



GORDON
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2019

Undergraduate
Research Symposium

Program Content and Schedule

Wednesday, May 1, 2019
Ken Olsen Science Center

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Poster Display

Posters will be displayed in the Loggia in the Ken Olsen Science Center.

Students will staff their entries for a minimum of one hour on Wednesday, May 1 between 2:30 p.m. and 4:30 p.m.

Posters must be taken down immediately after the event.

Please enjoy refreshments during the event.



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Poster Entries

Natural Sciences,
Mathematics,
and Computer Science

Using FRET to Elucidate the Lipid Trafficking Mechanism of SP-B C Terminal Peptide

Amanda Page, Kayla Kroning

Dr. Otonye Braide-Moncoeur

Surfactant protein B (SP-B), a component of lung surfactant (LS), plays an essential role in lowering the surface tension of alveoli, and in trafficking lipids to the air-fluid interface. Challenges in expressing native SP-B, have resulted in a number of synthetic peptide analogs being used to mimic its functionality for mechanistic studies and surfactant replacement therapies. Specifically, the terminal ends of SP-B, SP-Bc and SP-Bn, have retained certain functional properties of the protein and can be more easily studied. SP-Bc, is examined in comparison to its synthetic mimic, KL₄, which is the main ingredient of a surfactant replacement known as Surfaxin.

In our studies, we utilize fluorescently labeled lipid probes, NBD-PE and Rhodamine-PE, to monitor membrane fusion events in DPPC:POPG and POPC:POPG liposomes using Fluorescence Resonance Energy Transfer. A decrease in FRET among the studied peptides will indicate increased rates of membrane fusion and may reveal a selective interaction with certain LS lipids. Preliminary results have identified a Red Edge Excitation Shift or REES peak at a wavelength of 542 nm in the KL₄ spectra. REES peaks are mostly observed with polar fluorophores in motionally restricted environments due to slow rates of solvent reorientation around an excited state fluorophore. The presence of this peak may be indicative of the location of the NBD probe in the bilayer or reveal differences between the KL₄ and SP-B membrane environments. Current data displays a decrease in FRET within the DPPC:POPG KL₄ system which supports previous NMR studies that showed the peptide selectively interacts with DPPC-rich liposomes and may indicate that KL₄ facilitates membrane fusion events, which is a proposed mechanism of lipid trafficking at the air-fluid interface.

The Effect of Water Conductivity on the Presence of Chytrid Fungus in Wood Frogs and Salamanders in Ponds in Essex County

Pillar Desouza, Courtney Barlotta, Caroline Conte, Taynara Goncalves, Sedia Massaquoi

Dr. Dorothy Boorse

The study was set up to test the hypothesis of the effect of chytrid fungus on *Lithobates sylvaticus* (wood frogs) and *Ambystoma maculatum* (spotted salamanders) in two vernal pools in Essex County. Vernal pools are essential for the survival of the two species because of the trade-off benefit of laying their eggs in the pools. The pools allow for less competition as it does not have any fish and has less of a risk of drying up. For the experiment, cover boards were laid out numbered 1 to 31 around the area of both Wilson Drive (vernal pool #1) and Wilson floodplain (vernal pool #2). Each cover board was placed about 5-15 feet apart, and about 2-10 feet away from the vernal pools. Unfortunately, there was enough time to allow the salamanders to reach the cover boards. However, we took a preliminary

survey of egg mass abundance of spotted salamanders and wood frogs, observed developmental stages of the egg masses and water quality data.

Effects of Tree Density on Salamander Abundance in Vernal Pools

Jessica Tozer, Anne Carsey, Abbie Werner, Roxanne Gonzalez Pedraza, Christeena Joel

Dr. Dorothy Boorse

Spotted salamanders (*Ambystoma maculatum*) and wood frogs (*Lithobates sylvaticus*) use vernal pools as nurseries for their eggs and hatchlings. This study was set up as an experiment for the hypothesis that comparative tree density of hemlocks and beeches would affect the density of salamanders. Thirty-one coverboards, which are 30.48cm x 30.48 cm squares of untreated wood, were placed around two vernal pools in Essex County Massachusetts. The first pool was bowl shaped and the second was very large and shallow with multiple trees inside the basin of the pool. The pools were surveyed for egg masses and the coverboards for salamander individuals. Although egg masses of both species were found in both pools and adult wood frogs were heard, no adult individuals of either species were seen in or around the pools within the timeframe of our experiment. Water quality and canopy cover were measured, and although our sample size is not conducive to statistical testing, we were able to see a trend in temperature but not pH.

A Preliminary Survey of the Developmental Stages of Massachusetts Spotted Salamanders (*Ambystoma maculatum*) and Wood Frogs (*Lithobates sylvaticus*) in Two Vernal Pools of Different Water Quality

Leanne Hallenbeck, Jieun Jun, Rebecca Martin, Joshua Ward

Dr. Dorothy Boorse

Spotted salamanders (*Ambystoma maculatum*) and wood frogs (*Lithobates sylvaticus*) breed in vernal pools in New England each spring. These amphibians use vernal pools because they contain water seasonally, and thus are fishless, lowering the risk of mortality for developing amphibians. We laid out 31 wooden coverboards around two different vernal pool sites on April 11, 2019 at Gordon College's campus in Essex County, MA. They were placed for the purpose of attracting spotted salamanders and swabbing their abdomen to test for the presence of chytrid fungus (*Batrachochytrium dendrobatidis*). We found no salamanders during our study time period, but were able to observe water quality measures including temperature, pH, and water color. We also observed a difference in the rate of development of wood frog and spotted salamander eggs between the pools.

**Unique Molecular Index in Correcting for Bias and Error
in RNA Transcript Amplification**
Shinae Lee, Anna (Bingqing) Si, Edward (Yi) Zhou, Jacob (Qiang) Yang

Dr. Mike Veatch, Dr. Jonathan Senning

Our team has been working with New England Biolabs (NEB) regarding the nature of RNA transcripts and PCR Library Amplification. NEB has added random Unique Molecular Index (UMI) sequences to the molecules before amplification in order to identify amplification biases and correct for any errors on transcript level assessment. These UMIs are made up of 12 base pairs (A, C, G, T), and there are 11 stages of amplification. We have been provided with data consisting of transcripts and sequencing reads that can be attributed to each specific transcript and their attached UMIs, after the 11 stages of amplification. Our main goal is to determine the true amount of each RNA transcript in the given samples. To do this, we considered the distribution of UMI sequences, counted the abundance of each transcript without using the UMIs, used the UMI information to correct for the abundance of the observed transcripts, and manipulated different mathematical and probability models.

Modeling of Estrogen Receptor Using Molecular Operating Environment (MOE)

Anna Maeng, Quincy Dougherty

Dr. Mike Paul

Molecular modeling involves developing computational simulations of the structures and reactions of molecules. It has extensive applications that span both the fields of chemistry and biology, especially due to the close relationship between molecular structure and function. Molecular Operating Environment (MOE) is a molecular modeling software that can be used on a wide variety of platforms including both Microsoft Windows and Mac OS. MOE is often used in undergraduate classrooms due to its discounted cost for academic programs. In this study, MOE was used to model the estrogen receptor (ER). Natural estrogens play an essential role in the normal growth and development of a wide variety of tissues. Estrogens exert their effects through their interaction with the ligand-binding domain of the estrogen receptor. Factors such as hydrogen bonding, hydrophobic and hydrophilic regions, and other non-covalent interactions all affect the binding of the ligand to the ER. These factors can be modeled using MOE and can help us better understand the function of the estrogen receptor.

