

**Cornell Undergraduate
Research Board**

~ Presents ~

**The 32nd Annual
Spring Research
Forum**



April 27th, 2017

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 events are the annual fall and spring undergraduate forums. Hundreds of undergraduates from all majors and disciplines have presented their hard work for over 25 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 curb.cornell.edu or email curb@cornell.edu.

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PREFACE

Welcome to the 32nd Annual Cornell Undergraduate Spring Research Forum. This year we are proud to showcase the research endeavors of approximately 80 undergraduate students from various academic fields. The Spring Forum is designed to acquaint undergraduates with the rigors of presenting research in a scholarly manner. It serves as an opportunity for students to engage an audience of faculty, administrators, peers and family with their research.

CURB encourages the attendees and supporters to join us in our celebration of undergraduate research at Cornell. We congratulate these students for their accomplishments and hope that this experience helps to launch productive and satisfying academic and professional careers.

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

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AEM
Poster #1

What Affects Consumers' Likelihood to Shop Online: A Conjoint Study on Millennial vs Non-Millennial Online Grocery Shopping Behaviors

This research project examines the perceptions of online grocery shopping between millennial and non-millennial shoppers. A conjoint experimental choice analysis was conducted to investigate if and how situational factors such as the delivery fee, time required to travel to the store, time available to shop, and purpose/nature of the trip affect consumer's perceptions on online grocery shopping. An online survey was administered to 338 respondents in the U.S. via Amazon Turk. The respondents were presented with two hypothetical shopping scenarios with different situational factors. This was followed by a series of questions asking them about their perceptions on the price, reliability, convenience, and value for each scenario. The results were analyzed using a conditional logistic regression model to determine the factors that affect millennials and non-millennials perceptions' of online grocery shopping. The results from this research study can be used to develop a targeted pricing model and marketing strategy for emerging businesses in the online grocery delivery industry.

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Monarch and Pig Na⁺/K⁺ Pump inhibitions in response to Pachypodium and Asclepias Extracts

Pachypodium, a genus of toxic plants endemic to South Africa and Madagascar, are known to be toxic due to their historic use in poison arrows. However, the mechanism for their toxicity is unknown. Given that these plants are part of the milkweed family, famous for its cardiac glycosides, we decided to test for the presence of these compounds in Pachypodium. This toxin is active in all animal cells and binds specifically to the sodium potassium pump of the consumer, inhibiting the action of the enzymatic pump ATPase. Pachypodium is a genus in the same family as Asclepias. Primarily found in South Africa and Madagascar, their feeders are quite different from the ones of milkweed. Some primates and a moth have been seen to feed on Pachypodium.

Using current HPLC methods, low quantities of peaks resembling cardenolides (abs 218) were found in the plants. Because these peaks were small and difficult to resolve, we investigated the inhibitive activity of whole plant extracts on a sensitive sodium-potassium pump (isolated from pig brains). Enzymatic activity was found to be similar than the inhibition levels caused by Asclepias cardenolides.

Given that Pachypodium species possess ATPase-inhibiting compounds that are likely cardenolides, we decided to investigate the toxicity of these Pachypodium extracts in direct comparison with whole milkweed (Asclepias) extracts. In this case, we were interested in both the differences in overall inhibition on the sensitive enzyme, as well as differences in inhibition of an enzyme known to be cardenolide resistant. This test would give us indirect information about the similarity between the plant toxins in these two genera. Monarch butterflies, *Danaus Plexippus*, specialists of Asclepias species, have co-evolved with their host plant to build resistance against the plant's main toxic compound: cardenolides. Over evolutionary times, the arms race between plant and herbivore led to monarchs being much more resistant compared to a generalist to this toxin. The question we investigated was: how would this resistant ATPase function in the presence of Pachypodium toxins?

Microplate assays was performed where plant extracts were applied to Na⁺/K⁺ pumps of monarch and pig brains. Activity levels of monarch and pig enzymes were measured and compared to a ouabain standard. As expected, monarchs were found to be about a hundred times more resistant to milkweed cardenolides compared to pig (*sus scrofa*).

However, Monarch and pig ATPases were found to be similarly inhibited by Pachypodium species, which shows that although monarchs are resistant to milkweed cardenolides, they haven't evolved to be resistant to Pachypodium cardenolides. This information could mean that the Pachypodium toxin is not a cardenolide, or has a slightly different structure. It could also mean that Pachypodium plants have other secondary metabolites that are not found in Asclepias and enhance the plants' defense against novel herbivores.

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Poster #3

Effectiveness of programs, interventions and approaches to protect, promote and support exclusive breastfeeding practices for children 0-23 months in South Asia

The impacts of breastfeeding have been shown to provide perfect nutrition for neonates up to 6 months as well as protect them from potential infections. If provided during the first 1000 days after birth, the critical period for growth and development, neonatal mortality rates as well as childhood stunting could be severely reduced. We conducted a literature review to examine the effects of different approaches in five South Asian countries on improving exclusive breastfeeding practices from 1990 to 2015. Both observational and experimental study designs to protect, promote, or support exclusive breastfeeding for up to 6 months were selected in examining impacts at the individual, household, and community level. We observed the type, delivery, and duration of observational exposures or experimental interventions to determine effectiveness through reported outcomes of change. The implications of our study can be useful in developing future programs or policies in improving the exclusive breastfeeding landscape in South Asia.

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Poster #4

Citizen Science Provides Insights into the Decline of House Sparrows in North America

House Sparrow populations declined across the world through much of the 20th century. Most research examining this decline has been conducted in the species' native European range, but Europe encompasses a small portion of the species' current distribution. Population trends for the House Sparrow in the United States, for example, have not been thoroughly examined nor have potential mechanisms driving population trends been examined. We use 21 years of data from Project FeederWatch, a large-scale citizen science project, to investigate House Sparrow population trends at large spatial scales. Winter flock sizes are greater in urban areas than in rural areas across the United States and Canada. Despite greater relative abundance in urban areas, I show that House Sparrows declined by ~30% in urban areas from 1995 to 2016 while remaining stable in rural areas. House sparrow declines have coincided with an increase in populations and expansion of the winter distributions of Accipiter hawks, known predators of House Sparrows. Despite the correlation between declining numbers of House Sparrows coincident with increasing abundance of a main predator, our data do not support a direct connection between the presence of Accipiter hawks at a count site and house sparrow abundance. Rather, sparrow flock sizes are larger at sites with Accipiter hawks, suggesting a potential behavioral change (greater propensity to form flocks) when exposed to predation pressure. This is the first extensive study of House Sparrow population dynamics in the United States and suggests that future studies focused on explaining declines in urban areas should be a research priority.

How Do Achievement Goals Influence False Memory Processes?

There is some evidence to suggest that achievement goals, which inform how we motivate ourselves in work and performance related contexts, can affect memory. Specifically, it has been suggested that mastery goals promote relational encoding (a gist process) while performance goals support item-specific processing (a verbatim process). Differential adoption of achievement goals could therefore explain some of the variability between subjects in memory experiments. In the present study, we explored the effects of achievement motivation goals on false memory. We predicted that the adoption of mastery goals would promote gist-based false memory, whereas performance goals would promote verbatim-based false memory.

Subjects aged 18-24 were recruited through the Cornell University SONA system and tasked with completing a recognition memory test of Deese-Roediger-McDermott word lists. Using a between subject design, participants were prompted to pursue either a mastery goal, performance goal, or no goal at all (i.e. achievement goal instructions omitted) during the instructional phase of the experiment. Results demonstrated that recollection rejection (a verbatim process) increased under the mastery goal condition, contrary to our original prediction. Additionally, an interaction between gender and motivational condition in response-bias measures suggests that achievement goals differentially affect male and female decision processes. Analysis of manipulation checks also showed that goal manipulations were not consistently salient. Future studies exploring within-subject goal manipulations could help shed light on the relationship between motivation and memory.

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A new species of *Dendrocephalus* from Highlands County, Florida

In June of 2016 I discovered a new species of fairy shrimp (Anostraca) in a temporary pool at Archbold Biological Station in Highlands County, Florida. Archbold is situated on the scrubs of the Lake Wales ridge, a narrow strip of former islands that supports a highly endemic xeric community. To the best of my knowledge, this is the first Anostraca species recorded from the station as well as the county. Adults vary between light green, yellow, and orange based on diet and culture conditions, and females produce rust-colored, semi-spherical eggs at the age of two weeks. This new species can reach about 1 cm in length and its type locality is a single pool with a diameter of 10 m. Live adults were present in about 4 cm of water when found. Anostraca is an ancient order known from the Upper Cambrian (approximately 500 mya) and members of the order are able to inhabit temporary pools because their eggs are resistant to desiccation and lie dormant in the soil when the pools dry.

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Poster #7

What's in a feather? Reconstructing mercury concentrations through time using museum specimens from New York State

Mercury (Hg) released into the environment from anthropogenic sources has become increasingly problematic in ecosystems worldwide. From the late 1860s until the early 1980s, global anthropogenic Hg emissions increased exponentially due to coal emissions, industrial practices and artisanal gold mining. In this study we examined how methylmercury (MeHg) concentrations vary through time in birds, which can be used as a biological indicator of ecosystem health, within New York State. We focused on the time period 1880 - 2016 to capture variation in biologically available MeHg, corresponding to peak industrial activity and environmental legislation restricting Hg emissions. We examined MeHg concentrations in the feathers of six species that have distinct habitat and dietary preferences: Belted Kingfisher (*Megacerlye alcyon*), Cooper's Hawk (*Accipiter cooperi*), Eastern Phoebe (*Sayornis phoebe*), Wood Duck (*Aix sponsa*), Ruffed Grouse (*Bonasa umbellus*), and Virginia Rail (*Rallus limicola*). We used carbon and nitrogen stable isotopes to account for possible changes in habitat and trophic levels between species through time. Results to date show predicted patterns in isotopic niches and MeHg concentrations for these species. Species feeding at higher trophic levels (e.g., Cooper's Hawk) and in aquatic habitats (e.g., Belted Kingfisher) tend to have higher MeHg concentrations than species that are mostly herbivorous or land dwelling (e.g., Ruffed Grouse). Our results for changes in avian MeHg concentrations through time are more complex, suggesting that the effects of anthropogenic Hg emissions may be highly localized and species-specific.

FAS Expression Following Hypoxia in the Newborn Piglet Brain

Perinatal hypoxia-ischemia (HI) is a major cause of brain developmental problems in children. The apoptosis of brain cells as a result of HI leads to high risk for brain damage. The extrinsic pathway of apoptosis utilizes FAS, a tumor necrosis factor receptor that leads to regulation of cell death. This process occurs through binding of soluble FAS, isoform 6, to a membrane bound FAS ligand. We tested the hypothesis that the concentration of soluble FAS in brain tissue serves as a marker of apoptotic brain damage as a result of HI. Anesthetized and ventilated 3-5 days old piglets were exposed to either HI [FiO₂ 0.07 for 1 hr and hypotension (40% decrease in systolic BP); n=2], then returned to FiO₂ 0.21 to restore O₂ and BP for 4 hrs (HI-4Hr), or were maintained with normoxic FiO₂ 0.21 for 4 hr (Nx-4Hr; n=3). Cytosolic fraction of the cerebral cortex was obtained by homogenization and centrifugation at 40,000 x G. FAS protein expression was determined on Western blots. Optical density of the bands was expressed as ratios to a normal control. Soluble FAS protein expression in the cerebral cortex was increased in the HI piglets compared to normoxic controls. The percent optical density of the band on the Western Blot was 19.69±0.29 in HI and 56.18±21.39 in Nx piglets (P<0.05). The data show that HI correlates with increases in soluble FAS protein expression four hours following hypoxia. Our findings demonstrate a significant change in soluble FAS expression 4 hours after HI in piglets. This opens the door to pursue more research to further support these preliminary results. The relationship found between FAS expression and hypoxia could allow soluble FAS to be used as a biomarker for apoptotic brain damage in children suffering from HI.

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Poster #9

Effects of Repeated Inoculations of *Christensenella minuta* on Weight Gain, Adiposity and Gut Microbiota Composition of Humanized and Conventional Mice

The composition of the gut microbiome is intimately linked with metabolic phenotypes such as obesity. Previous studies have shown that a higher abundance of Christensenellaceae, a member of the gut microbiome, is correlated with a lean phenotype, both in experiments with germ free mice and human subjects. Studies using germ free mice directly show a causal role for *Christensenella minuta*, a cultured representative of the family Christensenellaceae, in promoting a lean host phenotype. However, the mechanism through which the presence *C. minuta* results in a healthy host is poorly understood. Here, I inoculated humanized mice with heat killed or live *C. minuta* twice per week for ten weeks and investigated the effects on weight and adiposity. I also analyzed the effects of the biweekly inoculations on the overall composition, alpha diversity and beta diversity of the intestinal microbiota of the mice in the two treatment groups. While I did not detect significant differences in weight gain or adiposity between the treatment groups, I observed a trend of increased weight gain and adiposity in the mice inoculated with live *C. minuta*. In a second experiment, I inoculated conventional mice with live *C. minuta* or PBS daily for eleven days and did not observe any differences between the two treatment groups. It should be noted that the small sample size of both experiments may have masked any genuine differences between the treatment groups. These findings indicate that *C. minuta* may have a different influence on weight gain and adiposity in humanized and conventional mice compared to germ free mice.

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Poster #10

How Do you Remember More Accurately? Young Adults Postdating Earliest Childhood Memories

Thirty-two young adults were recruited on SONA, a Cornell University Psychology Experiment Sign-up system. They reported their five earliest memories and the properties of these memories (i.e. personal significance). Parents were then contacted to confirm these memories and dating estimates, and to provide any additional details. Consistent with the first hypothesis, these young adults postdated memories before 48 months and predated memories after 48 months. Furthermore, more dating techniques was associated with less dating error and the most frequently used techniques were seasons, school year, and landmark events, consistent with my second hypothesis. Finally, memories with landmark events were not different in dating error from memories without, evidence against the third. This study is the first to examine postdating effects in young adults. These findings have important implications on autobiographical processes.

