The poster abstracts that follow have not been edited. They appear in the way they were submitted.
Elucidating the mechanism of Ubp6 induction during the ubiquitin stress response using DNA footprinting

Rachel Keller*, Craig Story | Gordon College
Monica Boselli | Harvard Medical School

Conjugation of the 76-residue protein ubiquitin to other cellular proteins is a form of posttranslational modification. The best-understood function of this ubiquitination event is the selective tagging of intracellular proteins for degradation by a cellular protease complex called the proteosome. Degradation is key to the cell’s ability to weather environmental changes. Therefore, it is essential that the cellular ubiquitin pool be maintained. A novel pathway for dealing with ubiquitin stress (i.e. ubiquitin depletion) dependent on upregulation of the deubiquitinating enzyme Ubp6 has been discovered. We performed polyacrylamide gel electrophoresis to produce a DNA footprint of the UBP6 promoter under ubiquitin stress conditions with the goal of locating the sequence to which the transcription factor binds. This information will allow Dr. Monica Boselli (Finley Lab, Harvard Medical School) to identify the specific transcription factor involved and continue to elucidate the mechanism by which the Ubp6-dependent ubiquitin stress response occurs.

The Effect of Hurricane Earl on Invertebrates and Algae along the North Shore

Kelcy Rich* | Gordon College

The disturbance of a hurricane or ocean storm has the ability to alter the coastal environments they hit. The difference of species richness and abundance are commonly analyzed before and after a hurricane to determine the storms impact on the coastal conditions. Before Hurricane Earl hit the North Shore of Massachusetts on September 2, 2010, eleven sites were chosen along the coast where water samples were taken and the abundance of macro invertebrates and algae were recorded in that area. After the hurricane hit, the same sites were visited and the same samples/observations were taken. The distance of roads from the sites, the amount of residential area surrounding the sites, and the exposure of the sites were also noted. It was found that the richness of macro invertebrates was lower after the hurricane hit, while the richness of micro invertebrates and algae remained relatively stable. Also, where there was more residential area and a closer proximity to roads, the site had a higher exposure and thus created a greater impact on the coastal ecosystem.
Influence of Landscape Edge and Forest Cover Type Elements on Abundance of Three Native Year-Round Passerine Species.

Whitney Fenton*, Greg Keller | Gordon College

Landscape elements can be linked to bird species abundance in geographic areas. During October and November of 2010, we investigated the influence of forest cover type and forest edge type and proximity on bird abundance. The abundances of three resident passerine species, Poecile atricapillus (black-capped chickadee), Sitta carolinensis (white-breasted nuthatch), and Cyanocitta cristata (blue jay), were measured at sixteen sites around Wenham, MA. The sites varied according to cover type in a 30m radius. Abundance was compared with percent coniferous and deciduous cover type in 30m and 150m radii using GIS. Abundance was also compared to edge distance and edge type. A seven predictor stepwise regression found correlations between all three species for nearest edge, and chickadees and nuthatches for natural edge. Negative correlations occurred for chickadee abundance relative to percent coniferous forest in a 150m radius and for the nuthatch abundance relative to both nearest human edge and percent deciduous forest in a 150m radius. These results reiterate the importance of edge type and proximity to site use by species. The results also exemplify the importance of scale to landscape studies. Follow up studies may include efforts towards defining critical scalar thresholds for percent cover type according to bird abundance.

Detection of Genetically Modified Crops in Food by Polymerase Chain Reaction Amplification of the Cauliflower Mosaic Virus 35S Promoter Sequence

Grant Eilers*, Dwight Tshudy, Craig Story, Ming Zheng | Gordon College

The cultivation of genetically modified (GM) crops is an attempt to maximize the yield and nutrient content of agricultural products in order to solve problems of hunger and malnutrition. The global community disagrees about the hazards and risks of GM crops. Although a solution to this controversy is not readily available, there is cooperation toward better testing methods for detection and identification. GM crops can be detected by polymerase chain reaction (PCR) amplification of inserted DNA sequences. In this project, a liquid-liquid extraction was used to isolate DNA from plant cells for amplification by PCR. The purity of the DNA was assessed by the ratio of UV absorbance at 260 and 280 nm; a high A260/A280 ratio confirms the purity of the DNA and the success of the extraction protocol. PCR amplification targeted the Cauliflower Mosaic Virus 35S promoter sequence, a commonly used transcription promoter for GM crops.
A Comparison of Allicin and Erythromycin against Streptococcus pneumoniae