Using a Continuous Flow Cryostat for Ultrasonic Pulse-echo Studies of Material Elasticity

Donald Ethan Williams

Dr. Oleksiy Svitelskiy

The pulse-echo technique is used in order to find a materials elasticity. This will be done while the material is in a cryostat with an extremely low temperature. Said temperature is achieved with the use of continuous flow of helium through the cryostats chamber. While the sample is held in the chamber undergoing cooling, a transducer attached to the sample sends a pulse through it while another transducer receives the pulse that has traveled through the sample. Based on the difference of the pulse received from the pulse sent, the materials elasticity can be determined. The difference in temperatures and pulse sent will also narrow down the elasticity of the sample.

Time-Resolved Spectroscopy of Molecular Products of Cooling C, N, & B Plasmas

James St. Julien

Dr. David Lee

Laser Induced Plasma Chemistry (LIPC) is a technique used for molecular composition analysis. A high irradiance laser (10^8 - 10^{11} W/cm²) ablates a sample, ionizing its surface and generating a plasma. The cooling of this plasma allows for the formation of molecular bonds, which can be characterized by the emissions they produce as they change states. In this work we characterize the vibrational states of diatomic molecules and compare the temperature of the molecules to the temperature indicated by the atomic emission spectrum of impurities in our samples.

The Path to Optical Sorting of Large Dielectric Microparticles with Whispering Gallery Modes

Nathan Jordan, Alex King

Dr. Oleksiy Svitelskiy

Optical cavities with whispering gallery mode (WGM) resonances are interesting as building blocks for photonic devices, including fiber-integrated couplers and spectrometers, photonic crystals, and lasers. The high Q factors (10^3 - 10^6) along with their sensitivity to the surrounding environmental conditions allow the use of optical cavities as sensors of various physical quantities. We present results on polarized optical spectroscopy of spherical WGM resonant microcavities ($D \sim 5$ -50 micron) made of plastic, and silica and barium titanate glass, performed in air and water. The resonances were excited by evanescent light from optical fibers tapered either by chemical etching or by thermal pulling. The results of our experiments are

consistent with theoretical predictions. We will discuss how to use these WGM resonances in order to apply forces to microparticles for microfluidic and biomedical applications.

Simultaneous Dual-plane, Real-time Magnetic Resonance Imaging of Oral Cavity Movements in Advanced Trombone Players

Lian Atlas

Dr. Peter Iltis

This study describes the use of real-time, magnetic resonance imaging (RT-MRI) to simultaneously obtain MRI videos in both a sagittal and coronal plane during the performance of a musical exercise in 5 advanced trombone players. Dual-slice recordings were implemented in a frame-interleaved manner with 20 ms acquisitions per frame to achieve two interleaved videos at a rate of 25 frames per second. A customized MATLAB toolkit was used for the extraction of line profiles from MRI videos to quantify tongue movements associated with exercise performance from both perspectives. Across all subjects, the analyses revealed precise coupling of vertical movements of the dorsal tongue surface (DTS), viewed from a sagittal perspective, with reduction in the vertical and horizontal dimensions of the air channel formed between the DTS and the hard palate, viewed from a coronal perspective. The cross-correlation between these movements was very strong (mean $R = 0.967$). These results demonstrate the unique utility of this dual-slice technology in describing the coordination of complex tongue movements occurring in two planes (i.e. three directions) simultaneously, lending a deeper understanding of lingual motor control during trombone performance.

Remote Allergen Challenge to Lung or Skin Increases Intestinal Eosinophils

Nathan Gill, Qitong Yuan

Dr. Evangeline Cornwell

Clinicians report that patients with one type of allergic disorder (inflammatory asthma, food allergy, atopic dermatitis) have a higher incidence of developing a second or third atopic disease at a remote site, but the reasons for the increased risk are not well understood. Eosinophils, a type of leukocyte, are known to be increased in allergic disorders with inflammatory components, so understanding their role in allergic disease may help provide a mechanistic link for the increased risk of developing multiple allergies. To determine whether or not remote allergen exposure of the lung or skin would impact baseline eosinophil, we quantified eosinophils from remote compartments in a mouse model of asthma (lung OVA/alum challenge) as well as a mouse model of atopic dermatitis (skin OVA/alum challenge). We sensitized and challenged mice with ovalbumin (OVA) allergen by endotracheal spray (lung) or tape-stripping on shaved dorsal skin (skin). Using flow cytometry and by histology, we quantified eosinophil populations in the small intestines (remote compartment) as well as in lung, skin, and blood. We found significant increases in gut eosinophils in both the lung-challenged and skin-challenged mice, and significant increases in blood eosinophils in skin challenged mice, suggesting that increased eosinophils in one compartment may lead

to increases in other body compartments. These findings may be an important step towards a better understanding of the biological mechanisms behind the increased likelihood of individuals diagnosed with eosinophil-mediated allergic disorders developing further allergic diseases.

Modulus Measurements Using Impact Acoustic Spectroscopy

Michael Patoto

Dr. Oleksiy Svitelskiy, Dr. David Lee

Impact acoustic spectroscopy is a method to excite sound waves in a solid. An analysis of the excited frequencies allows us determine important properties of that material, such as the young's modulus, shear modulus, and the velocity of sound. We present an adaptation of this method to allow for temperature dependence measurements. Preliminary results will be discussed.

Composite 3D-printed Metastructures for Low-frequency and Broadband Vibration Absorption

Betzaida Berrios

Dr. David Lee

An acoustic metamaterial is a material designed to control, direct, and manipulate sound waves as these travel through gases, liquids, and solids. Using acoustic metamaterials, the directions of sound propagation through the medium can be controlled by effectively tailoring the refractive index of the material. Specifically, in periodic solids such as phononic crystals, the acoustic spectrum can exhibit spectral gaps which prevent transmission of sound waves at prescribed frequencies. These prohibited frequency ranges (or bandgaps) can be tuned by varying the size and geometry of the metamaterial. We demonstrate the existence of an acoustic band gap for longitudinal waves over the frequency range 10 – 70 kHz in a one-dimensional phononic crystal consisting of a 3d-printed skeleton with embedded solid brass cubes. This approach to acoustic bandgap engineering can be scaled up for use in ultralow-frequency vibration absorption or isolation applications, such as for the design of earthquake-resistant infrastructure.

Comparing the Effect of TurboFect and Lipofectamine on HEK 293T Cell Transfection with pAd-RFP and pEGFP-N1

Yewoo Lee

Dr. Greg Keller

Dr. Ming Zheng, Dr. Evangeline Cornwell

Transfection is the process of introducing nucleic acids into eukaryotic cells. A common type of transfection involves introducing bacterial plasmids with a mammalian expression promoter into mammalian cells. These plasmids are then expressed inside the mammalian cells as proteins. My study looked at the transfection efficiency of green fluorescent protein plasmids (pEGFP-N1) and red fluorescent protein plasmids (pAd-RFP) in human embryonic kidney 293t cells (HEK 293t cells). The HEK 293t cells were transfected with pEGFP-N1 and pAd-RFP using lipofectamine 3000 transfection reagent. Co-transfection of HEK 293t cells with pEGFP-N1 and pAd-RFP was also studied. The transfected cells were visualized using fluorescence microscopy and the transfection efficiency was calculated by counting the cells manually. The results were 70% transfection efficiency for pEGFP-N1 and pAd-RFP alone and 30% transfection efficiency for co-transfection. The end goal of this study is to collect the supernatant of transfected HEK 293t cells and transducing mesenchymal stem cells.