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Taking inventory: Drivers of a bee associated fungus (Genus: *Ascosphaera*) in the solitary mason bee, *Osmia cornifrons*

Estimations of pollinator declines often neglect the vast biodiversity of bees that pollinate our world (nearly 20,000 species). Wild bees impact crop productivity and can be functionally complementary to managed honey bees in agricultural settings. Losses of these bees are suggested to be caused by multiple combined factors, including infectious diseases. Thus, it is essential to investigate the impact pathogens have on wild bee species. My research explores the drivers of bee-associated fungi in the genus *Ascosphaera*, and its prevalence in nests of the horned mason bee, *Osmia cornifrons*, across landscapes.

In this project I screened overwintered trap nests of *O. cornifrons* with two techniques, the first being visual identification and the second through PCR analysis. The bees were collected from apple orchards, which varied in surrounding landscape composition. A phylogenetic tree was constructed from DNA extracts of infected individuals for species level identification of the *Ascosphaera*. I found both pathogenic and saprotrophic species of *Ascosphaera* among nests. I also found differences in body size, inter-tegular distance, and sex ratio among the *O. cornifrons* bees infected with *Ascosphaera*. As urban and natural habitats increased in proximity to the apple orchards, *Ascosphaera* presence increased among infected adult bees. Pesticide data among the landscapes was also explored and fungicides had a significant effect on the presence of both infected adult bees and dead larval bees.

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Poster #12

Sex- and Age-Based Latitudinal Segregation in the Wintering Distribution of Herring Gulls (*Larus argentatus*)

Herring gulls, though a monogamous species, have been observed in several North American colonies to show evidence of polygyny and/or female-female pairings. Such mating strategies are often a result of a skewed sex ratio, which is generally maladaptive and is often caused by differential survival between the sexes. Our study population shows parity of sexes at hatching and fledging but a skewed adult sex ratio. Considering how migration and choice of wintering sites might affect survival, and differential migration by age and/or sex is not uncommon among migratory birds, we looked at winter site variation as a function of age, sex, and age+sex in our population. During the 2010-2015 nesting seasons, chicks were banded and bled, in order to sex them genetically. A website was set up for members of the public to submit sightings, including information on the band numbers, location and date of sighting. Using this information, we modeled four response variables (distance from nesting colony, distance from nearest marine coastline, latitude, and longitude) as a function of sex alone, age alone, and age+sex. Model results indicate that older birds wintered closer to the nesting colony than younger birds, with first-year females traveling farther from the nesting colony than other age- and sex-groups. Males were more likely to be detected inland than females in all age categories, and although distance from the nearest shore was highly variable in females of different ages, the males showed no significant difference between age groups. To our knowledge, we are the first to find a difference in distance from shore as a function of sex in herring gulls. Our data also strongly supported the full model demonstrating that females were detected farther south than males and young birds were detected farther south than older birds. Since females appear to survive better than males into adulthood, our results may suggest that spending the winter further south carries with it an advantage, which could be related to reduced competition or better habitat quality.

Perinatal Geophagy is Associated with HIV and Anemia Among Women in Western Kenya

Geophagy is the craving and purposeful consumption of earth. Although the practice has been well documented globally, its socio-demographic, psychological, and biological covariates are not well understood. We therefore sought to assess predictors of geophagy during pregnancy and the first year postpartum among a cohort of women (n=368) in Nyanza Province, Kenya. Women were purposively recruited at mid-pregnancy to achieve a 1:1 ratio of HIV-uninfected: infected. Results are based on data from 2 antenatal and 3 postpartum visits, during which a range of assessments was made (e.g. earth eaten in prior 24 hours). Geophagy was more common during pregnancy (23.2%) than postpartum (6.7%).

A backward stepwise logistic regression model of any geophagy during pregnancy indicated that the odds of geophagy were higher for those with HIV (OR=1.84 (CI 1.02, 3.32), p=0.042), those who reported pica during childhood (OR=2.42 (1.24, 4.73), p=0.01), and those who live in urban/peri-urban settings (OR=2.17 (1.14, 4.14), p=0.018). The odds of geophagy during pregnancy were lower for each g/dL lower hemoglobin concentration (OR=0.78 (0.66, 0.93), p=0.007). Similarly, in a model of any geophagy between birth until 9 months postpartum, lower hemoglobin concentrations were associated with geophagy (OR=0.73 (0.58, 0.92), p=0.009) and GI distress was positively associated with geophagy (OR=4.17 (1.50, 11.6), p=0.006). In sum, we observed biologically and statistically significant relationships between geophagy and physiological (Hb, HIV status) and behavioral (pica in childhood) covariates. Given the dangers of maternal anemia for both mother and infant, the causal mechanisms underpinning these associations should be elucidated.

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Poster #14

The Efficiency of the Idea Density Measure as a Diagnostic Tool for Prodromal Alzheimer's Disease

Alzheimer's is a neurodegenerative disease with no known cure. Due to the aggressive and terminal nature of Alzheimer's disease, early diagnosis of the condition prior to clinical manifestation is imperative for the efficaciousness of preventative drugs, which exist in want of a cure.

The classic Nun study found that early Idea Density (ID) translates to the development of Alzheimer's in late life through the examination of early diaries. The study was the first to present a longitudinal prediction of impairment based on these linguistic means. Subsequent papers adopted ID with variations in manner of measurement. ID is defined as a measurement of the ability of the speaker to convey complex/interconnected ideas "rather than simply referring to entities", represented by the "average number of ideas" expressed in an oral or written sample.

The goal of this project is to investigate the ID measure to better understand the properties of language that are predictive of subsequent development of dementia through the consideration of the following questions: Is ID a reliable measure of the language deficit as present in Alzheimer's disease pre-manifestation; and which ID definition is most useful in distinguishing Healthy Ageing (HA) and Mild Cognitive Impairment (MCI) populations?

These questions are based on the examination of the results of a collaborative project that compares linguistic and cognitive competence using a Picture Description task across three populations, Mild Cognitive Impairment (MCI), Healthy Aging (HA), and Healthy Young (HY) with standardized measures. This project has Cornell, Mass Gen, MIT as collaborators. MCI subjects, the focus of this study, are patients in the prodromal stage of the disease, which have been tested by Mass Gen and demonstrate a mild degree of cognitive impairment.

In order to create a complete understanding of the ID measurement and accuracy of certain definitions, this project will compare four variations on ID measurement, one each from the Snowdon, Farias, and Engelman papers as well as my own proposed ID measure designed specifically for the Picture Description task, taking into account certain findings regarding the nature of MCI language as well as the task itself. We will then analyze how each of these definitions either does or does not serve as an accurate representation of cognitive impairment based on the relative comparison between participant scores on cognitive tests and each of the ID measurements. This will be presented via scored samples from both MCI and HA populations. Through this examination, the previous definitions will be clarified, and the newly proposed definition will raise important points of consideration in regard to the nature of Alzheimer's disease and the role of language in the progression of the disease.

Overall, the intent of this project is to analyze the reliability of the ID measurement, as well as formulate a better methodology for scoring this measure. In this way, it is possible to define ID so that it could potentially serve as an early diagnostic mechanism for Alzheimer's disease.

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Poster #15

Neural circuits underlying performance evaluation in songbirds

Many behaviors, such as speech and movement, are learned by matching variable performance to internal goals. In zebra finches, song learning is driven by dopaminergic error signals from VTA, a midbrain nucleus that compares ongoing performance to a benchmark and reinforces “better-than- expected” motor sequences. Preliminary neural recordings suggest that VTA receives ongoing performance information from a region called basal forebrain; however, it is unclear how BF computes the performance signal. We hypothesized that BF would receive (1) auditory information, or what note the bird is singing, (2) timing information, or the note time-step, and (3) a weighted error signal. To confirm our model, we identified potential nuclei that project to BF through survival neurosurgeries, using viral tracing techniques coupled with in-vivo electrophysiology and stereotaxic coordinates to label key projection nuclei. Brain tissue was subsequently analyzed through confocal and fluorescence microscopy. By visualizing labeled axons and cell bodies, we found that Uva, a timing nucleus, projects to lateral BF; we also observed axons from AIV, an auditory nucleus, terminating on VTA-projecting BF nuclei. Thus, Uva and AIV are likely sources of timing and auditory information, respectively. Additionally, we found evidence for a reciprocal connection from VTA to BF, which may be the source of the dopaminergic error signal. Thus, we anatomically identified three inputs to BF that likely drive performance evaluation, further elucidating the mechanism of reinforcement learning that drives the acquisition of complex motor sequences.

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Poster #16

Dietary Patterns and Lung Function: Assessment of the Alternative Health Eating Index-2010 (AHEI-2010) and Rate of Change in Forced Expiratory Volume in the First Second (FEV1)

Objective: Prior studies of diet and lung function focus on individual nutrients or foods, whereas US Dietary Guidelines focus on dietary patterns. We investigated the association of the Alternative Healthy Eating Index-2010 (AHEI-2010), a measure of overall dietary quality and compliance to the US dietary guidelines, and lung function, quantified by the rate of change in forced expiratory volume in the first second (FEV1).

Methods: The Respiratory Ancillary Study (RAS; N=2,920), which was nested within SELECT (Selenium and Vitamin E Cancer Prevention Trial), studied the effect of supplementation with vitamin E and selenium on the longitudinal trajectory in lung function. RAS also assessed usual dietary intake with a food frequency questionnaire (FFQ) at study baseline; the current analysis investigated the AHEI-2010 score (higher score indicates greater compliance to dietary guidelines), derived from the FFQ, in relation to rate of change in FEV1. Linear mixed-effects models estimated the AHEI-2010—rate of change in FEV1 association, with AHEI-2010 as a continuous variable (null hypothesis $\beta=0$). Models were adjusted for race, age, height, weight, smoking status and pack-years, education, marital status, residence status, treatment arm, multivitamin use, and energy intake, and extended to test the AHEI-2010 score x smoking interaction.

Results: A higher AHEI-2010 score was associated with a slower rate of decline in FEV1 across the full cohort such that an increase of 10 (~1SD) in AHEI-2010 was associated with a 7.0 mL/year attenuation in the rate of decline ($P=0.0009$). Models confirmed a statistically significant interaction of AHEI-2010 and smoking status ($P=0.0278$), which indicated a stronger association of AHEI-2010—rate of decline in FEV1 in current smokers compared to never/former smokers. In current smokers, an increase of 10 (~1SD) in AHEI-2010 was associated with a 17 mL/year attenuation in the annual decline in FEV1 (95% CI: 7, 26); in never/former smokers the same increase in AHEI-2010 was associated with a 5mL/year (95% CI: 0.4, 9) attenuation in rate of decline.

Conclusions: In a population of North American men, a higher AHEI-2010 score was associated with a slower decline in lung function, and the association was 3-fold stronger in current smokers compared to never/former smokers. Translating this to dietary intake, in smoking men consuming one additional serving of vegetables or fruit/day (i.e., increase of 2 in AHEI-2010), the annual rate of decline in FEV1 was attenuated by 3.3 mL/year.

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Poster #17

Randomized Control Trial of an Obesity-Prevention Curriculum to Improve Psychosocial Mediators of Health Outcomes (Based on Fuzzy-Trace Theory)

Using fuzzy--trace theory, we created and tested a curriculum, GistFit, aimed at promoting healthy values and behaviors related to fitness and nutrition. As predicted, subjects who completed GistFit subsequently showed greater endorsement of healthy values and greater perceived benefits of regular exercise when compared to subjects in a control condition.

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Poster #18

Field characteristics and the distribution of wintering birds in New York

Populations of open field birds have been declining for decades in North America. Research has primarily focused on the breeding season, however, while wintering distribution and habitat selection are understudied. Research during the nonbreeding season may be especially important in Northeastern North America, where reforestation is reducing the amount of open field habitat. In this study, we examined how the abundance of Snow Buntings (*Plectrophenax nivalis*) and Horned Larks (*Eremophila alpestris*) varied between agricultural fields of different cover types and sizes. We conducted repeated transect surveys in nine fields with different crop residues (stubble), a rapid, one-time survey of 99 fields of varying sizes and agricultural use, and an analysis of eBird data examining the presence or absence of our focal species at a larger scale across New York State. The transect surveys revealed that both Snow Buntings and Horned Larks were more likely to be detected in corn stubble fields compared to pasture and hay fields. The rapid survey revealed no difference in detection probability of Snow Buntings related to cover types or field size, with no buntings detected in fields smaller than eight acres, but for Horned Larks, detection probability was greater in corn and soy fields compared to all types of grass fields, and detection probability was also greater in larger fields. The analysis of eBird data revealed that likelihood of occurrence for both species increases with the increasing percentage of open habitat in the surrounding landscape (500m radius). This study highlights the importance large field complexes where corn and other agricultural stubbles likely provide winter food for granivorous birds.

