

**Cornell Undergraduate
Research Board**

~ Presents ~

24th Annual Spring
Research Forum



April 15th 2009
Proceedings and Abstracts

THE CORNELL UNDERGRADUATE RESEARCH BOARD



The Cornell Undergraduate Research Board (CURB) is an organization dedicated to enhancing the Cornell University undergraduate research experience. CURB is committed to fostering academic excellence through undergraduate interaction at events that bring student endeavors to the forefront of the Cornell community's attention.

CURB's key event is the annual spring undergraduate forum. Hundreds of undergraduates from all majors and disciplines have presented their hard work for over 20 years in undergraduate forums. In addition, keynote speakers including Bill Nye (College of Engineering, 1977) have addressed the research and Cornell community with words of advice to help guide them on their paths to the future.

There's no typical undergraduate experience, and furthermore, there is no typical undergraduate research experience. CURB's mission is to help undergraduates with a nascent desire for research to find their niche at Cornell; a process that we hope aids them in defining themselves and their dreams for the future.

For more information about the Cornell Undergraduate Research Board, please visit <http://www.research.cornell.edu/curb/> or email curb@cornell.edu

PREFACE

Welcome to the 24th Annual Cornell Undergraduate Research Forum! The Cornell Undergraduate Research Board (CURB) is honored to have Francis X. Diebold, the J.M. Cohen Professor of Economics, Professor of Finance and Statistics, and Co-Director of the Financial Institutions Center at the Wharton School, University of Pennsylvania, and Faculty Research Associate at the National Bureau of Economic Research in Cambridge, Mass.

This year's abstracts reflect the genuine enthusiasm for research harbored by both Cornell undergraduates and their dedicated faculty mentors. Student research is further celebrated by showcasing projects in poster and oral presentation formats. Monetary prizes will be awarded to the top three presenters based on a weighted vote by students and faculty members.

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MARILYN EMMONS WILLIAMS AWARD

The Marilyn Emmons Williams Award is annually presented to the dean, administrator, faculty member or student who has contributed significantly to promoting undergraduate research at Cornell University.

Named after CURB's beloved advisor emeritus this award is a testimony to her unrelenting commitment to Cornell and undergraduate research.

The first member of her own family to attend college and to earn a PhD, Marilyn has recognized how difficult it can be for first-generation college students to find their way in a large research university. With this dedication in hand she went on to develop the undergraduate research program into one that has gained national recognition.

The Cornell community and the Cornell Undergraduate Research Board wish to thank this year's award recipient, **Professor Lara Estroff** for her advocacy of undergraduate research in the tradition of Dean Williams.

Lara Estroff is an assistant professor in the department of material science and engineering. Professor Estroff conducts research in the area of bio-inspired materials synthesis and has been praised as an enthusiastic, dedicated, and patient mentor who helps her students with a wide variety of undergraduate research projects.

Nominations for the award are accepted year-round, and are announced at CURB's Annual Spring Forum.

KEYNOTE SPEAKER: Francis X. Diebold

Francis X. Diebold is J.M. Cohen Professor of Economics, Professor of Finance and Statistics, and Co-Director of the Financial Institutions Center at the University of Pennsylvania and its Wharton School, and Faculty Research Associate at the National Bureau of Economic Research in Cambridge, Mass. Diebold works in econometrics, forecasting, finance and macroeconomics.

He has published extensively and has served on the editorial boards of numerous journals, including *Econometrica* and *Review of Economics and Statistics*. He is an elected Fellow of the Econometric Society and the American Statistical Association, and the recipient of Sloan, Guggenheim, and Humboldt fellowships.

A prize-winning teacher and popular lecturer, Diebold has also held visiting appointments in Economics and Finance at Princeton University, the University of Chicago, Cambridge University, Johns Hopkins University, and New York University.

From 1986-1989 he served as an economist under Paul Volcker and Alan Greenspan at the Board of Governors of the Federal Reserve System in Washington DC. He received his B.S. from the Wharton School in 1981 and his Ph.D. in 1986, also from the University of Pennsylvania. He is married with three children and lives in suburban Philadelphia.

This event would not have been possible without the support and funding of numerous individuals and departments. We would like to extend our gratitude for this assistance!

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The Research Paper**

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Bruce Monger, *CURB Advisor*
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Lisa Shaffer, Director of Student Services, *Hotel Admin Grad Program*
Laurel Southard, *Director of Undergraduate Biology Research*
Lesley Yorke, *Office of the Vice Provost for Research***

AND

The Presenters of the 24th Annual Undergraduate Research Forum!

Nicholas Abel '10
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Human Development

Dr. Daniel Barbash

**Classifying the role of the hybrid lethality gene *Lhr* in
the regulation of heterochromatin in *Drosophila***

Species are generally defined as two groups of interbreeding populations that cannot interbreed between the two populations. In our lab we study the interbreeding of two *Drosophila* species, *Drosophila melanogaster* and *D. simulans*, and the hybrid incompatibilities that arise from a mating of the two. In the *D. simulans* gene *Lhr* (lethal hybrid rescue) a mutation that caused a loss of function was found to rescue hybrid male inviability when *D. simulans* males were crossed with *D. melanogaster* females. At the molecular level *Lhr* has been shown to co-localize with *HPI* (Heterochromatin protein 1) in the heterochromatic regions of polytene chromosomes. Results from numerous other assays performed strongly suggest *Lhr* to be a heterochromatic protein. With the knowledge *Lhr* was a HP we wanted investigate its properties compared to other HPs. A standard experiment used to examine chromatin-associated proteins is a position-effect-variegation (PEV) assay. The key component of a PEV assay is inversion of a gene into the heterochromatic region of the chromosome. Usually what occurs is "gene silencing" where the heterochromatin "invades" and the inverted gene cannot be expressed fully resulting in a mosaic pattern of expression. This mosaic pattern of expression can be affected by modifiers of variegation. There are two types of modifiers: suppressers and enhancers. A cross was done where a mutated copy of *Lhr* was in the same fly as a variegating gene. The degree of variegation was compared with *HPI*, which is established in the literature as a suppresser of variegation. Analysis of the results showed that *Lhr* is a suppressor of variegation.

Poster Presentation

Alex Ainslie '10
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Computing, Cognition & Aesthetics

Modeling Community : Mobile Sensing and Network Analysis

Commercially available devices with embedded sensors and networking hardware are becoming increasingly pervasive. This preliminary work examines the sensed digital traces shared by such devices to inform a richer understanding of social behavior and network structure. Two sensing platforms are being developed to continuously scan and log information about discoverable, collocated Bluetooth-enabled devices. Analysis of collected data will focus on network structure and will draw from the social sciences. Particular emphasis will be placed on network properties (density, etc.) and evolution over time.

Poster Presentation

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Independent Major
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Robin Bellinder

A Novel Method of Thermal Weed Control

Traditional thermal weed control techniques use direct combustion of fossil fuels to generate heat. This technique of weed control is highly effective for most applications, but it is relatively expensive, labor-intensive, and harmful to the environment. In this presentation I will discuss a novel method of thermal weed control which uses electricity to generate heat in a resistive wire. Both 2-4 and 4-8 leaf lambsquarters (*Chenopodium Album*) and barnyard grass (*Echinochloa crus-galli*) were treated for 15 seconds at a rate of 2kW/ft² resulting in an estimated temperature of 700C at the leaf's surface. The youngest lambsquarters were completely controlled by this treatment. 2-4 leaf barnyard grass was highly controlled, but exhibited regrowth after treatment. Larger lambsquarters were severely damaged, and the larger barnyard grass was poorly controlled. This experiment showed that using this method to control weeds can be highly effective, though further study is needed to determine optimal rates of exposure to adequately control older weeds.

Poster Presentation

Danial Asmat '09
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Policy Analysis and Management
(Consumer Concentration)
Prof. Sharon Tennyson

Claims Settlements in Car Insurance: Does the Law Affect How Much Money Your Insurance Company Will Pay You After an Accident?

It is common practice for automobile insurance companies (“insurers”) and their clients (“insureds”) to haggle over how much money is owed to the insured following an accident falling under the insurance policy. When insureds are unhappy with their insurer’s reimbursement offer or the time it takes to pay it, “bad faith” liability gives consumers the power to sue their insurer. States that allow insureds to sue on bad faith grounds classify the claim in one of the three ways: tort, contract, or statute. The tort classification interprets bad faith as harming the insured in extra-contractual ways; it allows for non-economic damages such as mental anguish that are typically not allowed in contractual or statutory suits. Because of this, one would expect insurers in states under bad faith tort regimes to pay insureds more: they have a strong incentive to avoid potentially costly litigation if the insured accuses them of bad faith. I test this hypothesis using regression analysis, measuring the effect of bad faith tort law on average claims settlements.

The conventional approach is to measure the change in average claims payments cross-sectionally, controlling for relevant variables, such as the severity of the accident and other accident characteristics. Using this method, I replicate earlier findings that show a significant, positive relationship between bad faith tort regimes and claims costs. Using a time-series approach, however, and examining changes in claims payments through the 1980’s and 1990’s in states that changed their bad faith laws, I find no effect of the law on claims payments. These findings cast doubt on the presumption that bad faith tort law leads insurers to settle at higher values than they would in its absence, a belief that is essential to the theoretical argument in favor of bad faith tort law in general.

Oral Presentation

Sharon Avgush '10
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Biology & Society

Manuel Aregullin

Catalpa as a Potential Anti-Malarial Agent

Malaria requires prompt treatment within twenty-four hours to minimize damage and access to affordable, effective antimalarial drugs is crucial to control and reduce the cases of Malaria. The first malaria treatment came from powdered bark of the chinchona tree, containing the plasmodicidal quinoline alkaloids quinine and quinidine. These natural compounds served as a basis for synthetic antimalarial drug development at the turn of the century, with chloroquinoline as the leading cost-effective drug of choice. Recently, chloroquinoline mono-treatment has resulted in resistance of the drug. A new cost-effective multi-treatment strategy must be examined. Here, we examine the potential bioactivity of Catalpa, a deciduous flowering tree of the Bignoniaceae, anecdotally known to have been used by Native Americans as an anti-malarial treatment.

Poster Presentation

Michele Batista, '09
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Animal Science

Sylvia Bedford-Guaus

Investigating the role of protein kinase A in the acrosome reaction of stallion sperm

In mammals, ejaculated sperm cannot fertilize an oocyte and must undergo changes that are conferred by the environment in the female reproductive tract in order to become fertilization-competent; collectively these changes are termed “capacitation.” Capacitation of sperm can be achieved *in vitro* by incubating sperm in a defined medium that mimics conditions *in vivo*. One of the hallmarks of capacitation is the ability of sperm to undergo the acrosome reaction; the process whereby the sperm release enzymatic contents of the acrosome to facilitate the penetration of the zona pellucida of the oocyte. My research aims to discover which proteins are involved in the signal transduction pathway that leads to the acrosome reaction in stallion spermatozoa. Protein kinase A (PKA) is one of the proposed components of the acrosome reaction signal transduction pathway, and is activated by the secondary messenger cyclic AMP. The acrosomal status of sperm is visualized under a microscope using a fluorescent dye that binds to the beta-galactosidase in the acrosomal membrane. The amount of sperm that are intact and reacted are counted and compared between experimental and control conditions. My experiments demonstrate that by adding a cAMP analog that targets PKA to spermatozoa incubated under capacitating conditions, 34.8% of sperm underwent the acrosome reaction. This percentage is significant when compared to sperm treated with DMSO (negative control, 18.8%; $P=0.0074$). Additionally there was no significant difference observed between sperm treated with calcium ionophore (positive control, 36.2%) and sperm treated with cAMP analog ($P>0.05$). These results demonstrate that PKA is part of the molecular pathway that leads to the acrosome reaction. An understanding of this pathway is not only intrinsically important for comprehension of equine reproduction, but could also help improve *in vitro* fertilization techniques in horses.

Poster Presentation

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Biological Sciences
(Cell and Molecular Biology)
Dr. Valerie Reyna

The Importance of Risk Perception in Surgery

There is little research on informed consent, but evidence suggests that patients will fail to retain verbatim information but will retain the “gist” of risk. Nineteen patients were surveyed: 73.7% of the patients were consulted for biopsic surgery, 21.1% for heart surgery, and 5.3% for another type of procedure. After their consultation with the physician, the patients were each interviewed to determine if they could recall the risks and benefits associated with their treatment options. Patients were then interviewed a second time asked to recall the same information a second time, after more than two weeks.

Out of those needing biopsies, the doctor described ten procedures as minimally risky; the rest were medium or high risk. During the first free recall, out of the 42.1% who were presented with percentages, 25% recalled actual percentages.

Perceived categorical risk from the first interview correlated with perceived categorical risk from the second interview (Pearson coefficient at 0.631, $p < .05$); subjective quantitative risk estimates did not correlate across interviews. Categorical risk and subjective quantitative risk from the first interview each significantly correlated with the doctor’s categorical risk (Pearson coefficients at 0.631 and 0.621 respectively, $p < 0.05$). Patients with minimally risky surgeries differed in their categorical risk estimates from patients with higher risk surgeries at both interviews (quantitative risk differed only for the first interview)

Therefore, patients understand the gist of the risk information, but exact figures do not persist in memory. Initially patients understand what they are being told by the doctor quantitatively and qualitatively. Similarly, many patients can discern a minimally risky procedure from a non-minimally risky procedure. However, consistent with fuzzy-trace theory, gist memories were more stable and better discriminated risk categories.

Poster and Oral Presentation

Amy Bleisch '10
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Animal Science and Natural Resources
(Applied Ecology)
Dr. Paul Curtis

Home Range Size and Resource Selection in a Suburban White-tailed Deer (*Odocoileus virginianus*) Population

Increased levels of human-wildlife conflict with white-tailed deer (*Odocoileus virginianus*) in suburban landscapes have forced many communities to manage these overabundant animals. In order to best allocate limited resources for deer management, deer ecology, including resource selection, must be thoroughly understood. We conducted a telemetry study on 21 sterilized deer to determine habitat preference across seven different land types at two levels within and between two seasons. Deer exhibited significant differences in resource selection during spring and summer at the telemetry point location level and the home range level. Deer also displayed significantly different preferences between the two seasons. Proportional habitat-use data appeared to indicate that deer were more tolerant of low and medium density development during summer than in the spring. Deer also preferred mixed forest cover and agricultural lands in spring vs. summer. In the spring, deer appeared to select for developed open spaces. Deer avoided high density development regardless of level of selection or season. These results indicate that season must be taken into account when implementing deer removal, sterilization, or other management activities. Further study of deer resource use and habitat preference may allow managers to devise strategies to discourage deer from causing conflicts in suburban areas.

Oral Presentation

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Astronomy

Joseph Burns

The How and Why of Saturn's Inclined "Charming Ringlet"

The "Charming Ringlet", a dusty ringlet in the outer rift of the Cassini Division, 119.940km from Saturn's center, appears to be inclined in a series of images captured by the ISS cameras aboard Cassini. The ringlet has been found to be heliotropic –i.e. the geometric center of the ringlet, considered as a whole, is shifted towards the sun (Hedman et al 2007, DPS). This behavior is likely caused by non-gravitational forces acting on the ringlet's primarily micron-sized particles, as identified by the ringlet's extreme brightening in forward-scattered (high-phase angle) images. Under appropriate conditions solar radiation pressure will cause an individual particle's orbit to reach its maximum eccentricity when its apocenter is aligned with the sun. Through study of the Charming Ringlet's position over a range of viewing geometries we are constraining its vertical structure, namely its orbital inclination, node and the probable cause of such a tilt, and seeing if they are consistent with the earlier hypothesis.

We study a series of images, and their associated radial scans, that contain both the Charming Ringlet and a nearby gap edge that is used as a fiducial for navigation. By aligning the gap edge within each image to subpixel accuracy, we can very precisely obtain the apparent position of the ringlet. By combining this information with the emission angle at which each image was captured, we quantify the inclination of the ringlet which helps to determine whether its vertical excursions can be explained by solar radiation forces. We will then study whether this inclination may result from the out-of-plane component of solar radiation pressure, just as the in-plane-component is likely responsible for the ringlet's heliotropic behavior.

Poster Presentation

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Operations Research
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Rooting phylogenies using gene duplication events

Phylogenetic rooting methods using outgroups have thus far failed to establish a robust root node for the phylogeny of the bees. The goal of this project is to use gene paralogues as an alternate means of determining this node.

The first part of the project entails simulating gene paralogue evolution over a series of tree topologies. I programmed a simulation that generates dna sequences and evolves them according to a particular tree topology and model of evolution. My program then analyses these dna sequences using Parsimony, Bayesian and Maximum Likelihood analysis which try and recover the true topology. We analyze the accuracy of these two methods with the results of these simulations to see under what parameters each method performs well and where they perform poorly. Because of the computational intensity of these simulations (they would have taken almost 4 years on my lap top) I had to parallelize my simulations and submit them to Cornell's Linux cluster.

Results have shown that when there is little divergence between the paralogues, Bayesian analysis outperforms Parsimony, but as the level of divergence increases, parsimony beats Bayes. When the Bayesian method is given more information about how the sequences evolved, its accuracy increases tremendously, and parsimony is no longer able to outperform it for reasonable branch lengths. We are also analyzing the effects of sequence length on the accuracy. Preliminary results have shown that increasing the sequence length always improves Bayesian analysis but Parsimony shows signs of statistical inconsistency (accuracy decreases with increasing data). Maximum Likelihood analysis performs nearly as well as Bayesian Analysis but takes significantly less time.

