GORDON
COLLEGE

# 2017 Undergraduate Research Symposium

Tuesday, May 2, 1017

Ken Olsen Science Center

# Program Content and Schedule

## Poster Display

Posters will be displayed in the Ken Olsen Science Center and Loggia & Chairman's Room.

Students will staff their entries for a minimum of one hour on Tuesday, May 2 between 11:30 a.m. and 4:30 p.m.

Posters must be taken down immediately after the event.

Please enjoy refreshments during the event.

## Table of Contents

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# Poster Entries

## Natural Sciences, Mathematics and Computer Science

Listed in alphabetical order by first author's last name

## Measuring Efficiency of Dry Shampoo by Quantification of Squalene Absorbed Using HPLC

**Lisa Blais**
**Otonye Braide-Moncoeur**

*Poster #1*

Dry shampoo is a cosmetic product designed to absorb excess oil from hair. Though it is typically made from a base product of starch, when a denatured alcohol is added to it, the dry shampoo can be sprayed on for added convenience. In this experiment, an organic powdered dry shampoo and an organic aerosol dry shampoo and a non-organic aerosol dry shampoo were compared for efficiency of oil absorption. Olive oil was used to imitate sebum, the natural oil that coats hair because olive oil has a high concentration of squalene, a compound naturally found in sebum. The absorption of squalene of each dry shampoo was analyzed using an Ocean Optics UV-Vis Spectrometer. After mixing with 3 mL of olive oil, the dry shampoo brands, Shea Moisture, Sun Bum and Psssst!, had squalene concentrations of _____, _____, and _____ respectively. Because Shea Moisture had the lowest concentration of squalene, it absorbed the most oil, making powder the most effective dry shampoo.

## Quantification and Comparison of Ascorbic Acid in Canned and Fresh Oranges

**Julia Bonney**
**Otonye Braide-Moncoeur**

*Poster #2*

Ascorbic acid (vitamin C) is a nutrient that plays a significant role in the growth and repair of tissues within the body. It is readily consumed through a number of dietary sources such as dark leafy greens, tomatoes, strawberries, and citrus fruits. However, when considering some of the convenient options of these sources, it is believed some of the nutritional value may be compromised due to its sensitivity to light and heat. Processes such as canning employ high temperatures, which have the potential to degrade ascorbic acid, leading to a reduction in nutritional content. In this study, we predicted that the amount of ascorbic acid in fresh oranges would be greater than the amount in canned oranges. Following extraction, we were able to isolate the vitamin and quantify it using High Performance Liquid Chromatography (HPLC). It was determined that the concentration of ascorbic acid was $38._3 \pm 6._2$ ppm in the fresh orange samples and $25._0 \pm 4._7$ ppm in the canned orange samples. A statistical t-test was performed and was conclusive in determining the ascorbic acid content to be significantly different in both sources. After further research, it was deduced that the difference in the ascorbic acid content between the two sources might also be a result of the removal of the outer membrane during the canning process

## Pulse-Echo Characterization of Materials

**Peter Crossman**
**Oleksiy Svitelsky**

*Poster #3*

The pulse echo technique is used in this research to characterize the temperature dependence on the speed of sound of KTN crystal and Bulk Metallic Glass. This technique relies on measuring the phase difference in a material from the input (a pulsed acoustic waves sent through the material) and the transmitted signal (including subsequent echoes).

The research consists of several stages. In the first stage we completed building a highly-sensitive pulse-echo instrument with improved time and temperature stability. This allows us to detect the smallest of changes in the properties of the material under investigation.

The second stage involves exploring low-temperature properties of a $KTa_{1-x}Nb_xO_3$ single crystal. Utilizing a liquid nitrogen cryogenic probe, we observe how the crystal experiences several phase transitions resulting in noticeable changes in the speed of sound.

In the third stage we turn to low-temperature properties of metallic glass. The endpoint being to create a bench mark understanding of how the pulse echo technique works on metallic glass. In future work, this glass will be analyzed at high temperatures near the glass transition in which the material changes to a crystalline state.

## Mathematics of Network Security: Graphic Counting

**Luke Cui, Jess Wild, Ethan Kang**
**Michael Veatch**

*Poster #4*

Cyber security is very important to our daily life because networks are a huge part of our life. This project aims to further explore the network system and anomaly analysis. We mainly use two methods to detect the anomalies. The data we used is from Czech Technical University in Prague. The first method is graphlet counting: we divided the datasets into multiple time windows and counted the graphlets over each time window. After this, we use Kolmogorov-Smirnov test to detect anomalies. The second method is to analyze the distribution of the degree of nodes on the graph and use the Chi-Square test to detect anomalies. In the end, we compare the two methods and analyze the methods of detecting anomalies in general.

## Effects of Dissolved Organic Materials in the Water of Vernal Pools on the Number of *Ambystoma Maculuaturm* and Rana *Sylvatica* Egg Masses.

**Verna Curfman, Laurelyn Anderson, Jack Gilbert, Karoline Niles, Rachel Nygren**
**Dorothy Boorse**

*Poster #5*

Vernal pools are temporary, seasonal bodies of water that create unique environments for amphibian species. These unique habitats are especially important to the reproduction of amphibians, specifically for egg laying. These pools are important for the life cycles of amphibians such as the spotted salamander, *Ambystoma maculaturm,* and the wood frog, *Rana sylvatica*. Pools contain substances known as dissolved organic materials (DOMs), which are defined as organic substances that play a role in ecosystem functioning, pollution management, photodegredation, carbon management, and overall water quality. Each pool contains different levels of DOMs, which can be quantified using photospectrometry. We hypothesize that increased levels of dissolved organic materials will allow for a greater numbers of egg masses in comparison to vernal pools of lower levels of dissolved organic material, due to a potential camouflage protection from predation and UV radiation. We expect that more spotted salamander and wood frog egg masses will be found in vernal pools with higher levels of DOMs because of their protection from predation and UV radiation.

## Water Quality of Coy Pond

**Kali Denty, Emily Richards, William Biegun, Quincy Dougherty, Sara Lareu**
**Otonye Braide-Moncoeur**

*Poster #6*

Water quality of Coy Pond was assessed using 5 different variables: turbidity, pH, temperature, dissolved oxygen (dO) and electrical conductivity. Data was collected with individual sensors using the Vernier LabQuest 2 interface at 11 different locations along the perimeter and at the center of the pond. Surface measurements were performed in real time in both the morning and afternoon. Most of the assessed parameters fell within ranges that are characteristic of healthy ponds (10-15 mg/L for dO, less than 200 NTU for turbidity, 4.6–7.0 for pH, 200-500 µS/m for conductivity, and 2-30 ◦C for temperature). Future work in assessing pond health would include sampling at varying depths, increasing the number of sampling locations, and testing additional variables.

## Optimization of Transfection Efficiency of pEGFP-N1 into Human Embryonic Kidney (HEK) Cells

**Quincy Dougherty**
**Angie Cornwell**

*Poster #7*

Transfection is a process by which foreign DNA is introduced into eukaryotic cells. It is an effective tool to study molecular signaling pathways, gene function, and gene expression. Enhanced green fluorescent protein (EGFP) can be used as a reporter protein because its location inside a cell can be observed using fluorescence microscopy. When EGFP is fused to protein of interest, the location of the protein of interest can be indirectly observed. In this experiment, we transfected human embryonic kidney (HEK) cells with purified plasmid DNA expressing EGFP (pEGFP-N1) under the control of a CMV promoter. The pEGFP-N1 plasmid was first amplified in DH5-$\alpha$ *E. coli* cells, then harvested, purified, and transfected into human embryonic kidney (HEK) cells. Successful transfection was visualized by fluorescence microscopy after 24 hours. There was a positive correlation between high DNA concentration, high DNA purity, and transfection within the window-of-transfectability with transfection efficiency. We believe that these factors are three of the most important factors in optimizing transfection efficiency. By optimizing the process of transfection efficiency using a reporter plasmid, we can learn how to more efficiently transfect eukaryotic cells. These optimized transfection conditions can then be used to transfect expression plasmids, plasmids that alter gene expression and permit the study of cellular signaling pathways.

## The dangers of recreational oxycodone abuse: A comparative analysis of acetaminophen extraction techniques employed by recreational drug users

**Pauline Gaudette**
**Otoney Braide-Monceour**

*Poster #8*

Oxycodone is a semi-synthetic opioid prescribed for the management of moderate to severe pain, often sold in mixed formulation with a NSAID like acetaminophen in Percocets for pain relief and inflammation control after to aid in recovery from surgical procedures. In the US it is classed as a Schedule II drug as it is considered to have a high potential for abuse. In an attempt to reduce the renal damage associated with high doses of acetaminophen, recreational drug users perform at-home cold water extractions (CWE) to separate oxycodone from acetaminophen. In the present study, two different variations of at-home acetaminophen extraction from Percocet tablets were performed and their effectiveness were compared by quantification of both drugs by UV-VIS spectroscopy.