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Generic Language Influences Preschool Children's Category Learning

The language used by adults and peers is integral in shaping how a young child views his or her world; as children are constantly observing their surroundings and drawing conclusions based on people's statements about what they see. One of the most important uses of language is to communicate information about categories - kinds of things rather than just single instances. Languages use many semantic tools to impart information about categories, the most pervasive of which are generic noun phrases, such as "rocks are made of minerals" or "flowers are beautiful." These generic phrases imply that the assertion applies to all objects of a particular nature, but they can also be misleading. An example of generic language's potential to be misleading would be that "birds lay eggs." The phrase suggest that all birds lay eggs, but glosses over exceptions to this rule (male birds, baby birds). Kushnir & Gelman (2016) conducted a study to determine how adults make inferences about category properties based on generic noun phrases. They found that, even when they see direct evidence that a property is relatively infrequent, hearing generic language leads adults to overestimate the prevalence of that property in the category as a whole. In the current study, we use a similar method to examine how four and five year old's predictions, generalizations, and memory of events can be influenced by generic statements. In the first phase of the two-part study, the children were shown a video in which a generic, specific, or label only statement was made about fictional "blickets" making a machine make music. They then observe as only 30% of the blickets make the machine make music. A series of questions followed the video which asked about the children's memory of the video and their predictions for future blickets that may enter the machine. Results of the three conditions were compared to determine the effect of language choice on their responses. We found that, like adults, children's overestimated the properties of future "blickets" after hearing generic language. Interestingly, children's memories for their own observations were similarly influenced, suggesting that generic language had an effect, not only on beliefs, but also on information processing. In a second study, we are extending this finding to examine the effect of hearing generic language on children's inferences about social groups. Together, these findings can help illuminate the mechanisms by which language shapes children's learning about the world around them.

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Poster #20

Understanding the Mechanism behind the Differences in Pain Self- Management Techniques across Racial and Ethnic Groups

The literature suggests that the adoption and use of pain-management techniques varies across racial and ethnic groups. However, potential mechanisms for the observed differences remain unclear. The present study wished to determine whether the Theory of Planned Behavior (TPB) could predict the use of two types of self-management techniques, exercise and psychological strategies, among White, Black, and Hispanic older adults with chronic pain ($n = 134$). Thus, we examined participants' attitudes, perceived control, implementation intentions, and usage of these two techniques as well as the influence of race/ethnicity on this model. The results were consistent with the TPB, however race/ethnicity only showed to be a main effect on exercise usage. The implications and limitations of this study will be discussed in order to provide suggestions for future research.

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Poster #21

Ornamental Plumage in the Non-breeding Season is Associated with Behavioral Change in a Tropical Passerine

Sexual ornamentation, such as bright plumage coloration in birds, is thought to incur costs such as increased risk of predation and an energy input required for maintenance and display of signals. We might expect individuals to modify their behavior in order to mitigate those costs. Furthermore, sexual differences in behavior during the nonbreeding season are very understudied. To determine if the ornamented individuals changed behaviors in response to the costs of ornamentation, we conducted behavioral observations on male red-backed fairywrens (*Malurus melanocephalus*) in conspicuous ornamented and cryptic non-ornamented plumages. We used conspecific alarm call playback to provoke antipredatory vigilance responses and observed behavioral differences between ornamented and unornamented males without playback. We found no difference in response to playback between phenotypes, suggesting that they may not use behavioral changes to mitigate the increased predation risk of conspicuous ornamentation. Our non-playback observations revealed few differences between male phenotypes in vigilance behaviors; however, ornamented males engaged in allopreening and courtship displays to a greater extent than did non-ornamented males. These results suggest that, surprisingly, the presence of conspicuous ornamentation does not influence vigilance behaviors, but that the presence of bright plumage outside of the breeding season is associated with higher frequencies of certain social behaviors, namely allopreening and courtship. Future research will consider exploring the costs and benefits of these apparent changes in social behaviors, which could influence performance in the subsequent breeding season.

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Poster #22

Intrinsic functional connectivity of the default network is associated with individual differences in social reasoning

Social cognition involves the ability to understand the thoughts and feelings of other people in order to successfully navigate social situations. In the current study, we examined the relationship between the brain and social cognitive functioning in healthy young adults. Our objective was to elucidate the relationship between individual differences in the intrinsic functional connectivity of the default network (a.k.a. the “social brain network”) with an objective measure of social inference of emotional states. The Reading the Mind in the Eyes Test (RMET) involves participants viewing the eye region of a face and decoding the emotional expression. In this study, the default network was identified in a sample of 96 adults from an independent components analysis of resting state functional MRI data. The pattern of connectivity for each participant was then related to scores on the RMET in a partial least squares analysis. One significant latent variable was identified that related individual differences in RMET performance to the functional connectivity of the default network ($r = 0.36$, $p < .05$). Within the default network, higher levels of connectivity in cerebellum were related to better RMET performance. In contrast, lower levels of connectivity in bilateral amygdala, precuneus, anterior temporal lobes, and left angular gyrus were inversely associated with RMET performance. The results provide novel insight into the role of the default network in objectively verifiable social cognitive reasoning performance across individuals.

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Poster #23

Survival processing and heart rate variability

Abstract: Research suggests that human memory developed to enhance survival aptitude, however the relationship between this theory and autonomic processes is one that has not yet been explored. In two experiments, participants were asked to rate neutral words for survival relevance, personal relevance, and pleasantness. Consistent with previous research, surprise recall tests revealed greater recall for stimuli rated within survival contexts compared to other encoding conditions. In study two, these analyses were extended to include physiological differences in heart rate variability. Data analyses again showed that recall was greater for stimuli processed within the context of survival, and revealed that individuals with low heart rate variability were more likely to recall words from survival conditions than individuals with high heart rate variability. These findings support research documenting inherent memory biases toward fitness relevant information, and suggest that cardiovascular health may be a differentiating factor in memory retention abilities.

Keywords: memory, survival, heart rate variability, recall, adaptation

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Poster #24

Evidence for crosswise migration in a Nearctic-Neotropical passerine migrant

Full life-cycle tracking of individual birds is required to understand linkages between breeding and wintering areas (migratory connectivity) and answer related questions about population dynamics and conservation. Yellow warblers (*Setophaga petechia*) are abundant, well-studied breeding birds in North America, but their migratory and non-breeding biology remains poorly understood. Previous research using genetic and isotopic techniques suggested parallel migration systems and identified longitudinal segregation among eastern and western breeding and wintering populations of yellow warblers, but this work had low spatial resolution. I tagged yellow warblers breeding in Maine and Wisconsin with miniaturized light-level geolocators, elucidating fine-scale migratory connectivity and determining fall migration timing, routes, and wintering locations of individuals of this species for the first time. Fall migration was leisurely for all individuals, lasting from 44-55 days with departures in late August and early September and arrivals in late October and early November. In the majority of individuals routes followed peninsular Florida, crossing to Central America before completing the final eastward leg of migration. Yellow warblers breeding in Maine wintered in north-central Colombia, west of Wisconsin breeding birds, which wintered in Venezuela and the border region between Brazil, Colombia, and Venezuela. In addition to advancing knowledge of the migratory and non-breeding biology of the yellow warbler, my results provide an example of crosswise migration, a rare phenomenon in birds, and add to a growing body of knowledge related to the migratory and overwintering behavior of small Nearctic-Neotropical migrant passerines.

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Poster #37

Evidence of Phytoestrogenic Activity in the Andean Medicinal Maca Used as a Sports Energy Supplement in North America

The root of the Peruvian herb maca (*Lepidium meyenii*, Brassicaceae) has been used in the South American Andes for centuries and it is reported to possess medicinal properties and is traditionally used to treat sexual dysfunction and menopause symptoms among the many attributed therapeutic benefits. Currently, in North America maca root powder is used as an over-the-counter sports supplement claimed to have an energy boosting effect. Most of the pharmacology reported for maca lacks information on the chemistry associated with these observed, potentially therapeutic effects. One of our particular interests of late is the study of the pharmacology and chemistry of medicinal plants that have purportedly been used as reproductive modulators, specifically plants with chemical constituents that can elicit endocrinological responses analogous to those caused by estrogen (estrogen mimics or phytoestrogens). Some of the anecdotal medicinal properties of maca suggest such hormonal properties; however, in our view the exploration of these properties has yet to yield further chemical and biological evidence. The aim of this study was to investigate the potential estrogenic effect of chemistry in maca that might be the associated with some of the reported medicinal effects. An experimental approach to the assessment of estrogenic activity is to establish the estrogen receptor binding capacity of chemistry present in the plant. To this end, an assay that uses a human estrogen receptor-engineered yeast strain is utilized as a proxy for estrogenic activity. The organic extracts of a Peruvian commercial maca product were investigated using such yeast based estrogen assay yielding evidence of estrogenic activity in some of them. Furthermore, the semipolar extract prepared was found to be the most active. This extract was partitioned between chloroform and methanol resulting in an active methanol phase. The maca methanol phase was further fractionated with size-exclusion column chromatography and the chemistry of active fractions was investigated using thin layer chromatography and High Pressure Liquid Chromatography. The thin layer chromatography provided evidence of phenolic groups, alkaloids, and possibly steroidal compounds in the active extract. UV/Vis spectra obtained from the HPLC analysis provided strong evidence for the presence of alkyl amides (macamides) in the active extract as well. Chemical and biological data on the phytoestrogenic activity of maca will be presented and discussed.

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Poster #38

The Potential Use of *Achillea millefolium* (Asteraceae) as a Reproductive Modulator

Post-menopausal declines in estrogen production and availability results in a constellation of symptoms some of which can cause great discomfort while having direct effects on bone density and cognition. Furthermore, as a key regulator of choline acetyltransferase, estrogen is largely responsible for the production of the pertinent neurotransmitter, acetylcholine. The lack of this neurotransmitter has been shown to lead to cognitive impairment and an increase in susceptibility to Alzheimer's Disease. Paradoxically, post-menopausal supplementation with estrogen hormone has been proven to drastically increase the risk of breast cancer in women genetically predisposed to the disease. This conundrum has led to increases in exploration for natural hormone supplements that maintain adequate estrogen stores without increasing cancer susceptibility. In our study, chemical constituents suspected to be partly associated with the pharmacological profile of *Achillea millefolium* (Asteraceae), commonly known as yarrow, were investigated. More specifically, contradicting reports in the literature on the emmenagogue qualities of yarrow prompted the assessment of its phytoestrogenic capacity and chemistry associated with it. Using an assay based on a human estrogen receptor-engineered yeast strain the phytoestrogenic activity of yarrow organic extracts was studied. Our results demonstrate that yarrow possess estrogenic activity and one of its chemical constituents, Rosmarinic acid, is in part responsible for this pharmacology. The presence of Rosmarinic acid in yarrow was initially suspected by thin layer chromatography and the use of Folin-Ciocalteu spray reagent that established the phenolic character of an estrogenic component, and later the use of High Pressure Liquid Chromatography confirmed being a component of yarrow. The phenolic character of Rosmarinic acid led us to evaluate its antioxidant properties using a conventional method that makes use of DPPH. Our results show that Rosmarinic acid is a strong antioxidant present in yarrow possibly along with other phenylpropanoids. Identification of Rosmarinic acid as part of the chemical milieu of *A. millefolium* could prove useful in further understanding the medicinal properties of this popular millennial plant species. Furthermore, the confirmation of yarrow's phytoestrogenic properties would expand on its traditional ethnobotany as an emmenagogue and antimicrobial agent. Estrogenic, antioxidant and chemical data will be presented and discussed.

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Poster #39

The Anti-Estrogenic Pharmacology of *Salvia guaranitica* in Breast Cancer Therapy

An initial interest in menopause and natural hormone replacement therapy through herbal supplements led to the investigation of a group of plants in the genus *Salvia* (Lamiaceae) for pharmacology relevant to this age-related condition. Five *Salvia* species were investigated for acetylcholinesterase inhibition, antioxidant properties, and estrogen receptor binding capacity. One specific *Salvia* species, *Salvia guaranitica*, was chosen to be reexamined due to the lack of information on its chemistry that could be associated with phytoestrogenic activity. Our results show that several chemical constituents of this species exhibit estrogen receptor binding capacity as a measure of estrogenic activity. Recent research suggests that the estrogen receptor binding capacity of these constituents results in an unexpected anti-estrogenic response. This anti-estrogenic response offers a clinically validated mode of action in the treatment of estrogen responsive cancers such as breast cancer.

Breast cancer is the most common cancer among women in the world. A hallmark associated with breast cancer is estrogen signaling, which stimulates breast cancer cell proliferation. As a result, the development of clinical therapies focuses on compounds that block estrogen signaling (anti-estrogens). Our results on the pharmacology and chemistry of *Salvia guaranitica* indicates the presence of active compounds that possess estrogen receptor binding capacity. Bioassay fractionation of the most active *Salvia guaranitica* extract (Chloroform/Methanol) revealed two separate fractions to possess estrogen receptor binding capacity. One of these fractions contains exclusively Rosmaranic Acid, and our chemical evidence for the other is consistent with a recent report on the presence of the triterpenoids betulinic acid, ursolic acid, and olenolic acid in various *Salvia* species. These triterpenoids have been experimentally shown to exhibit estrogen receptor binding capacity and to act as anti-estrogens suggesting these compounds block the transcription of estrogen responsive genes some of which are cell proliferation factors. The chemical and pharmacologic data that this project has yielded for *Salvia guaranitica* will be presented and discussed.

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Poster #40

Surface Chemical Detections using Waveguide-based Raman Spectroscopy

We present a means to understand the surface chemistry of materials through quantifying the detection sensitivity of on-chip waveguides using Raman spectroscopy. The first part of our project is a geometry study to determine the most efficient waveguide in terms of cross-sectional area (width) and length. The waveguides used are found to have losses ranging from 5.6 to 7.8 dB/cm using a 633nm laser. Comparisons between specific conversion efficiency of experimental data and theoretical models were made. Determining the geometry of waveguides with the best conversion efficiency would enable us to conduct a sensitivity study more effectively.