These results will be useful for biologists want to find the best method to analyze their data sets. Bayesian analysis can take months to do an analysis that would take parsimony a couple of days, so it's good to know when you can get away with just Parsimony.

Poster Presentation

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Biological Sciences
(Biochemistry)
Dwight D. Bowman

A Brief Overview of the Parasite *Toxocara Canis*

The purpose of this project is the planning and construction of a cDNA library of the larval stage of the parasitic nematode *Toxocara canis*, which infects dogs and is zoonotic to humans.

Total RNA was released from *T. canis* by mechanical grinding in a suitable RNA stabilization reagent. Messenger RNA was then isolated from the tRNA solution by oligo-dT chromatography. Two micrograms of mRNA were reverse-transcribed into double-stranded cDNA using RT from Avian Myeloblastosis Virus supplied in the Promega Universal RiboClone cDNA synthesis kit. Ligases and free adapter ends in the same kit will be used to ligate EcoRI adapters to the cDNA.

The Stratagene Lambda gt11 Vector Kit will be used to ligate generated cDNA into lambda phages. After ligation and packaging, the phages will be used to transduce a supplied lawn of *E. coli*. After plaques are observed, indicating expression of proteins coded by the cloned insert, the plaque plates will be blotted onto a nitrocellulose membrane and washed with a mammalian (possibly rabbit) antiserum solution to check for affinity with any of the expressed protein. Plaques displaying affinity to the antibodies will then have their cDNA insert sequenced to determine the nature of the associated protein. This will help elucidate the host-parasite immunological interaction of *T. canis* in mammalian systems for further study.

Poster and Oral Presentation

Elaine Cheung '09
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Human Development
(Social and Personality Development)
Dr. Joseph Mikels

I'm feeling lucky: The role of an affective mechanism in the framing effect

The framing effect is the tendency for people to make systematically different choices based on whether alternatives are presented positively (i.e., as gains), or negatively (i.e., as losses). Specifically, people tend to be risk averse when alternatives are framed as gains, and risk seeking when alternatives are framed as losses. In my poster and oral presentation, I will present research exploring the role of emotion in the framing effect. Study 1 investigated whether a relationship existed between affect ratings and decision choice on a framing task adapted from De Martino et al. (2006). Sixty-four undergraduates completed a computerized gambling task in which participants were asked to rate how positively or negatively they felt before making each decision. We found that affect was a significant predictor of framing-consistent behavior. However, we only found a significant relationship between affect and choice in the loss frames, such that positive affect was significantly associated with risk-seeking behavior. In Study 2, forty-three undergraduates completed a gambling task identical to Study 1 with the addition of a decision strategy manipulation. Participants were instructed to either focus on their feelings or to emotionally reappraise the situation such that they did not rely on their emotions when making their decisions (emotional reappraisal condition). We found that participants in the emotional reappraisal condition were significantly more risk averse in the gain frames, and no longer displayed risk-seeking behavior in the loss frames. These findings suggest that affect plays a critical role in the framing effect. This research has implications for risky decision making in domains such as economics and healthcare.

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Industrial and Labor Relations
(Law and Society)
Sarosh Kuruvilla

Beneath the Surface of China's Floating Population: An Investigation into the Internal Dynamics of Migrant Workers in Kunming

In the past few decades, the relaxing of certain socialist policies and an increasingly capitalist economy have created an enormous population of migrant workers in China. However, this shift in the labor force has not resulted in the organization of labor. Most research into the solidarity of this floating population focuses upon the effect of external factors, such as discriminatory state policies and governmental opposition, but does not take into consideration in-group dynamics. To assess internal factors affecting migrant cohesion, fieldwork was conducted in DaShu Ying, a migrant district in Kunming. The physical layout of the district, the nature of social interactions, the psychological viewpoints of the residents, and the district's stratification structure all combine to create an environment generally preventative of the development of class consciousness or greater group solidarity. Ethnic divisions and strong native-place ties cleave the migrant population into subgroups that often do not even associate with one another. A cultural emphasis on "place" instead of "class" coupled with a "chase ball" mentality leads to an over-dependence on self-reliance rather than collective interest. Despite the fact that Chinese migrants could potentially wield a great deal of power from sheer numbers, it would seem that the internal dynamics of the floating population do not lend themselves to the creation of working-class solidarity amongst laborers in the most-populated country in the world.

Oral Presentation

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Bioengineering
(Biomedical Engineering)
Dr. Jonathan Butcher

**Solid Freeform Fabrication of Mechanically Heterogeneous Cell-Seeded Hydrogels:
Towards Living Anatomical Valvular Replacements**

Heart valve disease affects an estimated 5.6 million adults in the USA. Current tissue engineering methods for prosthetic heart valves are unable to model the anatomical and mechanical heterogeneity of native valves. Our novel approach is to 3-D print cardiac valves using solid freeform fabrication with the Fab@Home system developed at Cornell University, with data from MRI or CT scans. The printer deposits cell-seeded hydrogels, curing each layer with UV light. To obtain desired heterogeneous mechanical properties, we designed a composite hydrogel with varying concentrations of poly(ethylene glycol)-diacrylate (PEG-DA), poly(ester amide) (PEA), and alginate. Preliminary studies indicate comparable cell viabilities of over 70% for both a PEG-DA/PEA mixture and a PEG-DA/fibronectin mixture cured with 10 minutes UV exposure, somewhat less than the 90% viability observed in a similarly exposed control sample of cells suspended in FBS/PBS. This solid freeform fabrication has the potential to create arbitrary three-dimensional living geometries with intrinsic mechanical heterogeneity, which could be a powerful tool towards engineering patient specific tissue replacements. Furthermore, our ability to create heterogeneous tissue models will allow unprecedented exploration of cellular response to mechanical gradients. In this presentation, I will be discussing my role in the project, involving the cytocompatibility and mechanical characterization of the hydrogels, along with a project overview.

Poster and Oral Presentation

Jessica Cooperstone '09
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Food Science
Dennis Miller

Whipping Egg Whites in Copper Bowls, Culinary Myth or Scientific Truth?: The Effects of Copper on the Stability of Egg White Foams

Foams consist of gas bubbles trapped in a liquid or a solid. Many of the foods we enjoy are foams, including ice cream, quick breads, and the head on a glass of beer. Foams are made by whipping air into liquids or generating a gas within the food. Foams collapse quickly unless they are stabilized by a macromolecule such as a protein. Egg whites make good foams but a major problem is that they easily deflate when the liquid surrounding the bubbles drain. Chefs commonly recommend whipping egg whites in copper bowls to yield more stable foams. The purpose of this study was to investigate whether adding copper (either from a copper bowl or a salt) and other divalent cations like zinc and iron increase the stability of egg white foams and how other common additives (like sugar and cream of tartar) affect foam stability. An apparatus consisting of a bowl with a small hole in the bottom positioned over an electronic balance was built to collect and measure liquid drainage from foams prepared by whipping egg whites with an electric mixer. The rate of drainage provides an index of foam stability. Foams were made in either stainless steel or copper bowls, with or without added copper sulfate. The liquid drainage from foams prepared with varying concentrations of copper were analyzed by inductively coupled plasma atomic emission spectrometry to determine the concentrations of copper in the drainage. This was done in an attempt to learn how the copper was binding with conalbumin in the egg white to stabilize the foam. Foams prepared by whipping in copper bowls or with added copper were more stable, confirming the age-old recommendation to use copper bowls for making egg white foams. Adding iron, zinc, sugar or cream of tartar also creates more stable foams.

Oral Presentation

Josephine Cuda '09
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Human Development
Social & Personality Development
Dr. Dawn Schrader and Dr. Marianella Casasola

**Guilt and Anxiety Surrounding College-Aged Women
in their Decisions to Behave Sexually**

Sex and the idea of sexuality have become ingrained in our American cultural identity. Through this study I hope to gain some insight as to the limits, restrictions, and motivations that women have felt or feel in their past/concurrent experiences regarding the initiation of sexual behaviors and activity, and whether or not a promise to not engage in these activities leads to guilt or anxiety. Understanding that religion, friendships/relationships, personal morals and parental influence act as factors in this decision making, I will, through semi-structured interviews and surveys with college aged women, look at how these influences are reportedly manifesting sexual guilt and anxiety. My aim is to examine whether having made an initial promise of restricting sexual behaviors until a particular future date results in girls saying they place more weight on the influences of religion and parents and therefore have more sex guilt and anxiety compared to females who had not made some sort of promise. Data and examination of interview records reveal a redefining of the self and a reliance on friendships to deal with conflicting emotions surrounding this decision. These findings show support for the social development theory proposed by Sullivan and Piaget and Josselson's perspective on the restructuring of the self in various forms of relationships.

Poster and Oral Presentation

Rebecca Daley '10
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Science of Natural and Environmental Systems
(Environmental Biology)
Dr. Christine Goodale

Hydrological control over stream nitrate loss in an aggrading New Hampshire forest

Stream chemistry of a 36 ha watershed in the Hubbard Brook Experimental Forest (Watershed 4) displays higher nitrate export than expected for an early successional forest in this region. Within Watershed 4, a small tributary has a chemical signature far different from the main channel. Previous monitoring has shown that the pH of the side tributary was significantly higher than that of the main channel and contains detectable levels of nitrate whereas the main channel had no detectable nitrate. It is suspected that this side tributary significantly contributes to watershed export under base flow conditions. We hypothesized that the side tributary is the dominant source area under normal base flow conditions of summer and that the main stem exerts dominance under high flow conditions brought on by events. Daily water samples were taken throughout summer 2008 with three ISCO automated samplers: one placed at the main stem of the stream, a second at the small internal tributary, and a third placed at the weir. The samples were analyzed primarily for pH, ANC, and major ions. Chemical data were compared to precipitation and the watershed flow rates calculated at each sampling hour to detect associations between chemical dominance and hydrological conditions. Under base flow conditions, the chemistry of watershed outflow was dominated by the short side tributary, with lower acidity and higher nitrate levels than the main channel, but with notable contributions from the main tributary. During each of three high flow events that occurred, flow in the main channel increased dramatically and flow at the weir corresponded to temporarily increased acidity and decreased ANC. Nitrate data show that a dilution response was associated with these events since there were significant declines in nitrate concentrations of both the side tributaries and at the base of the watershed during high flow conditions.

Poster Presentation

Caleb Dresser '09
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Biology & Society
Population, Ecology & Development
Dr. Peter Hobbs, IARD/CSS

Plant-parasitic nematodes: a threat to aerobic rice productivity in Northern India?

Climate change, declining water tables, and changing labor conditions threaten the productivity of the rice-wheat system on the Indo-Gangetic plains, a system that feeds 800 million people in Nepal, Bangladesh, Pakistan, and India. Newly developed direct-seeded aerobic rice production systems increase labor productivity and water use efficiency, but questions about long-term productivity remain. There have been concerns that aerobic rice production increases levels of infestation by plant-parasitic nematodes, leading to a decrease in rice productivity.

The impact of rice cultivation techniques on plant-parasitic nematode populations was tested at a long term field site in northern India. Species specific nematode counts, bioassay experiments using French Bean (*Phaseolus vulgaris*) and two varieties of rice, and evaluation of the level of root galling induced by root knot nematodes (*Meloidogyne spp.*) were evaluated.

Transplanted rice plants grown on raised beds had significantly more root galls than plants grown using other treatments. ($p < .001$) This is consistent with a scenario in which soil oxygen content is a major determinant of nematode population levels. Similarly, flooded rice plants displayed significantly lower galling rates than those collected from dry terraces at a farmer's field site in Nepal. ($p = .027$) Bioassay experiments were inconclusive due to technical problems at the research site. Soil samples nematode identification is still in progress at IARI, New Delhi.

Existing data indicates that rice cultivation practices impact *Meloidogyne* populations but does not support the conclusion that these nematodes significantly impact aerobic rice productivity. There are indications that traditional practices such as flooding and puddling lead to lower levels of *Meloidogyne* activity, as do zero-till practices to a lesser extent. However, patterns of productivity that emerged were not consistent with root-knot nematodes constituting a primary threat to rice productivity, even under aerobic conditions.

Poster Presentation

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Industrial and Labor Relations
(Law & Society)
Jon Kleinberg

Networks in Collective Bargaining

When Karl Marx said, “Workers of the world unite; you have nothing to lose but your chains,” he understood some of the underlying network principles that drove Adam Smith’s capitalist economy (1848). Marx asserts that as labor produced more commodities for the capitalist, each additional product formed another chain enslaving the wage-earner to the rich and for which the rich would get richer by profiting off what the laborer produced. In rich-get-richer models, “power laws arise from the feedback introduced by correlated decisions across a population... as people have a tendency to copy the decisions of people who act before them” (Easley 2008). Through these examples, and others, we ask to what extent can network tools, such as network exchange theory, game theory and information cascades, be applied to analyze industrial and labor relations. The findings might be more than what Nash bargained for.

Poster and Oral Presentation

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Biological and Environmental Engineering
(Biomedical and Bioprocesses Engineering)
Dr. Elizabeth Buckles

**Identifying and characterizing *avipoxvirus* in American crows (*Corvis brachyrhynchos*)
from Tompkins County, New York and in historic Galapagos finches**

Avian pox, a disease that infects birds, can be caused by any one of the *avipoxviruses* and can have mild to severe effects. Each species of bird has its own poxvirus and infections generally do not cross species. Three common strains of the *avipoxvirus* have been identified: fowl pox virus, pigeon pox virus, and canary pox virus. In Ithaca, New York, American crows (*Corvis brachyrhynchos*) have been observed to be infected with poxvirus. One goal of the study is to sequence the genome of the virus found in crows with pox lesions in order to determine whether it is the same as any existing *avipoxvirus* strains or a new strain altogether. *In ovo* growth has not yielded observable lesions but pox specific PCR has shown promising amplicons for cloning and sequencing to be compared to other *avipoxvirus* strains. In the Galapagos Islands, the poxvirus causes severe responses in finches. The second objective of this study is to characterize the *avipoxvirus* that was present in historic Galapagos finch samples. Histological analysis confirmed the presence of pox lesions in a number of samples.

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Policy Analysis and Management
Consumer Policy
Rosemary Avery

The Impact of Over the Counter (OTC) Weight Loss Product Television Advertisements on the Consumption of OTC Weight Loss Products and Other Diet-Related Behaviors

This study examines the impact of over-the-counter (OTC) weight loss product television advertisements on health-related behavior. To measure potential exposure to television advertisements, I matched survey data on television viewing habits and health-related behaviors to data on television advertisements. I find evidence that exposure to OTC weight loss product ads increases the likelihood of use for such a product in women, and increases the likelihood of diet and exercise for both men and women. Though increased use of OTC weight loss products with little record of efficacy and no record for safety is troublesome, the positive spillover effects from the advertising complicates a possible new regulatory strategy for the Federal Trade Commission.

Poster Presentation

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Design & Environmental Analysis
(Human Factors & Ergonomics)
Nancy Wells

Fostering Whole Systems Thinking Through Architecture: Exemplary Green School Case Studies in Europe & Japan

The relationships between teacher and student, building and occupant, and nature and structure are changing in the context of schools. Increasing attention is paid to students' academic performance in healthier schools, but what impact does a green school have on their environmental behaviors? In this study, I examine the sustainable building's influence on students' biophilic values and behavior. In eco-schools, the building itself is used as a lever for environmental education. Fundamental to this "instructive structures" approach to design is the idea that the learning environment itself should incorporate the environmental principles being taught in the school. This research shows how architecture, engineering, landscaping, and educational systems are combined to make school buildings the instruments through which students learn how to lessen human impact on the environment.

This research aims to address these specific questions:

1. What is involved in starting an eco-school?
2. What are contemporary exemplars, in architecture and activities for eco-schools to promote environmental stewardship and long-term responsibility?
3. Does an eco-school influence a child's way of thinking: in different ways than traditional schools, e.g. thinking in cyclical patterns, analogous to natural systems?

This study investigates four green schools that are designed to make ecological sensitivity salient in every aspect of students' lives. Interviews with principals, architects, and government officials in four different countries revealed that eco-schools are more successful with enthusiastic principals who excite their students, faculty, and school board members with occasions to think and act in ecologically responsible ways.

With the help of thoughtful architects, green buildings can be integrated into the educational design, producing graduates of eco-schools who know 'green' not as the alternative, but as the norm.

Poster Presentation

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A Community Database for Grain Boundary Interface Structures

The atomic structure of grain boundaries (GB) has long been known to play an important role in determining metallic material behaviors. Although the structures of many such interfaces are given across the literature, access can be difficult. The purpose of this research is to overcome this inefficiency by populating a web-based interface structure databank. Modeled after the leadership success in the field of biology research with the Protein Data Bank (pdb.org), the online Grain Boundary Interface Data Bank establishes a systematic standard for uploading newly identified interface structures from the materials research community. These structures formed along the nano-scale GB are essential in quantifying their affect on the structural, mechanical, thermal, electrical, et al. properties for macro-scale engineering performance.

Existing research has successfully predicted these grain boundary structures uniquely from the individual grain crystal-to-crystal (bicrystal) misalignment with one another. Using parallel computing resources, a UNIX-based atomic simulation environment was established as a framework to produce these multiple GB structures based on individual grain boundary orientations, or sigma numbers. Dynamics and conjugate gradient methods are alternated during simulations at low temperatures to achieve the minimum energy structure for each orientation. Focusing on symmetric tilt grain boundaries of aluminum along a $\langle 110 \rangle$ tilt axis, the computed grain boundary energies for these structures match existing literature. These results, which include minimum grain boundary energy, tilt angle, etc., are continuously being uploaded onto the databank as they are simulated. Currently, we are engaged in a more comprehensive simulation sampling of a broader orientation space. This process will involve several automation steps towards self-sufficiency, including a means for automatically updating the databank with newly identified structures.