## Response to H2O2-Induced Oxidative Stress on Human Glial Cells

**Gabrielle Capone**
**Jennifer Noseworthy**

*Poster # 9*

Oxidative stress caused by exposure to free radicals is one the leading causes of inflammation leading to cellular death in the brain. Brain cells are highly vulnerable to oxidative stress due to its high metabolic activity. Increased oxidative damage has recently been linked to cognitive decline in the elderly and may contribute to the onset of Alzheimer's disease. Antioxidants such as lutein and docosahexaenoic acid (DHA) have previously been reported to lower oxidative stress in the nervous system as they can both cross the blood-brain barrier. In order to better understand the mechanism of the role of these antioxidants on reducing oxidative stress on the brain, human glial cells grown in cell culture were exposed to hydrogen peroxide ($H_2O_2$). Optimal $H_2O_2$, concentrations that would result in 25 % cellular death were determined by exposing cells to a range of $H_2O_2$ concentrations 0uM to 800uM for two hours before imaging. Cells were imaged using Cytation 3 and stained using a Live/Dead assay protocol. To determine the role lutein and DHA play on lower oxidative stress, each will be used as a treatment to observe if exposure to these nutrients in culture decreases oxidative stress and lowers cellular death in glial cells.

## Computational Studies of Oxygen Band Weakening with Group 10 Metal Clusters

**Daniel Gray**
**Mike Paul**

*Poster # 10*

The race to develop sustainable, environmentally friendly, and cost effective forms of energy production is central to many research projects today. Proton Exchange Membrane Fuel cells (PEM-FC) produce electricity with minimal environmental impact, as the only product is water. The efficiency of PEM-FC's is limited by the kinetics of the oxygen reduction reaction (ORR) ($O_2 + 4e^- = 2O^-$) due to the strength of the O=O bond. Platinum clusters are typically used as a catalyst for the ORR.

To assess the effectiveness of group-10 metal clusters to weaken O=O bonds, computational modeling simulations have been carried out. The length of the O=O bond has been measured with oxygen attached to different sites on the cluster. Platinum, palladium, and nickel-3/5/7/9/13 atom nanoparticles were built using Material Studio and evaluated using density functional theory on VASP. The principal findings show that platinum is the most efficient catalyst to lengthen the $O_2$ bond, especially at larger sizes, though the other group-10 metals exhibit similar properties when compared with their same-size counterparts.

## Polyethylene's Effects in Toothpaste Whitening and Stain Removal

**Kyle Hayes**
**Otonye Braide-Moncoeur**

*Poster # 11*

High Performance Liquid Chromatography was used to analyze the concentrations of hydrogen peroxide in Crest Whitening toothpaste and Crest 3D white toothpaste. The method for the experiment was adapted from the Gimeno et al. procedure, which calculated hydrogen peroxide concentrations through its reaction with triphenylphosphine. The data for hydrogen peroxide concentrations in each toothpaste are pending. Crest 3D toothpaste contains small polyethylene beads that increase the abrasiveness of the toothpaste. After staining large white eggs in Pepsi, Arnold Palmer, and Ocean Spray Cran-Grape drinks it is expected that the Crest 3D will have a more qualitative whitening affect on the stained large white eggs, as it's abrasiveness is more intense due to the polyethylene beads – data pending.

## Galaxy Clustering

**Kelly Herrick**
**Dale Pleticha**

*Poster # 12*

Are galaxies clustered? Using the most powerful tool to access information of millions of galaxies, the Sloan Digital Sky Survey, the distances between galaxies can be found.

In order to show whether or not galaxies are clustered, the actual distances between galaxies are compared with those whose distances are randomized. A statistical analysis will show whether or not these galaxies come from the same parent distribution. If they do, then galaxies are not clustered in the universe. If they do not, then galaxies are clustered.

Another easy method to see if the galaxies are clustered is to compare the average nearest neighbor distance for the original set of galaxies verses the randomized set of galaxies.

## Broad Support in Voting

**Min-Sun (Sunny) Kim, Luke Cui**
**Karl-Dieter Crisman**

*Poster # 13*

The majority rule is a universally popular voting system, at least for two candidates. But it does not resolve all situations, such as when there are multiple groups, one of which is much bigger than other groups. In such a case, a candidate who is affiliated with the largest group of voters will always win, which is not quite fair. This paper examines how broad support could be achieved by looking at several different methods including a two-step plurality, quota system, and a weighted system.

## Use of Membrane Fusion to Understand Lung Surfactant Protein B Mimic in Lipid Tracking

**Kayla Kroning**
**Otonye Braide-Moncoeur**

*Poster # 14*

Respiratory Distress Syndrome (RDS) is a disorder affecting premature babies who lack or have a complete absence of the essential lung surfactant components produced during proper fetal lung development. Composed of a mixture of lipids and proteins, Lung Surfactant lines the alveoli, providing a barrier against inhaled pathogens, lowering the surface tension at the air-fluid interface, and facilitating oxygen absorption. Specifically, Surfactant protein B (SP-B) has been identified as a major protein in surface tension reduction and lipid trafficking to the air-fluid interface of the alveoli. Previous studies have shown selective interactions with DPPC in SP-B penetration, possibly suggesting the flipping of DPPC to the air-fluid interface. We will study the phase separations and trafficking abilities of SP-B to better understand how it lowers surface tension. Using Fluorescence Resonance Energy Transfer with the fluorescent probes Rhodamine-PE and NBD-PE, we will monitor the predicted effects of SP-B in mediating membrane fusion and inducing phase separations. This method allows us to demonstrate the role of SP-B in lipid trafficking in a fast and cost effective manner with minimal sample consumption.

## Quantitation of Flavor Compounds Released by Yellow and Red Bone Marrow

**Kayla Kroning**
**Otonye Braide-Moncoeur**

*Poster # 15*

When using chicken bones to prepare chicken broth, the meaty flavor of the broth is a result of volatile flavor compounds found in the bones and released into the air as the broth boils. These flavor compounds are produced by the Maillard reaction, which is catalyzed by the thermal degradation of lipids. The bones with high fat contents are expected to contain more flavor compounds, because they have a higher concentration of lipids, which can thermally degrade. Bones with a large percentage of yellow bone marrow have more fat. In contrast, bones with a high percentage of red marrow have less fat. We will compare bones of different marrow types to measure which of these contain more flavor compounds and, therefore, produce more flavorful broth. The concentration of the volatile compounds released can be isolated by a distillation, extracted by solvent extraction, and quantified by gas chromatography (GC.)

## Effects of One Shoulder and Two Shoulder Backpack Carrying on Walking Gait

**Jenna Labbadia, Courtney Page, Spencer Roffee**
**Jessica Ventura**

*Poster # 16*

Backpack carriage is both useful and universal, however, more concern has arisen about the adverse effects wearing a backpack may pose. While pain is the main complaint associated with backpack wearing, researchers must uncover what it is about backpack carriage that is causing this pain. We speculate that changes in stride length, ground reaction forces (GRF), and joint angles could be the culprit when carrying a detrimental amount of weight. A twenty-one-year-old female, who had a height of 1.778 m and weighed 68.5 kg, volunteered to participate in this study. The subject was instructed to wear a relatively high percentage of her BW (20%) while walking under different wearing modalities; one-shoulder carriage, two-shoulder carriage. A third condition was non-loaded walking, which was used as a control for comparison with the loaded conditions. Forty-two reflective markers were placed on prominent landmarks all over the subject's body except the arms. A six-camera Vicon Nexus system captured the markers, while the subject walked in a straight line, hitting two AMTI force plates. The subject chose a comfortable, self-selected walking speed (SSWS) with which to walk across the level ground and was instructed to hit both force plates. This study observed spatiotemporal measures, joint body torques and muscle forces while walking with a backpack. For spatiotemporal measures, an increase in step time of the left leg, an increase hip flexion on both left and right sides of the body, and a decrease in forward lean were seen. For joint body torques and muscle forces, we found that an increase in GRF is directly related to an increase in backpack carriage, and muscle forces of the hip extensors were higher on the side that carried the one-shoulder backpack weight.

## The Effects of KinesIQ Training on Gait Biomechanics

**Brent Larson, Ben Rivers**
**Jessica Ventura**

*Poster # 17*

The Center for Balance Mobility and Wellness on campus recently acquired a new balance and gait training device called the KinesIQ. It's a gait simulator that is used to train balance, reflexes, and muscle tone using visual as well as kinesthetic stimuli. Gordon College has been selected as one of the handful of facilities to try out this new prototype. This study was designed to assess specifically the gait training potential of the KinesIQ.

Using a Logitech c920 camera, three participants had their walk cycle recorded across flat ground as well as going up steps. Then they were recorded on the KinesIQ performing simulations that replicated walking and stair climbing. Using Dartfish 8, a program for analyzing biomechanics from video, the hip, knee, ankle, and foot angles for each of the conditions was measured and compared to their respective counterpart.