CD11c Expression on Eosinophils Harvested from Small Intestine of Eosinophil-specific Notch2 Knockout Mice in an OVA Food Allergy Model

Grace Pepler, Tochi Anioke, Qitong Yuan

Dr. Evangeline Cornwell

Up to 7.5% of children and 2% of adults are known to suffer from food allergies, many of which involve pro-inflammatory activity from eosinophils (Carlens et al, 2009, Ganeshan et al, 2009, Chohade & Mayer 2005). During inflammation, eosinophils migrate to inflammatory foci and increase inflammation (Rothenberg & Hogan, 2006). We used eosinophil-specific Notch2 knockout mice to study the role of Notch2 signaling in eosinophil activity in response to an allergen trigger. To mimic murine food allergy, mice were sensitized with intraperitoneal (IP) injection with OVA in PBS or vehicle only, followed by oral gavage challenge with OVA in PBS or vehicle only. We analyzed the requirement of Notch2 for allergen-induced eosinophil expression of CD11c, a mucosal docking integrin, due to its biological importance in migration and survival of eosinophils (Abdala Valencia et al, 2016). With this model, we observed lower levels of eosinophil infiltration into the intraepithelial layer of the small intestine in Notch2 mutant mice compared to wild-type. We also observed that CD11c expression on eosinophils did not increase to the same degree as the increase in wild-type mice following allergen trigger. These results provide further insight into the mechanisms driving eosinophil infiltration during food allergy, as well as a potential target for future pharmaceuticals for eosinophilic diseases.

Characterization of Eosinophils Extracted from Bronchoalveolar Lavage Fluid in EoCre MHC Class II Floxed Mice Post HDM Sensitization and Challenge

Tochi Anioke, Qitong Yuan, Grace Peppler, Nathan Gill

Dr. Evangeline Cornwell

According to a study carried out by the Centers for Disease Control and Prevention, the incidence of inflammatory asthma in the US increased from 1 in 14 to 1 in 12 over the past decade. The reason for these dramatic increases needs further study. However, it is known that in response to an allergen such as mold, pollen or house dust mite feces, eosinophils migrate to the lungs. In an inflammatory asthmatic lung, activated eosinophils secrete granules containing cationic protein that destroy surrounding pulmonary tissue, leading to fibrosis and scarring. The molecular signaling pathways triggering the activation of eosinophils are not well understood. Recent studies have demonstrated the presence of Major Histocompatibility Complex (MHC) Class II proteins on eosinophils. These studies raise questions about the role of eosinophils as antigen presenting cells to naïve or activated T cells. In order to determine whether or not MHC Class II proteins are necessary for eosinophil production, migration or activation, we created an eosinophil-specific MHC Class II knockout mouse. We induced a mouse model of inflammatory asthma by exposing both wild-type and eosinophil-specific MHC Class II knockout mice to house dust mite (HDM) and harvested eosinophils from bronchoalveolar lavage fluid (BALF). We first confirmed the phenotype of the MHC Class II knockout mouse by flow cytometry. Although we did not observe a decrease in eosinophil accumulation in BALF in HDM-treated MHC Class II knockout mice, our new mouse model can be used to study other conditions where eosinophil activity is necessary. Our work opens up avenues for the development of therapeutic strategies for the treatment of inflammatory asthma.

Electric Field Effects On KTN Ferroelectric Phase Transitions Studied By Ultrasound Pulse Echo

Robert Mech

Dr. Oleksiy Svitelskiy, Dr. David Lee

We investigate changes in the elastic properties of ferroelectric materials when an electric field is present during phase transitions. Measurements are performed using phase-sensitive ultrasound pulse-echo probing, with ultrasound with pulse frequency 10 kHz, and pulse duration 1 μ s. An external electric field is present across a KTN bulk ferroelectric crystal, with magnitudes varying from 0 V/cm to 2 kV/cm. The speed and attenuation of sound are both sensitive to the changes in the crystal. The observed behavior can be understood in terms of a mixed model that includes elements of soft-mode and order-disorder to describe the mechanisms of the transitions. The obtained data will be applied for understanding behavior of ferroelectric films.

Development of a Differential Scanning Calorimeter for Undergraduate Materials Science Labs

Christian Kunis, David Yan

Dr. David Lee

Differential scanning calorimetry is a standard technique used in materials research. However, the cost of research quality systems is beyond the resources of undergraduate level college departments. We present here a power compensated differential scanning calorimeter capable of measuring thermal traces from room temperature up to 300 C, using inexpensive components and a National Instruments DAQ box, with the accompanying software being written in MATLAB and made available under a GNU General Public License.

Evaluation of Different QuEChERS Methods for Cannabinoids Analysis in Lozenges Edibles

Chongyeon Cheang

Dr. Greg Keller, Dr. Evangeline Cornwell

The recreational use of products infused with tetrahydrocannabinol has recently been legalized in Massachusetts but the development of analytical methodology to analyze these products is still evolving. Accurately measuring and quantifying the active ingredients in these products is important for public health and the merit of the industry. Several methods have been used to test for safe levels of active ingredients, most of which have been adapted from methods used to measure pesticide levels in agricultural and food products. The present study compares several different published methods used to extract and quantify tetrahydrocannabinol from a homogenous candy matrix. Tetrahydrocannabinol, and other similar compounds, were quantified using high-performance liquid chromatography with ultraviolet detection (HPLC-UV). We compared the efficiency, yield, and reproducibility of these extraction methods. Optimization of quantification methods will increase product safety and decrease risk to the public.

Impact of LED Supplemental Lighting on Accumulation of Carotenoids on Greenhouse Tomato (*Lycopersicon esculentum*)

Elizabeth Antonelli, Jihwan Yu

Dr. Jennifer Noseworthy, Dr. Greg Keller

Lycopene is the major carotenoid pigment found in tomato (*Solanum lycopersicum*) a known potent antioxidant of nutritional importance in the diet. Several factors influence accumulation of lycopene in tomato including duration and intensity of solar radiation. Use of supplemental lighting during winter production of tomato occurs in northern climates to offset the differences in the daily amount of photosynthetically active radiation (PAR). Light emitting diode (LED) lights provide an alternative to high

pressure sodium lamps because they offer a narrower wavelength of lights ideal for plant growth and development and emit less heat. Exposure to narrowed red to blue ratios of light have been found to affect biomass accumulation, plant morphology, nutrient uptake, and pigment concentration in a range of greenhouse crops. In this study, three greenhouse tomato varieties were treated with 90:10 red/blue ratio and 86:14 red/blue ratio respectively, with 600 W LED light treatments for 16 hours/day. At harvest, yield, soluble solids and carotenoids were determined. According to our preliminary results, fruit yield increased 3-fold compared to the control among both light treatments. Soluble solids and carotenoid values were comparable to the control ranging from 5.5-7.0% and 62-77 ug/g FW respectively. Therefore, the benefit of the increased yield did not appear to negatively impact accumulation of sugars and carotenoids.