Poster and Oral Presentation

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Biology & Society
(Biology, Behavior, & Society)
Joseph Mikels

I Need the Emotion: Improved Memory with Emotional Stimuli in Older Adults

This study investigated the false memory of emotionally charged words in older and younger adult populations as a means of measuring changes in emotional memory over the life span. According to current findings, as people age normally, cognitive abilities are known to decline, while emotional processing abilities have been found to remain intact, or even improve (e.g., Fung & Carstensen, 2003). In the present study, I investigated whether older adults could remember stimuli better if the content was emotional. The participants in this study were a group of 33 young adults (M= 20.31 years; range= 18-27 years) and a complimentary group of 32 older adults (M= 75.75; range= 64-92 years). All participants listened to a tape recording of target words of varying emotional content, and then completed the Deese/Roediger/McDermott (1995) exam, the standard laboratory paradigm for studying errors in gist memory. Analyses of variance were run on the data after signal detection statistics were completed for the “yes”-response rate for each participant (e.g., Sodgrass and Corwin 1988). Results indicate that that older adults falsely remembered hearing more positive stimuli than younger adults, while younger adults selectively recalled negative stimuli. Significant results were found on correlation between age, emotional valence, and false memory, indicating that age and emotion accompany changes in recall memory. These results support the positivity bias in older adults, and the negativity bias found in younger adults postulated by Carstensen & Mikels (2005).

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Operations Research and Information Engineering

Huseyin Topaloglu

Connect Four – Who Will Win?

The project is a Java program that simulates the playing of the 2-player *Connect Four* game. Beginning as a game with two human players, the program eventually evolved into a game with two computer players. Artificial intelligence programming was used to create decision methods for the computer player that mimic a human player's logic when playing the game. The decision methods involve looking ahead a certain number of plays in the game to determine the next best move.

There are several basic concepts of the *Connect Four* game. The game entails one board with 6 rows and 7 columns and is played by two players. Each player takes turns putting coins in slots, attempting to get four of his coins in a row – horizontally, vertically, or diagonally – while preventing his opponent from doing the same.

The project began as a simple human player versus human player game. The computer program prompts each player to update the board on his turn by entering the slot number where he wishes to play. The project then evolved into a human player versus computer player game. In this case, the computer needs to be able to make smart decisions to increase his chances of winning. To make a smart move, the computer needs to know the current layout of the board, his position, and his opponent's position. Hence, the computer player is programmed with artificial intelligence to reflect this knowledge, which allows him to make smart moves.

In its final state, the project simulates the *Connect Four* game with two computer players, in which each player can look ahead a certain number of moves to determine the best next move. This state of the game was analyzed to determine the dependency of a player's chance of winning on certain characteristics of game setup and play.

Oral Presentation

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Human Biology, Health, and Society

Barbara Strupp

The Effects of Altered Folate Metabolism on Cognitive and Affective Functioning

Folate is a naturally occurring B vitamin required for cell production and repair. Increasing evidence suggests that folate status may influence cognitive functioning, particularly age-related cognitive decline. However, most of the evidence derives from observational studies, precluding causal inferences. The present study was designed to assess the effects of altered folate status on various aspects of cognitive functioning, using a mouse model. The study employed a 2×2 experimental design with four treatment groups, in which both genotype and diet were manipulated. The genotypes included wild-type mice and mice with an *Mthfd1* gene mutation. This mutation inactivates C1-tetrahydrofolate synthase, thereby altering folate metabolism. A folate-sufficient diet was fed to half of the wild-type mice and to half of the transgenic mice; a diet completely devoid of folate was fed to the other wild-type and transgenic mice. The wild-type mice fed a folate-sufficient diet served as controls. Performance of these four groups was compared on a series of automated visual attention tasks, which evaluated learning, attention, inhibitory control, and reactivity to errors. This poster will present findings from one of the administered tasks, a test of sustained attention. Analysis of performance revealed specific areas of dysfunction for the three experimental groups, relative to controls. The pattern of results implicated attentional dysfunction in mice with the *Mthfd1* mutation, regardless of dietary folate intake. In contrast, the wild-type mice fed a folate-deficient diet exhibited transient impulsivity during the early stages of testing, indicative of either a heightened emotional response to the new testing conditions or impaired regulation of emotion and/or arousal. In sum, the findings of this study indicate that altered folate status significantly influences attentional and affective functioning. These findings may eventually lead to revised recommendations for folate intake as it relates to optimal brain function.

Poster Presentation

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Science of Earth Systems
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Bruce Monger

Interannual Variability of Mixed Layer Depths in the North Atlantic, 1998-2007

The mixed layer depth of an oceanic region can tell us much about its physical and biological processes. This layer of almost constant density, temperature, and salinity results from turbulent wind mixing and heat fluxes at the atmosphere ocean interface. In this project, more than 100,000 ocean temperature and depth profiles from the World Ocean Database 2005 are compiled in order to calculate mixed layer depths in the North Atlantic. Following the methods of *Montegut 2004*, a 0.2°C threshold from the surface temperature defined at 10m is used to estimate the mixed layer depth. These estimates are then binned into 2°x2° seasonal grids over the North Atlantic from 1998-2007. Examination of interannual variability of winter MLDs with EOF analysis reveals a tripole spatial pattern, often associated with SST and North Atlantic Oscillation (NAO). Correlation of winter MLDs with the NAO Index also shows this tripole pattern, which is not surprising since NAO is one of the most prominent sources of seasonal to interdecadal variability in the global atmosphere. Summer MLDs show a significant deepening trend over the ten-year period, a surprising result in light of expectations under a global warming scenario.

Poster Presentation

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Linguistics
(Cognitive Studies; Law and Society)
Dr. Molly Diesing

Schizophrenia and Language: The Possibility of Early Detection with Syntactic Analysis

Schizophrenia, possibly the most debilitating psychiatric disorder, is a deep reminder of how little we understand the brain. Though it has a high diagnostic accuracy rate relative to other psychiatric disorders, it still comprises a very broad range of symptoms. This paper proposes a longitudinal study to determine the possibility of using language to detect a predisposition, or liability, for schizophrenia before the onset of psychotic symptoms, which are typically targeted by neuroleptic medications. Thought disorder, a fundamental symptom of schizophrenia, may be present before onset of psychosis. Some psychopathologists contend that early detection of subtle, initial signs of thought disorder, triggering use of antipsychotics, could prevent this onset. This viewpoint is controversial because of the need for reasonable diagnostic certainty before administering a medication with potentially serious side effects. There may be many methods of early detection which could be used in concert to develop a solid diagnosis, but language is so closely interwoven with thought that it is the most direct way to assess it. Linguistic analysis of schizophrenic speech could target any of several dimensions – and has – but the most relevant for the purposes of this paper is syntax. Studies show that speech samples produced by individuals with schizophrenia can be distinguished from manic and control samples with accuracy reaching 95% based only on syntactic complexity. The next step is a longitudinal study of genetically vulnerable and control groups, to determine the value of syntactic complexity as a predictive factor. If this factor is reliable and valid, sensitive linguistic tests for schizophrenia could be used by clinicians to help reveal the presence of the disorder. This research also has implications for better understanding of the range and boundaries of syntactic complexity in normal speech, in contrast to the impoverishment of schizophrenic speech.

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Human Development
Dr. Michael Goldstein

The Influence of Gender on Parental Teaching Behaviors

Extensive research exists on both the influence of gender on parental speech and on parental teaching behaviors. Mothers display different speech patterns from fathers. Parents speak differently to male infants than to female infants. Additionally, parental speech varies based on whether the parent is speaking about a stereotypically male object, a stereotypically female object, or an object that is gender-neutral. Furthermore, parents can facilitate an infant's word learning by engaging in specific teaching behaviors. Although research exists on both topics, these two literatures have not previously been combined. My study sought to unify these two topics and investigate the impact of gender on parental teaching behaviors. I examined the ways in which parental gender, infant gender, the gender of the object, and parents' implicit beliefs about gender intersect to influence the teaching of novel object labels. Implicit beliefs about gender were measured through the Implicit Association Test (IAT). This test is a reliable and valid measure of a person's beliefs of which he or she may not be aware. Each parent was allotted five minutes to teach his or her infant the name of a novel object (a stuffed animal). Although every stuffed animal was gender-neutral in appearance, the parent was told that it was either male or female. The parent-child interactions were coded for gender-dependent behaviors and parental speech patterns. This data was analyzed in conjunction with the results from the IAT. Data analysis is currently underway. As such, results are pending.

Poster and Oral Presentation

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Biological Sciences
(Molecular and Cell)
Prof. Richard Cerione

Understanding the role of Rheb in mTOR-activated cancers

Rheb (Ras-homolog enhanced in brain) is a small GTPase in the mTOR (mammalian target of rapamycin) pathway responsible for transducing signals integrated from a variety of sources, including growth factors and nutrient availability, to activate mTORC1 (mTOR complex 1), leading to transcription activation and ribosome biogenesis. Deregulation of the mTOR pathway, however, leads to aberrant cellular growth and is implicated in a number of human diseases, including cancer. Indeed, activation of the pathway is frequently found in a number of human cancers, and elevated Rheb expression has been specifically established in prostate cancer, lymphoma, and glioma. Rheb presents a promising target for treatment in mTOR-activated cancers, but the successful development of such therapies requires a thorough knowledge of Rheb's role in the pathway and its control mechanisms.

We sought to establish that fast-cycling mutants of Rheb which can spontaneously bind GTP will activate mTOR. However, our work demonstrated that even over-expression of wild-type Rheb is sufficient to induce oncogenic transformation, suggesting that regulation of Rheb GTP-exchange may be an important factor in mTOR-activated cancers. Thus, the current goal of this project is to identify the Rheb guanine nucleotide exchange factor (GEF), which activates Rheb by facilitating GTP-loading. Currently we are testing the hypothesis that DOCK7 (dedicator of cytokinesis-7), a member of the DOCK180 superfamily, can function as a GEF for Rheb. DOCK7, a GEF for another small GTPase, Rac1, has previously been shown to bind TSC1 (tuberous sclerosis protein 1), a protein which forms part of the dimeric complex TSC1/2 which serves as the Rheb GTPase activating protein (GAP). Additionally, we aim to characterize true binding partners of Rheb and to test these molecules for GEF activity.

Poster Presentation

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History and & Government
Greg Stott (Nipissing University)

***“Non pas pour defendre le pays natal”*: French Canadian Participation in the Canadian Militia Leading up to the First World War**

At the time of Confederation, the Canadian militia, under the leadership of George Etienne Cartier, was supported by both French and English citizens. However, as Canadian military institutions continued to evolve, considerations of the cultural and linguistic needs of French Canadians were not addressed. Unofficial policies of bilingualism were abandoned, career advancement became difficult for francophones, and religious and historical traditions were ignored. Consequently, military recruitment in Quebec failed during the First World War. This resulted in a rejection of military service by many French Canadians, and ultimately helped to cause the Conscription Crisis of 1917.

Oral Presentation

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Human Development
(Social and Personality

Dr. Qi Wang

**The Self-Reference Effect in Semantic and Source Memory:
A Comparison of Elderly and Young Adults**

Research on older adults has examined cognitive declines associated with aging, particularly those related to memory. The present study examines age-related differences in the self-reference effect, which suggests that individuals tend to relate new information to their own thoughts, feelings, and experiences. The study also examines how self-referencing influences semantic memory (i.e., memory for details) and source memory (i.e., from where information came). Fifty young adults ($M=20.81$ years) and 40 older adults ($M=70.80$ years) participated in the study. Participants watched a video in which four speakers verbally presented various factual statements. Next, participants were asked to recall as many statements from the video as accurately as possible and indicate which of the four speakers said each recalled statement. Compared to older adults, younger adults recalled a greater number of statements with a higher degree of accuracy. Younger adults also had more correct source identifications. Across both age groups, those who self-referenced recalled more details but had poorer source memory compared to those who source monitored. The source-monitoring group had superior memory for the source but poorer memory for the statements overall. This difference was significant for younger adults but not for older adults. These findings suggest that older adults' memory for semantic details benefit from self-referencing, but not to the same extent as younger adults. Additionally, older adults would benefit from source-monitoring, especially if they needed to remember the source of important information. These findings have implications for the health and legal fields.

Poster and Oral Presentation

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Electrical Engineering

Hod Lipson

Octopus Robot

This project aims to expand the design possibilities an engineer has when creating new robots. The structure of most robots is similar to a vertebrate skeleton: stiff components connected at defined locations with rigid actuators. We, however, hope to build a motile robot more similar to an octopus. Such a device would have a soft, compliant body that distributes the force of blunt impact, can operate in confined spaces and can tightly grasp objects of arbitrary shapes and sizes.

This ongoing research has yielded a submersible unit that actuates six independent artificial muscles specially segmented to allow groups of them to bend. Several prototype tentacles have been built, and we demonstrate a 3-segment fin that allows the robot to move underwater like an eel.

Poster Presentation

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Biological Sciences
(Nutrition)
Dr. Alan J. Nixon

Characterization of Connexin 43 and Proteoglycan 4 in cartilage of horses with Osteochondrosis dissecans

Osteochondrosis dissecans (OCD) in growing individuals represents a chondrodysplasia with uncertain etiology. Regions of retained cartilage result from retardation of the progression of subchondral ossification. Focal avascular necrosis is hypothesized to initiate OCD. The molecular events defining OCD, a prevalent developmental joint disease in human and animal, have been limited to the study of a relatively small number of candidate molecules. After examining a large-scale microarray study, two of the most dysregulated genes were that of Connexin 43 (Cx 43) and Proteoglycan 4 (PRG 4), a gap junction protein encoded by the GJAP1 gene, which provides routes for the movement of low-molecular weight materials and a surface lubricating protein, respectively.

Using more advanced quantitative real-time polymerase chain reaction methods, Cx 43 was found to be expressed 7 folds higher in OCD cartilage than normal cartilage and PRG 4 was found to be expressed 3 times lower in OCD cartilage than normal cartilage. Through histological methods of immunohistochemistry and *in-situ* hybridization, Cx 43's expression and translation were found to be around the area of osteoclasts/ chondroclasts as well as the subchondral bone separation as a result of the OCD lesion with clefting.

While the cascade of molecular events from the initiation of OCD could not be better explained by the up-regulation of Cx43 and down-regulation of PRG 4, matrix change is represented by the dysregulation of these two genes. With a traumatic injury with avascular necrosis, this matrix change predisposes the cartilage to clefting and the detachment of the cartilage from the subchondral bone.

Poster Presentation

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Biology
(Biochemistry)
Ralph Obendorf

Purification and molecular structure of digalactosyl *myo*-inositol (DGMI), trigalactosyl *myo*-inositol (TGMI), and fagopyritol B3 and identification of *N*-(β -glucopyranosyl)-nicotinic acid from buckwheat seeds by NMR

The galactosyl cyclitols digalactosyl *myo*-inositol (assigned the trivial name DGMI), trigalactosyl *myo*-inositol (assigned the trivial name TGMI), and trigalactosyl *D-chiro*-inositol (fagopyritol B3) were isolated from common buckwheat (*Fagopyrum esculentum* Moench) seeds. Structures of the three compounds were determined by ^1H and ^{13}C NMR spectroscopy, confirming their absolute configurations for the first time. DGMI is α -D-galactopyranosyl-(1 \rightarrow 6)- α -D-galactopyranosyl-(1 \rightarrow 1)-1L-*myo*-inositol, TGMI is α -D-galactopyranosyl-(1 \rightarrow 6)- α -D-galactopyranosyl-(1 \rightarrow 6)- α -D-galactopyranosyl-(1 \rightarrow 1)-1L-*myo*-inositol, and fagopyritol B3 is α -D-galactopyranosyl-(1 \rightarrow 6)- α -D-galactopyranosyl-(1 \rightarrow 6)- α -D-galactopyranosyl-(1 \rightarrow 2)-1D-*chiro*-inositol. DGMI and TGMI are higher oligomers of the galactinol series of compounds. Samples of TGMI and fagopyritol B3 also contained the compound *N*-(β -glucopyranosyl)-nicotinic acid as determined by ^1H and ^{13}C NMR spectroscopy.

Oral Presentation

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Food Science
Dr. Randy Worobo

Characterization of *Enterococcus mundtii* bacteriocin immunity

Approximately 500 of the 2500 cases of Listeriosis are fatal, so there is a need to eliminate the threat of *Listeria monocytogenes* in foods, especially in ready-to-eat products. The use of bacteriocins, antimicrobial peptides produced by bacteria, has been investigated as a potential barrier to prevent the growth of *Listeria* in processed foods. A recently identified class IIa bacteriocin, produced by *Enterococcus mundtii*, is comprised of 43 amino acids and exhibits high inhibitory activity against *Listeria* spp. Mundticin L, produced by *E. mundtii* C011308LM, can also act against other *Enterococcus* spp., however, *E. mundtii* possesses self-immunity towards its own bacteriocin. In this study, the putative immunity gene, which is allegedly just downstream from the structural genes of the mundticin peptide and the ABC transporter, was attempted to be confirmed as the gene responsible for conferring immunity to the producer strain through subcloning and heterologous expression of the suspect gene. The plasmid DNA containing the putative immunity gene was digested with the restriction endonucleases *Xba*I and *Hind*III, and subcloned into pMG36e, a Gram positive shuttle vector plasmid, and transformed into the mundticin-sensitive *Enterococcus faecalis*. The immunity phenotype was determined in the transformed *E. faecalis* strain upon exposure to mundticin L.