Based on our findings, there is a large percent difference between the control groups and experimental groups, meaning the simulated gait on the KinesIQ was substantially different from flat ground walking and stair climbing. Although there was this difference, the KinesIQ still facilitates the patient through a normal gait cycle, except many of the joint movements are over-exaggerated.

Even though the KinesIQ produces very different joint angles, when compared to over-ground gait, it seemed to resemble normal gait. The motions at each gait event were similar; however, the motions produced by the KinesIQ were over-exaggerated. Future research would need to be conducted to determine whether this over-exaggeration would be beneficial or harmful to gait training.

## Is a Low H:Q Ratio an Indicator of Quadriceps Dominance During Drop Jump?

**Christopher Leavitt, Brian Van Doren, Vaness Tones, Sammi Moren**
**Jessica Ventura**

*Poster # 18*

In order to screen female collegiate athletes for Anterior-Cruciate Ligament (ACL) injury risk, a proper understanding of neuromuscular deficits related to the injury is necessary. This study focuses on one deficit called quadriceps dominance (QD). QD is reliance on the quadriceps muscles to stabilize the knee joint when landing. QD can be measured using Hamstring-Quadriceps (HQ) strength ratios on a dynamometer, or through functional testing. The HQ ratio that is attained when conducting an isokinetic

strength test at 240°/s on a dynamometer will provide maximum strengths of the hamstring group to the quadriceps group over a range of angles. If the ratio is lower than 0.60, it is understood that the athlete is QD. Functionally, QD correlates to low flexion at the knee and high GRF peaks when landing. The goal of this study is to test if the HQ ratio correlates to GRFs and knee flexion angles during a drop jump. We hypothesize that there will be a positive correlation between the HQ ratio and peak GRF, and a negative correlation between the HQ ratio and the knee flexion angle. Measuring these two variables during functional drop-jump testing is important because subjects who are identified as having a low HQ ratio during strength testing can be more closely evaluated to determine: 1) If their landings produce high peak GRFs, indicating a stiff landing, and 2) low flexion angle at the knee which can lead to ACL injury risk.

## Heat Diffusion Simulation

**Kuo Lu**
**David Lee**

*Poster # 19*

We are writing a program in matlab that produces heat diffusion simulation of the quenching in the production process of metallic glass.

## Effect of Roadside Salt on Spotted Salamander and Wood Frog

**Caris Lyons, Abena Mantey, Ye Eun Bae, Michelle Satava, Grace Park**
**Dorothy Boorse**

*Poster # 20*

Vernal pools are temporary isolated pools of water that provide habitat for amphibians and invertebrate animals. They serve as essential breeding habitats for certain species of wildlife, including spotted salamanders (*Abystoma maculatum*) and wood frogs (*Lithobates Sylvaticus*). Normal vernal pool activity may be affected by certain human activities like the use of de-icing road salts during winter. We measured the conductivity and the numbers of spotted salamander and wood frog egg masses at 22 vernal pools near Gordon College. Using the geographic information system (GIS), the distances from each vernal pool to the roads were measured in order to categorize the vernal pools into three groups: far from the road, close to the road, and no salt area. The collected data was analyzed using the ANOVA test. We expected to find that the vernal pools close to the road will have a higher conductivity and fewer salamander and frog egg masses than pools far from the road and at no salt areas. The time that the egg masses started to appear was later than expected due to the persistent colder, dryer climate this year. In spite of this,

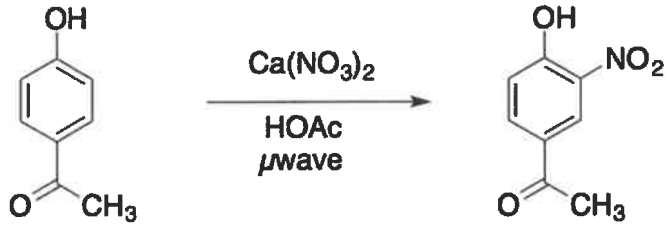
our results showed that fewer egg masses were found in vernal pools that had higher salt concentrations. This could be due to the unproductive effect that increased road salt concentrations may have on the salamander and wood frog populations.

## The Green Microwave Nitration as an Undergraduate Lab Procedure

**Mirielle Nauman**
**Irv Levy**

*Poster # 21*

The purpose of this research is to modify a recent method from the literature[1] to design an undergraduate organic chemistry lab that utilizes the "12 Principles of Green Chemistry" and that is significant in the curriculum. In this procedure, 4-hydroxyacetophenone is nitrated with calcium nitrate and acetic acid to create 4-hydroxy-3-nitroacetophenone. The transformation occurs smoothly, at high yield, with microwave irradiation at low power for under 10 minutes. This procedure is efficient, feasible in a three-hour lab period, and uses much safer conditions than the usual approach with nitric acid and sulfuric acid.




## The Green Microwave Nitration of Benzyl Alcohol

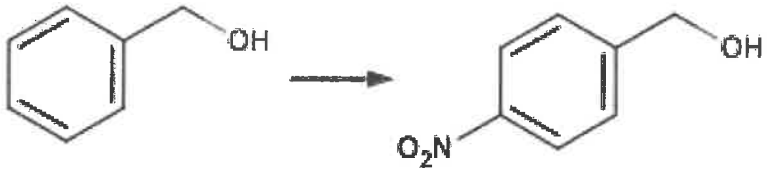
**Mirielle Nauman, Anna Kjellson, Sara Petrillo**
**Irv Levy**

*Poster # 22*

The purpose of this project is to test an undergraduate organic chemistry method that was recently developed from the literature[2] and utilizes the "12 Principles of Green Chemistry" with a new molecule. In the original procedure, 4-hydroxyacetophenone is nitrated with calcium nitrate and acetic acid to create 4-hydroxy-3-nitroacetophenone. In this project we use the same green reagents but try to nitrate

[1] Bose, A.K.; Ganguly, S.N.; Manhas, M.S.; Rao, S.; Speck, J.; Pekelny, U.; Pombo-Villars, E. "Microwave promoted rapid nitration of phenolic compounds". *Tetrahedron Lett.* **2006**, *47*, 1885-1888.
[2] Bose, A.K.; Ganguly, S.N.; Manhas, M.S.; Rao, S.; Speck, J.; Pekelny, U.; Pombo-Villars, E. "Microwave promoted rapid nitration of phenolic compounds". *Tetrahedron Lett.* **2006**, *47*, 1885-1888.

benzyl alcohol instead, hoping to make 4-nitrobenzyl alcohol. This procedure uses much safer conditions than the usual approach with nitric acid and sulfuric acid. We will discuss preliminary results of our attempts to transform benzyl alcohol with microwave irradiation in under one hour.




## Exploring Classroom Assignment Problem at Gordon

**Kevin Neil, Sarah Li, Jarron VanCeylon**
**Michael Veatch**

*Poster # 23*

The Registrar's Office of Gordon College is seeking detailed evidence that there is a lack of space on campus for the number of courses offered, and their occupancy. The College has seen increased student enrollment over the past few years, but no corresponding growth in space available or adaptive policies. The results of this growth without additional space, or shifting policies, have given the Office of the Registrar significant problems.

Using data analytics and configuration, alongside formulating a complex cost-assignment linear program run through the program MPL, we will analyze the feasibility of the classroom assignment problem at Gordon College. We will also analyze the effects of current policies, recommending shifts in policy and increase in enforcement.

## How Student Chapters Have an Impact on Green Chemistry and Social Justice

**Ivy Ngo, Verna Curfman**
**Irv Levy**

*Poster # 24*

Education is the most important tool that we have for furthering the ideas of how Green Chemistry applies to social justice. Future generations need to understand the connection of these topics and their role in encouraging the fair treatment of others in the context of sustainability and environmental justice. Our ACS student chapter has been addressing education developments in schools that are either failing or in great need of curriculum resources in Lawrence, MA and Harlem, NYC. We would like to create a space for conversation about ways to increase resources for further opportunities in this topic.

## Determining the Hardness of Water in Frost Hall Through Titration

**Ivy Ngo, Tochi Anioke, Castele Juslin, Bridget Mellon**
**Irv Levy**

*Poster # 25*

Water, an essential part of human life, is as simple as it is complex. Many factors can affect the quality of water for use and consumption such as the presence of particular ions, calcium and magnesium, also known as the "hardness of water." This project explores the hardness of the water provided to the faculty and staff in Frost Hall through the method of titration with ethylenediaminetetraacetic acid (EDTA). Preliminary results have shown that overall pH of the water is neutral therefore leading to the exploration of the hardness of water. The project will culminate in an understanding of water hardness as well as titration through the development of an undergraduate lab procedure.