Use of ArcGIS Landscape Analysis to Determine Important Coastal Habitat for Sea Ducks

Caris Lyons, Karoline Niles

Dr. Greg Keller

The Massachusetts North Shore coast provides valuable habitat for both migratory and residential sea duck species. The purpose of this study was to evaluate the importance of different types of coastal habitats by observing presence of sea ducks at each site. Duck abundance surveys for 7 common species were conducted at 29 different sites along the North Shore coast. Using ArcGIS, sites were evaluated based on coastal orientation, substrate type (rocky or sandy), exposure, wetland proximity, and surrounding urban development. ANOVA and step-wise regression were used to analyze the relationship between coastal habitat characteristics and duck abundance. Results showed a relationship between some duck species such as buffleheads (*Bucephala albeola*), common loons (*Gavia immer*), and red-breasted mergansers (*Mergus serrator*). These results can be used to determine which types of coastal habitats are most valuable when considering sea duck conservation.

Colligative Property: How Can We Make It Greener?

Yoon Ha Shin, Cal Owen, Danelys Nunez

Dr. Mike Paul

Green Chemistry has its foundations in the art of designing chemical processes that yield products while reducing or eliminating the use and generation of hazardous products. In this experiment, students observed the colligative properties of boiling point elevation and freezing point depression using stearic acid, sucrose, and urea to determine molar mass of the solutes. Stearic acid is an effective teaching tool, but the experiment produced large amounts of waste and ruined glassware. The goal of the investigation was to find an alternative lab with similar learning applications but which produced fewer, greener products.

What is Molecular Operations Environment? Docking Statins Using MOE

Yoon Ha Shin, Kevin Crowshaw

Dr. Mike Paul

MOE, Molecular Operating Environment, is a drug discovery software that supports Cheminformatics, Molecular Modelling, Bioinformatics, Virtual Screening, Structure-based-design and can be used to build new applications based on SVL (Scientific Vector Language). This research is based on the article, "In Silico Evidence of Direct Interaction Between Statins and α -amyloid". In this study, they tested various statins to figure out how they interact with amyloid-peptides. The aggregation of these peptides represents a crucial step in the pathogenesis of Alzheimer's Disease. Our work will be showing different dockings of statins such as pitavastatin, pravastatin, and simvastatin.

Cleaning Up Soap

Sujin Cha, Victoria Ganss, Joshua Winnett, Miranda Pomphrett

Dr. Mike Paul

Green Chemistry aims to develop chemical processes that are safer for human health and the environment. Modern techniques of soap making include harmful chemicals that have detrimental effects on both the environment and human health. Using the principles of green chemistry, a greener form of soap is possible. The Gordon College Department of Chemistry and the Student Chapter of the American Chemical Society seeks to introduce these principles to a larger audience through interactive outreach. An academically diverse group of college students experienced this through a soap making activity that taught them the history and chemistry behind the soap making process. In order to make this greener soap, harmful chemicals were replaced by natural oils such as castor, palm, olive, and coconut. Through this event, people learned about the techniques behind soap making and how to apply green chemistry to their everyday lives.

Going Peanuts for Green Chemistry: Essex Elementary STEM Night

Victoria Ganss, Samantha McKinney, Melody Chan, Julia Holt

Dr. Mike Paul

Teaching elementary science education, including aspects about green chemistry, is incredibly important. Students are the next generation of chemists, and teaching them is what will make a huge change in how the environment is treated in the future. The goal of green chemistry is to develop safer chemical substances and processes, so chemistry is more environmentally friendly. Two interactive, hands-on experiments were brought to the annual Essex Elementary School STEM Night to give students an engaging experience with green chemistry. The two principles of green chemistry taught were eliminating waste and less hazardous synthesis. To demonstrate eliminating waste, students tested Styrofoam versus

biodegradable cellulose packing peanuts in water, and observed and compared the results. Students observed the durability of the Styrofoam and were informed about the life span of such harmful waste in comparison to the eco-friendly biodegradable peanuts. To demonstrate less hazardous synthesis, students used cabbage juice as a pH indicator with household acids and bases. Students mixed the cabbage juice with shampoo, vinegar, Sprite, orange juice, and baking soda. They then compared the resulting color to the colors of a pH scale. Overall, this project aimed to introduce students to a new science topic and teach them some principles of green chemistry.

Green Chemistry Analysis of Fall Semester Labs

Kegan Hatfield

Dr. Mike Paul

The purpose of this research project was to take a Chemistry lab procedure related to titrations and adapt it in order to reduce waste production, maintain the teaching quality, and minimize potential error. Various methods were utilized to bring about these changes, such as using a different indicator or a pH meter. Based on the data collected, the previously mentioned methods were not able to provide a greener alternative to the original procedure. Further research would include reducing the volume or changing the concentration of the KHP solution. Theoretically, these modifications would yield a significant waste reduction.

Inhibition of Anti-Inflammatory and Anti-Coagulation Enzymes in Snake Venom

Michael Hahn, Travis Singh

Dr. Mike Paul

The purpose of this research project was to reproduce the experiment that aimed to understand the interactions of the proteins that cause anti-coagulation and anti-inflammatory responses found in snake venom and their medicinal potential. Various proteins were downloaded from PDB and uploaded to the program MOE. Three different inhibitory molecules were tested in an attempt to understand the inhibitory effects on PLA₂(Phospholipase A₂). Of the different proteins chosen, inhibitor 4 had the lowest fitness score while inhibitor 14 produced the highest fitness score. Even though indomethacin did not yield the highest fitness score, other studies have shown that it is a more effective inhibitor due to its dual inhibitory abilities.

Cheaper and More Renewable Metallic Catalysts for Fuel Cells

Michael Hahn, Cal Owen, Anna DeOliveira

Dr. Mike Paul

As the need for sustainable energy continues to grow, people have been searching for creative and different ways to develop diverse forms energy in the most cost effective and environmentally friendly ways. The use of Proton Exchange Membrane Fuel cells (PEM-FC), which produces electricity with water being its only by-product, has the potential to be a very efficient way to create usable energy. PEM-FCs manipulate oxidation-reduction reactions (ORR) ($O_2 + 4e^- = 2O^-$), however their efficiency is limited by the strength of the O=O bond. At this time, platinum has proven to be the most efficient metal in use, however platinum has a diminishing supply and is quite expensive.

Ruthenium, iridium, gold, nickel, and iron 13 and 15 atom nanoparticle clusters were built using Material Studio and evaluated using density functional theory on VASP. An O_2 molecule was bonded to a variety of different positions on each cluster. Over the course of the trials, the ruthenium crystals proved to be most effective in both breaking the O_2 bonds as well as maintaining their stable crystal structures. Despite resizing and reshaping the iridium crystals, they were never stable enough to be optimized with an O_2 molecule. Additionally, testing has begun on nickel-13 and iron-15 crystals, and have yet to provide any conclusive results.

While these results provided intriguing data on possible alternatives to platinum for PEM-FC reactions, the crystal structures were still comparatively small, and further testing on larger, more complicated crystals would be beneficial for any extrapolation into real world application.