Poster Presentation

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Human Development
Social & Personality Development
Seth Pardo

Exploring Conceptualizations of Gender Identity and Overlooked HIV-Risk Groups in Transgender Populations

Recent research on HIV/AIDS has shown that transgender populations may be at significant risk. However, the various gender identities that transpersons take on may prevent identification with groups that have traditionally been targeted for HIV prevention, such as “men who have sex with men.” This study thus seeks to explore possible at-risk populations within the transgender community in order to better identify target groups in the future.

Descriptive data are presented on 91 gender-variant natal males (M age=43.5, range 18-77). Relevant data were taken from an online anonymous non-clinical community survey exploring gender identity, behavior, and sexuality. From their responses, subjects were divided into three gender groups: Trans-but-male Identified (21%), Female Identified (43%), and Fluid (38%; multiple or less defined gender identities). Five risk factors were assessed for the individuals within these three groups: Sexual activity, sex partner preferences, relationship type (e.g. open or polyamorous relationship), risky sex practices, and socioeconomic status. An average risk score was calculated for each identity group.

Results showed that MTF-spectrum transpersons have many conceptualizations of gender identity. The various identity constellations suggest that over half of the MTF-spectrum population may not necessarily conform to any particular gender identification and may be overlooked when sampling for HIV risk assessments in trans-feminine populations. Overall, calculated risk scores showed that Trans-but-male identified respondents had the highest risk profile, with an average of 2.16. The Fluid group closely followed with 2.03, and the female-identified group had a much lower average risk at 0.90.

Results reinforce that “men who have sex with men” is a fairly good population to target in trans communities; however, the existence of a large gender fluid-identified group in trans communities suggests that new methods of targeting may be needed to reach out to such groups for HIV prevention.

Poster Presentation

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Policy Analysis and Management
Family and Social Welfare
Sharon Sassler

The Tempo of Relationship Progression among Low-Income Couples

This paper examines the factors affecting the tempo of low-income couples' relationship progression into sexual involvement and coresidence (cohabitation and marriage). Data come from a recently-collected survey, the *Marital and Relationship Survey (MARS)* that obtained information from 700 low-income couples, who provided independent reports of various aspects of their relationships. Nearly one-third of the sample (32.7%) had become sexually involved with their current partner within the first month of dating, while only about a quarter deferred sexual involvement for six months or longer. Furthermore, about two-thirds of this low-income sample had begun living with their partner within six months of the start of their relationship. However, not all union statuses exhibited the same patterns of progression, highlighting the diversity within this low-income sample. Currently cohabiting respondents reported the fastest transitions into sexual involvement and coresidence, while those who married without first cohabiting experienced more tempered entrance into more committed relationships.

Multivariate results indicate that family background and ascribed characteristics were significant only in predicting duration to coresidence. Individuals who grew up in non-intact families moved faster to coresidence, as did females and non-Hispanic Blacks. For both duration to coresidence and to first sex, place of meeting, previous relationship experience, and current union status were significant. Respondents who met their partners at school, at a place of worship, or through a dating service, special interest group or personal ad, move slower to both first sex and coresidence. Respondents who had at least one previous coresidential relationship moved significantly faster on both measures of tempo. Individuals who were currently cohabiting or cohabited with their current spouse prior to marriage moved significantly more rapidly to sex and coresidence than respondents who married without first cohabiting. Results are interpreted in light of recent public policy aimed at creating stable and lasting relationships.

Poster Presentation

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Biological Sciences
(Ecology and Evolution)
Dr. Antonio DiTommaso

Biomass Allocation of Pale and Black Swallowwort (*Vincetoxicum rossicum* and *V. nigrum*) in Contrasting Competitive Environments

The invasive perennial vines, pale swallowwort [*Vincetoxicum rossicum*] [PSW] and black swallowwort [*V. nigrum*] [BSW] are becoming increasingly problematic in the northeastern U.S. and adjacent Canada because of their disruption of sensitive ecosystems. One important trait shared by many invasive plant species is their ability to respond to a novel or changing environment by altering their morphology and biomass allocation pattern to maximize resource capture. The objective of my research is to assess the effects of intra- and inter-specific competition and water availability in four competitive environments on resource (biomass) allocation in PSW and BSW. The hypotheses tested are: (1) belowground biomass and root-to-shoot ratio of both PSW and BSW will be greatest in the root competition and water-limiting treatment, and (2) PSW belowground biomass and root-to-shoot ratio will be greater than for BSW across all competition and water availability treatments. Seedlings were planted in pots with four competition settings: (1) shoot competition only, (2) root competition only, (3) root and shoot competition, and (4) no competition. Each competition treatment was replicated with three species set-ups and followed either a water stressed or watered daily regimen. After a growing period of 3 months, the roots and shoots of each swallowwort will be separated, dried, and weighed to determine above- and belowground biomass and root-to-shoot ratio. Preliminary height data taken 50 days after seedlings were potted indicate that shoot allocation in the watered versus water stressed treatments are already beginning to diverge – with watered plants showing increased height and vigor relative to water-stressed plants. Results from this research will provide valuable information on how these two species allocate resources under various competitive environments and water availabilities and will better inform natural areas managers as to which management tactics may be most effective against these aggressive plants.

Oral Presentation

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Human Biology Health and Society

Dr. Richard Canfield

Demographic characteristics and cognitive function in infants with congenital HHV6 Infection

Although the clinical features of congenital human herpesvirus 6 (HHV6) have been well defined in past research, the demographic correlates and cognitive outcomes of congenital HHV6 have yet to be identified. This thesis tested the hypotheses that (1) there will be significant differences in the prevalence of congenital infection based on various demographic characteristics; and (2) Infants with congenital HHV6 will exhibit lower levels of cognitive functioning than infants with postnatal HHV6 infection. Cord blood samples of infants born in all obstetrical facilities of the Strong Health System were tested for HHV6 DNA and 242 subjects underwent additional neurodevelopmental testing at follow-up visits. Results did not show an effect of various background variables on acquisition of congenital HHV6 infection, and no differences in scores were detected between infants with and without congenital HHV6 infection on neurobehavioral testing. The significance of these findings and implications for future research is discussed.

Poster Presentation

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Biology
(General Biology)
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Inactivation of *Ascaris* Eggs Through Exposure to Organic Fatty Acids

The nematodes *Ascaris suum* and *A. lumbricoides* infect billions of people worldwide, and are among the most resistant pathogens when it comes to biocontrol. As such, *Ascaris* is a model organism for developing effective disinfection methods. This study analyzes the ability of various organic fatty acids to inactivate the eggs of the pig nematode, *Ascaris suum*. Eggs were exposed to varying pHs and molarities of acids ranging in molecular weight from acetic acid up to heptanoic acid, and then incubated for viability to determine each acid's effectiveness against *A. suum*. To further determine the likely success of these acids in decontaminating waste, sludge samples containing *A.suum* eggs were exposed to different acids. In direct exposure to the acids, certain molarities of pentanoic, hexanoic and butanoic acids at pH less than 4 were highly successful, inactivating essentially all eggs. Exposure to acids in sludge also appears to be effective, and interestingly, with a longer exposure time butanoic acid appears to destroy most eggs.

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Biological Sciences
(Biochemistry)
Dr. Steve E. Ealick

Crystal Structure of Thiamin Phosphate Synthase from *Mycobacterium tuberculosis* at 2.25Å Resolution

The crystal structure of the *Mycobacterium tuberculosis* thiamin phosphate synthase (*Mt*TPS) was determined at 2.25 Å resolution. Thiamin phosphate synthase has an α/β structure with a triosephosphate isomerase (TIM barrel) fold. *Mt*TPS are bacterial proteins involved in the part of the biosynthesis of thiamin pyrophosphate (TPP), an active form of thiamin (vitamin B₁) which is essential component of the human diet mainly because humans cannot biosynthesize thiamin. *Mt*TPS catalyzes the coupling reaction of pyrimidine pyrophosphate and thiazole phosphate to form thiamin phosphate (TP). *Mt*TPS is a 23 kDa protein and forms a dimer conformation. The *Mt*TPS structure clearly shows that it is very similar to the structure of *Bacillus subtilis* TPS. Active site of *Mt*TPS is highly conserved when compared to *Bs*TPS and phosphate group is bound in the same position as in *Bs*TPS.

Oral Presentation

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Biology
(Biochemistry)
Peter Moffett

Gene silencing as a tool for studying *Phytophthora capsici*-host interaction

Phytophthora capsici is one of the most destructive pathogens to dicotyledonous plants. *P. capsici* has caused tremendous damage to different cultivated species of tomato, cucumber, and pepper. It was shown in our laboratory that when a non-host plant is inoculated with *P. capsici*, the AVR3A protein—conserved among *Phytophthora* species—is recognized by the plant's resistant genes. Here, we used two approaches to study *P. capsici*-host interaction: plant-mediated RNAi and Virus Induced Gene Silencing (VIGS). The RNAi method facilitated the examination of Avr3a's pathogenic role by agroinfiltrating *Nicotiana tabacum* with a hairpin construct—a double stranded RNA that mediates gene silencing—of Avr3a, followed by inoculating tobacco with *P. capsici*. VIGS of different candidate defense genes using tobacco rattle virus enabled us to understand how “non-resistant” plants like *N. benthamiana* can become even more susceptible to infection. Our results showed that silencing Avr3a by plant-mediated RNAi makes *P. capsici* more virulent in tobacco. We concluded that Avr3a triggers a defense response in tobacco; accordingly, tobacco confers resistance because it recognizes Avr3a. VIGS of two resistance-related genes, Sgt1 and I2, showed an enhanced susceptibility to *P. capsici*, proving that Sgt1 and I2 are very important for *N. benthamiana*'s resistance to infection.

Poster Presentation

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Innovative Application of Supercritical Fluid Extrusion (SCFX) for Yeast-free Bread Production

Supercritical carbon dioxide (SC-CO₂)-based extrusion is a technology that allows continuous dough production using a high-pressure extruder to mix and knead dough and SC-CO₂ to leaven it. Current bread manufacturing processes produce large amounts of alcohol byproduct and require extra time and space for proofing. The objective of this study was to produce SCFX-leavened dinner rolls that have density comparable to that of commercial rolls. The study investigated the effects of dough formulation, extruder configurations, and baking practices on bread roll density.

Dough was fed to an extruder at 120 rpm, injected with 1.5% SC-CO₂, rounded and baked at 180°C for 30 min. Density measurements were done using rapeseed displacement method. The data were statistically treated by variance analysis and Duncan's multiple range test ($p < 0.05$), and were presented as percent density reduction.

In the first part of the study, the effects of shortening, sodium stearoyl lactylate (SSL), and guar gum were evaluated. In the second part, a static mixer was attached to the extruder to increase the residence time. In the third part, the effects of oil layering and steam injection during baking were evaluated. With each treatment alone, the densities of bread were reduced ranging from 0.5 to 29.6%. However, when treatments were combined, density of bread was reduced to $0.30 \pm 0.017 \text{ g/cm}^3$ (36.9%). The results suggested that the density was significantly lowered ($p < 0.05$) through the combination of gas cells stabilization from shortening, dough strengthening from SSL, enhanced mixing of SC-CO₂ from the static mixer, and improved gas retention from steam injection.

The study suggested the potential use of SCFX technology in industrial bread production, with advantages such as shorter production time (4-5 minutes), absence of alcohol byproduct, and ability to control flavor characteristics of bread. Additionally, this technology also offers the potential of manufacturing gluten-free bread of good quality.

Oral Presentation

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Chemistry
William Dichtel

**The Molecule - Graphene Interface: Progress
Towards Noncovalent Binding Motifs**

Interest in graphene - flat, single atom-thick sheets of sp^2 -hybridized carbon - has recently intensified because of the development of methods that provide single-layer material and because of graphene's desirable electronic, mechanical, and optical properties. It therefore offers a wealth of possible applications in molecule-based storage, sensing, and energy conversion. Many graphene-based devices will rely on interfacing molecules to the sheets in a well-defined way. Although many compounds can be expected to bind to graphene through π - π interactions, most will simply lie flat on the surface rather than remain solution-accessible. To address this challenge, we have designed tripodal compounds that bind to graphene in a well-defined way, such that a readily-varied functional group is projected normal to the surface. Progress towards the synthesis of these molecules will be presented. We have synthesized and characterized a central tetraarylmethane unit, to which we will attach three polycyclic aromatic hydrocarbon (PAH) "feet". We have made significant progress toward the synthesis of these PAH derivatives. We will evaluate the binding ability of these compounds in part by functionalizing them with a redox-active species and characterizing their redox properties on a graphene electrode. The synthesis and characterization of our first compound capable of these functions will also be reported.

Poster Presentation

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Animal Science
Yves Boisclair
Siu Sylvia Lee

IIS-Dependent Starvation Resistance in *C.elegans*- Possible Modulation through a Binding Protein Homologous to Imp-L2 in *Drosophila*

Insulin-like signaling (ILS) regulates metabolism, growth, development and lifespan in both vertebrates and invertebrates. In vertebrates, ILS is triggered not only by insulin but also by insulin-like growth factors (IGFs.) IGF-specific modulation of ILS is partially conferred through IGF-binding proteins (IGFBPs). In *Drosophila*, ILS is initiated by insulin-like peptides (ILPs) and is also modulated by an IGFBP homolog known as Imp-L2. Specifically, Imp-L2 is upregulated when *Drosophila* larvae are starved and segregates the ILP in non-signaling complexes. This mechanism prevents ILS-dependent nutrient utilization and prolongs the lifespan of larvae during starvation. Interestingly, the nematode *C.elegans*, which possesses ILP and ILS, also prolongs its lifespan through decreased metabolism during periods of starvation or other chronic stresses (heat, crowding, etc.) This metabolic arrest, called the dauer state, is achieved through decreased ILS. However, it is not known whether ILS in the worm is modulated by an Imp-L2-like protein. As an initial step to resolve this issue, studies were performed to determine whether an Imp-L2-like protein exists in *C.elegans*, and whether it prolongs lifespan during periods of stress. Using the Imp-L2 amino acid sequence as a template, the *zig-4*, *zig-3*, and *zig-2* genes were identified as possible homologs in *C.elegans*. Next, RNAi techniques were used to assess the possible roles of the candidate gene products in dauer arrest and lifespan determination. The *zig-4* RNAi lowered dauer arrest frequency compared to the control RNAi ($P < 0.05$), while RNAi against *zig-3* and *zig-2* had no effects. Data on the effects of these RNAi on lifespan are pending. These data are consistent with *zig-4* attenuating ILP-dependent ILS and with *zig-4* possibly encoding an Imp-L2 homolog in *C.elegans*.

Oral Presentation

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Biology, Sociology
(Molecular & Cellular Biology)
Dr. Michael Goldberg

The Greatwall to G₁ Stage: Through Interaction With PP2A B56 ϵ And A PP2A Inhibitor Mapmodulin, Greatwall Kinase Ensures That Cells Stay In M Phase.

Mitosis is a carefully regulated part of cell cycle. Cancer cells have a compromised or defective mechanism that allows them to proliferate without restraint. Along with the maturation promoting factor (MPF), Greatwall (Gwl) is a kinase involved in the regulation of mitosis. Greatwall is required for maintenance of the mitotic phase, and without it cells exit mitosis prematurely. Following upon the recent results showing that Gwl may be achieving its function by inhibiting a phosphatase called PP2A, this study tests *Drosophila* PP2A subunits, a PP2A inhibitor, and a human PP1A subunit as possible substrates for Greatwall using an *in vitro* kinase assay. I report that Widerborst (PP2A B56 ϵ) and Mapmodulin (PP2A inhibitor) are Gwl's two substrates. By phosphorylating these proteins, Greatwall may be inhibiting PP2A and thereby maintaining cells' stay in the M phase.

Oral Presentation

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Food Science
Dr. Dennis Miller

Your cup of tea...: Characterization of antioxidant and nutritional properties of green, black and white teas

Tea contains high levels of polyphenols (antioxidants), which may protect against some forms of cancer by scavenging free radicals in the body. However these same polyphenols may bind to iron and inhibit its absorption thereby contributing to the development of iron deficiency. It is important, therefore, to understand how strongly and under what conditions polyphenols bind iron. Our objective was to compare the concentrations of total phenols in green, black and white teas and to measure the iron-binding capacities of these polyphenols under various brewing conditions. Teas were brewed in water at a range of times and temperatures. Total phenolics were determined in each sample using the Folin-Ciocalteu (F-C) method. Iron binding (I-B) was assessed by mixing a solution of Fe^{+3} with the tea and measuring absorbance at two different wavelengths (Fe^{+3} forms colored complexes when it binds to phenolic compounds. The wavelength of the peak absorbance varies depending on the structure of the phenolic compound.). Standard curves for the F-C assay and the iron binding assays were constructed using catechin (for the F-C assay) and catechin and tannic acid (for the iron binding assays). Results were expressed as catechin equivalents (CE) for the F-C method, and as both CE and tannic acid equivalents (TAE) for the I-B assay. The results showed that, after brewing, green tea contained the highest amounts of total phenols and had the greatest iron binding capacity. Black and white tea each contained lower levels of both total phenols and iron-binding phenols, with black tea containing similar but slightly higher levels of total phenols and iron-binding capacities than white tea.