## Generation and Validation of an Eosi

**Courtney Olbrich**
**Angie Cornwell**

*Poster #26*

Eosinophils have recently been implicated in a growing number of inflammatory diseases including Chron's disease, allergic rhinitis, and some types of respiratory asthma. In these inflammatory diseases, eosinophils are secreted from the bone marrow into the circulatory system, transmigrate into the affected tissues, and cause inflammation and tissue destruction. In order to more easily study the intracellular signaling pathways involved in the activation of eosinophils during inflammatory disease, we crossed mice expressing *Cre* recombinase under the control of the EOS EPX promoter (Eo*Cre*), with a double-fluorescent *Cre* reporter mouse (mT/mG). The mT/mG mouse expresses membrane-targeted Tomato Red in all tissues prior to *Cre*-mediated excision, but green fluorescent protein after *Cre*-mediated excision. The double mutant reporter strain (Eo*Cre* +/- mTMG fl/fl) expresses green fluorescent protein only in cells fully committed to the eosinophil lineage. We have validated this reporter line through ex vivo cell culture and flow cytometry, as well as by histological examination of gastrointestinal and respiratory tract frozen tissue sections. We have also confirmed that eosinophil compartments remain intact in the Eo*Cre* mouse strain. The establishment of the Eo*Cre* mTmG reporter mouse permits the assessment of eosinophil-related activity during inflammatory disease. Eosinophil location and number can be studied with relative ease using this eosinophil-specific reporter strain.

## Comparison of Added Sugar Content in Greek Yoghurt Versus Regular Yoghurt by High Performance Chromatography

**Rachel Olugbemi**
**Otonye Braide-Moncoeur**

*Poster # 27*

The FDA has recently decided to require that added sugar content be included on food labels, generating much interest in this controversial topic. This research project compared levels of added sugar in Dannon® Greek vanilla yoghurt and Dannon® regular vanilla yoghurt. Yogurt sample preparation consisted of dilution, deproteinization by perchloric acid, then filtration. High-performance liquid chromatography was used to determine the amount of sucrose and fructose in the samples. Added sugar was calculated as the sum of sucrose content minus fructose content, to correct for sucrose hydrolysis. The added sugar content of the Greek yogurt and regular yogurt was compared for statistical significance using a two-sample t-test at the 95% confidence level.

## Variable Number of Tandem Repeats: Study of Chromosome 1 Location DIS80 Using PCR Gel Electrophoresis

**Daniel Perez, Colin Dowd, Grace Jun, Dilanjan Anketell, Youngeun Park, Uyaiobong Ibanga**
**Angie Cornwell**

*Poster # 28*

The D1S80 location on chromosome 1 has no known genetic function, yet it is used in forensic science to distinguish between people. Each individual has unique VNTRs that are more alike among related individuals. In this study we examined the differences in D1S80 region of chromosome 1 between a general mix of unrelated individuals and an unrelated Korean population of the same size. We obtained 10 samples per group of buccal cells and extracted the DNA. We amplified the VNTR via PCR by using D1S80 forward and reverse primers. The amplified DNA was separated using DNA gel electrophoresis. We would expect to find similar sized VNTR bands among the Korean population, in comparison to the general population.

## Fresh or Frozen: What Kind of Broccoli Has More Vitamin C?

**Anne-Milda Pu**
**Otonye Braide-Moncoeur**

*Poster # 29*

Ascorbic acid, commonly known as vitamin C, is a water-soluble vitamin essential to the human body for growing and repairing tissue, synthesizing collagen, and supporting healthy teeth and bones. Water-soluble vitamins are not produced or stored in our bodies; therefore, vitamin C-rich foods are a crucial element of a balanced diet. Broccoli is one such food. In this experiment I determined and compared the content of ascorbic acid (AA) in fresh and frozen broccoli *via* high performance liquid chromatography with ultraviolet spectrophotometry. After the broccoli was homogenized in solvent, the samples were subjected to a series of centrifugations, decantations, and filtrations. Samples were refrigerated and kept at a low pH with a 50 mM phosphate buffer to prevent AA from oxidizing to dehydroascorbic acid (DHA). An 80:20 buffer:methanol mobile phase was coupled with a C18 column and ultraviolet spectroscopy at a 243 nm wavelength.

## Progress Towards Time Resolved Laser Induced Breakdown Spectroscopy

**Ji In So**
**David Lee**

*Poster # 30*

Laser-induced breakdown spectroscopy (LIBS) is a type of atomic emission spectroscopy that uses high energy laser pulses as an excitation source to create plasma from the sample. As the plasma relaxes, it emits characteristic wavelengths of light that are unique to its composition. The creation and relaxation of the plasma involves several physical processes that occur on varying time scales. A time-resolved technique allows for isolation of the plasma emission and subsequent analysis of the elemental makeup of the sample. I discuss progress made toward the implementation of time-resolved LIBS.

## Impacts of Habitat Fragmentation on Breeding Songbird Behavior and Abundance

**Joshua Spoonhour, Catherine Schweitzer, Chen Chow, Lauren Purdy**
**Greg Keller**

*Poster # 31*

Habitat fragmentation has both obvious and subtle impacts on populations of breeding songbirds. Edge habitat increases with fragmentation and can drastically change the composition of bird communities. However, impacts more subtle than species composition are often overlooked in community-level research, such as the effects fragmentation may have on behavior. We compared fragmented sites (pasture and residential edges) to heterogeneity (natural edges) to determine the effects of habitat on bird-species composition and breeding behavior (i.e., singing by territorial male birds). We studied eight focal species that are typically associated with edges to see how they respond to these three habitat categories at 36 study sites during the 2015 and 2016 breeding seasons. Four of our eight focal species were more abundant in natural edges than in pasture or residential edges, whereas the other species exhibited no difference in habitat use. In addition, three species were negatively affected by landscape-level fragmentation, whereas two species were positively affected. Furthermore, Common Yellowthroat (*Geothlypis trichas*) had a strong relationship between song rate and amount of natural edge, supporting our prediction that behavior is affected by fragmentation and heterogeneity. By studying behaviors alongside abundance, we can more deeply understand factors that cause species to vary in their responses to habitat fragmentation.

## Searching for Periodic Three Body Orbits

**Andrew St. Germain**
**Dale Pleticha**

*Poster # 32*

The three-body problem is a problem in classical physics where the goal is to find all periodic orbits of a system of three masses. Isaac Newton accomplished this for a system of two masses (such as the Earth and the Moon), but it has yet to be done for three or more masses. The math is too complex to be done by hand and must be solved using numerical approximation methods on a computer. A few years ago, two physicists published *A guide to hunting periodic three-body orbits* in the American Journal of Physics, which presents a proven method for finding periodic orbits in the three-body problem. The goals of my research have been to study the three-body problem in depth, replicate the results of the AJP paper, and search for new periodic orbits myself.

## Furthering the Practice of Microwave Chemistry in the Undergraduate Organic Chemistry Curriculum: Conversion of Hydrobenzoin to Benzil

**Logan Walsh, Emma Folkerts, Victoria Ganss**
**Irv Levy**

*Poster #33*

The purpose of this experiment is to demonstrate a greener method of creating benzil from hydrobenzoin. The traditional method utilizes cyanide an extremely toxic substance. A catalytic amount of copper (II) acetate, ammonium nitrate, an acetic acid solvent, and hydrobenzoin were heated in a microwave reactor. Trials were conducted at 150 degrees Celsius for 15 minutes, and also conducted at 120 degrees Celsius for 15 minutes. An FTIR scan and the melting point test were used to confirm Benzil was the product.

## Comparison of EPA and DHA in Fish Oils Supplement Brands That Have and Have Not Been Validated by the IFOS Using Gas Chromatography

**Logan Walsh**
**Irv Levy**

*Poster # 34*

An important job of analytical chemists is to verify the labelled quantity corresponds to the actual value. A very common consumable product in the United States are fish oil supplements; however, it is not mandatory for those supplements to be regulated by the FDA. Companies can voluntarily undergo evaluation by the International Fish Oil Standards program. EPA and DHA are the two most important components of supplements. The purpose of this research is to how the actual amount compares to the labelled amount in two validated and two non-validated supplements. The fish oil was extracted and methylated using hydrochloric acid, methanol, and toluene. The solution was then heated and extracted with hexane. The EPA and DHA quantities were measured using a SRI 8610C gas chromatograph.

## Towards Green Multistep Synthesis in the Organic Chemistry Laboratory Curriculum: Conversion of Alcohols to Ketones via Conventional Heating

**Logan Walsh**
**Irv Levy**

*Poster # 35*

Green Chemistry has become an increasingly important paradigm within chemical education, but much work still has to be done to fully integrate it into the undergraduate curriculum. In our efforts to further integrate green chemistry into the organic chemistry laboratory curriculum, we have previously reported a multistep synthesis of an interesting product, 6-nitro-1,2-diphenylquinoxaline. One of the steps of that synthesis uses a microwave reactor to transform benzoin into benzil. While the microwave reactor is an instrument of great value for performing greener transformations, few undergraduate labs have access to the tool.

The goal of this project is to determine if the benzoin to benzil conversion can be accomplished using traditional heating methods following published procedures using the benign oxidant ammonium nitrate with a catalytic amount of copper. Additionally, we have examined the scope of the transformation by working with other alcohols.