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Poster #41

Adsorption of Thiamine to Analysis Materials and Optimization of Fish Egg Sample Preparation

Thiamine, commonly known as Vitamin B1, is critical to the health and survival of living organisms, has implications for biogeochemical processes in both aquatic and terrestrial ecosystems, and potential influence on the earth system at large. Thiamine is a critical co-factor in the metabolic processes across the tree of life. There exists a diversity of pathways that have evolved as adaptations to minimize energetic expenses and maximize the competitive advantage of organisms in the acquisition of this resource. This indicates that the availability of thiamine was an important factor in the evolution of many taxa. In its free form, thiamine is found at low concentrations in the environment as well as in biological samples such as plant and animal tissues. Therefore, to better understand the role of thiamine in biological and environmental systems, it is critical to accurately estimate the amount of thiamine in samples of interest. Thiamine adsorbs to substrates as a result of cation exchange with different types of materials (Schmidhalter et al 1994). To optimize materials used in contact with thiamine during analysis, this study explores the amount and rate of adsorption of thiamine to various types of materials used during the analytical processes in order to optimize future thiamine related experiments. Thiamine samples were placed under a variety of conditions in contact with types of commonly used materials including glass and plastics. The adsorption of thiamine was tested in a practical context by simulating conditions required during the extraction thiamine from fish eggs. The amount of adsorption that occurred in each experiment was measured by oxidizing thiamine that has not been adsorbed through contact with materials through the use of potassium ferricyanide. The oxidized product, thiochrome, was then measured using a fluorescence reader. It was found that the greatest amount of adsorption occurred in the presence of glass while little adsorption occurred to plastics of different compositions. Thiamine absorption in glass could be reduced through the addition of NaCl or low pH buffer. Additionally, adsorption of thiochrome and TDP is lower in glassware as compared to adsorption of thiamine in glassware.

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Poster #42

Microfibrillated cellulose-reinforced bacterial cellulose green composite for water purification

Recent industrial waste disposal practices have triggered the release of heavy metal ions in water, resulting in health issues and environmental damage. Simultaneously, increased population has placed high demands on the need for potable water. Present research offers a sustainable and cost-effective approach for water purification compared to the energy intensive and non-biodegradable methods that currently exist. Microfibrillated cellulose (MFC) was incorporated into bacterial cellulose (BC) to obtain durable membranes suitable for water filtration. Its abundance and mechanically reinforcing properties make MFC an advantageous material. Isolated from residual fruit pulp, MFC was successfully integrated into a BC network. This MFC/BC composition was further surface-modified to adsorb heavy metal ions. Results indicate that the membrane filters water efficiently.

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Poster #43

Good-Turing Estimator and its Application to Data Analytics for Real-Time Electricity Markets

Getting accurate electricity price estimates is critical to electricity market participants. However, electricity prices can be highly unpredictable, especially with the rapid development of renewable energy in recent years. Estimating its probability distribution is also hard because not much data is useful to be included in the sample. This research looks at the Good-Turing estimator and one of its variants, the Simple Good-Turing (SGT) estimator, which works particularly well when estimating the probability distribution of a random event given only sparse data. A detailed (and new) proof of the central formula in the Good-Turing estimator as well as the intuition for the SGT estimator is given, and the performances of the SGT, empirical, and Laplace estimators are compared for samples of different kinds. The fact that the SGT estimator is doing better overall suggests that the Good-Turing estimator and its variants may yield relatively more accurate results when applied to real electricity prices.

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Poster #44

Medical Applications of Machine Learning in Diagnosing Heart Disease

In the United States, heart disease is the leading cause of death. Thus, early diagnosis of heart disease is essential for increasing chances of survival. In this research, a computational model using ensemble machine learning is created to increase the accuracy of diagnosing heart disease in patients. The machine learning model was equipped with adaptive algorithms, iterations, and learning classifiers to decrease classification error and create an enhanced prediction approach for diagnosing heart disease. Clinical heart disease data was obtained from several health institutions and utilized in developing the ensemble machine learning model. The results of the model achieved an overall accuracy of 90% in heart disease diagnosis and improved the accuracy of those in currently published research models. Therefore, health professionals can use the ensemble machine learning model to aid them in diagnosing heart disease with high accuracy.

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Effects of Mechanical Stress on Atrioventricular Cushion Remodeling

Embryonic heart valves develop in a highly demanding hemodynamic environment. Mechanical stresses trigger chemical pathways that control remodeling events in the development of valve precursors (cushions) into valve leaflets. Understanding how these mechanical and chemical processes link may form the basis of novel biomedical engineering strategies for artificial valves. Recent studies show how chemical pathways control the stiffening of atrioventricular (AV) cushions during their growth and remodeling. TGF β 3 treatment leads to a stiffening of AV cushions as well as a reduced extent of compaction during remodeling, indicating growth (Buskohl, Sun, Thompson, & Butcher, 2012). In addition, phenotype markers for contractility, cell proliferation, and ECM synthesis are all upregulated. Other studies develop a computational model demonstrating that compressive stress is likely conducive to AV cushion growth (Buskohl, Jenkins, & Butcher, 2012). In this study, we test the effects of mechanical stress on cushion remodeling by culturing cushion samples in osmotic media treatments designed to replicate types of stresses: hypertonic treatment for compressive stress and hypotonic treatment for tensile stress. After that, we measure their compaction to indicate growth and measure gene expression through qPCR. We then substantiate the compaction results with immunohistochemistry and the gene expression results with inhibition studies. Our compaction data show that compressive stress reduces compaction, whereas tensile stress increases compaction. The gene expression data indicate both an increase in TGF β 3 expression and a decrease in expression for cell contractility marker RhoA for the compressive stress treatment. The tensile stress case shows an expression increase in markers for cell proliferation, but not for TGF β 3. These results corroborate the conclusions made in recent papers and link compressive stress to the TGF β 3 pathway increasing cushion stiffness over gestation.

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Development of an Optimal Fluorescent Protein Sensor to detect ATP:ADP Ratios in Cells

Cancer cells often exhibit an altered, unique metabolic state in which they utilize glycolysis followed by lactic acid fermentation in the cytosol to generate ATP, rather than glycolysis followed by pyruvate oxidation in the mitochondria. Cancer cells can have glycolytic rates 2 orders of magnitude higher than typically found in cells of normal tissue, leading to increased proliferation and metastatic potential. A quantitative means for measuring ATP and ATP:ADP ratios in living cells in real-time is important for studies of tumor development for in vitro 2D and 3D cancer model systems, animal models, and patient-derived xenografts (PDXs). Here, we have modified PercevalHR, acp-Venus/ATP-binding protein (GlnK1) construct originally created by the Yellen Laboratory at Yale, by the addition of red fluorescent protein (mCherry) connected with 27 amino acid-linker to make it undergo ratiometric detection. Although the sensor has K_d of around 10 μ M for ATP in absence of ADP, we find that it is still functional at physiological ATP:ADP ratios (0.5 to 10) due to possibly the competition between ATP and ADP for the GlnK1 binding site. The sensor was characterized in vitro and expressed in a breast cancer cell line for in vivo validation.

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Poster #47

Investigating three ways of improving biotin-functionalized electrospun nanofiber properties for biosensor applications

Nanofiber mats have increasing potential for use in biosensor applications because of their high specific surface area, high porosity, and customizable surface chemistry appropriate for biomolecule detection and capture. Our research team has electrospun poly(lactic acid) (PLA) nanofiber mats functionalized with poly(lactic acid)-block-poly(ethylene glycol) (PLA-b-PEG) copolymer and biotin to create hydrophilic surfaces that can bind proteins. Because nanofiber mats composed of PLA, PLA-b-PEG, and free biotin demonstrated poor water stability, this research investigated three ways to develop a PLA, PLA-b-PEG, and biotin system with better water stability while maintaining desirable characteristics of hydrophilicity and biotin availability: optimizing PLA-b-PEG copolymer block length, attaching biotin directly onto the PLA-b-PEG copolymer, and comparing nanofiber mats electrospun from dimethylformamide (DMF) and hexafluoro-2-propanol (HFIP) organic solvents. Variation in these properties were analyzed by studying fiber stability in water, fiber morphology, water wicking ability, and quantity of surface-available biotin.

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Poster #48

Surfaced Charged Polyvinyl alcohol (PVA) Electrospun Nanofiber Mats for Dye Adsorption

The purpose of this research is to spin nanofibers to form fiber mats that will be used to absorb dye in water. This is important as dye is toxic, it can destroy ecosystems and poison drinking water. In these experiments, positively surface charged PVA electrospun nanofiber mats were obtained from PVA aqueous solution incorporated with polybrene(PB) and/or chitosan via an electrospinning process. The resulting PVA nanofiber mats were then heat treated at 140°C to cause crosslinking which thus gives rise to an improved stability of PVA in aqueous solution. The morphology of the fiber mats was characterized by scanning electron microscopy (SEM). Dye adsorption studies were conducted using anionic dye, Acid Red 1 (AR1), as a model compound. The three main nanofibers that are compared in these experiments are those composed of PVA only, PVA/+PB, and PVA/+PB/ with chitosan. The dye adsorption measurements showed that PVA/PB/chitosan has higher adsorption capacity of AR1 than PVA/PB nanofiber mats due to the fact that both PB and protonated amino groups on chitosan backbone have ionic interactions with dye molecules. The effects of contact time, initial dye concentration, and pH were also investigated.

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Poster #49

Thermosensitive Fabrics

Cotton fabrics are chemically treated after production in order to improve properties such as wrinkle resistance, softness, whiteness, etc. This process oftentimes uses polymers, which are substances with large amounts of repeating organic molecular units and unique physical and chemical properties. Likewise, two or more differing polymers can be combined into a final block copolymer and, therefore, combine the properties of the constituent polymers. The purpose of this project is to synthesize P(VCL-co-HEAA) block copolymer and characterize its' properties, to optimize the conditions for its' treatment onto cotton fabrics, to confirm the bonding of P(VCL-co- HEAA) to the cotton fabric, and to eventually determine the effects and reproducibility of the treatment. Free radical chain polymerization will chemically bond these two different molecules in order to add new functionality to the cotton. This process is expected to change the hydrophilicity of cotton fabric and make it thermally responsive. Therefore, the resulting fabric is expected to have a higher water absorbance at higher temperatures and a lower water absorbance at lower temperatures. Likewise, the copolymer has been successfully produced and characterized. Then, the copolymer was successfully treated onto the cotton fabrics at three different concentrations. Water vapor permeability testing was used in order to evaluate the water absorbance of the treated fabrics at different temperatures. As this project has broad applications in textiles, we expect that these fabrics treated with P(VCL-co-HEAA) will exhibit a significant difference in water absorbance with changes in temperature.

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Poster #25

Surveillance of *B. burgdorferi* (Lyme) in *Ixodes scapularis* (ticks) on *Felis Catus* (cats).

Lyme disease is the most common arthropod-vector-borne illness in the Greater New York region. Symptoms of the illness have only been experimentally induced in cats, and it is unclear if felines exposed to *Borrelia burgdorferi*, the causative agent of Lyme, via tick bite, are susceptible to the disease. This study examines the prevalence of *B. burgdorferi* in ticks recovered from domestic cats across the United States. Ticks were identified to species, DNA was extracted from them, amplified via a nested flagellin gene Polymerase Chain Reaction, and run on ethidium bromide stained agarose gels. Thus far, 18 ticks tested positive and 30 tested negative for infection with *B. burgdorferi*. A majority of the cat ticks were identified as *Ixodes scapularis*. Further study is required to determine the direction of infection and *B. burgdorferi* effects on cats.

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Poster #26

**Investigating Notch2 as a potential binding partner of Progranulin:
Implications for Neurodegenerative Disease**

Pharmaceuticals designed to treat neurodegeneration are often inefficient in halting or slowing disease progression, thus necessitating investigation of more efficacious forms of treatment. Progranulin (PGRN), a secreted glycoprotein of 7.5 granulin repeats, has been implicated in Frontotemporal Lobar Degeneration (FTLD); however, the mechanisms behind PGRN's effects, specifically those behind neuronal growth and survival, are not fully understood. In an attempt to elucidate how PGRN promotes neuronal growth and survival, the current study investigated Notch2, a Type 1 transmembrane receptor protein characterized as a neurotrophin, as a binding partner of PGRN. To determine if PGRN and Notch2 bind, PGRN and Notch2 were immunoprecipitated and a cell surface and uptake assay was performed. Data revealed that PGRN and Notch2 bind at the cell surface. These results identify Notch2 as a binding partner of PGRN, which with further study, may elucidate the mechanisms behind PGRN's effects and identify Notch2 as a pharmaceutical target for neurodegenerative disease.

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Poster #27

Imaging remyelination in vivo using chemical probes

In the central nervous system, oligodendrocyte cells form myelin by extending out their plasma membrane to wrap around nerve axons. Myelin serves as insulation thus allowing action potentials to propagate and enables rapid communication with neighboring cells. Damage to oligodendrocytes can permanently sever the communication. Understanding the differentiation and growth of oligodendrocytes during the process of remyelination will facilitate the development of therapeutic treatments for myelin-related diseases. Galactosylceramide, a myelin specific lipid, is abundantly found in the extracellular face of the plasma membrane of oligodendrocytes. Here, we applied bioorthogonal chemistry to image the galactosylceramide biosynthetic pathway in vivo. Various azide and alkyne functionalized galactose analogs were synthesized in order to be delivered to cells. The functionalized lipids are fluorescently tagged through click chemistry using an azide/alkyne cycloaddition. We hope to use this technology to illuminate the role of galactosylceramide in remyelination.