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Science of Natural and Environmental Systems
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Anti-viral responses induced by plant NB-LRR proteins involve Argonaute4-dependent translational control of viral transcripts.

Active resistance to viruses is afforded by the products of plant disease resistance (*R*) genes encoding proteins with nucleotide-binding site (NB) and leucine-rich repeat (LRR) domains. Upon recognition of pathogen-derived elicitors, these NB-LRR proteins are thought to initiate a number of signalling pathways that lead to pathogen restriction. However, little is known about the molecular mechanisms that ultimately curtail virus accumulation. Here we show that co-expression in *Nicotiana benthamiana* of a plant NB-LRR protein with its cognate elicitor results in an anti-viral response that inhibits the translation of virus-encoded proteins. This anti-viral response is dependent on viral *cis* elements and, upon elicitation of the NB-LRR protein, viral transcripts accumulate but do not associate with ribosomes. The induced control of virus translation and NB-LRR-mediated virus resistance were compromised by the down-regulation of *Argonaute4*-like genes. Argonaute proteins have been implicated in small RNA-mediated RNA degradation and in degradation-independent translational control. Our results suggest that the engagement of Argonaute proteins in specific translational control of viral transcripts is a key factor in virus resistance mediated by NB-LRR proteins.

Poster Presentation

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Undeclared
Prof. Carl Franck

**Searching for Cell Assisted Cell Growth in Low Density Suspension Cell Cultures of the
*Amoeba Dictyostelium discoideum***

For years, the lag phase has been assumed to be part of the cell culture process, taught in biology courses and taken for granted in research. The accidental discovery of a “lagless” strain of the amoeba *Dictyostelium discoideum* last year by our group (Physical Review E, **77**, 041905 (2008)) has therefore led to fundamental questions regarding the collective nature of cell growth at low densities. In an effort to isolate lagless and lagging strains, we recently built an apparatus to track cell growth patterns over time by exploiting light transmission. In it, a laser beam passes through a quasi-monoclonal culture sample in a low volume vial in order to measure cell density at any given time. Of the 78 samples measured, lagging and lagless candidates were chosen, transferred to new growth media to equalize cell densities, and a second growth round was performed. Although a candidate lagging specimen was again identified, this was not confirmed by traditional culture and counting methods. If the lag phase theory were to hold, cell growth rate would increase as a function of cell density, a simple example of cell assisted cell growth and an elegant example of multicellular life. The data show that the lag phase was surprisingly nonexistent in the samples studied; this alters how we regard organic growth and has practical implications for cell culture protocols.

Oral Presentation

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Psychology
Behavioral and Evolutionary Neuroscience
Robert Johnston

An evolutionary analysis of sexual preference behaviors in hamsters and their underlying neural mechanisms

In the first part of the study, male preference of estrous females is explored. Habituation-dishabituation tests were conducted and found that males do not use information from female flank gland secretions to determine estrous cycle state. An analogous experiment was then conducted to investigate whether or not males are sensitive to and use sexual information about the females' estrous cycle that may be contained in vaginal secretions. Males *were* sensitive to estrous cycle information in the vaginal secretions, and they *did* prefer to investigate scents from sexually receptive estrous females. These findings provide a starting place to look for chemical compounds responsible for the communication of this sexual information. The third experiment instead explores female sexual preference based on an experiment from 1978, where captured female Turkish hamsters exhibited the ability to identify and maintain a preference for conspecific males. The experiment was repeated 30 years later on descendants from the original colony, and the females had lost this ability. Preliminary experimentation shows that subjects regained the ability to discriminate between species after an 8 day exposure. As a follow-up, neurogenesis was examined as a possible underlying neural mechanism for this learning process.

Poster Presentation

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Mechanical Engineering
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Prof. Mark Campbell

Sensor Fusion of LIDAR and Vision Data and Constructing High Resolution Range Measurements

Light Detection and Ranging (LIDAR) sensors (i.e., laser range finder) have been widely used for a number of applications. These LIDAR sensors have wide range of reading, but its density of data is low. On the other hand, vision data from a camera are much denser than LIDAR sensors. Our robot has a LIDAR sensor and a fire-wire camera on two different positions. The laser is mounted on a set of actuator which moves in two degree of freedom so that the laser scan can cover the area camera vision. Once these two sensors are aligned either physically or computationally, using color information of vision data, range data can be reconstructed into a high resolution matrix (i.e., 640 x 480) after calculation. This calculation involves coordinate transformation, color gradient analysis, and computation using Conjugate Gradient algorithm. The reconstructed high resolution range data will make robots to scan environment more effectively, and will enhance the precision of identification process.

Poster Presentation

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Biological Engineering

Matthew DeLisa

Examining and Engineering Protein-Protein Interactions in the Bacterial Periplasm

Protein-protein interactions are crucial to many cellular and industrial processes, including enzymatic pathways, molecule secretion, glycosylation, therapeutic production and function, and antibody function. Currently, many methods characterize protein interaction affinities *in vitro* and *in vivo* in the cytoplasm of various organisms, but to our knowledge, no such systems report folding and interaction of proteins in the periplasm. The periplasm of gram-negative bacteria offers an environment with different, beneficial characteristics for the production of heterologous (e.g. therapeutic) proteins. Thus, a means to easily and accurately detect and engineer protein interactions in the periplasm would be transformative for the development of novel antibodies and protein therapeutics. We have used a split β -lactamase protein complementation assay to successfully report interactions of several known interacting domains in the periplasm of *Escherichia coli*. Currently, we are using this technique to select for novel interactions *in vivo* from naïve directed evolution libraries. This powerful methodology allows for a broad expansion of the protein engineer's toolbox for periplasmic expression and works towards a novel, efficient way to engineer new protein interactions in *E. coli*.

Poster and Oral Presentation

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Chemical Engineering
(Biomolecular)
Claudia Fischbach

Engineering the Perivascular Niche of Brain Tumor Stem Cells

Glioblastoma multiforme (GBM) is the most prevalent and lethal form of human brain cancer, with patient survival time of less than one year. Tumor stem cells (TSCs), which are responsible for initial and recurring tumors, reside in perivascular niches in the brain. Other cell types, stromal elements, and the extracellular matrix (ECM) comprise the niche and affect TSC behavior. We are examining interactions between endothelial cells, bulk GBM cells, and TSCs in a simulated tumor microenvironment. Endothelial cells are part of tumor vasculature, which is necessary for delivering nutrients and oxygen to the tumor. We developed a MatLab analysis tool to quantify endothelial cell tube formation when these cells are treated with GBM cell-conditioned medium. Our results have shown that endothelial cells grown in Matrigel, an artificial ECM, with conditioned bulk tumor cell medium exhibits an increase in vascularization. These data suggest that other bulk tumor cells secrete factors to organize tumor vasculature, a component critical to TSC maintenance. This data will help us develop a biologically relevant artificial tumor model that may be useful as a drug-testing platform.

Poster Presentation and Oral Presentation

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Electrical and Computer Engineering
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Hardware and Software Design for Walking Bipedal Robot

Cornell's Biorobotics and Locomotion Laboratory is developing a walking bipedal robot, with the intention of understanding the most versatile, robust, and efficient way of controlling it. The purpose of this research is to relate the controls of this particular robot to the mechanics of human locomotion, in hopes of expanding our knowledge in this still unfamiliar field. The experiments conducted in this lab can be used for various medical applications, such as the development of prosthetic body parts (particularly those directly related to walking).

The electronics group has been restructuring the electronics system of the robot, which consists of several communicating microprocessors. These processors control various motors, communicate with other internal and external devices, read data from sensors, and perform all calculations required for proper manipulation of the robot's movement. The motivation behind the restructuring of the robot's hardware and software architectures is to make a more robust, versatile, and powerful control system. During the Fall 2008 semester, the group designed new printed circuit boards (PCBs) for the electronics control hardware. The hardware architecture is based on ARM7 and ARM9 microcontrollers. The group is currently designing and implementing the robot's new software architecture, including communication protocols, control algorithms, and data collection.

Poster Presentation

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Biological Engineering
(Biomedical Engineering)
Kimberly S. Bostwick, Ph.D.

‘Swishing’ for a Mate: Mechanism of Sound Production in the Male Greater Sage Grouse (*Centrocercus urophasianus*)

Non-vocal sounds or sonations are important in avian communication. However, the mechanisms of production for many sonations are not well understood. To gain a better understanding of avian sonations, we studied the mating display of the male Greater Sage Grouse (*Centrocercus urophasianus*). This bird uses its enlarged esophageal sac to produce many sonations, including two ‘swish’ sounds produced when the bird rubs its wings over its sac to stimulate the feathers on the sac. Interestingly, the change in frequency over time in each of the two sounds is different. Therefore, to understand how the Sage Grouse produces the ‘swish’ sounds, we compared the properties and production of the two sounds. We hypothesize that the difference between the sounds can be explained in one of two ways: either (1) a bird moves its wings over its esophageal sac at different speeds, or (2) the properties of a bird’s feathers change across its sac, and the bird moves its wings across different parts of the sac to stimulate different feathers. To test our hypotheses, we used three approaches. First, we determined if the sounds were significantly different by comparing the changes in frequency and time between the sounds statistically using sound data. Second, we targeted the first hypothesis by analyzing high speed video of Sage Grouse performing their display to examine how the motions of the wings and sac compare between the two sounds. Third, we targeted the second hypothesis by measuring the changes in feather properties, including shaft length and diameter, across the sac. Initial results indicate that the sounds occur over the same amount of time, but the frequencies over which the sounds occur are significantly different. This work will help us understand how birds produce sonations and give insight into the behavior and evolution of the Greater Sage Grouse.

Poster and Oral Presentation

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Plant Science
Dr. Tim Setter

Sugar and ABA Levels in Normal, Water Stressed, and Shaded Conditions of Corn

Drought causes major corn (*Zea mays*) yield loss all over the world. Climate change makes it worse since there is greater possibility of having extreme weather, and global warming creates more drying conditions. Today, there are some corn genotypes that are susceptible to drought and others have quite a lot of tolerance. However, the underlying basis of these differences is unknown. Comparing the amount of sugar, the product of photosynthesis; and abscisic acid (ABA), the stress hormone, on different conditions can give a clue to how the plant adapts to stress. The poster reports these on normal, shaded, and water stressed conditions. Plants were allowed to grow under normal conditions until reproductive stage. For one week, the plants were placed under the different stresses: water deficit and shade. Non destructive samples of the flowers were then taken and plants were returned to normal conditions. A second sample for the water stressed plant was taken 24 hours later. Chromatography was done to separate the different sample components. Peroxidase-glucose oxidase assays and enzyme-linked immunosorbent assays were done to analyze sugars and to measure the different ABA levels respectively. Shade decreased sucrose levels in flowers by 50% and drought by 66% compared to controls. Both shade and drought increased ABA levels by at least 2.5-fold. Effects on glucose and ABA metabolites were less extreme. Interestingly, phaseic acid, a metabolite of ABA, increased on the tolerant genotypes of both drought samples. This study can support further research on the development of drought tolerant corn.

Poster Presentation

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College Scholar and Biological Sciences
(Neurobiology and Behavior)
Tamar Carroll

**Untying the Knot: The National Gay and Lesbian Task Force and Same-sex Marriage
in the 1990s**

How did same-sex marriage become central to the agenda of the gay rights movement in the United States? An analysis of the archival records of the National Gay and Lesbian Task Force (NGLTF), founded in 1973 as the first national gay/lesbian political organizing force reveals the groundwork laid from the late 1970s to the late 1990s facilitating the ascendance of gay marriage to the top of the gay rights agenda in the early twenty-first century. Based on my reading of the National Gay and Lesbian Task Force Records for the 1980s and 1990s and interviews with Urvashi Vaid, a former executive director and policy director of the NGLTF, I contend that the mobilization of the Religious Right in 1995-1997 around the federal Defense of Marriage Act and a host of anti-gay marriage state ballot measures catapulted advocacy of legal same-sex marriage to the top of the gay rights agenda. The history of same-sex marriage in the United States is of great interest now that state legislature and state supreme courts are pondering the legality of excluding same-sex couples from marriage. A focus on the one of the most well-known and, arguably, mainstream gay rights organizations will help us understand how same-sex marriage went from being a distant dream in the minds of a few derided as “assimilationists” to one of the most hot-button issues in state and even presidential elections. It is also instructive to examine the arguments for same-sex marriage and if and how they have changed over the years. Knowledge of which arguments for same-sex marriage were thought by activists to be the most persuasive to the American public and to politicians offers a sense of our national sensibility, values, and thought.

Poster and Oral Presentation

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Animal Science
Dr. Richard Austic

Designer Eggs: Increasing Long Chain Polyunsaturated Omega-3 Fatty Acids in Chicken Eggs

Linoleic acid (an omega-6 fatty acid) and α -linolenic acid (an omega-3 fatty acid) are essential dietary polyunsaturated fatty acids (PUFA). They are converted into longer chain PUFA through common enzymes in tissues. The amount of long chain PUFA synthesized in the hen may depend on the ratio of linoleic to α -linolenic acid in the diet. Poultry diets usually contain high levels of linoleic acid from corn. The objective of this experiment was to determine whether a low dietary ratio of linoleic acid to α -linolenic acid would increase the incorporation of long chain omega-3 PUFA in eggs. I fed four experimental diets and one control diet to 6 replicates of five chickens (30 chickens fed each diet). Each diet had 9% flaxseed as a source α -linolenic acid. The control diet was a typical poultry diet based on corn. The first two experimental diets were based on wheat and the second two experimental diets were based on triticale, which are both low in linoleic acid. The first diet for each type (diets 1 & 3) were supplemented with 2% olive oil, which is low in linoleic acid, to create a low ratio of linoleic to α -linolenic acid. Diets 2 and 4 were supplemented with 2% corn oil, which is higher in linoleic acid, to create a higher ratio of linoleic to α -linolenic. Chickens were fed these diets for six weeks. Feed intake, body weight, daily egg production, and yolk and egg weights were documented. Egg yolk lipids were extracted from the yolks. The lipids were saponified and analyzed for fatty acids by gas chromatography. The dietary treatments did not alter egg weight or yolk weight as a percent of egg weight. The profile of long chain PUFA in yolk lipids is being analyzed statistically and will be presented.

Oral Presentation

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Biological Sciences
(Molecular and Cell

Dr. Jeffrey Pleiss

Regulated RNA Splicing in Budding Yeast

Splicing contributes to the regulation of gene expression by serving as one of the multiple checkpoints before translation. This process of excising the non-coding introns and ligating the coding exons of pre-mRNA to create a final mRNA transcript that can be translated into a functional protein is catalyzed by the spliceosome, a large ribonucleoprotein complex. Although in the past regulation at the level of splicing was largely disregarded due to its high fidelity, recent studies have begun to reveal the spliceosome's regulatory capacity. One expression profiling study has shown that a single point mutation of the spliceosomal subunit Prp8 affected the pre-mRNA splicing profile of only five genes thus conferring lethality. This is quite surprising because Prp8 is ubiquitously expressed, thus indicating that the spliceosome is capable of transcript specific differential splicing. Experiments have also suggested that a related protein, Prp16 is involved in a system controlling fidelity of pre-mRNA splicing by either associating with the spliceosome in a manner that facilitates the second catalytic step in the splicing mechanism or triggering the release and degradation of the mRNA by lack of association with the spliceosome. Understanding the role of specificity and fidelity in pre-mRNA splicing is critical in illuminating the mechanism through which regulation occurs during splicing. We hypothesize that this specificity arises from a multitude of transcript specific factors that interact with the various subunits of the spliceosome. We have chosen to explore this hypothesis through high throughput reverse genetic screens, wherein query mutant *S. cerevisiae* strains are crossed to an array of deletion strains. Through this systematic approach we hope to reveal unknown factors that express suppression or synthetic lethal interactions between such factors and the spliceosomal complex that allow differential recognition of transcripts.

Poster Presentation

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Human Development
(Social and Personality Development)
Dr. Marianella Casasola

Parent-child book reading facilitates emotion understanding in 12-and-24 month-olds

Children whose mothers frequently label, explain, and discuss emotions have better emotion understanding. These children who understand emotions better are more behaviorally competent, showing more pro-social behavior and less physical aggression. Therefore, it is important for parents to have conversations about emotions with their children; an important context where these explanations can take place is in picture book reading. This is because picture book reading enables the parent and child to focus on the same task and to have shared attention and interaction. Few studies look at the development of emotion understanding in the context of book reading, which may serve as a valuable context for learning about emotions and even become a possible preventative measure. Furthermore, an area in which the knowledge is limited on children's emotion understanding is in very young children (12-month-olds). This is important because it will help determine what contributes to social understanding early in life and how to facilitate it. The purpose of the present study was to examine how the amount of emotion words used by mothers during book reading related to their child's emotion recognition and emotion understanding. To conduct this experiment, one- and two-year-old children and their mothers were videotaped reading the book, *Frog Where are You* by Mercer Mayer. This book only has illustrations, which allowed for variability in word choice and story telling. The amount of emotion words used was coded. Then the child was tested for emotion recognition and understanding. It was hypothesized that the more emotion words used by the mother corresponded to increased emotion recognition and understanding on the part of the child.