Quantification of Sodium Benzoate in Commercialized Coconut Water Beverages Using High-Performance Liquid Chromatography

EunSeo (Anna) Maeng

Dr. Mike Paul

Coconut water has become a popular hydrating beverage since its benefits on human health were noticed. In this experiment, the amount of sodium benzoate, a substance commonly used as a preservative in foods, in different brands of commercialized coconut water, three brands made from concentrate and the other three not from concentrate was compared. Liquid chromatography was used to identify and quantify the sodium benzoate content in coconut water samples. Standard and sample solutions were prepared by diluting in mobile phase which contains 90% of sodium acetate buffer (pH 4.2) and 10% of acetonitrile. The HPLC determination of the sodium benzoate was performed using reversed-phase C18 column and UV detection at 225 nm for its maximum absorption. Flow rate of 1.6 mL/min and run time of 8 minutes were optimized for the sodium benzoate peak elution. The result shows that coconut water not made from concentrate has average sodium benzoate concentration of 5.92 ± 6 mg/L whereas samples made from concentrate has 2.70 ± 5 mg/L. This result concludes that there is higher amount of sodium benzoate in coconut water not made from concentrate.



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Poster Entries

Social Sciences &
Behavioral Sciences

Embodied Cognition Based on Different Levels of Condition

Yeonjae Jang, JinHee Kim, Makayla Noyes, Maggie Qiu

Dr. Bert Hodges

It is a common phenomenon among bilingual speakers to experience a sense of personality change when speaking their first and second language. Research on this topic is still at a fairly young stage, and while studies have found results that fit the claim of personality change, there have not been many studies pertaining to people of other languages or backgrounds. For this partial replication study, we chose to observe Korean English bilinguals, as they have not yet been included as subjects for this research. In the current study, monolingual and bilingual participants took a personality assessment called TIPI. We then observed interactions between bilinguals and monolinguals as they participated in a get to know you activity, in order to assess the validity of the previous findings on language and personality. The results concluded that there was a significant personality change observed in the bilingual participants.

Choice as a Nudge: Investigating "Mere Choice" as a Mitigator of the Decoy Effect

Ryan Hulbert, Kaitlyn Vercellono, Abigail O'Grady

Dr. Susan Bobb, Dr. Jonathan Gerber, Dr. Kristen Cooper

This study aims to explore theories of choice architecture—how the manner in which choices are framed affects the decisions that people make. Specifically, it seeks to evaluate the decoy effect, a behavioral nudge based on asymmetrically dominated choices, by examining a potential counter-effect or mitigating factor, which we call the “mere-choice effect.” While the decoy effect posits that the presence of an inferior (decoy) option increases the appeal of a superior target option, it seems reasonable that an additional option could also decrease a person’s propensity to select the target option compared to opting-out. We sought to test this effect by sending ~120 students a fake psychology study signup form containing various choice architectures assigned at random. Students were presented with one of four Survey Monkey pages: a decoy effect experiment, a mere-choice effect experiment, and two controls. Follow up questions were used to provide deeper insight into participants’ choice rationale. Results pending. Ultimately, we seek to explain the mere-choice effect through several theoretical frameworks drawn from both microeconomic and cognitive-behavioral theory.

Cultural Bias as an Environmental Cue for Bilingual Language Selection

Vanessa Torres-Lacarra, Devani Cordero, Taemar Shearer, Julissa Rodriguez

Dr. Susan Bobb

It is hypothesized that language cues such as pictures or words relating to the intended language may activate a cognitive selection process whereby the participant selects one language and inhibits the other (Bobb, Hoshino, Kroll; 2008). In the present study, Korean-English bilinguals and English monolinguals were to name pictures biased towards Korean or North American cultures, in English. Concurrently, we collected electroencephalograph (EEG) data to measure for the N400 effect. For Korean-English bilinguals, we anticipated our results to show a response time delay between the two language cues, with Korean cues having a slower response time and greater N400 effect in comparison to English cues. We also anticipated that with increasing L2 proficiency, participants would show a reduced N400 effect. Preliminary analysis manifested a difference between groups that is nearing significance, suggesting that both languages may be active and cultural cues might indeed aid in the process of language selection.

Multilingual Individuals' Perceptions of Foreigner-Directed Speech

Renee Ruppel, Andre Marques Ferreira

Dr. Jonathan Gerber, Dr. Susan Bobb

The objective of this study was to analyze whether non-native speakers of English perceive native speakers' accommodation of communication and whether non-natives perceive such accommodation positively, negatively, or simply do not mind it. An anonymous, online questionnaire was sent out to non-native speakers of English to assess their perception of speech accommodation, language proficiency and general personality factors as well as empathy and anxiety. We predicted a negative correlation between anxiety and perceived helpfulness of speech accommodation. We also predicted that empathy and English proficiency would have a positive correlation with perceived helpfulness. Results are forthcoming. Analyzing non-natives' response to speech accommodation may help native speakers be more sensitive to the possible positive and negative effects of their speech accommodation in the process of assimilating non-native speakers to English language and culture.

Relationship Between Dyadic Self-Other Agreement and Personal Intelligence

Julissa Rodriguez, Rachel Allison, Sarah DeGenero

Dr. Jonathan Gerber

Personal intelligence (Mayer, 2017), the capacity to reason about personality, might be related to a high self-other agreement after minimal interactions. To test this, 78 undergraduates (mean age = 19.76, SD = 1.43) completed the Mini-IPIP then completed the Relationship Closeness Induction Task (Sedikides, Campbell, Reeder & Elliot, 1999) with a partner. After this, participants rated their partner's personality

via the mini-IPIP, then completed the TOPI test of personal intelligence, Ravens Matrices, and an emotional intelligence scale (WLEIS). Consistent with previous research (Kenny, 2002), within-person accuracy was high ($r = .53$). However, accuracy showed no correlation with personal intelligence, Raven's, EI or personality ($|all\ rs| < .12$). Nevertheless, the TOPI converged with Raven's ($r = .53$), diverged from EI scales ($|all\ rs| < .17$), and converged with extraversion and openness ($r = -.31$). Personal intelligence may not explain self-other agreement. Furthermore, there exists a negative correlation between high levels of extraversion and Consistency-Congruence Personal Intelligence (the ability to find patterns in personality that aid in understanding and anticipating the behaviors of others). High levels of extraversion were negatively correlated with Dynamic-Analytic Personal Intelligence (the ability to synthesize information about an individual and deducing the traits of an individual).

Vocal Communication of Canada Goose (*Branta canadensis*)

YeongJin Bae (Samuel)

Dr. Kaye Cook

Canada Geese, *Branta canadensis*, are the most widely distributed geese in North America and are easily found around Gordon campus. They are characterized by highly stable, interacting family groups (Raveling, 1970) and communicate vocally as well as nonverbally. Goslings selectively respond to their own parents through the low-pitched call given by both the parents when leading the young (Cowan, 1973). Stokes lists other vocal communications which I observe in this study. For example, when in an alarm situation, parents give high-pitched, loud alarm calls that serve as both warning and elicit approach of the goslings. This study was set up to observe geese vocalization, both by observing their behavior and by introducing contexts in which geese might perceive aggression. Collected data is affected by the context that the goose encounter. Ethogram was created to distinguish the different calls on different situations. The different calls of Canada Geese are analyzed and presented through data collected through free-observation and intervention.

Chicken Hierarchy and Aggression

Amanda Snyder, Chrissy Fallon

Dr. Kaye Cook

There is a hierarchy within every flock of chickens. Much research has shown that aggressive behavior, such as pecking, indicates dominance. We have hypothesized that pecking behavior will increase and cuddling behavior will decrease when a stress-induced factor is entered into the flock of chickens. In this study, we compared the difference in behaviors before and after one piece of compost was introduced to a random sample of the flock of 15 hens and 2 roosters. We decided to use one piece of compost as the stress inducer because research has shown that thwarting food causes aggression. Our data showed that pecking did indeed increase while cuddling decreased throughout the set of second trials. This proves that stress affects aggression which reveals hierarchy within this flock of chickens. Therefore, our hypothesis

is correct. We conclude that aggressive behavior in chickens is a clear indicator of hierarchy based upon a stress-inducing factor.