Luke Perkins*, David Perry | Gordon College

Allicin is a molecule found naturally in garlic. Researchers have recently become interested in its antimicrobial properties and potential to treat human pathogens. Many bacterial species are developing resistance to common antibiotics, like penicillin and erythromycin. Since bacterial resistance continues to rise, it is important to seek alternative treatment methods to combat this growing problem. In this research, the effectiveness of allicin and erythromycin were compared in both aerobic and anaerobic conditions. A broth dilution method was used to determine Minimum Inhibitory concentration of the compounds. The limitations of these antimicrobial compounds were tested against a facultative anaerobe, Streptococcus pneumoniae.

The Effects of Three Levels of Human-Induced Forest Fragmentation on Passerine Birds in Essex County, Massachusetts

Jonathan Harris*, Greg Keller | Gordon College

The creation of forest edge through human-induced fragmentation has been a widely researched topic in landscape ecology. However, little work has been done to determine if passerine birds respond similarly to all types of human-induced fragmentation. I studied bird communities in Essex County, Massachusetts to determine if three types of human-induced fragmentation had different affects on richness and abundance. The three levels of fragmentation that were tested were fields, residential areas (mowed grass), and roads. I found that both richness (p=0.0002) and abundance (p=0.045) were significantly greater at field sites in comparison to road sites. Only one target species, Black-capped Chickadees (Poecile atricapillus), showed significance toward field sites (p=0.005). However, Dark-eyed Juncos (Junco hyemalis), did show significance toward residential sites (p=0.000). No species showed a preference toward road sites, and only Black-capped Chickadees showed a significant preference to a landscape characteristic (amount of natural edge). This may show, in fact, that edge type is more important for songbird communities than other landscape level metrics.
**Landscape composition effects on small mammal richness and abundance in northern Massachusetts**

Eric Lindemann*, Jonathan Harris*, Greg Keller | Gordon College

In southern New England forests, Peromyscus maniculatus (deer mice), Peromyscus leucopus (white-footed mice), and Clethrionomys gapperi (red-backed voles) are essential to food-web interactions and seed dispersal for overall ecosystem health. This region has been exposed to extensive fragmentation due to residential and agricultural development, resulting in a considerable amount of edge creation, in addition to natural landscape heterogeneity. Yet limited research has been conducted relating species abundance to the different types of edge habitat in this region. We predicted that small mammal richness, total abundance, and abundance of Peromyscus maniculatus, Peromyscus leucopus, and Clethrionomys gapperi would be affected by edge sites; specifically, we expected that human-edge sites would have reduced abundance compared to natural edges and interior forest habitat. In order to test this hypothesis, we selected twelve sites total with four of each edge type. We used Sherman live traps to survey small-mammal populations. We baited 75 traps for 4 nights at 12 sites for two trapping seasons, resulting in 7200 total trap nights. Each morning, captured animals were identified and tagged with a unique number to document recaptures. Abundance of Clethrionomys gapperi and Peromyscus leucopus were higher at natural edge sites than at human edge. Peromyscus maniculatus appears not to discriminate between human or natural edges and interior forest.

**Development of a PCR protocol to screen Ixodes scapularis for the presence of Borrelia burgdorferi, the causative agent of Lyme disease.**