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Policy Analysis and Management
(Consumer Policy)
Professor Sharon Tennyson

**Insuring Against Another Enron: The Role of Cross-listing Status of Canadian Firms
on the Purchase of Directors' and Officers' Insurance
in the aftermath of Sarbanes-Oxley Act of 2002**

The Sarbanes-Oxley Act of 2002 (SOX) was enacted as a reaction to the high-profile corporate scandals that were publicized in the United States in 2001. Since then, the topics of corporate governance structure and accountability of managers have seen an increase in interest and debate. This paper seeks to examine the effect of Sarbanes-Oxley Act on firms' decisions to purchase directors' and officer's (D&O) insurance, which protects directors and officers from liabilities when they are faced with lawsuits. I specifically study Canadian firms, all of which are listed in Canada's Toronto Stock Exchange but some also in a stock exchange in the United States. The purpose of choosing such a sample is that firms listed in both Canada and the U.S. are directly affected by the passage of SOX whereas those listed only in Canada are not. Thus, the expectation is that after SOX, firms that are cross-listed in the two countries would be more likely to purchase D&O insurance if they had not previously done so and to purchase insurance of a higher premium. The results indicate that such a relationship does not exist, for firms do not significantly change their decisions regarding D&O insurance after SOX was passed. There may be some other factors, such as a general decrease in insurance premium or an expectation that Canada may pass legislation similar to SOX, that may have affected D&O insurance decisions. However, the evidence shows that SOX does not have a direct affect on firms' D&O insurance purchase decisions nor the amount of insurance purchased.

Poster Presentation

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Physics

Professor Itai Cohen

Poking at a colloidal crystal: Studying the dynamics of dislocations

You may not know it, but you see colloidal suspensions everywhere around you in your daily life! Toothpaste, milk and corn starch are all colloidal suspensions. And they are really interesting things to study! You may recall the common cool-science experiment where you start with a large tub filled with corn starch. If you step onto it, your feet will sink in, but if you jump on it, it gets hard as concrete! Colloidal suspensions are basically systems of large (~micron sized) particles suspended in a solvent, and depending on the time and length scales, exhibit different behavior. These systems are exciting because they are large enough to be seen under a microscope and they can be used to model atomic behavior. Not to mention by themselves they provide a pretty cool statistical physics problem to study!

Spherical colloids have been studied for decades, but our group is currently one of the leaders in studying non-spherical colloids experimentally. We want to look at the next logical step – dimer particles. Our system is simple; imagine two ping pong balls taped together, shrunk down a thousand times, with no electrostatic interactions, just plain billiard-ball type elastic collisions. We want to see how they crystallize (yes, ping pong balls do crystallize without any interactions!) in a 2D confinement cell. With confocal microscopy, we can look right down into the single layer region and observe how the system changes dynamically with time.

And if that isn't exciting enough, we are able to use innovative techniques (such as holographic optical tweezers) to perturb the crystal and observe the dislocations that form and travel through the crystal. Dislocations, as you may know, are the reasons for fractures and material failure, and studying how these dislocations propagate in our system gives us an insight into creating stiffer materials – we may even well be on our way to the next Kevlar!

Poster and Oral Presentation

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Psychology

Dr. Barbara Lust

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History

(Asian American Studies)

Dr. Barbara Lust

**Acquisition of English in a young Korean child:
Assessing the roles of maturation and learning**

In this study, we report advance in English in a young Korean child, across a period between the ages of 3 years; 4 months; 14 days and 4 years; 0 months; 10 days. During this period, the child was removed from an English speaking nursery school in the US for a summer in Korea. Given this situation, our question was: would the child's developing English regress during this time or remain stable? Alternatively, would it be possible that the child's English would improve?

We applied a newly developing methodology for the scientific study of multilingual language acquisition, based on longitudinal, multi-sampling case studies, to address this question. Fine grained quantitative and qualitative analyses of interview sessions before and after the summer period are reported.

Results showed, remarkably, significant improvements in the child's control of English lexicon, phonology, syntax and semantics.

We discuss our results in terms of their implications for the role of maturation versus experienced input in the environment.

Poster Presentation

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History of Art
Prof. Laura Meixner

**Reading Pictures / Picturing Words:
The Theory and Practice of Children's Picturebooks**

Since the 1950s, various authors and illustrators have advanced the genre of the picturebook, creating a complex medium where text and image interact in exciting and influential ways. Many picturebook authors, designers and illustrators, including Dr. Seuss, Barbara Lehman, and the team of Jon Scieszka, Lane Smith and Molly Leach, have developed new liberating techniques: merging text and image; blurring the boundary between the written word and the picture; representing text as image and letters as pictures; and finally rejecting text altogether. In so doing, picturebook creators have developed contemporary methods that not only challenge the constraints of language, but unfold the traditions of the picturebook genre itself. How do their picturebooks expand the genre, enable imagination, and liberate readers from linguistic, pictorial and picturebook conventions?

My research explores the relationship between text and image, as well as the picturebook as an art- and cultural-object. I apply theories of critical literacy and reception alongside other Postmodern models to understand the way picturebooks, as text-objects, dictate how children learn and read. My research is twofold. I also have written, designed and illustrated two picturebooks, entitled [This Little Snail Climbs the Mountain](#) and [This Little Snail Needs a New Home](#). Theorizing contemporary picturebooks has helped me define my own creative process. Along the way, I have experimented with narrative arc and the balance between descriptive text and image. Key questions include: What is the relationship between text and image in contemporary picturebooks, and how do the two combine to create meaning? How can I work with the medium to forge my own meaning? The creative process has allowed me to reflect on the actual work of book production, and how the practice of making a picturebook illuminates the meaning and message of the medium.

Poster Presentation

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Policy Analysis

Jordan Matsudaira

The Effect of Tenure on Teacher Performance

The merits of teacher tenure policies are currently being debated across the country, but little is known about their true effect on teacher performance. Critics argue that tenure, originally designed to provide job protection, may have adverse effects on teacher quality if job security removes incentives to perform at higher levels. Using a nationally representative survey of high school students, I examine the effect of receiving tenure on student achievement. Because tenure laws vary across states, I am able to compare teachers with the same level of experience but who differ in tenure status. I find no significant relationship between a teacher's tenure status and classroom performance. The magnitude of the effect of tenure increases, though it remains statistically insignificant, when I limit the analysis to more similar groups of teachers. I argue that further research is necessary to better understand the implications of tenure policies.

Poster Presentation

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Animal Science

Dr. Susan Quirk

The Hedgehog Signaling Pathway Plays a Critical Role in Directing Correct Primordial Follicle Formation in the Mouse Ovary

The Hedgehog (HH) signaling pathway regulates cell differentiation, cell fate determination and cell proliferation. While HH signaling is essential for ovarian function in *Drosophila*, its role in the mammalian ovary remains a mystery. At the time of birth, the mouse ovary consists of oocytes and somatic cells arranged in cord structures. Within a few days, the cords undergo fragmentation to form primordial follicles which consist of oocytes surrounded by a layer of flattened epithelial cells (pre-granulosa cells), enclosed by a basement membrane, and loosely associated with mesenchymal cells. In mammals, primordial follicles represent a reserve of quiescent follicles that gradually activate and develop throughout life. The purpose of this study was to determine the role of HH signaling in primordial follicle formation by evaluating the effects of blocking HH signaling using two methods: 1.) injection of newborn mouse pups with cyclopamine, a plant alkaloid that inhibits the HH signal transducer smoothed (SMO); and 2.) conditional deletion of the *Smo* gene in the developing ovary of transgenic mice using cre-lox technology. Detection of laminin in the basement membrane by immunohistochemistry revealed a higher percentage of discontinuous basement membranes around primordial follicles in ovaries of cyclopamine-treated and mutant mice, and also abnormal follicles containing multiple oocytes. These results suggest that HH is required for proper cord breakdown and primordial follicle formation. Histological analysis revealed a significantly lower ratio of mesenchymal cells to oocytes in ovaries from cyclopamine-treated mice as compared to controls, suggesting that association of mesenchymal cells with primordial follicles was affected. In conclusion, the results suggest that HH signaling is required for communication among oocytes, epithelial cells and mesenchymal cells necessary for assembly of primordial follicles. These findings are of interest because the size and quality of the primordial follicle reserve determines lifelong fertility of mammalian females.

Poster Presentation

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Materials Science and Engineering

Professor Giannelis

Synthesis of Nanoscale Ionic Materials Based on Gold Nanoparticles

Nanoscale ionic materials (NIMS) are a new class of hybrid organic-inorganic materials made up of an inorganic nanocore and an organic corona. These liquid-like materials were recently discovered at Cornell. By combining the tunability of nanoparticles with the flow properties of polymers, one can design materials that manipulate interparticle interactions to realize desired material properties. Due to their high nanoparticle content, zero vapor pressure and inexpensive mass production capabilities, NIMS can outperform expensive lithographic techniques and traditional nanofluids in cost and efficiency. A procedure for the synthesis of gold nanoparticle based NIMS was developed by modifying nanoparticle growth conditions and interparticle interactions, resulting in monodisperse nanoparticles with charged surface groups. Subsequently, the oppositely charged organic canopy could be added, completing the NIMS synthesis.

Poster and Oral Presentation

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Policy Analysis and Management
(Family/Social Welfare)
Dr. H. Elizabeth Peters

The Economic Consequences of Divorce: The Role of Child Support, Labor Force Participation and Means Tested Transfers Over Time.

My research studies the economic consequences of divorce for women. Following the increase in divorce rates in the 1970's, there was a substantial literature documenting the decline in women's household income following divorce (Peterson 1996, Holden and Smock 1991, Smock, Manning and Gupta 1999; Duncan and Hoffman 1988). The consensus from this literature was that household income for divorced women, adjusting for family size, decreased by about a third after divorce. Over time there have been significant changes in factors that might affect the well-being of divorced women's households—increases in labor market attachment of women, declines in fertility rates, and a policy focus on increasing and enforcing child support awards. This research addresses the question of whether the situation for women following divorce has changed in recent years, and what factors may mitigate the decline in income. The data in this analysis comes from the Survey of Program Participation (SIPP) from three different panels: 1984, 1993 and 2001. I analyzed income data of women who had divorced or separated within each of the 2-3 year long panels. My results indicate that although earnings and child support awards have increased between 1984 and 2001, the decline in household income has stayed the same. There was an increase in labor market participation, however it did little to increase household income to pre- divorce or separation levels.

Poster Presentation

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Biology and Society

David Levitsky

The Effects of Nutrition Labeling On Consumption in Dining Halls

Nutrition labels were introduced in Spring 2008 by Cornell dining to various prepackaged meals on campus. Food sales data were analyzed before and after the nutrition labels went into effect to determine whether the nutrition labels led to a difference in which foods were purchased. While a number of previous studies have shown that consumers use nutrition labels when purchasing foods, most of these studies have relied on self-reported data. Previous studies have also shown that consumers may not be able to apply the information on nutrition labels when trying to purchase healthier foods. Therefore, this study sought to determine whether the Cornell community purchased healthier foods as a result of the nutrition labels. Foods sold in three dining locations throughout campus were categorized by their amount of calories, fat, saturated fat, sodium, percent calories from fat, protein, fiber, and sugar. Food sales data were analyzed using SPSS statistical software to test for how sales data changed from Spring 2007 to Spring 2008, when the nutrition labels were introduced. The results showed that there were no significant differences in foods purchased between the two years. This study has public policy implications as menu-labeling laws, which require nutrition labels be available to consumers in restaurants and fast-food chains, are becoming more popular across the nation.

Poster Presentation

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Engineering Physics

Richard G. Hennig

Molecular Dynamics Study on Binding Selectivity of an Organic Molecule with Carbon Nanotubes

Recent research into the properties of carbon nanotubes has spurred an interest in using nanotubes as wires. A current problem with using carbon nanotubes as wires in applications is an inability to produce nanotubes with a select radius and chirality. One way to solve this problem is to design organic molecules that bond selectively to carbon nanotubes of specific size and chirality. We performed a computational study of the intermolecular binding between carbon nanotubes and organic binding agents to identify the properties of a selective binding agent. In our study we use the empirical force model MM2 implemented in the molecular dynamics code Tinker. We confirm the accuracy of the empirical force field by comparison to quantum mechanical calculations for the benzene dimer. The first organic molecule we studied is composed of carbon and hydrogen in the shape of a butterfly with outspread wings where the wings of the butterfly were attracted to and folded around the width of the carbon nanotube. Our calculations of the binding energy between this "butterfly" molecule and nanotubes with a variety of diameters showed that the molecule lacked size selectivity. In other words, the molecule binds to a wide range of nanotubes with different diameters, without a preference for any particular diameter. However, this is only the first stage in designing organic molecules that selectively interact with carbon nanotubes. Based on our results we are designing and testing new organic molecules.

Poster Presentation

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Industrial Labor Relations
Professor Vicki Bogan

Chapter 11 Reorganization: Characteristics of Successful Post-Reorganization Performance

Although the preponderance of companies recently filing for bankruptcy is disheartening, it does not signal the end; some of these firms will reorganize with much success. This study found that among firms that successfully reorganize from bankruptcy, larger companies that file prepackaged bankruptcies experience the shortest duration of time under bankruptcy protection. A statistical regression suggests that the efficacy of Chapter 11 as a rehabilitative process is most salient for those companies that take early informed steps to file for bankruptcy protection while assets are intact and before debt spirals beyond control. Alternatively, this may signal that the rehabilitative process of Chapter 11 operates best for larger companies who may restructure and utilize assets.

An analysis of which factors pertaining to the reorganization process most influence successful emergence from Chapter 11 was conducted using panel data of 131 publicly traded companies that filed for bankruptcy between 1997 and 2002. Performance data was collected for the five years before filing date, as well as the five years after filing date. Relevant variables collected included: asset value, net sales, net income, SIC code, filing party (debtors or creditors), filing type (prepackaged, prenegotiated, or both), duration (in months) of bankruptcy, and the subsequent outcome of reorganization (active, merger, acquired, privatized, liquidated, bankruptcy).

Chapter 11 proceedings filed by debtors, utilizing prepackaged filing types, by companies with large amounts of assets spend the least amount of time under Chapter 11 protection. Additionally, among the many potential outcomes of reorganization those most likely to remain active are correlated with higher assets and higher net income. These findings reveal characteristics of companies that reorganized successfully and imply recommendations for firms that face strategic choices relating to reorganization.

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Science of Natural and Environmental Systems
Environmental Biology, Ecology
Christine Goodale

Patterns of foliar ^{15}N uptake in seven Northeastern temperate forest tree species

The effects of increased anthropogenic-induced atmospheric nitrogen deposition on woodland ecosystems are relatively uncertain. The responses of many tree species to increased nitrogen exposure are even less understood. This study looks at how foliar nitrogen content varies among American beech, eastern hemlock, basswood, quaking aspen, red maple, sugar maple, and white ash trees to help understand such response behavior. Leaf samples were taken from trees located in a plot used by a large, long-term temperate forest heavy nitrogen (^{15}N) tracer experiment in the Arnot Teaching and Research Forest located in Van Etten, New York. Associations between nitrogen content and parameters including species type, tree size, tree growth rate, and type of mycorrhizal association were analyzed. Although significant differences in nitrogen content exist, no overall convincing patterns that can explain such differences were observed.

Poster Presentation

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Biology
(General Biology)
Dr. Robert Raguso

Do *Manduca sexta* moths prefer specific visual characteristics of *Nicotiana* flowers?

The relationship between a flower and its pollinator depends on reliable and consistent visitation by the pollinator. It is known that pollinators use a variety of olfactory and visual cues when selecting a flower to visit. This study investigates the role of floral corolla shape in influencing flower choice by *Manduca sexta* moths based on their natural interactions with wild tobacco (*Nicotiana*). 97 two-day old floral specimens across ten species of *Nicotiana* were photographed, and geometric morphometric analysis was used to investigate the shape variation across these specimens. The resulting relative warps showed that the flowers grouped in apparent clusters by shape, where flowers with similar shapes had a common pollinator. Behavioral assays were then performed with *M. sexta* to determine whether the moths would indeed distinguish between the average floral shape they tend to visit in nature (hawkmoth_{consensus}) and the average floral shape across the ten *Nicotiana* species included in this study (overall_{consensus}). Of the 12 artificial flowers presented, it was found that *M. sexta* emptied significantly more of the hawkmoth_{consensus} flowers than overall_{consensus} flowers. This indicates *M. sexta*'s significant preference for hawkmoth_{consensus} flowers and/or greater success at emptying hawkmoth_{consensus} flowers. Preference is supported by *M. sexta*'s significant first- and second-choice biases. However, the total number of visits by *M. sexta* to different flower shapes did not differ significantly, suggesting that any differences in preference are relatively weak in the absence of differences in nectar reward or other floral attributes. *M. sexta* also showed a lack of constancy, making significantly more transitions between non-like flowers than between like. It was also found that *M. sexta* females make significantly more visits than males regardless of flower shape, which may be a result of biology or body mass differences.

Poster Presentation

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Policy Analysis and Management
(Consumer Policy)
Professor Rick Geddes

The Effect of the 2002 Sarbanes-Oxley Act on Small Firms and Entrepreneurship

The 2002 Sarbanes-Oxley Act (SOX) was enacted to protect investors by improved accuracy and transparency of corporate financial reporting. It is seen as one of the most influential revisions of federal securities laws in the last 60 years. Some research criticizes SOX's imposition of disproportional costs on smaller public companies, particularly due to Section 404, which mandates management assessment of internal controls. I conduct an event study of legislative events related to the passage of SOX in 2002, and two additional events in 2005 and 2006, during which the SEC delayed compliance with SOX's Section 404 for small firms (defined by the SEC as firms with a market capitalization less than \$75 million). I examine stock returns of 2,776 public companies on these events, using stock returns and financial characteristics from the CRSP and COMPUSTAT databases.