Dog IQ Tests. Do They Actually Measure Intelligence? Comparison Between a Mutt and a Purebred

Amanda Quintana, Elliott Pierre

Dr. Kaye Cook

For this experiment, we were interested in dog intelligence. To find out if we could reliably measure dog intelligence, we tested two dogs, a purebred and mutt, that differ between both breed and upbringing. We used dog intelligence tests to determine the intelligence of both dogs. Also, we had the dogs learn and try to distinguish between 3 different toys. Our hypothesis is that the dog who scored higher on the intelligence tests would have a higher recognition of the three toys. During the intelligence test, we ran 8 different tests and used a point system based off of speed and accuracy while performing the task. The results showed Evah, our purebred, had proven to be more intelligent. She had earned a total of 30 points, meaning she was in the highly intelligent range. Reeses had earned a total of 16 points, which meant that she performed in the low-level range for intelligence. For the toy recognition, Evah, who was the winner, did not demonstrate that she could not distinguish between the 3 toys. Reese's showed the same results. Therefore, the test was determined inconclusive. Despite this, the intelligence test showed that Evah and Reese's do hold some capacity for intelligence.

A Guide to Dog Personality: Do Age and Size Influence Dog Personality?

Emily Lundberg, Sarah Uwandori

Dr. Kaye Cook

Dogs have often been called "man's best friend," but do they have the the personality traits that go with this label? Studies have shown that dogs indeed do have traits similar to humans which often vary within dogs based on breed, gender, or other biological characteristics. Using the Dog Personality Questionnaire (DPQ) designed by Jones (2009), this study looks at five factors of dog personality; fearfulness, aggression toward people, activity, responsiveness to training, and aggression toward other animals and analyzes how size and age impact these characteristics in dogs. We surveyed 31 dogs' owners at the beach and around Gordon College campus with the DPQ about their dog and had findings which mostly aligned with previous research and our hypothesis. We found that small dogs (<55lbs) showed more fearfulness and aggression toward animals and people than large dogs (55 lbs or more). We also found that young dogs (<7 years old) are significantly more active than old dogs (7 years old or more). However, we found no interaction effects between age and size on any of the personality factors we tested in the dogs. We also did not find that age or size has any significant effects on dog's responsiveness to training. They suggest that age in dogs has a lot of influence on dog activity, but not necessarily on dog personality as a whole because older dogs may simply be less active due to their bodies being weaker and more tired. These also

findings suggest that something about dog size has a large influence on dog personality, especially on how aggressive the dog is. This is where more research is needed to find the specific biological factors which may result in smaller dogs being more aggressive.

Classroom Arrangement and Participation and Knowledge Retention among Undergraduate Students: Effectiveness of Feedback and Evaluation

Marilyn Stoltzfus, Samuel Cho, Grace Juhlin, Grace Min, DJ Falcon

Dr. Susan Bobb

Keeping a class engaged and participating in class has been studied from many different aspects, with many different ideas put out there for teachers to utilize. Most of this research has been geared to a younger student body, such as elementary or high school students. This study looks at 6 groups of college students and their vocal communication in a classroom discussion. Different desk arrangements were employed to determine if the setup of the classroom affects the vocal participation of college students. A pre and post-study survey was given to help establish a baseline for retention as well as a general baseline of their participation. The post-study also gave feedback concerning the instructor and their encouragement or dissuasion of participation. A personality was also be given to account for natural vocalness or shyness in classroom discussions. 3 different classroom arrangements (rows, pods, semi-circle) were used to add insight toward the answer to the age-old question that teachers have as to how to increase vocal participation in class.

Sugar and Its Effects on Anxiety Levels in College Students

XinYue (Annie) Zhang, Nicole Reera, Hwa Yoon Lee

Dr. Susan Bobb

This study is designed to address the effects of sugar intake on anxiety and stress in college students. Added sugar consumption has been increasing in all age groups in the United States and worldwide, with the greatest increase in young adults (Murad, 2017). The research method used is a quantitative study with descriptive design. The sample (N=60) consists of 60 Gordon College students between the ages 18-22 years. Questionnaires and measures were chosen based on previous research in our area of interest. An anxiety scale, "State-Trait Anxiety Inventory (STAI)" along with Sternberg's Memory Task, was administered and completed both before, and after, the consumption of liquid. We expect to find that sugar intake positively affects anxiety levels in college students. The proposed study will contribute to general knowledge about the effects of sugar intake on anxiety levels.

Deindividuation and Leadership

Alec McMillan, Brenna Peterson, Mason Strawderman, Sarah Boggs

Dr. Jonathan Gerber

In this study, we looked at the correlation between group leadership and deindividuation - a phenomenon we measured through anonymity, conformity, and group identity. Twenty-eight undergraduate students from Gordon College were divided into four groups for research through a 2x2 design with leadership and shared characteristic. Two groups elected a leader while the other two groups did not. The other manipulation was a shared characteristic given by the minimal groups paradigm. We predicted the combination of a shared group characteristic and leadership would result in the highest reports of deindividuation; we further predicted that manipulating for just group identity would result in higher reports of levels of deindividuation than simply manipulating for leadership alone. As we predicted, we found that there was a significant increase in perceived group identity in the condition of a shared group characteristic along with a leader.

Effective Methods of Sexual Assault Policy Education

Catherine Steininger, Chloe McCracken, Meredith Carlile

Dr. Jonathan Gerber

At Gordon College, students have to go through sexual misconduct training once before their freshman year, as part of an online click-through video course. It is advertised that there is a fine for non-completion. Our study aims to understand how effective this current regimen of training is. In this study, (currently) 14 participants split into 1 of 3 conditions testing the effectiveness of our current program. These conditions included a group which re-completed the standard training, a group which completed the standard training plus a discussion portion, and a control group which completed an unrelated task. At this point in time, we are still collecting, processing, and analyzing data, so we are currently unable to draw conclusions.

How ASMR Effects Stress

Samantha Wallis, Giselle Flores, Maria DeOliveira

Dr. Jonathan Gerber, Dr. Susan Bobb

The aim of this study is to investigate whether autonomous sensory meridian response (ASMR) can be used as a way to cope with stress. Our sample is made up of 24 participants that were randomly selected and are primarily made up of undergraduate students. We used an experimental method with two control groups. All participants' vitals were taken before and after being exposed to a stress-inducing scenario. We expect that the difference in measurements will indicate a reduction in stress levels following the ASMR induction. This research contributes to a greater scientific understanding of ASMR and its potential uses in a clinical setting.

Personality and Interest in Typologies: A Correlational Study

Catherine Bee, Jacquelyn Fitzgerald, Julie Joyce, Danielle McGibbon, Allison Sweeney

Dr. Jonathan Gerber

The number of articles, quizzes, and other materials offering insight into personality reveals that people are fascinated with discovering the psychological types and traits of ourselves and others. Although it is known that the human mind loves categories in general, some individuals spend a great deal of time evaluating themselves based on any number of classification systems. Contrary to what one might expect, existing research suggests that young, intelligent, scientifically literate people have a relatively greater interest and investment in typologies. The present study aims to determine what demographic and psychological factors correlate with interest in typologies. Undergraduate students will participate in a survey including the TOPI MINI-12 scale of personal intelligence and the Big-Five Factor Marker scale of major personality domains, and a scale that has been developed to measure typological interest. The survey will collect basic demographic information which may provide a clearer understanding of which life stages and circumstances motivate typological interest. Finally, participants will have the opportunity to give free responses about what personal value, if any, they feel they have gained from personality typologies. The study aims to provide useful information about what motivates certain people to self-evaluate using personality typologies, which may be applied in businesses and schools.