## How Visual Impairments Influence Walking

**Hannah Woodworth, Ben Rivers, Lauran VanSchaick**
**Faculty Name**

*Poster # 36*

In previous research visual impairments have proven to affect the gait cycle by causing shorter stride lengths, longer plantar foot contact, instability, and greater caution when walking. The walking gait cycle can be analyzed using inverse kinematics, inverse dynamics, and muscle force activation. In this study our subject experienced different levels of visual impairment by analyzing three conditions: two contact lenses, one lens, and a no contact lens. Using a Vicon Nexus motion capture system, two AMTI force plates, and a level walkway the gait cycle of our subject was analyzed. Analyzing the inverse kinematics, inverse dynamics, and muscle force activation data with the Open Sim program, we were able to measure these determinants of gait.

We were able to determine that the previously mentioned methods of gait analysis displayed differences between the experimental and control groups. Overall, the varying degrees of visual impairment yielded decreased function compared to the control. In conclusion, this research study was conducted to add to the greater body of research concerned with walking gait cycles and visual impairments. This is an important subject to study as many individuals with visual impairments have their daily lives impacted negatively by this impairment which can lead to injuries of various kinds.

## The Highs and Lows of Heel Usage: A Biomechanical Analysis

**Sara Levine, Seth Kavin, Brian Van Doren**
**Jessica Ventura**

*Poster # 37*

The purpose of this study was to assess the effects of heel usage on walking gait. This study includes the analysis of spatiotemporal measures, focusing on the effects of high heels on posture and, stride efficiency (length and time). Analysis of joint moments stressed changes in knee and ankle torques, as well as vertical and anteroposterior ground reaction forces. Also included in the analysis are the muscle forces in the in dorsiflexors and plantarflexors of the ankle, as well as the hamstrings and the quadriceps of the knee. This study included an individual subject. The subject was a college age female who was familiar with high heel gait, but not a regular heel wearer. The procedure consisted of three walking trials all of which with different heel heights. Motion data was collected using a Vicon Nexus Motion capture system, and force data came from two ATMI force plates embedded in the floor. Spatiotemporal data was assessed using inverse kinematics, and concluded that high heels have a negative effect on both posture, and stride efficiency. Increases in knee flexion and ankle eversion were observed using inverse dynamics to assess joint torques. Data revealed that higher forces were evident in the ankle muscle groups during no heel application over the high heel, however, higher forces were observed in the hamstrings in the use of high heels, over no heels.

## Development of Iridium-Nickel Photochemistry Kits

**Dean Drukker, Marc Bazin, Ryan Buzdygon**
**Angie Cornwell, Craig Story, Dorothy Boorse**

*Poster # 38*

During the drug discovery process, medicinal chemists must synthesize and test the activity of many new compounds against specific diseases. Often, these compounds are synthesized using cross-coupling chemistry starting from simple building blocks and combining them in unique ways to quickly generate a diversity of structure. Photochemical cross-coupling reactions use light energy to catalyze reactions and are a novel way to make compounds. Reaction kits further optimize the synthesis of new compounds by screening many catalysts at once to find successful reactions. We describe the design of an iridium/nickel kit, which can be broadly used by medicinal chemists. We tested known reagents from the literature for photochemical cross-coupling reactions to find suitable reactions which could be performed using the kit. Multiple reactions were analyzed by HPLC/MS to find successful reactions and to test the stability of the kit. We will present the process of generating a new commercial kit.

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# Poster Entries

## Social Sciences, Behavioral Sciences and Education

Listed in alphabetical order by first author's last name

## Comparison of Calcium Levels in Milk With Atomic Absorption Spectroscopy

**Graham Tienhaara**
**Otonye Braide-Moncoeur**

*Poster # 39*

To determine and compare the calcium levels in pasteurized milk to non-pasteurized milk a flame atomic absorption spectroscopy was used. The preparations for the machines ideal levels are 8 mL/min for the carrier flow-rate, 20 cm for coiled reactor and 250 ìL for sample volume. A calibration curve was created using $CaCO_3$, HCl, and deionized water. 3 samples of pasteurized whole milk and 3 samples of non-pasteurized whole milk were prepared for the AAS as well. There are no conclusive results so far.

## Computer Simulation Study of Shapes of Metallic Clusters as Potential Catalyst for Oxygen Reduction Reaction (ORR)

**Bradley Welch, Jay Gallipo**
**Michael Paul, Otonye Braide-Moncoeur**

*Poster # 40*

In this study computer simulations were used to study the shapes of metallic clusters which are potential catalysts for the Oxygen Reduction Reaction (ORR). In current fuel cells, platinum nanoparticles are a well-known catalyst for the ORR but they are both expensive and rare. The goal is to model a structure that is as effective as or more effective than pure platinum. To do this multiple cheaper transition metals were used to replace the central platinum atom in a thirteen atom cluster. The result is a cluster of platinum built around a single metal atom. This may also slightly lower the crystal's oxygen affinity and would result in a more optimal catalyst.

## Does Valence Affect the Perception of Short Durations When There is Low Emotional Arousal?

**Mary Catherine Aston, Emily Lundberg, Megan Willeman**
**Bert Hodges**

*Poster # 41*

We examined the reproduction of short time intervals during which participants viewed pictures that are generally evaluated as positive or negative. Numerous studies have found that negatively evaluated pictures (sharks vs. puppies) or patterns (e.g., atonal vs. tonal music) are perceived as longer than positively evaluated ones, but the reason for this *valence effect* is not known. However, it has been claimed that this pattern is restricted to events that are emotionally arousing. This study (N=30) addressed whether low arousal pictures produced a valence effect when they are not shown in the context of high arousal pictures, as was done in prior studies. Thirty participants rated 60 pictures, for intervals ranging from 800 ms to 1600 ms, reproducing the elapsed time with two finger taps, measured to 1 ms accuracy. Preliminary results indicate overall accuracy was quite good, but no valence effects were observed. Other studies have yielded mixed results regarding valence effects, and, along with our results, suggest that valence effects may require greater emotional engagement or a more specific context of action to emerge.

## Sense of Belonging at Gordon College

**Wislene Augustin & Nigesca Maxime**
**Bert Hodges**

*Poster # 42*

Previous research has shown that the college experiences in first and second year is crucial for minority (Latino) students in developing a sense of belonging in their third year (Hurtado, S., & Carter, D.). The study revealed that a greater effort towards integrating minority students in campus life is imminent thus gaining understanding of culturally diverse students' adjustment on campus, especially when there is a hostile racial climate. In the current study we investigated whether academic curriculums had an effect on students' sense of belonging at Gordon College. We tested 103 students from diverse backgrounds who were asked to take a survey through SurveyMonkey that took approximately 15 minutes.

## Implicit Bias in Upper Level Education Majors

**Jocelyn Beaulieu, Lindsay Steranko, Nicholas Colleran**
**Susan Bobb**

*Poster # 43*

Implicit bias in teachers can be a significant issue among the academic community, as it can affect the confidence of students later in life (Van den Bergh et. al.). Past research has shown that teachers score names from less popular ethnicities significantly lower than those of primary ethnicities of that region for the same quality of work (Sprietsma). This study looked at implicit bias among upper-level education students at Gordon College. In addition to ethnicity, we were also interested in whether an implicit bias for age exists. Upper-level education students graded four short narratives. Participants were under the impression that they were participating in a study looking at different rubric styles. They were asked to write the name and grade of the student to reinforce awareness of participants' names and ages. It is expected that an effect will be found for both race and age. This is an ongoing study, and therefore no conclusions have been made yet. Future research can consider whether different areas of a rubric (spelling, punctuation, etc.) have more of an effect than others, or whether years of teaching experience changes levels of bias.

## No Lack of Top Down Effects When None Should Be Found

**Carly Bitzer, Olivia Buelow, Anna Neville**
**Jonathan Gerber**

*Poster # 44*

Recent research on motivated width perception suggests that people holding a rod have narrower width estimates of an aperture than people not holding a rod. Firestone & Scholl (2014) suggested this may be due to unforeseen demand characteristics and demonstrated that giving a cover story removes the narrowing effect. However, Firestone was not blind to his study's hypotheses and it is possible this may have influenced his results. We ran a direct replication of Firestone & Scholl (Exp. 1 & 3) with experimenters who were blind to the hypotheses of Firestone's study. 30 participants guessed the distance between two poles that were moved to seven different widths for a total of 35 trials. They were either given a rod to hold, given no rod, or given a rod with a cover story involving balance. No significant difference was found between conditions, $F(2, 27) = .45$, $p = .64$.We conclude it is highly probably that Firestone & Scholl's results were due to accidental experimenter effects. This seems particularly likely given that Firestone & Scholl's critical "cover story" condition was run after the other two conditions.