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Poster #28

Applying CRISPR/Cas9 to Identify Immunity-Associated Genes in Tomato

This project focuses on immunity-associated genes in tomato to determine if they play a role in resistance to a bacterial pathogen. The expression of the two genes, which encode putative transporter proteins, was found to be induced when tomato leaves are exposed to specific virulence proteins expressed by the pathogen *Pseudomonas syringae* pv. tomato. The pathogen causes speck disease, which manifests as blemishes on tomato fruits and decreases yield thereby negatively impacting grower's profits. CRISPR/Cas9 technology was used to generate plants carrying mutations in each of the transporter genes to determine the effect of the mutations on resistance to *P. s. pv. tomato*. Specifically, DNA was extracted from each of 47 plants generated by CRISPR/Cas9 mutagenesis. The DNA was used for PCR amplification of each transporter gene and the PCR products were sequenced. The sequences were then compared to the wild type gene sequence to determine discrepancies indicative of a mutation and whether the mutations are homozygous or heterozygous. Plants with apparent mutations in the heterozygous state were analyzed further to determine if both alleles had distinct mutations or if a wild type allele was present. Additionally, notes were taken of any aberrant morphological phenotypes of the plants. Plants with a heterozygous mutation expressed a normal phenotype when one of the alleles present was wild type. If both alleles were mutated in the plant, this resulted in a stunted, 'boron-deficiency'-like phenotype. These results reveal a possible connection between a boron-deficiency phenotype and biallelic mutations in tomato. Future experiments will include disease assays to characterize the immune response of the transporter mutant plants to *P. pv. syringae*.

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Poster #29

Small molecule inhibitors of mitochondrial glutaminase block K-Ras induced transformation and increased glutamine metabolism

Cancer cells often undergo metabolic reprogramming in order to support the increased energetic demands of cell proliferation under nutrient and oxygen stress conditions. In order to support this metabolic change, cancer cells often use glutamine as a carbon source and overexpress the enzyme glutaminase, converting imported glutamine into glutamate and ammonia in the mitochondria. Glutamate can then be further metabolized to satisfy the downstream energetic and biosynthetic demands of the TCA cycle in the cell and serve as a building block for macromolecule biosynthesis. The principle isozyme of glutaminase most often upregulated in cancer cells is termed GAC and may offer a druggable target for therapeutic intervention in glutamine dependent cancers. Using an inducible cell system capable of expressing the K-RASG12V oncogene, we employed focus formation and proliferation assays in order to explore the relationship between transformation phenotypes and glutamine metabolism. Using a range of inhibitors including direct inhibitors of GAC, we demonstrate the relative efficacy of these small molecules to inhibit glutamine metabolism and the effect this has on the transformation of K-RAS expressing cells. Next generation glutaminase inhibitors are now being applied to a range of different inducible, driver oncogene cell lines in order to determine how frequently transformation phenotypes are accompanied by glutamine dependence and how often glutaminase inhibition attenuates glutaminase facilitated neoplasms.

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Poster #30

Lysine Palmitoylation: Novel Regulatory Mechanism of GTPases

The goal of this research is to gain a better understanding of the role of lysine fatty acylation on small GTPases. Small GTPases are very interesting because they serve as an on/off switch for many other proteins leading to many different physiological functions, and play important roles in cells, including cancerous ones. We want to better understand the role that lysine fatty acylation plays on the function of small GTPases in an effort to identify novel therapeutic options for diseases such as cancer. We have found that DHHC3 is able to act as an acyl transferase of both the small GTPases Rac1 and Rac3, thus adding on this post-translational modification (PTM). We are further interested in seeing if other DHHCs can act as a lysine fatty acyl transferase for Rac1 and Rac3. To determine this, we will be screening all 23 known DHHC enzymes in Rac1 and Rac3 overexpressing mammalian cells. Moreover, it is known that several Sirtuins (Sirt1,2,3,6 and 7) can remove protein lysine fatty acylation. We believe that lysine fatty acylation is one mechanism to control GTPases. The research thus far has focused on testing the correlation between Sirtuin 2 (Sirt2) levels in mammalian cells and the levels of lysine fatty acylation on Rac1 and Rac3. Through metabolically labeling fatty-acylated proteins with a biorthogonal probe we have shown Rac1 might not be a Sirt2 target. To identify if the Rac GTPases are Sirtuin targets we have employed a pan Sirtuin inhibitor at various concentrations. Preliminary findings suggest multiple Sirtuins act on Rac1. Further studies are ongoing.

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Poster #31

Sod1 and Sod2 expression levels in *Porichthys notatus* vocal motor nucleus and surrounding hindbrain

The vocal motor system of the plainfin midshipman (*Porichthys notatus*) is controlled by a hindbrain central pattern generator that includes vocal motor neurons (VMN) whose activity patterns directly translate into sound amplitude. In this study we used this motor system to investigate the possibility of an antioxidant gene upregulation mechanism for withstanding oxidative stress from high rates of cellular respiration in the midshipman hindbrain. We tested the hypothesis that to combat oxidative stress, the VMN of type I males would exhibit higher levels of sod gene expression compared to the VMN of sneak-spawning type II males and females, which have a limited vocal repertoire including the absence of any evidence for advertisement calling. The results of this study showed no significant difference of sod1 across reproductive morphs in the VMN and surrounding hindbrain (SH), and no difference of sod2 across morphs in the SH. In the VMN, however, we observed a surprising, significantly lower expression of sod2 in type I males as compared to type II males in the VMN. The study also documented no significant sod1 and sod2 difference between actively humming type I males and non-calling males in both the VMN and SH. These findings overall lead us to conclude that sod1 and sod2 do not show increased expression to combat oxidative stress from the demands of the midshipman high-endurance vocalizations. These results eliminate one of the proposed mechanisms that allow male midshipman to generate long duration hum vocalizations and provide more insight to how different motor neuron populations are adapted to their particular functional tasks.

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Poster #32

Role of Dendritic Cell Activation by Natural Killer cells in the Presence of Heat Shock Proteins

Introduction: Heat Shock Proteins (HSPs) are protein chaperones present in all cells, and in tumor cells, they chaperone mutated antigens. Purified HSPs activate Antigen Presenting Cells (APCs) by providing antigen-specific and non-specific signals, allowing the APCs to prime T cell responses. NK cells are also essential for HSP-mediated immunity; however, the role of NK cells is currently unknown. Thus we explored three plausible roles of NK cells in the HSP-mediated anti-tumor immune response: positive feedback, activation of T cells, and targeting tumor cells directly.

Procedure: Murine-derived Bone Marrow Dendritic Cells (BMDCs) were cultured with purified NK cells in the presence or absence of three immunogenic HSPs: gp96, HSP70, and CRT. Three main experiments were performed. 1) Determination of CD91 receptor expression on BMDC populations, measured by flow cytometry. 2) Higher activation of NK cells, measured through ELISA assay of IFN γ production, by the HSPs calreticulin and gp96. 3) Incubation of BMDCs with gp96 or calreticulin and NK cells or no NK cells.

Results and Conclusion: 1) We confirmed CD91 receptor expression on DC populations. 2) We showed that calreticulin-stimulated BMDCs to produce IFN γ . 3) Incubation of BMDCs with gp96 resulted in some activation; however, with the addition of NK cells, there was more DC activations. These experiments showed that DCs do in fact express CD91, and gp96 and calreticulin are two HSPs that can be used to stimulate IFN γ production. Finally, NK cells do feedback to DC activation because the addition of NK cells to the BMDC and gp96 culture resulted in higher BMDC activation.

Future Directions: By utilizing NK cells with HSP immunization, tumors can be rejected with better efficiency. Current data has shown that the HSP vaccine, Vitespan, has had beneficial results in reducing tumor growth; however, the extent to which it reduces tumor growth needs to be improved. Through HSP immunization and NK cells immunotherapy of cancer is expected to produce better results.

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Poster #33

Regulation of Dendritic Cell Activation by NK Cells in the Presence of HSPs

Intro: Heat Shock Proteins (HSPs) are protein chaperones present in all cells, and in tumor cells, they chaperone mutated antigens. Purified HSPs activate Antigen Presenting Cells (APCs) by providing antigen-specific and non-specific signals to them, allowing the APCs to prime T cell responses. NK cells are also essential for HSP-mediated immunity; however, the role of NK cells is currently unknown. Thus we explored here plausible roles of NK cells in the HSP-mediated anti-tumor immune response.

Methods: Murine-derived Bone Marrow Dendritic Cells (BMDCs) were cultured with purified NK cells in the presence or absence of three immunogenic HSPs: gp96, HSP70, and CRT. NK cell and BMDC activation was measured by flow cytometry and ELISA assays.

Results: Three main experiments were performed. 1) We confirmed CD91 receptor expression on DC populations. 2) We showed that calreticulin-stimulated BMDCs to produce IFN γ . 3) Incubation of BMDCs with gp96 resulted in some activation; however, with the addition of NK cells, there was more DC activation.

Conclusions: These experiments showed that DCs do in fact express CD91, and gp96 and calreticulin are two HSPs that can be used to stimulate IFN γ production. Finally, we supported the hypothesis that NK cells feedback to DC activation because the addition of NK cells to the BMDC and gp96 culture resulted in higher BMDC activation.

Future Directions: By utilizing NK cells with HSP immunization, tumors may be rejected with better efficiency. Current data has shown that the HSP vaccine, Vitespan, has had beneficial results in reducing tumor growth; however, the extent to which it reduces tumor growth needs to be improved. Through HSP immunization and NK cells immunotherapy of cancer is expected to produce better results. Furthermore, it would be beneficial to discover the exact role of NK cells in HSP-mediated immunity.

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Poster #34

Decellularized embryonic heart as a scaffold for cardiomyocyte maturation

In the United States, heart failure accounts for 1 in 9 deaths and costs the US an estimated \$30.7 billion each year. Pluripotent and multipotent stem cells have tremendous potential as platforms for cell-based therapies to replace damaged myocardium and prevent heart failure. However, while robust differentiation protocols exist to generate immature cardiomyocytes, the creation of mature cardiomyocytes capable of functional integration in the heart remains a major challenge. Decellularized tissue holds promise as a scaffold for cardiomyocyte maturation since the extracellular matrix (ECM) remains intact while the removal of native cells allows for subsequent reseeded with cardiac progenitor cells. Little research has attempted to decellularize embryonic tissue, which is the natural environment where cardiomyocyte maturation occurs. We developed protocols for the decellularization of embryonic chick hearts at day 7 and day 10 using a variety of detergents, enzymes, and physical methods. Future studies will aim to reseed this scaffolds with immature cardiomyocytes derived from H1 human embryonic stem cells as well as chick neonatal cardiomyocytes.

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Poster #35

Mapping the reference genome *S.cerevisiae*: Exploring transposons, tRNAs and ty elements

This project explores the annotation of the SK1 strain of *S. cerevisiae*, the reference genome which chromosome structure and inheritance is often studied in the Hochwagen Lab. In order to completely assemble the SK1 genome, the project was split into two parts : the annotation of repetitive sequence elements and the de novo assembly of the terminal ~20kb of sequence of all chromosomes. I established pipelines for two classes of tRNAs which revealed several unexpected differences with the reference genome and adapted these pipelines for the remaining tRNAs and the other major repeat elements. These findings can help to identify transcriptional associations between tRNAs which quite often lead to chromosomal breakages (and consequently mutation) across the genome.

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Poster #36

Creation of the insertion plasmid, α MHC-GCaMP - iCAG, to be TALEN transfected into human iPSCs, displaying fluorescence upon successful differentiation into cardiomyocytes

Heart disease remains the leading cause of death in the United States. During an infarction, myocardial cell death occurs, which in turn decreases the heart's functionality. Human induced pluripotent stem cells (iPSCs) have shown much promise for future medical interventions and research has been fixated on differentiating iPSCs into fully functional myocardial cells. This project's goal was to create a research tool that could be utilized by many researchers in studying the differentiation of human iPSCs. This project was successful in creating the insertion plasmid, α MHC-GCaMP - iCAG, that can be transfected into human iPSCs which will display green fluorescence upon contraction. This is achieved because when calcium is present it will bind to GCaMP, which will subsequently undergo a conformational change resulting in green fluorescence. GCaMP will only be expressed in cardiomyocytes as it is expressed downstream of the unique cardiomyocyte promoter α MHC.

Imaging Upper Mantle Deformation beneath the Main Ethiopian Rift

The East African Rift in Ethiopia presents us with a unique opportunity to observe the evolution of an active continental rift. Using body wave tomography, shear wave splitting, and receiver functions, we can generate physical descriptions of the region beneath the rift; these help us understand the rifting process, which has been shown in the MER to extend over a broad region that has not been fully captured in past studies. This broad deformation is not in accordance with conceptual rifting models.

To further study this, recordings of seismic waves from teleseismic earthquakes have been generated from recent seismic deployments that focused on expanding the existing seismic network more broadly across the Ethiopian Highlands and Somalian Platform. Multi-channel cross correlation was then used on this dataset to generate travel time residuals relative to the global IASP91 1-d velocity model. The dataset, consisting of more than a thousand teleseismic events with moment magnitudes greater than 5, was used to create a tomographic velocity model which was further constrained with data from prior deployments of seismometers in the structural rift valley. This tomographic model is complemented with robust shear-wave splitting measurements on the Ethiopian and Somalian highlands, as well as maps of Moho depth spanning this range. Our tomographic results, including compressional wave velocity models, show a broad, slow-velocity region extending outward from the rift towards the northwest and Southeast- this region is far wider than the structural rift valley. Northwest and at greater distance from the rift, the velocity structure develops significant complexity. Notably, a robust and well-resolved low-velocity region is visible at a range of depths beneath the Ethiopian plateau, the site of Oligocene flood basalts, and is also consistent with surface expressions of diking. Shear Wave splitting results indicate that a pervasive N-S regional fast direction persists even far from the rift, and is slightly modified beneath the Ethiopian Plateau. Moho depth maps allow us, for the first time, to image what we interpret as the regional craton, as well as a region of crustal thinning consistent with a hitherto unexplained lineament of volcanism. Within the rift, results are consistent with previous work, exhibiting rift segmentation and velocity anomalies noted in previous studies.