Kimberly McCabe*, Daniel Adam*, Craig Story | Gordon College

Amplifying Borrelia burgdorferi DNA directly from ticks has proven challenging, and researchers often must culture the bacteria from the tick to identify whether it is a carrier of Lyme disease causing agent. Culturing is a more time consuming and challenging process than applying polymerase chain reaction (PCR) to directly detect the Borrelia DNA. The purpose of our study is to develop a sensitive PCR protocol to screen deer ticks, Ixodes scapularis, for the presence of B. burgdorferi bacteria, the causative agent of Lyme disease. Development of a reliable PCR method to quantify the incidence of Lyme-disease carrying ticks will allow us to determine how deer population size correlates with the fraction of ticks infected with B. burgdorferi. A robust PCR assay could also lead to more reliable testing for Lyme disease in humans and other organisms. Information on Lyme carrying incidence can provide useful public health information to communities to warn people where they are most likely to be exposed to Lyme disease. Ticks will be collected, their DNA extracted, DNA will be subjected to two rounds of PCR using a “flanking primer” method. A correct-sized product indicates the presence of the B. burgdorferi bacteria and a tick capable of causing Lyme disease. Positive and negative results will be recorded to determine if deer populations influence the rate of I. scapularis infection rates. Currently we are working on optimizing the protocol using purified DNA from B. burgdorferi cultures.
**Phenolic Polymerization using Fe$^{III}$-TAML**

Kristen Entwistle*, Dwight Tshudy | Gordon College; Terrence Collins | Carnegie Mellon University

Previous work has shown the effectiveness of the Fe$^{III}$-TAML (Iron Tetra Amido Macrocyclic Ligand) hydrogen peroxide ($\text{H}_2\text{O}_2$) system to degrade toxins. There have also been observations that the TAML system will also cause polymerization of phenolic compounds. It is reported in the literature that peroxidases along with hydrogen peroxide can be used to polymerize phenols, but little work has been done in characterization of the TAML polymerization process. As an initial study, 4-ethylphenol is being evaluated as a model compound to study this reaction mechanism. Hydrogen peroxide concentration, pH, Fe$^{III}$-TAML concentration, co-solvent composition and time are being studied in order to understand the reaction space. Infrared spectroscopy, liquid chromatography, gas chromatography, Ultraviolet-visible absorbance spectroscopy and size exclusion chromatography and MALDI mass spectrometry are utilized to study both the reaction products and the starting materials.

**A Comparison of Joint Kinematics under Different Running Conditions**

Brian Holahan*, Alyssa Williamson* | Gordon College

“The clothes don't make the man, but wearing no shoes might make the runner,” says Laura Sanders, author of several articles for Science News. Is it possible that speed, technique and even injury prevention could be affected by what a runner is… or isn't wearing on his feet? Today, shoe companies are working to develop specialized footwear to optimize performance. Barefoot running is also becoming increasingly popular, as it is the more "natural" form of running. The purpose of this study is to assess the differences in the kinematics of barefoot versus shod running. A VICON Motion Capture System was used to collect kinematic data of three athletes running on a treadmill under three different circumstances: barefoot, sprinting spikes, and training sneakers. The absolute ankle angle during foot strike was notably greater in shod trials compared to barefoot trials. This reinforces the idea that runners depend on the cushion in their heel to decrease impact during shod running. The results also showed that range of motion (ROM) was larger in hip and knee joints for running in comparison to jogging. In addition, hip and knee joint ROM progressively increased from barefoot, to training sneakers, to racing spikes. This implies that ROM and speed mutually affect one another. Also, this shows the importance of upper leg muscles in increasing speed. Finally, in analyzing the time segments of the gait cycle, it is clear that to increase speed, subjects shortened the time of foot contact with the ground in barefoot and racing spike trials.
Modeling the Hydrogen Atom With a Spherical Resonator

Stephen Collins*, Brian Landis* Morgan Shook*, Michael Simmons* | Gordon College

With one electron and a single proton, the hydrogen atom is the simplest atomic structure, and one of the few systems that can be solved exactly with quantum mechanics. As is commonly the case in physics, the spherical symmetry of the hydrogen atom allows for the simplification of the three-dimensional Schrödinger’s equation that defines the electron orbital by separating the angular and radial variables. The radial solutions of the Schrödinger equation are analogous to the resonant frequencies of a spherical acoustic resonator. The acoustic resonator used in this experiment creates standing waves with the spherical symmetry depicted in the mathematics of the Helmholtz equation. This symmetry is analogous to the probability densities predicted by the Schrödinger equation. The radial components of the Schrödinger equation and the Helmholtz equation have unique eigenfunctions because of the electrostatic potential between the electron and proton in a hydrogen atom. Resonant frequencies cannot be compared quantitatively with energy levels; however, the angular variables have the same eigenfunctions. The common angular eigenfunctions enable the electron orbitals of the hydrogen atom to be modeled with sound waves in a spherical acoustic resonator. The generated cross sections of the wave functions inside the spherical resonator are identical to the three dimensional probability densities predicted by the Schrödinger equation for the hydrogen atom. The spherical harmonic resonator clearly models the wave nature of electron probability densities and quantization of electron energies.