Carrying Objects and its Effect on Carefulness

Danielle McGibbon, Emily Lundberg, Kaylee Seward

Dr. Bert Hodges

What does it mean to walk carefully? Does it mean to walk cautiously, slowly or fearfully as some have suggested? This study aims to answer some of these questions as not many previous studies have looked at carefulness, especially while carrying something over a fairly long distance. 23 total parents participated in a 2 studies on “carrying household items” in which they walked across a different series of uneven steps in each study separated by gaps carrying their child, a paper bag filled with groceries, and an open bucket of water. The children and groceries were equal in weight, and water was 6.8 kg. Children generally were cooperative, water was “uncooperative”, and the groceries were “dead weight”. Point light films were shown to 28 participants who rated each kinetic display for carefulness. Observers did not know anything was being carried. Trials on which Water was carried were judged to be more careful in the first study. However, in the second study it was judged that people carried the child more carefully. The reason for the differences in the results from the 2 studies is unknown at the moment. Further research will be done to explain these results.

Americans Processing the Perception of Time when Viewing Varying Still Images Taken in an East Asian Perspective

Zu En Seow, Ashley Cordero

Dr. Bert Hodges

Ever since pictures were invented, people have always been fascinated by them. Today people like to take pictures on just about anything, and some pictures grab more of our attention than others. One can stare at a picture and think nothing of it and move on. On the other hand, a very captivating picture grabs you, and it might intrigue you so much so that you don't even notice how long you have been staring at that picture for. A similar concept is the belief that time passes by faster when one is having a good time in contrast to time feeling like it never ends when one is suffering. When looking at still images, the photographs that most arouse us are the ones we perceive to be seen for longer than pictures that do not arouse us.

This study is a replication of a study by (Hodges,) and is testing whether people perceive a difference in time when viewing clear or fuzzy pictures. Abstract art was also shown as a control since abstract art can appear both fuzzy and clear at the same time. Our hypothesis was that people would perceive fuzzy pictures as being displayed on a computer screen for longer than clear pictures. In addition to this initial test we are also testing to see if there is a difference in perception, based on the fact that the pictures are taken in an East Asian perspective and being viewed by Americans. There seems to be evidence that suggests that East Asians and Americans take pictures differently, and we hypothesize that this may affect the amount of time the pictures are perceived to be viewed for.

The Effects of Age, Gender, and Emotion on Perceived Trustworthiness and Time

Rebekah Dostie, Erin Marsh, Kaelie Mercado

Dr. Bert Hodges

People make rapid judgments throughout their day instantly and variables such as age, gender and emotion contribute to judging character traits such as trustworthiness (cite Krumhuber, E., et.al, 2007, Todorov, A., et.al, 2009, Sofer, C., et.al, 2015, Lee, K. H., et.al, 2011). These variables also influence time perception (Filip, P., et.al, 2016, Gil, S. et.al, 2011, Angilli, A., et.al, 1997, Ogden, R.S., 2013, Droit-Volet, S., 2004). Prior research suggests that emotional faces' time duration is overestimated, and perception is affected by facial emotions (Lee, K. H., 2011). Other research shows that brief exposure to a face can serve as accurate judgments, particularly of trustworthiness, because humans are good at detecting threats (Todorov, A., 2009). In the present study, twenty-five participants are told they will be judging trustworthiness and time duration for a series of pictures, each of a face (variables of gender, emotion and age). Following the exposure participants judge trustworthiness and perceived time duration. Predicted results will show that happy young faces will be perceived as trustworthy and lasting shorter than actual time duration. Conversely, old sad faces will be perceived as less trustworthy and lasting longer than the actual time duration. We propose a deviation from previous models and explain the findings from an ecological perspective. We propose that young faces afford more shared values and

therefore are more trustworthy. Conversely, old faces do not afford such trustworthiness. Further, sad faces afford the possibility of rejection.

Exhibited Aggression of White Students towards Latinx Students at Gordon College

Sara Mendoza, Anna Castles, Jessica Sweeney, Ethan Roberts

Dr. Susan Bobb

Racial aggression exhibited towards minority groups is a well-documented practice that modern society has tried to move away from. For all societies, racial aggression is still a harsh reality in the world today. Otherwise tolerant people can still exhibit increased aggression towards members of minority groups over individuals of the same race, particularly when agitated. This phenomenon, observed by Rogers and Prentice-Dunn, is referred to as regressive racism (Rogers, Prentice-Dunn, 1981). The present study sought to determine whether regressive racism was displayed among Gordon College students against Latinx members of the student body. By exposing participants to an intentionally frustrating task supposedly assigned to them by a partner who was either White or Latinx, and then allowing them the opportunity to choose a similar task for that same partner, we will seek to identify any regressive racism present through comparison of White responses to different confederate racial identities.

Effects of Temperature and Perceived Control on Undergraduate Cognitive Performance and Stress Levels

Madeleine Wiggins, Sophie Wood, Megan Hasty, Jameson Boeshans, Peter Lee

Dr. Susan Bobb

Previous studies have suggested there is a correlation between temperature and stress levels, as well as temperature and lower cognitive functioning. Studies have also shown having a sense of control helps people relax and focus. Thus, feeling warm may cause higher stress levels and lower cognitive functioning, but with a perception of control, a person may be able to relax and cognitively perform better. In this study, participants were randomly assigned to one of three conditions: high temperature (78-82°) with no control, high temperature (78-82°) with perceived control, and normal room temperature (68 - 70°). We hypothesized that people who had control over the temperature would perform better with less stress than people with no control over the temperature. We also hypothesized people in the normal temperature condition would perform better than those in the high temperature condition. A stroop test and beck anxiety inventory was used to measure participants.

Cross Cultural Differences in Procrastination

Abby Moline, Derek Nelson, Ilya Layton, Christiane Britt

Dr. Susan Bobb

The hypothesis for this study was that there are associations between procrastination and other personality traits. Our sample consisted of undergraduate college students gathered through various methods, including by recruiting in various core and lower level classes. Procrastination, locus of control, perfectionism, self-esteem, and religiosity were tested in hopes to find some sort of correlation between procrastination and the others. Confidentiality was maintained by having the data collected anonymously and stored online. Participants filled out an online survey made up of six inventories that required them to provide their demographic information, placed carefully to avoid priming questionnaire responses. All of the measures used came from the original study conducted by Boysan & Kiral (2017), excluding the Revised Intrinsic/Extrinsic Religious Orientation Scale. The results will be discussed in light of the hypothesis we are currently testing.