Recovery of Soft Resins from Brewery Waste Using Supercritical CO₂

Dry-hopping in the beer industry generates a significant amount of waste, and the hops used are not subject to the heat necessary for the isomerization and solvation of alpha acids. Therefore, this material could be recovered by extracting these components from dried waste. This investigation was undertaken to determine the efficiency of the extraction of soft resins from dry-hopping waste, as well as the effect of moisture content on the composition and yield of extract. Dry-hop slurry waste was obtained from a local brewery, dried, ground, sieved, and mixed to obtain 5, 10, and 15% moisture content samples of particle sizes from 0.075 to 0.590 mm. Samples were extracted in duplicate at the recommended optimal process conditions of 200 bar and 40C, and extracts were collected every ten minutes for an hour by depressurization into a vial in an ice bath at ambient pressure. Moisture was found to play a key role in the extraction process, with the 9.86% moisture sample yielding an average of 8.79 weight percent as compared to 4.80 and 5.99 weight percent for the 4.71 and 13.58% moisture samples, respectively. HPLC analysis of the 9.86% moisture duplicates revealed that 85.7% of the available alpha acids and more than 98.6% of the beta acids were extractable. It was found that a range of roughly 11-20% of the original alpha acid content in the pre-dry-hopped pellets could be recovered in the treatment groups studied, with an average of 35% of this material remaining after dry hopping.

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Poster #52

Entanglement: Quantum Probability in Human Memory

Experimental psychology has traditionally depended on using classical probability (CP) theory to model cognitive processes. The primary feature of CP is that data can be used to assign probabilities to mutually exclusive events prior to observation. However, researchers have been exploring alternate normative models to account for examples of human reasoning that routinely violate the basic axioms of formal logic and CP theory. In response to such empirical phenomena, psychological research has increasingly investigated a way of understanding cognitive processes using quantum probability (QP) principles. This project investigates entanglement in memory, a unique but unexplored characteristic of QP. Entanglement is a strong, but counterintuitive correlation between two unrelated concepts (e.g. fruits and planets). We used a memory analogue of Bell's inequality and were able to reliably predict concept compatibility. This supports the long-term goal of using QP principles to construct models that predict memory distortions, such as those caused by cognitive impairment and Alzheimer's.

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Individual Differences in Perspective Taking With Interactive Social Learning

Imitation and perspective taking have been studied extensively independently, but little research has examined how they can impact one other. The purpose of this study was to determine how one's perspective on a model performing a behavior can impact how veridically the observer imitates the behavior, and whether individual differences in autistic traits can mediate this relationship. 57 young adults and 29 young children were randomly assigned to observe a model open a puzzle box from one of three perspectives (0°, 90°, or 180° relative to model). All participants then attempted to open it from the model's perspective. Surprisingly, perspective did not affect success rate or overimitation, but did show an unexpected effect on reaction time in adults. As predicted, autistic traits score did mediate some outcomes among individuals in the 90° and 180° conditions. Low-trait adults had significantly more success at opening the puzzle box than high-trait adults. Moreover, the perspective from which participants desired to open the box was accurately predicted as a function of autistic traits: high-trait children were more likely to choose the perspective they initially observed from, whereas low-trait children were more likely to pick another perspective. The findings suggest that although the perspective from which one watches someone else solve a novel task does not substantially guide task performance, individuals with high levels of autistic traits can exhibit, and might be unconsciously aware of, deficits in imitation and perspective taking. Key implications of these results are discussed.

Rejection Sensitivity Mediates the Association Between Negative Urgency and Peer Relationships

Negative urgency – a facet of impulsive personality characterized by rash action in response to negative affect – uniquely predicts maladaptive outcomes in youth (Berg, Latzman, Bliwise et al., 2015). Children transitioning to adolescence show individual and normative rises in negative urgency, with adolescent girls at highest risk for its affiliated outcomes since they experience higher increases than boys and girls at other ages. Ironically, as peer relationships become increasingly important to girls, the impulsivity and emotionality associated with developmentally normative rises in negative urgency may result in difficulty getting along with peers (Cyders & Smith, 2008). However, there is a lack of existing research directly exploring relations of negative urgency with peer problems (Settles, Fischer, Cyders et al., 2012).

For negative urgency to predict problems in peer interactions, girls must experience and perceive some relationship-related distress. To more clearly understand how negative urgency connects with peer problems, we consider the information processing pattern rejection sensitivity, defined as the tendency to either anxiously or angrily expect, perceive, and overreact to rejection (Zimmer-Gembeck & Nesdale, 2013) as a potential mediator. This disposition often produces a self-fulfilling prophecy in which rejection expectations provoke anti-social behaviors, ultimately confirming expectations and impairing relationships. (London, Downey, Bonica et al., 2007; Zimmer-Gembeck, 2015). Thus, rejection-sensitive thinking may lead individuals high in negative urgency to engage in rash actions – such as confrontation or excessive reassurance-seeking – that result in relationship conflicts and decrease the sense of emotional connection with peers.

Participants comprised N=125 girls (Mage=11.50, Range: 10-14 years) recruited from two 4-H camps, who completed a questionnaire battery including the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001), the Children's Rejection Sensitivity Questionnaire (CRSQ; Downey, Lebolt, et al., 1998), and the Index of Peer Relations Scale (IPR; Hudson, 1990).

The Baron and Kenny (1986) four-step approach to mediation was used to model whether rejection sensitivity mediated associations of negative urgency and peer relationships. Separate regression models were used for angry and anxious rejection sensitivity. Step 1 established that regressing peer relationships on negative urgency was significant, $b_{nu}=8.2499$, $t(124)=5.01$, $p<.001$. In Step 2, regressions of angry and anxious rejection sensitivity on negative urgency were also both significant, $b_{nu}=2.6045$, $t(124)=5.78$, $p<.001$; $b_{nu}=2.8019$, $t(124)=5.22$, $p<.001$. Step 3 confirmed that the mediators, angry and anxious rejection sensitivity, significantly predicted peer relationships beyond negative urgency, $brs_{ang}=2.1013$, $t(124)=7.75$, $p<.001$; $brs_{anx}=1.8931$, $t(124)=8.76$, $p<.001$. Lastly, after including angry or anxious rejection sensitivity as a mediator, negative urgency no longer remained a significant predictor of peer relations, $b_{nu}=2.7768$, $t(124)=1.82$, $p=.0715$; $b_{nu}=2.7848$, $t(124)=1.95$, $p=.0532$. Sobel tests confirmed the significance of indirect effects in both the angry and anxious rejection sensitivity models ($z_{nu}=4.6342$, $p<.001$; $z_{nu}=4.48528$, $p<0.001$). Approximately 66% of the total direct effect was mediated by both types of rejection sensitivity for the association of negative urgency and peer relationships. The magnitude of this effect highlights the need to understand girls' information processing styles in the context of friendships, especially as peer relationships become increasingly important for adolescent wellbeing.

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Poster #55

Purposeful Eating: The Relationship Between Dietary Motivation and Sense of Purpose in Life

This study explored the relationship between dietary motivational orientations and sense of purpose in life. A sample of 300 participants, recruited via Amazon Mechanical Turk (MTurk), took part in an online survey. Given theoretical postulations of purpose as a prosocially oriented construct, we hypothesized that prosocial motivation would correlate positively with purpose and that personal motivation would not correlate with purpose. However, controlling for potential confounders, prosocial motivation did not correlate with purpose, whereas personal motivation correlated positively with purpose. Thus, viewing one's food choices as a means of improving oneself was associated with having a higher sense of purpose in life. Given that these findings contradict theoretical conceptions of purpose, future research is needed to examine the relationship between food choice and purpose further.

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Poster #56

The Effect of Minimal Group Membership on Children's Susceptibility to Suggestive Questioning

Humans have a strong desire to form social bonds, and do so easily under most circumstances. This need to belong begins in early childhood. The minimal group paradigm, first introduced by Henri Tajfel in 1971, capitalizes on individuals' need to be part of a social group by dividing participants along seemingly meaningless bases, such as what painting they prefer, or random assignment to a particular color t-shirt. A separate, robust body of research has focused on children's suggestibility under different conditions. For example, Leichtman and Ceci (1995) found that children who were exposed to both a stereotype and suggestive questioning about an event they experienced were more likely to accept and repeat false information. The current study seeks to examine the relationship between children's minimal group membership, susceptibility to suggestive questioning, and the effects of time delay on memory. After establishing minimal group membership, participants heard stories about children in both their in-group and out-groups while viewing corresponding photos of these members, answered either free-recall or suggestive questions, and then evaluated in-group and out-group members on a series of group preference tasks. With the exception of suggestive questioning, all measures were repeated approximately one week later. Group membership did not seem to bias children's memory. However, results indicated that children were generally resistant to suggestive questioning, and group membership may play a role in the way that children think about their in-group and out-group. Finally, children remembered significantly less information after the delay. Implications for children's role in the legal system are discussed.

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Communication
Poster #57

Death Thoughts: Decoding the Effects of Mortality Salience on Linguistic Intergroup Bias

Terror Management Theory (TMT) suggests that the combination of the ability to recognize mortality and innate survival instinct results in existential fear of death for humans. One of the ways to buffer against this terror is identification with social groups (Greenberg, et al., 1986). TMT shows that when this buffer is threatened, people seek to reinforce their cultural worldview through ingroup enhancement.

In this study, the researchers were interested in how ingroup protection is reflected in the emergence of Linguistic Intergroup Bias (LIB). Past research (Maas, et al. 1989; 1995; 1996) revealed that language abstraction increases with the description of expected and in-group enhancing behaviors and decreases with the description of unexpected and ingroup threatening behaviors. Therefore, we hypothesized that threats of mortality would reinforce the existence of LIB. Furthermore, we seek to understand the relationship between self-esteem and LIB, as self-esteem has shown to provide a buffer against death-thought anxiety (Pyszczynski, et al., 2004).

The intergroup setting occurred at Greek letter organizations at Cornell University, where historically memberships have been segregated across racial and ethnic lines (Sidanius, et al., 2004). Participants were 142 Caucasian and ethnic minority members of fraternities and sororities, assigned to a 3 Mortality Salience X 2 Respondent Ethnicity X 2 Protagonist Ethnicity X 2 Behavior Valence experiment. The stimuli were illustrations portraying African-American or Caucasian students engaged in positive (e.g., studying) and negative (e.g., cheating) behaviors, accompanied by a list of descriptor words, varying in abstractness. Consistent with our hypothesis, we found stronger evidence of LIB under the mortality salience condition than in the control conditions. We found no effect of self-esteem. Our study shows the evidence that mortality salience reinforces intergroup bias and thus indicates the direction for further researches on reactions to biased intergroup communication.

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Poster #58

Swipe to Unlock: The Hidden Forces Driving Everyday Technology

Our book dissects and explains the technology that plays a role in our everyday lives, but which few truly understand. The format of the publication is engaging case studies which answer questions like “Why are almost all apps free?” Through analyzing both the business and technological factors of various topics, we provide an interesting commentary that leaves the reader a better informed citizen in our increasingly digital world. The topics chosen for discussion are based on qualitative research conducted on undergraduate university students which asked what technology they most wanted to learn more about. Professors at Cornell and Harvard as well as industry professionals at Microsoft and Facebook were consulted to garner applied insights for our cases. The cases range from explaining the technology and business implications behind popular news stories such as “Target Figures Out A Teen Girl Is Pregnant Before Her Father Did” to elaborating on what is happening on the backend when you search something on Google. The book assumes no technical or business knowledge and has a similar target market to popular press works like Freakonomics.

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Poster #59

Criminal Caricature: A Survey of Criminal Stereotypes

In a social and political climate where most habitually denounce racial prejudice, and law enforcement officials repudiate the use of group-based stereotypes to implement policies, one would presume unjust outcomes to be atypical. On the contrary, many still possess stereotypes, and such stereotypes infiltrate our beliefs, leading to pervasive discrimination across a myriad of domains. Moreover, such stereotyping and discrimination that individuals hold toward minority groups may seep into individuals' perceptions of crime, despite the inaccuracies of these stereotypes. Past studies have found that perceptions of crime stereotypes significantly differed between racial and ethnic groups such as African-Americans were perceived to commit more violent crimes (Welch, 2007). In a 1991 National Race Survey, the lucid majority of respondents, both White and Black, agreed with the statement "blacks are aggressive or violent" (Sniderman & Piazza, 1993). Moreover, as recently ruled by the Supreme Court, racism in jury deliberations is so deleterious that prior verdicts can be overturned, even following convictions (Pena-Rodriguez v. Colorado, 2017). Previous research regarding the racialization of crime narrowly focused on perceptions of a few racial and ethnic groups using non-continuous measures, which leaves a large gap in the literature on perception of crimes based on group membership categories like gender and sexual orientation. In an endeavor to fill this empirical gap, the current study explores how violent and nonviolent crimes were associated with both racial and ethnic groups, as well as sexual minority, gender and age groups utilizing continuous dependent variable measures. The present study examines participants' perceptions of group associations with particular crimes. Subsequently, participants completed the Internal and External Motivations to Respond Without Prejudice Scales (Plant & Devine, 1998), the Moral Foundations Questionnaire (Graham, Haidt, & Nosek, 2008), and a measure of a sense of purpose in life (Ryff & Keyes, 1995). The present study strives to comprehend the propensity for some individuals to disproportionately associate certain crimes with, and seek more penalizing punishments for, particular social groups, and how variables such as political affiliation and moral beliefs can moderate these effects. Preliminary results show that participants disproportionately associate crimes with social groups beyond just race and ethnicity, but also gender, sexual orientation, and age.

