species can be found in a certain locality. Relating these localities or geologic environments to one another produces classifications by which these Unionoid Mussel's follow and thus can be illustrated graphically to understand the environments key to certain species of Unionoid Mussels.