Parallel Tight Binding Calculation of Band Structures in Zinc Blende Lattices

Zachary Capalbo* | Gordon College

Tight binding calculations were performed using Chadi and Cohen's tight binding parameters for diamond and Zinc-blend structures. The code for the calculations was ported to NVIDIA’s CUDA platform to leverage the massively parallel computational ability of the GPU architecture. Valence band structures were obtained and computation time results were compared.

Acoustic Modeling of Quantum Phenomena in a 1-D Solid

Zachary Capalbo*, Darrell Montonera*, Jesse Thompson* | Gordon College

Atomic level quantum phenomena, such as bonding and energy gaps, were modeled using analogous acoustic waves. Resonant frequencies were obtained and dispersion relations were mapped in reduced zone scheme for different sized unit cells.
Structural Determination of a Synthetic Polymer by Gaussian Computational Modeling Software and Nuclear Magnetic Resonance Spectroscopy

Kristen Entwistle*, Dwight Tshudy | Gordon College
Terrence Collins | Carnegie Mellon University

Previous research has used the Iron-Tetraamido Macrocyclic Ligand system (FeIII-TAML with hydrogen peroxide) to polymerize the model compound 4-ethylphenol1. The resulting polymer is thought to be phenolic, but structure has not yet been confirmed with analytical instrumentation. This portion of the research focuses on the structural determination of this polymer using Gaussian Computational Modeling Software and Nuclear Magnetic Resonance (NMR) Spectroscopy. Proton Nuclear Magnetic Resonance Spectroscopy (1H-NMR), Carbon Nuclear Magnetic Resonance Spectroscopy (13C-NMR), and Two-dimensional Nuclear Magnetic Resonance Spectroscopy (2D-NMR) are employed for this study using an Anasazi Eft60 NMR. The experimental and computational results from Gaussian 03W Software are compared and the structure of the polymer determined.

Mechanical Properties of Dental Composites

Jesse Thompson*, David Lee | Gordon College;
Jessica Kaufman | Endicott College

Dental filling materials must possess a complicated set of material properties, such as the ability to withstand large compressive and shear forces during chewing, inertness to decomposition under a wide range of pH levels (from basic egg whites to acidic fruits) and other chemical environments (such as mouthwash), and the ability to maintain shape, hardness and toughness across temperatures from 0°C to 40°C while in the presence of abrasives. Additionally, any dental filing material must match well with tooth enamel in terms of bonding, thermal expansion and colorability. In this project, we seek to study the mechanical properties of composites made of dental resins combined with hydroxyapatite. We estimate the modulus and hardness of this composite material through nanoindentation and force-displacement spectroscopy on our Park Systems XE-70 scanning probe microscope and correlate it to larger scale microindentation measurements made on our Wilson microindenter. We also use the SPM in non-contact atomic force microscopy mode to image the sample before and after performing nanoindentation.
Saturated Absorption Spectroscopy of Rubidium

Darrell Montonera* | Gordon College

Saturated absorption spectroscopy is a technique used to measure narrow-line atomic spectral features, limited only by the natural linewidth of the transition, Gamma, which for Rubidium is about Gamma ~ 6 MHz. The technique removes Doppler broadening of linewidths by using both "pump" and "probe" beams to select out and excite only atoms with the proper Doppler-shifted velocity from among the Boltzman distribution of speeds in the vapor. With Doppler broadening removed and with careful control of the diode laser frequency, I have been able to resolve hyperfine splitting of the ground-state of Rb-85 and Rb-87. The technique should in fact allow for resolution of the hyperfine splitting of the excited states as well. I estimate the spectral resolving power of the system to be f/Δf ≥ 107. In the future, this experiment should allow me to demonstrate the Zeeman effect with the addition of a modest external magnetic field.