Bilingual Moral Dilemma Decision Making

Arielle Moreira, Selena Santos, Eliud Guzman

Dr. Susan Bobb

The proposed research is designed to address the critical analysis within cognition that occurs in a literate bilingual when having to make a decision, including a lack of information about the impact ethnolinguistic identity theory may have on the mind. The focus of this study is on the differences in cognitive reasoning between the moral decision making of a bilingual speaker when answering a binary moral dilemma scenario in their native language versus their second language. Participants will be 34 bilinguals who speak, write, and read in both Spanish and English. Participation will vary in demographics, varying in location either from Gordon College, Massachusetts, or Mexico. Higher levels of an altruistic response following the native language while higher levels of a utilitarian response following the second language is expected. The proposed research will provide a window into the cognitive disagreement that may arise when a bilingual answers altruistically in one language, and utilitarian in another.

Introverts, Extroverts and Helping Others

Sofia Jeanes, Caleb Connor, Blake Millard, Ariana Williams, Jerushah Sweet

Dr. Susan Bobb

The purpose of this research study is to determine whether people with introverted or extroverted personality types benefit more from giving care to others. This benefit will be measured through anxiety levels before and after treatment. There has been past research on the benefits of giving care and on the effectiveness of anxiety treatments based on personality type. No previous studies have combined these two factors and our research will attempt to determine whether the benefits of giving care is correlated

with a specific personality type. A sample of 34 participants will be given an anxiety scale and a personality test to complete. After that participants will be given a prompt asking them to write about a memorable time where they helped someone. Next, they will read a series of vignettes that provide situations centered around having the option to help an individual. Finally, the same anxiety scale will be repeated. We will attempt to find whether there is a correlation between personality types, prior anxiety levels, and the decrease in anxiety levels after completing the treatment. Our hypothesis is that those who are more introverted will benefit more and their anxiety levels will decrease from giving help. The hope is that this will lead to a better understanding of methods that can reduce anxiety levels in individuals.

Replication of "Behaviour and personality of pet rabbits and their Interactions with their owners"

Sarah Degenero, Saliha Shelton

Dr. Kaye Cook

What influence does handling have on a pet rabbit's personality? While little research has been done on this topic, S. M. Mullan and D. C. J Main (2007) found a positive relationship between a nurturing environment and the rabbit's perceived overall personality. The current study is a replication of Mullan and Main (2007) and employs the same methods. Owners were briefly interviewed about their rabbit, and handling assessments by both the owner and an outside observer were analyzed. The rabbit's behavior was then recorded for ten minutes. A chi-squared test was used for measuring the rabbit's level of struggling while being handled. Quantitative behavioral data was analyzed using the Mann-Whitney U test and personality data was analyzed using the chi-squared test, as was done in Mullan and Main. Results indicated a positive correlation between pet handling and the rabbit's perceived personality.

Lived Experience, Culture, and Cognition at Faith-based Homeless Shelters

Sarah DeGenero

Dr. Ines Wenger Jindra

In this presentation, we examine religiosity, community, and forms of assistance in "House of Hope," a faith-affiliated homeless shelter in the Northeast. Our analysis consists of narrative biographical interviews (13 at House of Hope and 17 at Grace Ministries, a faith-permeated shelter in the Midwest) from former or current residents, including one or two from staff members in each shelter, which were analyzed using a narrative interview technique. Interviews addressed the question of how residents adapt to the religious aspects of specific shelters, take advantage of cultural resources, and to what extent this differs between people with various biographical backgrounds. Within House of Hope, we find fairly significant differences in shelter experiences based on resident life histories. We also find a general lack of religious impact among residents of House of Hope, despite the fact that Hope of Hope is a faith-affiliated shelter. Future analyses will compare these results to that of Grace Ministries.

Differential emotions response to first and second language visual stimuli in Spanish-English Bilinguals

Peyton Chen, Natalie Moretto, Vanessa Torres-Lacarra, and Moses Chatnik Pen

Dr. Bryan Auday

In this study we explored electrodermal activity of 12 Spanish-English bilingual participants in response to a list of 48 words (24 matched pairs of English and Spanish words, of varying emotional valence). This list was then presented as a randomised list of visual stimuli programmed through Superlab, which the participants would then rate for emotional valence. We expected non-emotional words to elicit little to no emotional response, and words with negative valence to elicit higher emotional response than their positive counterparts. Most importantly, we hypothesised that bilingual participants would have a more pronounced emotional response to their first language. Experimental results gave weak support to our hypothesis, and mixed feedback from Spanish-English Bilinguals, English-Spanish Bilinguals, and Balanced Bilinguals suggest that strong environmental factors are at play, muddying the original responses towards the language that encoded emotionally laden words.



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Poster Entries

Humanities

Topic-Valued Null Subjects and Noun Class Agreement in Kinyarwanda

Sarah Welton-Lair, Evan Platzer

Dr. Amanda Swenson

Introduction: Kinyarwanda, unlike canonical pro-drop languages, is highly agglutinating and includes noun class markers on the verb. Zeller (2008) proposes that Kinyarwanda null subjects are *pro*. His account, however, cannot explain how *pro* would get its reference. We solve this problem by proposing that the reference for *pro* in Kinyarwanda is determined by Topics through agreement, so that the null subject and its corresponding Topic always match. To show this, we compare Kinyarwanda and Italian data, where a similar analysis has been proposed (Frascarelli 2007). The similarity between these two unrelated languages shows that a Topic-valued account for null subjects could be useful for explaining null subjects in other languages as well.

The puzzle: Kinyarwanda marks subjects on the verb using noun class markers, (1).

1. I-mbwa i-riruka

NC9-dog NC9-run

‘The dog runs.’

Interestingly, even when a sentence lacks an overt subject, the verb still has a subject marker, as shown in (2).

2. A-riruka

NC1-run

‘(He/She) runs.’

This raises two questions: First, where does the noun class marker come from if there is no subject to agree with? Second, how does a speaker know what the subject of the sentence is when it is not explicitly stated?

Zeller states that Kinyarwanda null subjects could be *pro*, but points out that, because Kinyarwanda has 20 different noun classes, there would need to be 20 different lexical forms of *pro* to encapsulate all the possible features, a level of complexity which seems high. The only way for there to be a singular *pro* is if *pro* receives its features from somewhere higher in the tree.

Proposal: This problem can be solved if overt and covert Aboutness Topics at the CP-level serve as antecedents for null subjects (*pro*) at the TP-level (cf. Frascarelli 2007). Example (3a) provides a sentence with an overt Topic (“this pizza”) and another potential antecedent DP (“the first piece”). Examples (3b)-(3c) show that a null subject sentence following (3a) can only refer to the Topic and the verb has to have the NC marker, *i-*, for pizza, not the NC marker, *ka-*, for piece.

3. a. Iyi pizza, n-dimo n-dayirya kuko n-akunze agace_k ka mbere.

DET pizza NC-AUX NC-eat.it COMP NC-liked piece COMP first

‘This pizza, I am eating it because I liked the first piece_k.’

b. i-raryoshye

NC-is.tasty

‘(It_j/*_k) is tasty.’

c. *ka-raryoshye

NC-is.tasty

‘*(It_{*j}/*_k) is tasty.’

Frascarelli shows that, in Italian, covert and overt Topics cannot co-occur in a sentence, and that null subjects refer to Topics (whether overt or covert), even when other possible antecedents are present in the sentence or discourse context. Applying her tests to Kinyarwanda reveals that *pro* refers to overt and covert Topics as well, but unlike Italian, agreement between Topic-valued *pro* and the verb results in noun class markers on the verb, just as Zeller suspected.

References: Frascarelli, M. 2007. NLLT. ♦ Zeller, J. 2008. Southern African Linguistics and Applied Language Studies.