Events during the passage of SOX in 2002, that increased the chance it would become law, reduced stock returns of the market overall. Furthermore, the stock returns of smaller and more entrepreneurial firms in comparison to the entire market were particularly decreased by the 2002 events. The 2005 compliance extension for small firms from SOX's Section 404 increased stock returns for smaller firms, while the 2006 compliance extension for small firms from SOX's Section 404 showed no effect on stock returns for smaller firms. Thus only the first compliance extension was seen by investors as differentially benefiting smaller firms. The two compliance extension dates were not seen as differentially benefiting more entrepreneurial firms on the event in 2005 or on the event in 2006. The results indicate that investors viewed SOX during its passage as a negative regulation upon smaller, more entrepreneurial firms, and viewed at least the first of two compliance extensions to Section 404 of SOX as differentially beneficial to smaller firms.

Poster Presentation

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Economics
(Economics)
Dr. Karel Mertens

Predicting Recessions Accurately and Understanding Why They Happen

Recessions are elusive creatures; despite all of our economic thought and energy they remain one of the biggest mysteries of the business cycle. When will they occur? Why do they happen? Where do they come from? Most economists have yet to settle on these questions, but in my presentation I will unveil a method to accurately predict recessions, and a theory backed by evidence as to where in the economy they are being generated from.

Oral Presentation

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Human Development
Life Course, Social Contexts and Social Policy
Dr. Joseph Mikels

Getting the Message Across: Examining Information Presentation and Healthcare Decision-Making Among Older Adults

This study examined differences in health attitudes and opinions by presenting positively and negatively framed healthcare information to older and younger adults. Two bodies of research suggest differing influences of valenced information on individuals. Framing literature indicates that people are more strongly influenced by negatively framed information (Levin, Schneider, & Gaeth, 1998), while socioemotional selectivity theory and the positivity effect posit that older adults prefer, remember, and attend to positive information over negative information (Carstensen & Mikels, 2005). Participants included twenty-three older adults and twenty-four younger adults. They were randomly assigned to conditions where they read several healthcare pamphlets with either positively or negatively framed messages. Results were not significant and did not support the major hypothesis that older adults would be more influenced by the positive pamphlets. However, older adults recognized significantly more positive than negative statements from the pamphlets during a surprise recognition task. These findings draw attention to the importance of investigating delayed decision-making, as older adults seem to demonstrate a bias in the type of information they remember.

Poster and Oral Presentation

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Applied Physics
Professor Chris Henley

The Hunt for New Forms of Magnetism in Non-Bravais Lattices

We study the intrinsic magnetic structure of crystalline lattices. The magnetic structure is due to interactions between the magnetic moments (semi-classical spins); where the magnetic moments are free to rotate in any direction. The interactions considered here are isotropic; they are simply proportional to the angle between two spins. The problem of finding the magnetic ground state in a complex structure (a non-Bravais lattice) is analyzed as a means of discovering exotic new magnetic structures. The specific magnetic state sought here is one where the spins on the lattice sites sweep out a cone. Simulations of characteristic lattices suggests that this problem can often be reduced to two simpler problems: (1) determination of a mapping from a 3D non-Bravais structure to a 1D non-Bravais structure and (2) determination of the ground state in this new structure. For the structure considered here, the 1D non-Bravais lattice that is formed is actually the simplest possible non-Bravais lattice: a 1D chain with two coordinate sites per unit cell. A combination of simulations and perturbations frequently suffices to determine the 3D to 1D mapping function. To determine the ground state of the 1D non-Bravais lattice, it is often sufficient to use a variational approach to the minimum. Significantly, use of perturbation techniques isolates bifurcations between solutions in both of these problems, allowing for the construction of phase diagrams for the magnetic ground state.

Poster Presentation

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Biological Sciences
(Plant Biology)
Professor William Fry

A Novel Virus that Infects the Late Blight Pathogen, *Phytophthora infestans*

Phytophthora infestans (Mont.) de Bary is the oomycete that caused the historic Irish potato famine of 1845-1850 and beyond, and it continues to cause worldwide devastation of the modern potato industry. Double-stranded RNAs (dsRNAs) have been discovered in *P. infestans* but have never been further investigated. Our lab has discovered several dsRNAs that represent viruses. I am characterizing one of these viruses. The virus does not belong to any known virus families and has tentatively been named PiRV-4 (*Phytophthora infestans* RNA virus 4). PiRV-4 has a 3.0 kb genome with one open reading frame (ORF) coding for an RNA-dependent RNA Polymerase (RdRP). Based on sequence comparisons, the genome is most similar to a linear W dsRNA (2.5 kb) Narnavirus related to RNA coliphages found in *Saccharomyces cerevisiae*. No virus sequence was found in the *P. infestans* genome. The virus could not be cured from the *P. infestans* host after four generations of growth on antiviral media; it is still not clear if the virus is affecting the pathogenicity of its host. Upon further development, PiRV-4 could be used as a hypovirulent biocontrol or as a vector for gene expression or silencing.

Poster Presentation

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Fiber Science and Apparel Design
(Fiber Science)
Anil Netravali

Green Composites: Recycled Paper Products Reinforced with Starch-Based Resin

“Green” composites were produced using starch-based resins and recycled paper products. These composites have the desired properties to replace petroleum-composites for a variety of applications, including furniture, sports equipment and car parts. The benefits of using these “green” composites, as opposed to petroleum-based composites, include the elimination of pollution during production of composites, the capability of degrading and recycling the composites when they reach their end use, and the elimination of harsh chemicals that can be dangerous for workers.

Fully biodegradable starch-based resins were prepared using modified starch along with plasticizer additives. A total of six starches were prepared, along with a total of 4 plasticizer additives. These resins showed excellent mechanical properties, with the greatest strength being provided by the MGS starch with 30% by weight CMG plasticizer additive and 5% by weight sorbitol plasticizer. These resins were then impregnated into recycled paper products and hot pressed into composites. The recycled paper composites with the best mechanical properties were various paper towels and newspaper.

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Nutritional Sciences
Dietetics
Dr. Barbour Warren, Dr. Carol Devine

Walking the “Small Steps” Path: Community-based Environmental Change to Increase Physical Activity and Prevent Obesity

Obesity, fast becoming a national epidemic, has been linked to increased breast cancer risk after menopause. “Small Steps are Easier Together” takes an environmental approach to weight gain prevention by promoting changes in the workplace to make it easier for everyone to increase the number of steps taken per day and make more healthful food choices. As part of an eleven-week study, over 200 participants were given pedometers to track the number of steps walked each week and were asked to report aspects of food choice. As part of the project process evaluation I conducted in-person interviews with participants to learn about successes and challenges of the initiative. I used the constant comparative method to code the content of the qualitative interviews. Strategies that promoted walking in groups and group meals or snacks were most successful in increasing participants’ ability to meet the program goals. Sites were also surveyed to determine if the employees were efficacious in effecting an environmental change at the worksite. I found that sites that had buy-in from all members of a workplace, including managers, were more likely to successfully implement environmental changes. This research will be used to modify subsequent Small Steps initiatives. This research also has implications for other community-based programs, as it provides insight regarding stakeholder involvement and successful strategies for environmental change.

Poster Presentation

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Psychology, Economics

Timothy J. DeVoogd

**The Functional Role of the NCM for Recognition of
Familiar Songs in Female Zebra Finches**

Auditory cues modulate a female songbird's mate selection and the large fitness cost associated with potential "bad" mates has led females to develop very keen discriminatory behaviors for various complex acoustic signals. Research involving measurements of electrophysiology and ZENK protein expression have studied the functional roles of brain nuclei outside the song system in higher-level song perception with a large proportion of these studies having focused on male songbirds. Implications drawn from such research are limited in that they only provide correlational analyses, while the vocalization abilities of males potentially confound these implications. To more closely examine the specialized function of the caudomedial nidopallium (NCM), we conducted reversible brain inactivations on mated female zebra finches (*Taeniopygia guttata*) and evaluated preferences for different song stimuli through a phonotactic behavioral assay. The gregarious and socially monogamous nature of zebra finches allow resulting behavioral effects to be quantified by measuring the mean percent of time spent near either end cage. We found that the NCM has a crucial role in evaluating song familiarity, while the suggested dissociation of this ability from evaluating song quality is still being examined. Specifically, the normal preference for her mate's, directed song versus a stranger's, directed song disappeared upon inactivation and returned following reactivation of the NCM. In testing for tutored-isolate preferences, only 2 females have thus far completed behavioral testing; however, results so far point to a likelihood that the NCM is indeed important for song familiarity, but not song quality discriminations.

Poster Presentation

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Physics
(Biology)
Jonathan Butcher

Effects of TGF- β 2 on the Mechanical Properties of Mouse Atrioventricular Valves During Cardiac Development

Congenital heart defects are the leading cause of death due to birth defects, a majority of which involve the remodeling of preavalvular embryonic cushions into thin fibrous leaflets. While many studies have examined the genetic basis of the initial endocardial-to-mesenchymal transformation event in the development of the preavalvular heart cushions, our project focuses on the later stages of cushion remodeling where clinically relevant defects are likely to arise. Previous research has shown that transforming growth factor- β 2 (TGF- β 2) signaling is an important mediator of cushion remodeling, but its role is currently unclear. TGF- β 2 has various effects on cell growth and differentiation, including the mesenchymal growth and remodeling that takes place during cardiac development. While mice deficient in TGF- β 2 die around birth, both elevated and depressed levels of TGF- β 2 cause defects in valve formation in the heart, which we can study by examining RXR α knockout mice, which show increased TGF- β 2 gene expression, and TGF- β 2 knockout mice, which show decreased expression levels. Furthermore, cushion remodeling occurs in a dynamic mechanical environment, yet it is unknown how biomechanics contributes to this signaling pathway. Atrioventricular valves from these mice will be isolated and tested at several stages of embryonic development from E11.5 to E15.5, allowing us to study the role of TGF- β 2 in cardiac development. Using standardized pipette aspiration techniques, we will test the mechanical properties of the valves. We have found that AV cushions of wildtype mice stiffen over development, but further studies on RXR α knockout, TGF- β 2 knockout, and heterozygous RXR α and TGF- β 2 knockout mice must be performed. The results of these studies can then be further examined through testing the effects of TGF- β 2 in embryonic fibroblast culture or chick valve explants.

Poster Presentation

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Electrical & Computer Engineering
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Thin Silicon Pixel Sensors: *Used in the world's largest particle accelerator*

With the technological advances in particle accelerators there is an ever increasing need to upgrade and refine the mechanism to track the particles formed in extremely high energy collisions. In this research project I have studied and analyzed the detailed working of very thin silicon pixel sensors. These thin silicon pixel sensors would replace the existing strip detectors used in the Compact Muon Solenoid experiment at the Large Hadron Collider at CERN. I have completed 3D simulations and modeling of these sensors. The project involved complex steps such as device process simulations, extraction of doping profiles, and simulating single event upsets. Charge collection and electron-hole current characteristics were obtained. The main implication of this research is that adding a degenerately doped trench around the sensor cells, improves the charge collection efficiency of the sensor. The future scope of this project lies in increasing the complexity of the simulated sensor by adding an oxide layer, increasing the number of pixels and simulating multiple particle strikes.

Poster Presentation

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Psychology and Cognitive Science
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Dr. Vivian Zayas

Gaydar: Snap Judgments of Sexual Orientation based on Facial Photographs

Although researchers have found that naïve judges are able to read sexual orientation from faces of men presented for 50 milliseconds with above-chance accuracy (Rule & Ambady, 2008; Rule, Ambady, Adams, & Macrae, 2008), much remains unknown about the gaydar phenomenon. Can people similarly judge women, whose sexual orientation is assumed to be relatively fluid? Moreover, what are the facial cues used to make such judgments? The present research demonstrates that (a) perceivers read women's sexual orientation with above-chance accuracy from faces presented for 50 milliseconds, (b) perceivers read sexual orientation with above-chance accuracy from faces of women and men presented *upside-down* for 50 milliseconds, and (c) sexual orientation detection accuracy decreased for faces of women when presented upside-down, but not for faces of men. These findings indicate that the ability to read sexual orientation from faces applies to both female and male targets, is highly efficient, and appears to be driven by local facial features (e.g., eyes, mouth) for men's faces but by both local and configural (holistic) facial properties for women's faces.

Poster and Oral Presentation

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(Neurobiology and Behavior, Gerontology)
Dr. Valerie Reyna

Memory, Aging, and Cognitive Impairment

Over 9 million Americans have mild cognitive impairment (MCI); people with MCI progress to clinically probable Alzheimer's Disease (AD) at a rate of 10-15% per year. Fuzzy-trace theory is a dual-processing theory that identifies two parallel thought systems, verbatim-based (thinking using precise, detailed memory representations) and gist-based (thinking using vague but meaningful bottom-line memory representations). Consistent with prior research (using less sophisticated measures), we expect older adults who are among the healthy aged will experience a decline in verbatim memory but maintain strong gist traces. However, adults with MCI or AD are predicted to experience a decline in both verbatim and gist memory. Declines in both memory systems result in the catastrophic functional impairments observed in AD. Therefore, we tested aged adults 70 years of age and above, including MCI and suspected mild AD, and college-age controls. The task was a repeated, (multi-trial) associative recall task. We applied mathematical models derived from fuzzy-trace theory to estimate verbatim, gist, and metacognitive judgment (strategic remembering). Preliminary results suggest that, as predicted, younger subjects had higher memory scores, consistent with reliance on verbatim memory, whereas healthy older subjects had lower scores, suggesting a greater reliance on gist memory as opposed to verbatim memory. Parameter estimates from mathematical models will also be presented. These results have a host of important implications for assessing, predicting, and preventing cognitive impairment in aging and a variety of forms of cognitive dementia.

Poster Presentation

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Biological Engineering
Biomedical Engineering
Dr. David Wilson

The Degradation of Cellulose by Exocellulase Cel48A for Biofuels

The study of cellulose break down is imperative to the biofuels industry as it is the least efficient part of the process. Cellulose can be hydrolyzed by a number of cellulases, this research focuses on an exocellulase Cel48A from *Thermobifida fusca*, a thermophilic soil bacterium. Although the activity of Cel48A alone is relatively low, the presence of the enzyme drastically increases enzymatical activity of cellulase mixtures. This project aims to understand the hydrolysis mechanism of Cel48A in order to engineer the enzyme for higher activity, promoting the development of biofuels.

Poster and Oral Presentation

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Human Development
(Social and Personality Development)
Marianella Casasola, Ph.D.

The Role of Sign Language on Speech Facilitation in Children with Autism

Language deficits presented in children with autism spectrum disorders (ASD) are examined, as well as different intervention methods that aim to increase a child's word comprehension and production abilities (i.e. receptive and expressive vocabulary abilities). After reviewing the possible benefits of gestural ability on language, this study aims to determine whether children with autism aged three to five years can benefit from the combination of words and signing, also known as simultaneous communication, in terms of their speech production ability. Specifically, it is hypothesized that children with autism who are exposed to both a word and a sign for an unfamiliar toy will be more likely to verbally produce the target word than when exposed to verbal communication only. Their performance is compared to that of typically developing infants aged 16 to 24 months in order to control for pre-existing language abilities. In addition, typically developing children aged three to five years will also be tested as a comparison group in order to control for factors that accompany natural physical development, such as dexterity with gross motor movements, exposure to language, and experience due to age. Possible results are discussed.

Poster and Oral Presentation

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Biological Engineering
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Professor Moonsoo Jin
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**Customized Chitosan Nanostructures:
A Multifunctional Magnetic Nanomedical Platform**

Iron oxide magnetite nanoparticles were prepared and incorporated into chitosan nanomaterials to form novel magnetic agents for biomedical and environmental application. The polysaccharide polymer chitosan was used for encapsulation and has unique biorelated properties that permit various practical forms; thus, the biopolymer is a leading platform for hemostatic mediation and magnetic separation and purification. Morphologies of three experimental materials were observed by TEM and SEM, which included a chitosan reprecipitate control, a chitosan nanoscaffold, and a chitosan nanosphere. After integration of magnetite, the systems were evaluated in parallel with the specific goal of obtaining a magnetized nanoparticle for (i) Magnetic Resonance Imaging (MRI), (ii) Immunomagnetic Separation (IMS), and (iii) drug delivery. Solvent, solvent volume, and concentration ratio were the physicochemical parameters used to control the overall process, which lead to several nanostructural descriptions. While qualitative analysis suggested that a chitosan nanosphere (<200 nm) dissolved in DMF or dispersed in isopropanol incorporated magnetite (5-15 nm) the most effectively for the research aims, quantitative analysis verified structural and mechanistic characterizations. The experimental procedures performed included FT-IR, EDX, atomic absorption spectroscopy, thermogravimetry, contact angle, and zeta potential measurements. Finally, these systems were tested for DNA purification ability for gel electrophoresis by an original magnetic extraction technique, which demonstrated the vast application potential.

Poster and Oral Presentation

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Biological Sciences, Entomology
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Robert Raguso, Ph.D.