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Poster #60

Perspectives of Future Health in Self and Others: The Role of Culture

Previous studies have found distinctions in how individuals perceive the self and others: the self is placed more in a spotlight. The current literature suggests that this tendency to view oneself as being overly positive and special may bleed through temporal dimensions (past and future), as well as geographic/regional boundaries (West and East). However, the existing research also suggests that although this bias is universal, the degree to which individuals fall prey to it may differ depending on one's geographic/cultural upbringing. This study will utilize these previous findings and apply them to explore the relationship between mental time travel and health by comparing how people envision their own future health with how they see other people's future health and how culture might shape this perception. Participants will consist of two college student groups from both Eastern and Western cultures (N=400). All students will be randomly split into either self or other condition and they will be asked to complete an online survey in the language of their host culture. There are three objectives to the study: 1) Test the validity of bias in regards to people's views of health for self and others, 2) Test the findings of previous studies that suggest differences in the degree of bias depending on the culture, and, if the previous objectives are met, 3) Contribute to laying the foundation for interventions aimed at changing one's perspective of future health for the better, which may ultimately have positive impacts on actual future health.

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Poster #61

Group identity and emotion induced language

Drawn from Kunh and Nelson (2002), even though thoughts about in-and outgroups are largely cognitive constructs in Social Identity Theory, they are likely to be expressed discursively when identities conflict with one another. Ashforth and Johnson (2001) also note that people articulate their self identity through languages such as “we” and us”, and developing unique dress/language/logos.

Based on a Presidential Election study understanding the factors that impact how people evaluate articles written on current events, we are interested in language use and expression of group identity in relation to the extremity of the responses based on the participant’s group identity as a Democrat or Republican. Our method will be to do a textual analysis of the level of emotions depicted in the open-ended questions in the Presidential Election study. We hypothesize that an individual in a certain group will respond with level of emotion to positive evaluation of someone outside their group and negative evaluation of someone inside their group.

Finally with these frameworks in mind, we will study closely the relationship between the level of emotion of the responses for the open-ended questions and compare them with the individual’s group identity stated in the results of the Presidential Election study.

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Department of Communication

Poster #62

Any Person, Any Study -- Depending on your Personality: How Personality and Area of Study Relate

There is a substantial body of literature investigating the interaction between personality and job or academic discipline. In 1973, it was posited in Holland's Theory that psychological and sociological attributes could be used to create a predictive model that can explain career choice (Pike, 2006). Pike then asserted that Holland's Theory could be generalized to students and academic disciplines. We now explore how that connection can be evaluated using the Big Five Personality Traits: Emotional Stability, Extraversion, Openness, Agreeableness, and Conscientiousness (Thoms, Moore, & Scott, 1996). Based on this literature, we explored how course subject (Food Science, Biomedical Engineering, Fiber Science and Design, or Communication) or area of study (defined as Arts, Humanities, and Social Science; STEM; or Other) relate to personality. To discern this, we analyzed data collected for a larger study on student teams from the Group and Interpersonal Communication Lab in nine different courses (N=587). We ran two separate ANOVA regression analyses and then contrast analyses on the data. The results showed that three personality measures -- extraversion, emotional stability, and openness -- were significant for both course subject and academic discipline. The ANOVA for courses showed that students in the biomedical engineering courses had the lowest extraversion, while students in the communication courses had the most; the students in the fiber science and design courses had the lowest levels of stability, while students in the biomedical engineering courses had the highest; and the students in the biomedical engineering course had the lowest openness, while students in fiber science and design had the highest. The ANOVA regression for academic discipline had similar results with the highest extraversion ratings being in Art, Humanities, and Social Science and the lowest in STEM; the highest stability ratings were in STEM and the lowest in Art, Humanities, and Social Science; and the openness ratings were the highest in Art, Humanities, and Social Science and the lowest was in Other (undeclared or independent majors). Based on these findings, personality is a factor professors may want to consider when designing course plans and team projects.

References

Pike, G. R. (2006). Student personality types, intended majors, and college expectations: Further evidence concerning psychological and sociological interpretations of Holland's theory. *Research in Higher Education*, 47(7). doi:10.1007/s11162-006-9016-5

Thoms, P., Moore, K. S., & Scott, K. S. (1996). The relationship between Self Efficacy for Participation in Self-Managed Work Groups and the Big Five Personality Dimensions. *Journal of Organizational Behavior*, 17(4), 349-362.

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Poster #63

Do You Know the Difference?: Defining Purpose and Meaning Through Qualitative Analysis

The concepts of purpose and meaning in life lack clear distinction and consistent agreement among experts within the field, and between experts and the public. Despite the interchangeable use of these terms and moderate evidence of conceptual overlap, research suggests that key distinctions exist. Purpose is often defined as a meaningful intention for the self/society, whereas meaning emphasizes perceived coherence and significance of life. Our study aims to reconcile distinctive perceptions of purpose and meaning among laypeople, and analyze whether developmental context (high school vs. college) moderates how one articulates purpose and meaning. Existing literature on purpose and meaning were analyzed for the presence of prevalent themes that were then categorized as characterizing meaning, purpose, or both. The themes included: direction, prosociality, means for well-being, identity, motivation, social connectedness, coherence/understanding, significance, and spirituality. Using deductive qualitative analysis, writing samples (n=160) of high school and college students will be coded for the presence of themes by independent coders, and LIWC (Linguistic Inquiry and Word Count) software will be used to analyze the writing objectively. Chi-square tests will be used to statistically compare the distribution of themes across the writing samples of students who were assigned to purpose, meaning, and control prompts. The study findings will be applied to develop a conceptual framework that will help researchers understand how the public views/uses these terms, which will allow researchers in the future to better understand how to tailor interventions and study the effects of each concept in people's lives.

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Scheinman Institute for Conflict Resolution

Poster #64

Bargaining for Better Schools: Labor-Management Relations in New York State's Public Schools

The Bargaining for Better Schools (BBS) project is a multi-year research and public policy project on the state of labor-management relations in New York State Schools. Our goal is to provide multiple forums for dialogue and learning among school administration and union leaders, concerned citizens and policy makers, supported with accurate and up-to-date information and data on the relationships between employment practices and school improvement. By examining tenure, teacher evaluations, layoff clauses, labor-management mechanisms, and many other provisions of contracts between teachers' unions and school districts, our research provides valuable and useful information for more effective collaboration. To aid in discussions of educational policy reform, our research has analyzed variations in teacher salary across the state as well as the 2012 teacher evaluation initiative called Annual Professional Performance Review (APPR). Our current research has been focused on comparing the clauses in the Collective Bargaining Agreements between the school districts to understand which provisions are most common and seem to be gaining importance in negotiations.

By using longitudinal data, we are able to see how an individual school district's contract has evolved over time. We can also use this data to make comparisons between the contracts of different school districts at a given point in time. Our extensive collection of data on Collective Bargaining Agreements of New York State School Districts allows us to gain a comprehensive understanding of changes in the labor-management relationship.

This project is a collaboration of the ILR School's Worker Institute and Scheinman Institute on Conflict Resolution. To view our prior publications or read more about our current research, please visit www.ILR.Cornell.edu/Bargaining-Better-Schools.

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Human Development
Poster #65

Pulling the Trigger: the impact of self-affirmation and sense of purpose on shooting decision accuracy

Individuals face both small and large threats to the self each day, attempting to cope with these threats using a number of cognitive strategies; at times they may rely on defensive mechanisms such as cognitive distortions (Sherman & Cohen, 2006). Two particular constructs within the literature have the potential to promote well-being and to protect individuals from such threats: sense of purpose in life and self-affirmation. Research suggests that implicit biases and perceptions of threat can lead to inaccuracies in shooting decisions within high-stakes situations. Specifically, participants within these studies disproportionately and mistakenly shoot unarmed African-American men while failing to target armed Caucasian men (e.g., Correll et al., 2002, 2006; Greenwald et al., 2003). Furthermore, individuals are faster to shoot unarmed African-American targets than armed Caucasian targets (e.g., Correll, Park, Judd, & Wittenbrink, 2002; Correll, Urland, & Ito, 2006; Greenwald, Oakes, & Hoffman, 2003). The current study examines the effects of self-affirmation and sense of purpose in life as cognitive interventions aimed at improving shooting decision accuracy. Through a writing task, participants will either affirm the self, write about their own purpose in life, or complete a control task. Participants will then complete a shoot/don't-shoot simulation task. We hypothesize that participants primed with either self-affirmation or sense of purpose in life will have increased shooting decision accuracy compared to individuals in the control group. Furthermore, we predict that implicit biases and participants' moral intuitions will also serve to moderate these effects.

Clausal Syntax in the Sumerian Language

The Sumerian language, which was spoken in Early to Middle Bronze Age Mesopotamia and which is attested on cuneiform texts, displays a head-marking pattern in the verbal complex that is split-ergative based on aspect. In the imperfective aspect, subject cross-referencing is marked in the morphological slot following the verbal stem and object cross-referencing is marked preceding the verbal stem, shown in (1) and (2). In the perfective aspect, though, ergative cross-referencing is marked in the slot preceding the verbal stem, while absolutive cross-referencing is marked following the verbal stem, shown in (3) and (4). Case marking on free nominals in the clause do not show this split, instead always seeming to follow an ergative-absolutive alignment. The split in the verbal complex is summarized in Table 1 below:

- (1) Imperfective Transitive: T-Voice-Agr_o-Vstem-Agr_s
- (2) Imperfective Intransitive: T-Voice-Ø-Vstem-Agr_s
- (3) Perfective Transitive: T-Voice-Agr_erg-Vstem-Agr_abs
- (4) Perfective Transitive: T-Voice-Ø-Vstem-Agr_abs

Table 1: Verbal complex alternations between imperfective and perfective clauses.

I argue on the basis of this split that Sumerian shows Aldridge (2005, 2008)'s T-type ergative agreement pattern, in which a probe in T 0 establishes an Agree relation with the absolutive nominal. This account explains the alternation in the interpretation of the pre-stem and post-stem morphological slots, as well as predicts the simplified verbal template found in non-finite verbs. This account also fits with the diachronic pathway of ergativity posited for Sumerian by Coghill and Deutscher (2002).

I then argue against the stipulation made by Aldridge that allows her to identify T-type ergative languages as those languages that ban ergative extraction. Aldridge claims that T-type ergative languages allow only one outer specifier of a transitive vP, which must be filled by the absolutive argument in order for it to be assigned case. I show that the stipulation must be ruled out on independent grounds for Sumerian, as it is incompatible with the well-attested preverbal focus position. Removing this restriction accurately predicts that Sumerian should allow A' movements targeting ergative arguments.

Finally, I show that the structure presented to account for the agreement pattern in the Sumerian verbal template can very easily predict the seemingly ergative-absolutive realization of free nominals' case marking, even in the imperfective aspect. Case marking seems instead to transparently represent the theta role assigned to the nominal, rather than follow the structural or inherent case assigned in the syntax.

References:

- Aldridge, E. (2005). *Syntax and Typology of Ergativity*. MS., Northwestern University.
— (2008). *Generative Approaches to Ergativity*. *Language and Linguistics Compass*, 2/5, 966–995.
Coghill, E., & Guy Deutscher (2002). The origin of ergativity in Sumerian, and the 'inversion' in pronominal agreement: a historical explanation based on Neo-Aramaic parallels. *Orientalia*, 71(3), 267–290.

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Poster #67

The Effectiveness of Interventions to Support, Promote, and Protect the Practice of Early Breastfeeding Initiation in South Asia: A Scoping Literature Review

Purpose:

To conduct a scoping review in order to generate evidence on the effectiveness of programs, interventions, and approaches to protect, promote, and support early initiation of breastfeeding in South Asia (Afghanistan, Bangladesh, India, Nepal and Pakistan). The definition we used to define “early initiation of breastfeeding” was initiation of breastfeeding within the first hour after birth, which is based off the World Health Organization’s recommendations.

Methods:

Studies were found by searching online databases like JSTOR. Studies met the criteria for the review if their content was useful for the purpose mentioned above and if they were published after 1990. The full text of every eligible research article was synthesized and organized using a coding form in order to extract information about the setting, research methods/design, study participants, intervention content, outcomes measured and evidence related to intervention effectiveness.

Results:

71 peer-reviewed and program-evaluation literature articles were included. The framework of the socio-ecological model was used to understand how the government, community, workplace, health system, and family/early childhood development act as interdependent spheres of influence that impact the effectiveness of interventions to improve early initiation of breastfeeding among women in South Asia. The most commonly used interventions pertained to making a positive impact at the health system and community levels. More specifically, they aimed to improve the knowledge of institution/community health workers concerning proper breastfeeding practices, and the quality/quantity of counseling that these workers provide to expecting mothers. Regardless of which South Asian country these interventions were executed in, the outcome of most studies was an increase in knowledge or rates of early initiation of breastfeeding. The factors used to explain any lack of significant improvement included the misinformation distributed by family members to women and lack of support for this practice.

Conclusions:

In conclusion, the investigators of these studies accounted for differences in health worker training, rate of mother’s exposure to information, the accessibility of health care systems to mothers, and other discrepancies related to personal counseling. to account for any lack of results from interventions. However, at times the research literature presented a lack of evidence in successful attempts to incorporate family members and important members of the community as part of the intervention’s target population. Given that low rates of early breastfeeding initiation still pose a problem for these countries in South Asia, future steps could be taken to study how interventions could be improved to involve individuals that are a part of the social network of pregnant women.

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Poster #68

The effects of challenge and threat on the severity-attraction hypothesis.

The severity-attraction hypothesis suggests harsh group initiations elicit liking for the group. Although this effect is well-cited, past research has consistently failed to replicate it. I propose that this failure to replicate is the result of an as yet unknown moderator, namely whether the initiation is appraised as a challenge or threat. Across a cross-sectional survey (Study 1) and two controlled experiments (Studies 2 and 3), I tested whether the appraisal of an initiation as a challenge or threat moderates the relationship between severity of initiation and group attraction. Results demonstrated that stress appraisal does not moderate the severity-attraction hypothesis; thus, my revision to the severity-attraction hypothesis was not supported. The results also failed to show that harsh initiations lead to group liking, which constitutes a failure to replicate the original severity-attraction hypothesis. The current studies suggest that the severity-attraction hypothesis cannot be considered robust and may not consistently predict behavior.