## How to improve the Efficiency and Timeliness of Transitions

**Jenna Bourque**
**Ellen Ballock**

*Poster # 45*

This research study was designed with the goal to improve the efficiency and timeliness of transitions within an elementary school classroom. Transitions are frequently overlooked yet significant times during a school day in which students stop an activity, put away or take out materials, and either get ready at the proper place or actually begin the next appropriate action (Hine, Ardoin, & Foster, 2015). Research has shown that students may prolong transition times in a number of ways (ex: talking to friends, continuing previous activity, forgetting next task, moving slowly) if they are not encouraged to be aware and organized in their actions (Hine, Ardoin, & Foster, 2015). This study was completed in a suburban second grade classroom of 22 students involving a collaboration of interventions designed to improve the efficiency of less than desirable transition durations. The techniques implemented were aimed at reducing physical barriers, motivating students, adding content, and giving students and teachers an opportunity to reflect on the necessary components of transitions within the classroom. The three specific techniques used in this study were labeled as subdividing, internal motivation and external motivation. The first strategy attempted to make the physical space more conducive for shorter, more organized transitions and the last two strategies focused on raising awareness of expectations and motivating the students to transition more efficiently, for different end goals. Transition durations were recorded each day and the averages for each strategy were compared. Data collected suggests that the internal motivation strategy reduced the transition times most effectively and final conclusions propose that a higher degree of efficiency can be reached when supplementary techniques are combined with this approach.

## Religiosity, Prayer and Attachment

**Carter Crossett, Kari Lownes, Renee Cooprider**
**Susan Bobb and Jonathan Gerber**

*Poster # 46*

Emerging adults are often characterized by secular psychologist, most notably Erikson, by their quest for intimate relationships. Studies have been done examining religiosity and attachment in emerging adulthood but never with the added context of prayer. Prayer, as a communicative aspect, serves as a fundamental baseline for relationship with God, so one should expect religiosity and attachment scores to correlate with each other in light of prayer. This study evaluated whether or not emerging adults that claim a Christian identity, and therefore a relationship with God, approach relationships with peers in such a way that is reflective of their religiosity. Our collective expectation is to find that religiosity and prayer life are correlated, and therefore, both will be correlated with relationship to peers. This study was

designed to evaluate the extent to which one's personal religious beliefs affect other facets of one's life, namely peer relationships (Manglos-Weber & Mooney & Bollen, & Roos, 2016). A survey was comprised and given to 59 students at Gordon College. The results of the survey were used to help determine if, and to what degree, personal prayer and religious practices affect the ability of individuals to relate to others in their sphere. Results show that prayer is only significantly correlated with intrinsic religiosity, one's peer and parental attachment is positively correlated with extrinsic religiosity, and a positive correlation exists between parental and peer attachment.

## Dynamic Constraints on Carrying Household Items: Values Constrain Kinematics

**Nate D'Andre, Anna Cingale, Esther Lee, Hailey Moore, Megan Sedgwick**
**Bert Hodges & Jessica Ventura**

*Poster # 47*

What defines being *careful*? Prior research (Hodges & Lindhiem, 2006) has indicated that the kinematic patterns yielded by parents carrying their child, a bag of groceries, or a bag of trash across uneven terrain varied in how carefully they were perceived to be walking. The evidence suggested that the moral weight of the child altered walking patterns in some way that observers identified as careful. The present study explored variations in stepping patterns that might constitute carefulness and provide the information that guides others' judgments. Ten parents carried their child, a sack of equally weighted groceries (which nearly all parents indicated felt heavier than their child), and a 15 lb. bucket of water across level floor, and across an uneven set of steps about 18 in. apart. Kinematics were measured by a six-camera infrared system and ground reaction forces were provided by two force plates. Parents carrying children or groceries generate more force going up, and coming down off a step, than when carrying water. When stepping up, parents spend more time in single leg support while carrying children and water than while carrying groceries. When stepping down, parents spend more time in single leg support while carrying water than while carrying children and groceries. Results suggest that measures of force generation and time spent in single leg support can differentiate between patterns of carefulness.

## An Analysis of the Activity Levels of Pet Store Puppies

**Kara Dry, Matthew D'Urso**
**Kaye V. Cook**

*Poster # 48*

Most animals, including dogs, exhibit predictable energy levels based on the time of day due to circadian rhythm. Puppies, however, are not born with circadian rhythm, and it takes months, along with access to natural light and their mother, for circadian rhythm to develop. Although research has looked at circadian rhythm in puppies and the physiological processes involved, little research has been done specifically on the energy level patterns of puppies. In this study, puppies at a local pet store were observed during several different days of the week and within three different defined time frames: morning, afternoon, and evening. Puppies were observed for five minutes each, and displayed energy was recorded using a five-level energy scale, with "sleeping" being assigned the lowest numerical and "highly active" being assigned the highest. The most prominent energy level during each minute was recorded, and overall energy represented an average of the observed five minutes. We hypothesize that due to a lack of developed circadian rhythm, the puppies will display inconsistent energy levels based on time of day.

## Technology Use Before Sleep and Its Effects on Anxiety

**Erin Duffy, Kaelie Mercado, Olivia McCarrick**
**Susan Bobb**

*Poster # 49*

This research study focused on the effects of technology on sleep quality and consequently on the anxiety levels in participants. Past research has addressed the effects of technology on sleep quality and anxiety when examining technology use during sleep onset, while this study examined technology use prior to sleep. We addressed the question of how the use of technology within the hour before sleep affects the participant's mean level of anxiety, with technology use being the manipulated variable. The methodology in our study was to conduct a two-week long sleep study. In the first week, the control week, participants kept a daily record of their sleeping habits and filled out a modified version of the DASS-21 which measured anxiety and stress only. In the second week, the experimental week, participants were asked to continue their sleep log and daily submission of the modified survey, in addition to not using technology within the hour before sleep. Our hypothesis was that the anxiety levels of participants would originally increase due to technology dependence, and be followed by a subsequent decrease in anxiety once this effect had passed. After encountering issues with obtaining enough participants for the study to reach the required statistical power, the study's results did not produce statistically significant data. However, with

main effects in the variables of total sleep and anxiety approaching significance (p=0.092, p=0.074), marginal significance in pairwise comparisons of the total sleep between Time 2 and Time 3 (p=0.053), and consistent trends of decrease in the means of anxiety and stress, the data seems to suggest that if the study conditions been met their ideal there could have been significant data.

## Scientific Writing: Claim, Evidence, Reasoning Interventions

**Kylie Felix**
**Ellen Ballock**

*Poster # 50*

While student teaching, I noticed the 5th grade students in my classroom were struggling with writing evidence-based claims during science. The school used the Claim-Evidence-Reasoning method, which provides a frame for students to complete each part of the whole response. I noticed students had trouble discerning the differences between the claim, evidence, and reasoning within a response. For this study, I implemented two strategies to help students understand the features of a Claim-Evidence-Reasoning response, the differences between each part, and how they work together to form a scientific argument. The two strategies included providing examples and non-examples of responses, and prompts for verbal argumentation, using evidence-based claims. I collected data from student surveys, scores of Claim-Evidence-Reasoning responses, a rubric during verbal argumentation, and my own observations. Results revealed students had greater understanding of how to make evidence-based claims. I also noticed a trend of students focusing on mastering the claim first, and progressing to mastery for the next part in the response. Students also had increased confidence in their writing, could identify their own areas of improvement. Overall, interventions provided the necessary support for students in scientific writing.

## Replication Study: Music & Reading Comprehension

**Kerry Fenton, Sarah DeGenero, Elizabeth King**
**Jonathan Gerber**

*Poster # 51*

It is common practice among students to listen to music while they read or study. Many believe that the presence of music helps them to focus, read efficiently, or comprehend more of the material read or studied. In a replication study of Perham and Curry's 2014 experiment ""Does Listening to Preferred Music Improve Reading Comprehension Performance?", the results were different from what the original study found. In this experiment, there were four sound conditions tested, four levels of a single independent variable. Participants were presented with four packets of reading material and subsequent comprehension questions while listening to

one of four sound conditions—choice music, instrumental music, thrash metal music, or no music. The participant's scores were recorded as the dependent variable. It was hypothesized that the no music and instrumental music conditions would have the most positive effect on reading comprehension followed by choice music and then thrash metal music. When the results were calculated and analyzed, it was discovered that there was no statistically significant effect on reading comprehension for any of the music conditions. SAT scores, a test anxiety inventory, and responses to a post-experiment questionnaire were collected as covariates. Keywords: Studying, Reading, Music, Comprehension, Reading Accuracy, Study Music, Mozart Effect, Cognitive Processing, Multitasking

## Are We Really Compatible?

**Caroline Hymel, Alexandra Heinle, Sarah Newell, Abigail Shay**
**Susan Bobb**

*Poster # 52*

Compatibility is a wide- ranging topic that takes on a variety of different forms and there have been numerous studies conducted to analyze it. Previous studies supported the idea that the HEXACO personality test is linked to similarities in various connections such as friendships, relationships, and marriages. However, few studies have yet to show the compatibility between non-romantic relationships among cohabitants of college-aged people. This study tested the regression between the HEXACO personality traits: Extraversion, Agreeableness, and Honesty-Humility and roommate compatibility. The first survey that participants completed was the Acquaintance Description form which examines how well the subject and their roommate interact. The participants then completed a second survey which contained a HEXACO personality test comparing levels of Extraversion, Agreeableness, and Honesty-Humility. After performing a multiple-regression analysis, statistics showed that for the HEXACO levels of Agreeableness and Honesty-Humility, showed more similar roommates scored higher on the ADF. However, there was no significant correlation between Extraversion and overall ADF scores. Key Words: HEXACO, ADF, compatibility, extraversion, agreeableness, honesty-humility.