Little moth, big problem: A flower-galling parasite affects the development and fitness of its host plant

A galling organism alters the phenotype of its host plant in an intimate relationship where the galler modifies the plant's biology for its own benefit. Gallers that inhabit reproductive organs provide the potential for large fitness effects and therefore strong selective pressure on the plant to avoid, combat, or tolerate infestation. I investigated how the infestation of *Oenothera caespitosa* ssp. *caespitosa* (Onagraceae) flower buds by *Mompha definitella* (Lepidoptera: Momphidae) larvae affects bud development, floral phenotype and plant fitness. These experiments were conducted in natural populations in Bridger-Teton National Forest, Teton Co., Wyoming. The moth lays eggs on young buds and the larvae develop in the nectar tubes of growing buds. Infested buds become galls; they develop shorter, thicker nectar tubes and are more likely to abort than uninfested buds. If an infested bud blooms, it is likely to be missing parts of its corolla and/or be partially castrated. To estimate the fitness costs of infestation, I measured the seed set of infested and uninfested buds. As would be predicted, aborted buds and flowers with snipped styles had no female fitness. Interestingly, I found that the fruits of uninfested flowers had been infested by *M. definitella*. These late-infested fruits usually retain some fitness because the larvae do not eat all of the seeds. Thus, *M. definitella* appears to significantly alter the development and phenotype of the reproductive unit of its host *O. c. caespitosa* and impacts the fitness of infested plants.

Poster and Oral presentation

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(Biochemistry)
Dr. Marjolein van der Meulen

**Bone Tissue Composition Changes Following In Vivo Loading
in Male and Female Murine Tibiae**

The application of non-invasive mechanical loads to rodent limbs induces geometrical and material changes in the skeleton. The geometric adaptation has been characterized extensively, but the material changes are less well understood. Raman microspectroscopy measures chemical composition at the tissue level and was used to determine the effects of loading, sex, and cortical location on periosteal composition in mouse tibiae. The degree of mineralization (mineral-to-matrix) and carbonate substitution ($\text{CO}_3^{2-}:\text{PO}_4^{3-}$) ratios were used to assess tissue composition. The results showed that the degree of mineralization was lower with loading in mouse tibiae. The decreased degree of mineralization with loading reflects new bone formation on the periosteum which is less mineralized than the pre-existing cortex. Periosteal composition was also different between males and females with males having a greater degree of mineralization and lower carbonate substitution than females. To understand the implications of these findings on functional performance, the material changes reported here need to be combined with geometric and morphological analyses to form a more complete view of structural adaptation of the tibia.

Poster and Oral Presentation

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Civil and Environmental Engineering Double Major
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National Oceanic and Atmospheric Administration

Band of upwelling from interaction of a cyclonic ocean eddy with the Florida Reef Tract

The Florida Area Coastal Environment (FACE) program is a collaborative effort between state and federal entities to protect Florida's valuable coastal waters, which are a vital economic resource, home to diverse ecosystems and coral reefs, and popular fishery locations. In particular, the FACE project is concerned with alleviating the deleterious effects that anthropogenic discharges may have on the coastal environment, including eutrophication, marked changes in primary production, reduced biodiversity, coral bleaching, and other undesirable effects. However, before assessing the fate and transport of anthropogenic discharges of nutrients and other pollutants, it is necessary to tease apart relative contributions and the impact that nature imposes on transport processes. Specifically, this project dealt with characterizing an eddy-induced ocean field and discerning its effect on coastal dynamics. Data recorded from various instruments onboard the NOAA ship Nancy Foster during a cruise in February 2008 were processed and analyzed using MATLAB. Information was obtained from the following instruments: an Acoustic Doppler Current Profiler (ADCP), a Thermosalinograph (TSG), Expendable Bathythermographs (XBTs), and a Conductivity-Temperature-Depth recorder (CTD). Collectively, processed data from these instruments illustrates the passing of an eddy-induced ocean current field. Eddy induced conditions were compared alongside normal conditions, and preliminary analysis demonstrates a strong vorticity leading to a current reversal inshore; significant upwelling events and the associated rise of the thermocline; and a cold, saline front with high shear levels. Likewise, initial investigation of synoptic wind vectors indicates coastal Ekman divergence is not likely to be involved in the transport phenomena observed. Ultimately, this research provides insight into the prodigious effect that ocean eddy fields have on coastal dynamics and the fate and transport of nutrients and pollutants in the coastal environment in South Florida waters.

Oral Presentation

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Biological Sciences
(Neurobiology and Behavior)
Teresa Gunn

**Mahogunin-dependent lysosomal trafficking of Attractin:
Insights into spongiform neurodegeneration**

Spongiform neurodegeneration is a hallmark of numerous diseases and mutations, including prion disease, retroviral infection, lysosomal storage and metabolic disorders, yet the molecular mechanisms behind the spongiform phenotype is poorly understood. Mice with a loss-of-function for either *attractin* or *mahogunin* have a dark coat color as well as widespread and progressive spongiform encephalopathy of their central nervous systems, thus they make excellent genetic models for the study of spongiform diseases. However, the cellular function of the transmembrane protein Attractin, as well as its relationship to Mahogunin, an E3 ubiquitin ligase, has up till now been unclear. In this study, I provide evidence for a role of Attractin in the lysosomal trafficking pathway, whose targeting to the lysosome is regulated by Mahogunin-catalyzed ubiquitination. I have shown that Attractin traffics constitutively and rapidly to the lysosome, and accumulates in lysosomal compartments under lysosomal inhibition. In addition, over-expressing a Mahogunin construct lacking ubiquitin ligase activity, as well as inhibiting *mahogunin* expression, causes Attractin to accumulate at an intermediate step in lysosomal trafficking, and prevents it from arriving at the lysosome. While phenotypic and genetic evidence suggest that Attractin and Mahogunin act through a common cellular pathway, this study is the first to demonstrate that Attractin traffics to the lysosome in a Mahogunin-dependent manner, providing the much-needed link between Attractin and Mahogunin function at the molecular level, and proposing the involvement of the lysosomal trafficking pathway in the development of spongiform neurodegeneration.

Poster and Oral Presentation

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Government
Sherry L. Martin

Performing Gender at the Podium: “Women’s Language” in gubernatorial debates

The use of stereotypical “women's language” structures by women campaigning for state governorships in recent years is examined through analysis of their speech during televised general-election debates, and comparison of media responses to the various debates. Linguistic structures such as politeness, hedging, and imprecise forms are used to create a measure of each candidate's linguistic “femininity.” The tone of news coverage of each candidate's debate performance is analyzed to determine the effect of “women's language” structures on candidate assessment, and whether women's language structures are used by female candidates to negotiate a double-bind of being expected to seem competent but not unfeminine.

Poster Presentation

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Physics
(Education)
Jason Wright

**Ruprecht 147:
A Close, Old Open Cluster as a New Benchmark in Stellar Evolution**

At an estimated age of two billion years and an estimated distance of 200 pc, the star cluster Ruprecht 147 was recently identified by Kharchenko, Piskunov, Roser, Schilbach, & Scholz (2005) as the closest old open cluster. Here we identify > 100 probable stellar members determined through position, photometric, proper motion, and radial velocity cuts, and we calculate an improved estimate for the cluster's mean radial velocity. With this expanded membership list, we present the cluster's new age and distance estimates based on Padova isochrone fitting and rudimentary extinction adjustments; we find that the cluster is older and more distant than is reported in Kharchenko, et al. (2005). SME analysis further indicates that the cluster is roughly solar metallicity. Future work will include a robust determination of the age and distance to the cluster by the assignment of membership probabilities to the members identified here. Once its age and distance are calculated with high confidence, Ruprecht 147 will become an important benchmark in stellar evolution: its relative proximity will allow us to observe its member M dwarfs and thus observationally calibrate the age-activity relation found for low-temperature stars by Hawley, West, Bochanski, & Covey (2006).

Poster Presentation

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Biological Sciences
(General Biology)
Dr. Bowman

Morphologic and Molecular comparison of the cysts of the genus *Giardia* recovered from naturally infected dogs and cats

Area, length, width, and eccentricity between *Giardia* cysts from 7 dogs and 9 cats were compared to examine whether the cysts from the two species differed on a morphological level. Cysts from fresh fecal samples were isolated and concentrated using a magnesium sulfate flotation. Images were taken of 100 cysts from each animal with a binocular bright field compound microscope under oil immersion and measured using the computer program, Image J. Cysts from each of the animals also underwent DNA extraction, PCR, gel electrophoresis and sequencing to determine if the Triosephosphate Isomerase (TPI) sequences were molecularly different. Analysis of variance between the dog and cat cysts was statistically significant for width but not statistically significant for area, length, or eccentricity. One of the dogs was assemblage B, while the rest were assemblage C. Three of the cats were assemblage B, two were assemblage A, one was assemblage C, and three were assemblage F.

Poster Presentation

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Economics
(Math)
Dr. Afonso C. Silva
Dr. Ara Kocharyan

The Role of Cyclooxygenase on the Cerebrovascular Coupling

Well-regulated blood flow within the brain is vital to normal function. The brain's requirement for sufficient blood flow is ensured by a tight link between neural activity and blood flow. In order to ensure meeting the metabolic demands of the brain, cerebral blood flow (CBF) must be maintained within narrow limits and adjusted accordingly when there is an increase in brain activities, which process is known as functional hyperemia. Animal models of cerebral functional hyperemia play an important role in the study of maintaining homeostasis.

Although realized by the scientific community over a century ago, the mechanisms of cerebrovascular coupling remains widely investigated yet not fully understood. In the recent studies, controversies between whether the coupling is neuron-mediated or astrocyte-mediated emerged. In the present study, the effects of somatosensory stimulation on brain activities and the dynamic process of vasodilation are further explored. We investigated the influence of the selective cyclooxygenase inhibitors SC-560 and NS-398 (COX-1 and COX-2, respectively) on the cortical CBF response and on the evoked neuronal activity in a rodent model of somatosensory stimulation.

Poster and Oral Presentation

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Human Development

Dr. Wendy

Thinking Like a Scientist In Elementary School

This study evaluated how critical thinking skills can be implemented in young elementary school children in science class. Critical thinking skills were defined as the ability to utilize the scientific method and transfer skills learned from the process of the scientific method to various scenarios which might be encountered in making life decisions. Participants were a class of nineteen second graders ($M_{age}=7.2$, $SD=0.67$). The curriculum encouraged students to apply the scientific method to situations the student might encounter in real life. The results will examine student responses from open-ended questions about how they would apply the scientific method in response to prompts from real-life scenarios. If the results show improvement in student responses following instruction of the curriculum, it will demonstrate that the Thinking Like a Scientist curriculum is effective at a second-grade level and that this type of intervention may be successful and replicable in other classrooms.

Memory and Misinformation in Eyewitness Testimony

Blaine Huss, Lexi Pritchett, Samira Saifi, Kristen Koproske

Study proposed by Dr. Valerie Reyna and Dr. Charles Brainerd

This study examines how interviewing techniques influence memory reports in eyewitness testimony. Fuzzy-trace theory posits that memory is stored in two independent traces, verbatim (memory for exact details) and gist (memory for meaning). Gist traces are more durable over time and increased reliance on gist is the source of false memories. It is hypothesized that increasing the strength of gist traces will increase memory for the core gist of experience while also increasing acceptance of gist-consistent false items. Further, strong verbatim traces will allow for greater rejection of false items. Thirty adult participants were shown a video clip of a boy stealing a bike. Following this, they were given a positive-leading, negative-leading or unbiased-leading interview. Subjects were then given a memory test in which they were told to respond ‘Yes’ only to items that they had seen in the video. The test consisted of true, false and control items. Results showed that as the items moved further away from the core gist of the video (the boy stole the bike from the girl) participants were less likely to reject false items and less likely to accept true items, indicating a greater reliance on gist memory. In addition, viewing the video twice increased correct rejection of false items and acceptance of true items. This confirms the hypothesis that strong verbatim traces allow for correct rejection of gist consistent but false items. Finally, as the interview progressed from positive to unbiased to negative-leading, participants were less able to distinguish between true and false items. This is due to negative and unbiased increasing gist but not verbatim memory. Our results illustrate the importance of interviewing techniques in eyewitness reports. Techniques that increase reliance on gist memory will increase the probability of false memories, while accentuating verbatim memory can protect against false memories.

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Poster Presentation

Fuzzy Trace Theory and Suggestibility in False Memories

Dmitry Kozhevnikov '10, Jillian Russo '09, Anna Kharmats '11, Kristen Kopraske '10, and Priscilla Wong '10

Advisors: Dr. Valerie Reyna, Dr. Charles Brainerd, PhD Candidate Steven Estrada

The body of your abstract goes here. Use this space to describe your research and exciting findings. Your abstract may not exceed 300 words. Latin and foreign words, scientific names of organisms, and variables may be typed in italics; use subscript and superscript notations in your formulas. Try to make your description clear and concise.

This study examines the factors involved in the development of false memories. For fuzzy-trace theory, experiences are encoded in two independent traces. False memories occur when gist traces (memory for meaning) are strong and verbatim traces (memory for details) are weak. Further, suggestion increases false memory reports by interfering with verbatim memory and by increasing reliance on gist memory. For our study, it is hypothesized that recollection rejection, the ability to use verbatim traces to reject gist-consistent items, will be greatest when verbatim traces are strong. Further, suggestibility will increase false memory reports by interfering with verbatim memory. A sample of 161 Cornell students were read narratives either once or twice during the study phase. For the test phase, a memory test was given containing three true sentences that were exactly the same as those in the original narrative (true verbatim), four sentences that expressed the same relationships in alternate phrasing (true gist), and three false sentences as controls. Participants were instructed to say yes only to items that were exactly the same as the narratives presented at study (true verbatim) or say yes only to new items that retained the gist of the narratives (true gist). We found that when narratives were presented twice rather than once, participants were better able to accept true verbatim items and reject true gist items. This indicates that when verbatim traces were strong (when the narratives were read twice), participants were better able to use recollection rejection to reject gist consistent distracters. Further, participants accepted true items more when they were normal than when they were suggested, indicating interference in verbatim memory. Our results support recollection rejection as a viable process for protecting against the generation of spontaneous false memories.

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Poster Presentation

Risk & Rationality in Medical Decision-Making

Avery Miller '09, Afsana Alam '11, Stefani Birnhak '09, Christopher Del Prete '10, Hasini Ediriweera '09, Tracy Liang '10, Sara Rahman '12, and Emily Taub '10

Advisor: Dr. Valerie Reyna

Patients with acute coronary syndromes (ACS) account for nearly 1.7 million hospital admissions per year, and many patients with myocardial infarction (MI) are mistakenly released from emergency departments. Failure to diagnose ACS has serious consequences, but far more patients are admitted for ACS than are ultimately found to have them. This study investigates the consistency between physicians' estimates of a patient's risk for coronary artery disease (CAD) and MI and that patient's triage placement, as well as the correlation between these triage decisions and a physician's level of experience. A sample of 955 emergency room patients presenting with non-traumatic chest pain or pressure were assessed as low, intermediate, or high risk for both CAD and MI by physicians who varied in specialty and experience level. Using multiple regression analyses, it was found that a physician's estimate of a patient's MI risk was a better predictor for how that patient would be triaged, reflecting the notion that physicians found a higher risk of MI to be a more immediate threat than a higher risk of CAD. Less experienced physicians (1st year residents) were more likely to discharge patients at an intermediate risk level for both CAD and MI, whereas more experienced physicians (2nd & 3rd year residents and attending physicians) either discharged such patients or admitted them with about equal frequency. However, when intermediate CAD and MI risk levels were examined individually, patients with an intermediate MI risk were more likely to be admitted, whereas patients with an intermediate CAD risk were more likely to be discharged. This finding was true for all physician experience levels, providing further support for the previous conclusion that a higher MI risk is considered a more immediate threat than a higher CAD risk and thus warrants hospital admission more frequently.

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Poster Presentation

The Gist of Risk: Explaining Contradictory Relations in Risk Perception and Behavior over Time

Erica Shreck '09, Meghan Smith '10, Adrienne Romer '11, Zachary Lorsch '12, Kristin Lee '12, and Natalie Cook '12

College of Human Ecology, Cornell University. Advisor: Valerie Reyna

Studies have documented opposite relations between perceived risk and risk-taking behavior. The present study tested a theoretical explanation to reconcile these conflicting findings, based on fuzzy-trace theory. Adolescents (N=837) were administered a survey prior to assignment to one of three educational conditions. The subjects completed measures of risk perception that varied on such dimensions as cue specificity (e.g. more gist-based qualitative cues, such as “overall for you what risk do you perceive?,” versus verbatim quantitative cues, such as “what is your specific risk of getting an STD”) and response format (e.g., categorical responses, such as “low,” versus specific continuous responses, such as 0-100% chance) at five different time points over the course of one year. As predicted by fuzzy-trace theory, measures that emphasized verbatim retrieval and quantitative processing produced positive correlations between perceived risk and risky behavior, whereas measures that assessed gist-based, qualitative processing produced negative correlations over time. Data also confirmed that finer distinctions among degrees of risk (categorical vs. ordinal gist) were associated with more risk behavior; put differently, endorsement of the categorical version of the same principle was associated with decreased risk behavior. These findings also differed across interventions. Results support and expand a dual process understanding of risk perception and behavior, in which the observed relation depends on risk processing cues. Measures that emphasized verbatim retrieval and quantitative processing *reflected* the extent to which adolescents engaged in risky behavior. In contrast, endorsement of global, gist-based values and principles *protected* the adolescent against the risky behavior, as higher risk perceptions were associated with less risk taking. The presence of both protective and reflective longitudinal relations further elucidates the role that memory plays in risk perception and risk taking.

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Poster Presentation