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Poster #69

Perceived Fairness of Performance Feedback: Narrative vs. Numbers

Performance feedback is used widely across organizations as a means to both provide information to employees and inform strategic human capital decisions. At the individual level, employees' fairness perceptions of performance feedback are integral to its acceptance and ability to motivate future performance (Folger, Konovsky, & Cropanzano, 1992; Greenberg, 2011; Taylor, Tracy, Renard, Harrison, & Carroll, 1995). The format of feedback employed is a significant factor in influencing individual perceptions of fairness, possibly just as important as the feedback itself. Recently, organizational performance management systems have been shifting away from traditional, numerical-based rating systems to a heavier reliance on delivering narrative feedback; however, there is limited research examining the effects of these different types of feedback on various individual-level outcomes. In two experimental studies, 452 participants were given a job performance scenario and provided with randomly assigned feedback conditions: numerical, narrative, or both. Results showed that participants perceive narrative feedback to be fairer than both numerical ratings alone and even combined numerical and narrative feedback. Additionally, although participants rated narrative feedback as more useful, specific, and eliciting more positive comparisons to other employees, they did not report stronger motivations to improve performance.

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Poster #70

The Effect of Networked Phenomena on Lifestyle Politics

Popular experience suggests that people coalesce into groups that have similar lifestyle habits, social values, and beliefs. The authors provide experimental evidence suggesting one mechanism for this phenomenon: people change their opinions to match previously displayed beliefs from members of their "in-group". This research is meant to partially explain the willful lifestyle segregation that is so pervasive in modern society. It also lends credence to the claim that strong correlations between socio-political identities and lifestyle habits aren't directly causal, but rather due, in part, to networked events.

Intra-amniotic administration of prebiotics (*Cicer arietinum* and *Lens culinaris*) and duck egg white peptides affects the calcium status and intestinal functionality

Background: Calcium is one of the most abundant inorganic elements in the human body and has many important physiological roles. Prebiotics and bioactive peptides are two important substances used to promote calcium uptake. However, the difference in mechanisms of the calcium uptake from these two supplements is not clear. Using the intra-amniotic administration procedure, the aim of this study was to investigate whether Ca status, intestinal functionality, and health-promoting bacterial populations were affected by prebiotics (chickpea and lentil) and duck egg white peptides (DPs).

Materials and methods: Eleven groups (18 MΩ H₂O; non-injected; 4mmol/L CaCl₂; 50mg/mL chickpea+4mmol/L CaCl₂; 50mg/mL lentil+4mmol/L CaCl₂; 40mg/mL DPs+4mmol/L CaCl₂; 5mg/mL Val-Ser-Glu-Glu (VSEE)+4mmol/L CaCl₂; 50mg/mL chickpea; 50mg/mL lentil; 40mg/mL DPs; 5mg/mL VSEE) were utilized. Upon hatch, the blood, cecum, small intestine, liver and bone were collected for assessment of serum bone alkaline phosphate level (BALP), the relative abundance of the gut microflora, expression of Ca-related genes and brush border membrane (BBM) functional genes, liver and bone mineral levels, respectively.

Results: The BALP level increased in the presence of lentil, DPs and VSEE (P<0.05). The villus surface area and goblet cells diameters increased (P<0.05) in all treatment groups except for Ca injection group. The relative abundance of probiotics increased notably (p<0.05) by VSEE+ Ca and chickpea. The relative expression of CalbindinD9k increased (P<0,05) in Ca, chickpea+ Ca and lentil+ Ca groups. Finally, the brush border membrane functionality gene expressions increased (p<0.05) by chickpea or lentil.

Conclusions: Prebiotics and DPs beneficially affected the gut microflora and villus surface. The BBM functionality could only be affected by prebiotics. Moreover, DPs could promote calcium uptake by acting as calcium transporter. Our findings add to this knowledge by suggesting possible different mechanisms on calcium uptake by prebiotics and peptides. Further research should determine the exact calcium transport pathways stimulated by prebiotics and peptides.

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The Localization of Isotocin-containing Neurons in Gulf Toadfish with Comparisons to Mammals

This study focuses on localizing the oxytocin homologue, isotocin, in the brains of *Opsanus beta* (Gulf toadfish). While similar studies have been conducted in the closely-related midshipman fish, this is the first time that localization efforts have taken place in Gulf toadfish. Using immunohistochemistry, oxytocin antibodies were used to label isotocin in 10 Gulf toadfish. Considering oxytocin's well-documented implications in mammalian pair bonding, mate preference, and courting, isotocin labeling was hypothesized to be found in brain regions implicated in the modulations of vocalizations, which they use for both courting and aggressive signals. Immunohistochemistry revealed isotocin present in the pre-optic area of the hypothalamus (POA-H), which plays an important role in the vocalization system of teleost fish. The present study helps illuminate the evolutionary trajectory of this important neuropeptide.

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An Analysis of Factors Related to Declining Teen Births in Baltimore City

Adolescent pregnancy is a public health concern because of the lasting negative effects it has on young mothers and the children born to these mothers. Therefore, it is essential to investigate changing trends of teen pregnancy in order to create effective programs to target this issue. This study analyzed teen birth rate trends in Baltimore City and determinants including risky behaviors, reproductive health clinic visits and sexual health education available in the Baltimore City Public Schools. We compiled data from the Maryland Department of Health and Mental Hygiene, the Youth Risk Behavior Surveillance System and the School Health Profiles System to analyze trends from 2007 to 2015. There has been significant decrease in teen birth rates and the proportion of adolescents who have had sexual intercourse since 2007. However, the proportion of adolescent clinic visits in Title X clinics also declined in the same time period. Furthermore, a higher proportion of adolescents reported having sex and engaging in risky behaviors during sexual intercourse in 2015 than in 2007. Since 2008, there has been no significant change in the number of public high schools who reported teaching topics related to sexual and reproductive health. Results suggest that teen birth rates are declining but there is still a need for strategies to be focused on services and programs to reduce risky behaviors and encourage service utilization. Directions for future research are discussed.

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Human Development

Evidence or Emotion?: A Linguistic Analysis of Jury Deliberations

The Social Intuitionist Model posits that moral intuition, not moral reasoning, compels moral judgments (Haidt, 2001). According to Haidt and Joseph (2004), such moral judgments reflect values based on care and harm, fairness and cheating, loyalty and betrayal, and more. Moral judgments may play an important role in juror decision making. Here, the deliberation process plays an important role in determining group jury verdict as many jurors lack strong leanings prior to deliberations (Hannaford-Agor et al., 2002). In the present study, jurors' deliberations were linguistically analyzed to explore how juror language relates to juror decision-making and how it might reflect reliance on the moral foundations and/or moral emotions. In a 2 (Injury severity: high vs. low) x 2 (Evidence strength: strong vs. weak) fully-crossed factorial design, mock jurors listened to one of four possible audio recordings of a criminal trial, deliberated to reach a unanimous verdict, and completed pre- and post-deliberation questionnaires assessing emotion and case-related judgments. It was hypothesized that cases with strong evidence and high injury severity would result in more convictions compared to those with weak evidence and low injury severity, and that mock jurors with stronger reliance on care/harm and fairness/cheating would have higher negative affect scores on the PANAS after hearing the case compared to those with lower scores on these foundations. Lastly, it was predicted that individuals more prone to disgust would be more punitive. Preliminary results indicate that mock jurors' word count and use of anger-related words was highest in cases with high injury severity and strong evidence. The word 'evidence' was used most frequently when jurors deliberated a crime of high injury severity and weak evidence, while 'guilt' was used most frequently when injury severity was low and case strength was strong.

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CALS

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The Effects of Ship Noise on the Acoustics of Freshwater Fish Chorus

Anthropogenic noise from ship activity has received increasing interest due to the potentially harmful effects this noise has on aquatic species. This study examines the impacts of ship noise on the acoustic characteristics of freshwater drum (*Aplodinotus grunniens*), located in the western basin of Lake Erie. Data were passively collected using one marine autonomous recording unit (MARU) equipped with a Hobo Pro v2 (Onset, Bourne, MA), which was deployed offshore of Sandusky, OH for a three-month period during 2014. This recording period overlapped with the freshwater drum's spawning season, which occurred between 23-May and 3-July 2014. Through spectrographic analysis of the audio data collected, frequent acoustic signatures ranging within the known drum frequency range of 200-400 Hz were observed at various times of the day. Individual calls on average lasted 0.6 s and observed chorusing group events lasted as long as 7 hr. We assessed the impacts of ship noise on two robust parameters of their chorusing acoustics – center frequency and Sound Level Equivalent (LEQ). We found there was no significant difference in the center frequency (Hz) or LEQ (dB) of the drum chorus before the occurrence of a ship compared to after the ship had passed. Although statistically insignificant, these data illustrate variation in the chorus before and after a ship, which may be a result of confounding environmental factors. To better understand how ship noise influences freshwater drum chorusing, more information regarding the drum's acoustic behavioral variation over time and season could provide a better understanding of their adaptations to anthropogenic noise.

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Molecular Biology & Genetics

Determining the Effects of Meiotic Drive on Individual *Drosophila melanogaster* Viability

Mendel's Law of Chromosomal Segregation states that when two opposite gender flies mate, the DNA of the zygote should express genes in a 50/50 ratio with equal representation from each parental fly strain. In a previous study, it was found that when a particular strain of flies were back crossed and their offspring's DNA genotyped, deviations from this 50/50 ratio existed. The researchers looked at the pooled DNA of several flies and theorized that this deviation could be caused by meiotic drive, a scenario in which certain alleles are passed from the female parent to the gamete more than the expected 50% of the time. In the following study, we seek to either confirm or refute the researcher's theories of meiotic drive by genotyping the DNA of individual flies. In doing so, the error associated with losing some portion of pooled DNA is eliminated.

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Changes in Endometrial Development in Overweight or Obese Women with Regular Menstrual Cycles

INTRODUCTION: Obesity has increased at an alarming rate in the United States, with more than 55% of adult females currently classified as overweight or obese. Emerging evidence suggests endometrial function is disrupted in obese women, which is believed to contribute to impaired fertility and increased risk of endometrial hyperplasia later in life. Moreover, recent evidence suggests that the reproductive hormone production is altered in overweight or obese women with regular menstrual cycles, suggesting that increased adiposity may lead to subclinical disturbances in endometrial function. Whereas the relationship between body mass index (BMI) and endometrial disturbances have been evaluated in post-menopausal women, the potential impact of obesity on endometrial development in women of reproductive age is unknown. Early identification of abnormal endometrial development is imperative to prevent or minimize reproductive disturbance in women.

OBJECTIVE: To test the hypothesis that endometrial development is altered in overweight and obese women with regular cycles.

METHODS: Serial ultrasonographic videoclips collected every other day were retrospectively analyzed for endometrial thickness in 10 lean ($\text{BMI} < 25 \text{ kg/m}^2$) and 7 overweight ($\text{BMI} \geq 25 \text{ kg/m}^2$) regularly cycling women (i.e., every 21-35 days) from ovulation to ovulation (IOI). Participants underwent anthropometric assessments of height, weight, waist-hip-ratio (WHR), and dual x-ray absorptiometry (DEXA) to determine total and truncal body fat percent. Endometrial thickness was measured in the mid-sagittal plane by one investigator (JW), who was blinded to all anthropometric measurements. Changes in endometrial thickness in the luteal and follicular phases across IOI were tabulated for each participant. Differences between lean and overweight groups were evaluated using Mann-Whitney U-tests. Bivariate associations between measures of endometrial development and anthropometric measures were determined using Spearman's rank correlation coefficient (SPSS, v.24). Significance was defined as α less than 0.05.

RESULTS: BMI (28.6% (26.6-38.8%) vs 23.1% (21.7 -23.8%), $p = 0.001$), total percent fat (35.5% (29.0-40.9%) vs 25.8% (25.0-27.3%), $p = 0.005$), and truncal percent fat (34.9% (25.6-39.4%) vs 21.1% (20.2-24.6%), $p = 0.008$) were higher in overweight versus lean women. Endometrial growth was lower across the IOI in overweight versus lean women (192.3% (73.3-201.2%) vs (375.4% (258.8-404.4%), $p=0.026$). The number of days remaining in the luteal phase (ovulation to menses) following its maximum endometrial thickness was positively associated with percent total body fat ($p=0.503$, $p=0.047$) and the number of days remaining in the follicular phase (menses to ovulation) after achieving minimum endometrial thickness following menses was positively associated with WHR ($p=0.756$, $p = 0.030$).

CONCLUSION: This pilot study provides evidence that increased adiposity is associated with altered endometrial development in women of reproductive age with regular menstrual cycles. Increasing percent body fat was associated with less total endometrial growth across the cycle, yet increased time spent following peak maximal thickness in the luteal phase and a longer duration of endometrial growth in the follicular phase leading up to ovulation. Further research is needed to clarify whether these changes are associated with altered hormone production associated with increased adiposity. Moreover, these data provide evidence that BMI may not be an ideal proxy for investigating the role of increasing adiposity on endometrial function in women.

AWARDS

Thank you to all who came and presented at this year's Annual Spring Forum Poster Session!

First place overall: Sarah Toner '19

Second place overall: Aditya Agashe '17

People's choice: Tamara Kahan '17

Category winners:

Behavioral & Ecological Biology I: Erin Krichilsky '18

Behavioral & Ecological Biology II: Sharnendra Sidhu '17

Chemistry & Physical Sciences: Anant Hariharan '18

Fiber Science & Design: Julia Miao '19 and Kathleen Miao '17

Molecular & Cell Biology I: Katherine Phillips '17

Molecular & Cell Biology II: Jeannine Whelan '17

Psychology & Social Sciences I: Julia Lesnick '18

Psychology & Social Sciences II: Daniel Stein '17