## Money, Medicine & Grades: Time Perception, Context, Magnitude?

**Jeein Kang, Kim McQuade, Suzanne Rose**
**Bert Hodges**

*Poster # 53*

Three experiments explored the effect of magnitude (i.e., number and size) and valence (positive or negative) on time perception in three different action contexts. Thirty participants were asked to reproduce, as accurately as possible, short intervals (800-1600 ms), during which they were shown visual presentations of (1) varying amounts of money they were to receive or that they owed; (2) varying

numbers of positive or negative comments on a paper they had written; and (3) maps depicting the spread of a disease or an immunization program. Initial results support an interaction effect of valence (i.e., longer time intervals for negative events) and magnitude for the task depicting the number of positive or negative comments on a paper one had written, but little or no evidence for timing effects for the other two tasks. We explore the possibility that timing tasks will need to be embedded in more specific action contexts, if they are to have substantial effects on time perception. It is probably not accidental that the context that was easiest for students to imagine for its relevance was the one involving the number and valence of a professor's comments on a paper they had written.

## How Dogs Respond to Huma Play Signals

**Brianna Keating**
**Kaye V. Cook**

*Poster # 54*

Most animals, including humans, engage in some sort of social play. It is important to consider the way in which animals communicate play intention to one another. This study was carried out with the intent of investigating how dogs respond to play signals, when those signals are given by a human. Two dogs and one person participated in this study. The dogs included Pepper, an eleven-year-old male Papillion/Pomeranian mix and Fiona, a two-year-old female English Bulldog. The human who interacted with both dogs is Noah, a twenty-one-year-old male. Both of the dogs know Noah well and interact with him daily. Both dogs participated in individual, five-minute-long play sessions with Noah while I observed and recorded how each dog responded to specific signals given by Noah. Two ethograms were constructed for observation, one for human behavior and one for canine behavior. Both dogs responded in unique ways to the same human play signals. The mixed breed however, responded with more play bows than the bulldog did. Both dogs consistently responded to the human whispering with either walking away, stalking, or no behavior at all. These results indicate that breed and personality play a significant role in the play behavior of dogs when they interact with humans.

## Bird Frequency & Duration of Feeder Visits

**Merisa Kouvo, Hannah Millard**
**Kaye Cook**

*Poster # 55*

This study conducted an investigation into bird species that visited the Gordon College bird feeder located outside of Bromley Hall. The species of birds observed were woodpeckers (hairy), white-breasted

nuthatches, goldfinches, sparrows (American tree, chipping), cardinals, black-capped chickadees, tufted-titmouses, brown-capped cowbirds, dark-eyed juncos, and house finches. The hypothesis was that the species of birds at the Gordon feeder spend more time feeding on the ground than on the feeder. They also spend more time feeding in the presence of other birds than when alone. The gathered data on the amount of time (s) the birds spent at the feeder and on the ground was then averaged and put through ANOVA, with the results supporting the hypothesis. The variables of bird gender, weather conditions, and time of day were also analyzed. This study gives a deeper understanding of bird feeding habits in the artificial food environment of bird feeders.

## Factors Affecting Canine Odor Tracking

**Jennifer Krystyniak**
**Kaye V. Cook**

*Poster # 56*

We have all experienced the feeling of disgust in some form. Whether it be the smell of a garbage truck, the taste of milk that's unexpectedly past its due date, or finding a hair in our food. Disgust is a basic form of distaste that encourages avoidance of its cause. In evolutionary terms, disgust may have arisen to prevent humans from ingesting harmful or poisonous substances or to avoid a source of disease (e.g. Rottman, 2014). Disgust influences our decision making when it comes to what we deem as approachable or unapproachable, but can disgust also influence us in other ways as well? In this study, we had participants drink water, juice, or a bitter drink and rate the morality of questionable scenarios to determine whether disgust affects moral judgement.

## Experience with Social Media and Cyberbullying

**Christine Libaijia, Jerry Dung, Zoe Zhang**
**Susan Bobb**

*Poster # 57*

Cyberbullying is on the rise, and occurs at younger ages because children are exposed to social media at increasingly young ages. Social media use is increasingly common among teenagers but the health effects of cyberbullying on social media sites are largely unknown (Pappas, 2015). We were particularly interested in whether there are social environments in which cyberbullying is more common. In particularly, we asked whether cyberbullying occurs more frequently in secular as opposed to Christian schools. We asked 30 students at a small Christian college to complete an online survey and analyzed the probability of students from Christian or non-Christian environment having bullied or having been bullied before. We also analyzed the influence of different personalities as well as age on cyberbulling as potential confounds.

## Social Networking Replication Study

**Sara LePine, Kaylee Seward, & Stephanie Nicholson**
**Jonathan Gerber**

*Poster # 58*

With growing attention on the widely popular social networking Web site, Facebook, many have pondered the value and effect it has on its billions of users. It is a common assumption that Facebook and other social networking sites help individuals who do not have adequate or fulfilling relationships. In their 2012 study, Amanda L. Forest and Joanne V. Wood claimed to have found that users with low self-esteem saw Facebook as a safe place to disclose their thoughts and feelings and connect with other people. Kaylee Seward, Stephanie Nicholson, and Sara LePine replicated Forest and Wood's first study. We surveyed 80 Facebook users at Gordon College using the same material and methods from the original study.

## Checking "Just to Check":
## Is Impulse Checking Behavior Conditioned by Social Media

**Rebecca Maciuba, Linnea Hultberg**
**Kaye V. Cook**

*Poster # 59*

Communication capabilities have evolved with the emergence of popular social media apps such as Facebook, Twitter, Instagram and Snapchat (Guadango et al., 2016). What makes social media unique is that notifications are not administered on a consistent basis (classical reinforcement) but rather the users decide the schedule of reinforcement given to each other. Therefore, each user is being reinforced by other users on a randomized and unpredictable schedule (partial reinforcement), using "likes", commenting and sharing information. Response to reinforcement (i.e. conditioning) is predominantly manifested in the behavior of "checking-to-check" (checking phone without having received a notification). In this research, we predict that participants respond to the absence of reinforcement by reduced checking, and the presence of reinforcement, by increased checking. Data only partially match predictions, which we discuss.

## Culturally Biased Pictures as Cues to Language Membership

**Rebecca Maciuba, Jeein Kang, Sojung Lee, Alexa Didomizio**
**Susan Bobb**

*Poster # 60*

## Replication of Eskine et al. at Gordon

**Mikayla McClellan, Kimberly McQuade, Natalie Hoey, Jennifer Krystyniak**
**Jonathan Gerber**

*Poster # 61*

We have all experienced the feeling of disgust in some form. Whether it be the smell of a garbage truck, the taste of milk that's unexpectedly past its due date, or finding a hair in our food. Disgust is a basic form of distaste that encourages avoidance of its cause. In evolutionary terms, disgust may have arisen to prevent humans from ingesting harmful or poisonous substances or to avoid a source of disease (e.g. Rottman, 2014). Disgust influences our decision making when it comes to what we deem as approachable or unapproachable, but can disgust also influence us in other ways as well? In this study, we had participants drink water, juice, or a bitter drink and rate the morality of questionable scenarios to determine whether disgust affects moral judgement.

## Refusing money for truth: Disagreeing with correct answers to realize values

**Kimberly McQuade, Jeein Kang, MaryCatherine Aston, Alexa Didomizio, Emily Lundberg,**
**Elena Meyer, Mariah Lansdown-Howard, Al Boody, Kara Dry**
**Bert Hodges**

*Poster # 62*

People in a position of ignorance often agree with better informed others, but surprisingly often they knowingly offer wrong answers. Participants (N=54) offered 25¢ for each correct answer disagreed, answering incorrectly, 33% of the time; those offered 50¢ disagreed 17% of the time. This speaking-from-ignorance effect supports values-realizing theory.