Trajectories and Chaos in an O'Neill Cylinder

Michael Percuoco* | Gordon College

In 1977, a book was published by Gerard O'Neill entitled The High Frontier: Human Colonies in Space. O'Neill proposed to create large cylinders that will rotate with the correct speed to simulate the gravitational force that humans today feel on earth. O'Neill sought to create a colony whose conditions were vastly similar to Earth’s and would be inhabitable by the future generations of humanity. I study the phenomena of particles trajectories inside the sphere and note how they differ from those observed from Earth. I explore the conditions that create different types of trajectories including returning trajectories and trajectories that appear to create loops. Secondly I explore the chaotic behavior of a rotating cylinder orbiting around a star, studying the initial conditions that result in chaotic motion and the related phase portraits of the system.

The Spatial Distribution of Aid Recipients in Kenya

Matthew Forstrom, Hang Yang*, Michael Veatch | Gordon College

GiveDirect, a non-profit organization, recruits and delivers aid to recipients in Kenya. The aid delivered is cash funds that are directly transferred to the recipients through the use of M-Pesa agents using cell phones. This project studies where GiveDirect should deliver aid. Their goals include recruiting recipients with a variety of needs and in a significant number of communities, but visiting more and dispersed locations increases the costs of recruiting recipients. A model was developed to minimize recruitment costs while achieving the desired diversity and total number of locations visited. Three area-specific needs, malaria risk, poverty, and drought risk, were chosen as high priority.
**Sit-to-Stand Pilot Study: Examining timing and mechanics of college-aged, elderly, and elderly diagnosed with Parkinson’s disease in completing a sit-to-stand movement.**

Lisa Schott*, Dan Kang* | Gordon College

This pilot study determines whether there are significant differences between college-aged adults, healthy elderly, and elderly diagnosed with Parkinson’s disease in completing a basic sit-to-stand movement. One subject from each group completed two trials of the sit-to-stand maneuver at a natural pace and two at a fast pace. Vicon Motion Capture software recorded each subjects’ movements while a force plate recorded their center of pressure (COP) in the x and y direction. Average time to stand, standard deviation of COPx and COPy, and average maximum trunk angles were analyzed. Hypotheses all reflected the belief that the individual with Parkinson’s disease would be the least stable while the college-aged adult would be the most stable. Therefore, the Parkinson’s subject should be the slowest to stand, have the largest maximum trunk angle and the greatest deviation in COPx and COPy. During the natural pace trials, the Parkinson’s subject took the most amount of time to stand while the college-aged student took the least. However, fast trial results were less consistent. The average standard deviation values for each of the subject’s COP illustrated that the movement was completed with more stability and ease if the COP showed less deviation. There were no significant differences between the subjects’ average maximum trunk angles. Completion of this study revealed that aging and Parkinson’s disease have a degrading effect on the execution of the sit-to-stand maneuver. The significance of these findings warrants further research observing potential influences of both Parkinson’s disease and age on balance and stability.

**Conversion of Secondary Aliphatic Amine Moiety to Ketone by FeIII—TAML System**

Andrew Worth*, Dwight Tshudy | Gordon College
Longzhu Shen, Terrence Collins | CarnegieMellon University

TAMLs (Tetra-Amido Macrocyclic Ligands) are a family of green oxidation catalysts that activate hydrogen peroxide and have been reported to have the ability to degrade numerous persistent pollutants in aqueous conditions. The degradation reactions take place under ambient conditions over a wide pH range from neutral to highly basic. Previous work involving FeIII – TAML and components of antidepressant medications such as Zoloft® (sertraline) suggest that the TAML system is able to convert methyl amines into ketones.1,2 A secondary aliphatic amine moiety based on sertraline’s structure is used as a reference model compound to study the reaction. The ketone formation is confirmed using gas chromatography mass spectrometry and the reaction progression under varying conditions of pH, peroxide, and TAML concentration is being studied by means of liquid chromatography.
Gamma Ray Spectroscopy of a Unknown Radioactive Ore

Robert Fryer* | Gordon College

Excited atomic nuclei occupy discrete and unique (quantized) nuclear energy levels. During a nuclear de-excitation transition, a gamma-ray is emitted from the nucleus. Because the selection rules for transitions between allowed energy levels are exclusive to individual radioisotopes, gamma-ray byproducts of nuclear decay can serve as fingerprints, allowing identification of the emitters. In this experiment I performed gamma ray spectroscopy using an NaI(Tl) scintillation detector and multichannel analyzer to characterize and then identify an unknown radioactive ore.
Do I Control My Future?