## How the Presence of Others in a Line Changes Product Evaluation and Enjoyment

**Nathan McReynolds, Anastasia Landman, Julia Altman**
**Susan Bobb**

*Poster # 63*

## Mind Wandering Replication

**Aalayah Pierre, Annalia Jordan, Adrian Gedney, Julissa Rodriguez**
**Jonathan Gerber**

*Poster # 64*

## Testing Social Projection in a Religious Sample: A Person Centered Approach

**Hannah Reimel**
**Jonathan Gerber**

*Poster # 65*

Anthropocentric theories of religion have long argued that humans make God in their own image, a phenomenon called *social projection.* However, comparatively little is known about how widespread this phenomenon is (see Strawn & Alexander, 2008, for one of the few exceptions), and no empirical explanations for projection of Jesus' have been offered. Does projection follow the general levels given to other in-group (Otten & Epstude, 2006) and positively valenced (Ames, 2004) targets? What percentage of Gordon College students project their own personality onto Jesus'? 62 undergraduates rated themselves and five historical figures on 20 personality trait items, in a 2(group: in vs out) x 2(valence: positive vs negative) design, including a second positive/in-group figure. We then analyzed the ratings using person-centered analyses. When considering raw correlations, 76% of Gordon students sampled projected Jesus' personalities. This dropped to 13% when trait valence was partialled out (as per Machunsky et al's 2014 advice). Projection was dependent on the positivity of the target, with an essentially perfect correlation between average projection and average positivity of each target, $r(5) = .99$, $p = .001$. To examine whether religiosity was responsible for the effects, the correlation between

projection and faith variables were computed. None were significant, although the correlation between church attendance and projection was marginally significant, $r = .25$, $p = .07$. We conclude that social projection can be measured in various ways, is quite common in Gordon College students, and is related strongly to the positivity with which a target is viewed.

## Into a Clouded Mirror: Assumed Similarities in Roomates

**Carolyn Richards, Peiru Chen, ZuEn Seow**
**Susan Bobb and Jonathan Gerber**

*Poster # 66*

Previous research has offered evidence of assumed similarity, or the extent to which a person sees another person as the same as him/herself, but which personality traits are most projected and why remains a mystery. To investigate the nature of assumed similarity among friends, we recruited pairs of college roommates to take the HEXACO Personality Inventory and a simple survey rating themselves and each other on the HEXACO traits (*honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, openness to experience, and altruism*). They also rated the HEXACO traits on their importance in a relationship and on their positivity. The HEXACO results served as a baseline with which to correlate participants' perceptions of themselves and their roommates. Unfortunately, we were unable to reach our calculated sample size or observe the assumed similarity effect; however, analyses suggest that there may be a correlation between how much people value certain traits in a relationship and how positively they view those traits. There is also a possible correlation between which traits people value and which traits they believe themselves to hold.

## Replication of Griskevicius et al.

**Daniel Simonds, Sam Maguire, Mi Kim**
**Jonathan Gerber**

*Poster # 67*

## Athletes Feedback & Emotional Response

**Jamie Tafoya, Ana Rodriguez, Brooke Dyson**
**Susan Bobb**

*Poster # 68*

This research project investigated if the comments that coaches make toward athletes have an impact on their ability to perform. Specifically, this research focuses on positive and negative feedback during a task (corn hole). To analyze this, a sample of 27 NCAA Division III athletes from a variety of Gordon teams (7 different teams were represented) participated in a corn hole tournament. The tournament consisted of 3 different rounds. Round 1 tested for a baseline score and in rounds 2-3 the participant randomly received either positive or negative feedback from a "coach." After each round the participant filled out a survey on their emotions, and their score from the corn hole game was recorded. During this procedure, it was discovered that participants who received positive feedback did not have a significant variation in their score from baseline testing. However, participants who received negative feedback scored significantly lower from their baseline testing. As a result of this study, coaches can recognize the impact that a negative comment has on an athlete's ability to perform at their highest level.

## Novel Word Learning in Adults

**Vanessa Torres-Lacarra, Meghan Daly, Kaelyn Hall**
**Susan Bobb, Jonathan Gerber**

*Poster # 69*

Previous studies on language learning have shown that in early childhood and adolescence, children who were identified as shy were less adept at learning novel words (Hilton & Westermann, 2016; Chen & Hung, 2012). A question that has yet to be answered is whether shyness affects novel word retention in adults. In our study, we address this gap in the literature by adapting previous research methods to college-aged adults (18-23 years). We recruited participants with minimal language experience (monolingual) from the student population of the Gordon College campus. They were tested in a research lab and the test began with language history questionnaire followed by a survey of shyness, then by the presentation of four novel objects matched with four novel words (Hilton & Westermann, 2016). The novel objects were paired with four familiar objects. After the words were learned by participants, a five-minute break was administered and participants were asked to identify the object that they were instructed to point out (ex. "Which item is the Koba?"). Participants were then instructed to come back one week after the initial testing for a follow up in order to assess novel word retention one

week prior to original introduction of the four novel words. The results following this study showed the first and second tests had direct correlation, while shyness and language history proved to show little correlation to language retention.

## L2 English Learners' Perception of Foreign-Directed Speech

**Emilly Turco, Kristin Mello, Erika Fernandez, Larissa Lemes**
**Susan Bobb**

*Poster # 70*

In an increasingly global society, it is important to understand how to effectively communicate inter-culturally. Previous research has shown that people change the way they speak depending on the perceived comprehension level of the listener (Uther, M., Knoll, M., & Burnham, D., 2007). This study specifically evaluates the effect of foreign-directed speech on English language learners (ELLs). Participants were given auditory stimuli representing four different speech types (casual, clear, infant-directed, and foreign-directed) spoken by four different speakers (two males, two females) and were evaluated for what extent they thought the speaker was easy to understand, competent, condescending, friendly, and respectful. A repeated measures ANOVA showed an interaction between speech type and question type ($p<.001$). Casual speech was least intelligible, least competent, least friendly, and least respectful. No effects were found for condescension. The implications of these results are that a degree of accommodation in speech toward ELLs is viewed positively.

## Addressing Math Phobia at its Source: A Case Study

**Courtney Vitalie**
**Mindy Eichorn**

*Poster # 71*

Pre-service teachers may enter math methods and content courses with a traditional view of math and limited conceptual understand. In our research, we sought to understand the mindsets, attitudes, and beliefs that pre-service teachers have in different stages of their preparation and how we can adjust our coursework to help develop growth mindsets. The study focused on teachers' prior experiences, helpful coursework, and qualities that administrators look for in pre-service teachers.

## Aggressiveness in African Cichlids

**Lauren Watson**
**Kaye V. Cook**

*Poster # 72*

Convict Cichlids, though small, are quite aggressive fish. What is it that makes them so aggressive? Could it be that they are at their most aggressive when they are eating? That is question behind this research project. The purpose of this lab will be to demonstrate that the feeding time of the fish affects their aggression, thus making them the most aggressive at this time. In order to test the hypothesis "feeding time affects the aggressiveness of the cichlids," I have conducted an experiment by forming an ethogram. For this experiment, I have observed the biggest male in my aquarium. For the ethogram, I have kept track of the following behaviors that make up aggression: biting, chasing, fighting, flaring of fins, expansion of gills, resting, and eating. By using my phone, I set a timer for tem minutes and counted each behavior as it happened every thirty seconds. I did this for a total of four days at two different times of the day: 1:00PM when there was not a lot of activity, and 8:03PM when it was feeding time. As the results show, the male fish was more aggressive during feeding time. Because there are about ten fish (including him) in the forty, gallon aquarium, this added to the stress and making sure that all the fish got enough to eat. The results of this experiment showed that during feeding time, the cichlids do show more aggression than they do during the day.

## Dogs and Strangers

**Nicholas Colleran**
**Kaye Cook**

*Poster # 73*

The project I am doing is on certain types of dog's behavior toward strangers. When I say types of dogs I don't just mean the breed, I mean the way it was raised. The dogs I intend on using are my dog Lilly whose half Jack Russell Terrier and half Schnauzer was a stray her whole life in Texas, my neighbor's dog Fiona whose half Australian Cattle dog and half Tibetan Terrier they've had since she was a puppy, my friend Moises purebred German Shepard Xerxes who was adopted at the age of four years old. He had been surrendered to a shelter and the history of the dog mentioned it's been abused. Lastly my friend Dan's dog who is a Shih-Tzu and was with them since birth. My planning included testing how each dog with different backgrounds react to strangers walking in their house. I set up scenarios for the dogs that tested how they deal with strangers opening the front door and walking inside. I am taking into account what there breeds are and how that would affect their attitudes. The reason I think breed specification is so important is, because the breed of the dog has a lot to do with how it behaves in general.
The reason I decided to do this assignment on how certain dogs react to strangers is because I've been very curious as to how being a stray has affected Lilly. I know when I first got her she was petrified of

everyone and everything around her and would run. The first couple days we had her she escaped and lived in my neighborhood for 2 days. My whole neighborhood got involved trying to help find her. We eventually caught her by contacting a Massachusetts non-profit that specializes in capturing loose and stray dogs by using cameras, walkie talkies, traps, and decoys to capture the dogs. After that she realized living with us was much better than living outdoors. The national census shows that 53% of the dogs in the US are mixed breeds