Kate Gwozdz* | Gordon College

The present study deals with the effects of failing on the future achievement and attributional styles of students. Students were given a time limit to complete a difficult logic puzzle task where they either experienced perceived success or perceived failure. Upon completion, the participants completed the new Attributional Style Questionnaire (ASQ) to test the relationship between perceived agency and achievement. Finally, students completed a final timed puzzle. Results were consistent with the prediction that experiencing perceived success primes students for future improvement. However the data showed conflicting results regarding the prediction that experiencing perceived failure primes students for future failure by decreasing their sense of agency. Half of the participants that initially experienced perceived failure acted as predicted and failed again yet the other half acted in opposition to our prediction and succeeded on the second trial. Results of the new ASQ showed that those who succeeded in the face of failure had a greater sense of agency than those who failed repeatedly. Other studies show that this divergence in performance becomes increasingly significant as failure experiences increase (Boggiano, 1998) putting populations that lack resources or who experience frequent uncontrollable negative events, such as the working class, children, students and minorities, at greater risk for developing helplessness.

Do Christian College Undergraduates and Alumni hold onto their faith?: Moralistic Therapeutic Deism and Denominational Commitment

Laurieann Smith*, Lauren Stone*, Matt VanHamersveld* | Gordon College

Among Christian college alumni (2006, 2008, 2010) and undergraduates (freshmen, senior), surveyed by Dr. Cook and her research teams, we have been exploring religious denominational commitment and descriptions of God. We thought, after reading Arnett & Jenson (2002) and Smith (2005, 2009), that after graduation there would be a shift away from religious communities to which participants once belonged. We found however, that college graduates maintained their faith four years after graduation, although a minority (3%) did not. Our focus was predominately on Moralistic Therapeutic Deism (MTD), a phenomenon described as watered-down faith, where God is viewed as a source of moral rules (moralistic), a problem solver (therapeutic), and distant (deism; Smith 2005, 2009). We also measured expressions of trust in God, ownership of faith, and traditional Christian belief. We discovered that undergraduates give more classic expressions of faith than alumni and that females expressed MTD more than males. This difference did not increase with time out of college. Expressions of trust in God and ownership of one’s faith occurred more frequently than MTD.
What Would Jesus Do? An investigation into Jesus' agreeableness

Joanna Marsh*, Jordan Logan*, Jonathan Gerber | Gordon College

This study investigates whether Jesus’ personality was typical or atypical. Personality is best characterized as responses to situations, so we reworded scenarios from the Gospels to reflect modern day situations and then asked a sample of 86 people to rate how they would respond to the situation. We coded the agreeableness of our sample’s responses and then compared them to Jesus Christ’s reactions. These analyses will be used to examine whether Jesus responded in conventional or unique ways to situations when compared to a modern sample. In other words, was Jesus agreeable? Key words: agreeableness, personality, situational sensitivity, Jesus

The Quest for Cool

Carly Geiman*, Juliana Chase*, Sam Lahr* | Gordon College

There has been a lack of research that explores and attempts to define the accepted but abstract concept of “cool”. We tested four groups (total n = 47) in a round robin design. Each group ranked the other members on both their personal (i.e. What do you think is cool?) and societal (i.e. What does society think is cool?) views of coolness. Using a Social Relations analysis, there was significant consensus about how cool people were which increased as we moved from personal to societal notions of cool. Factors associated with cool were also collected, and these suggested that personal notions of cool are influenced by a broad range of factors while societal cool seems to be correlated with a small range of observable factors such as extroversion and appearance. This research establishes for the first time that cool can be defined, but it is seen clearest by thinking of what society thinks is cool. Keywords: Social Relations Model, cool, round-robin ratings, personality
GENERAL SESSION

B-09 Biological Sciences

Examining the Double Pendulum Model of Human Gait

Caroline Moore* | Gordon College

Clinical studies often prove to be a very limited and time-consuming approach to analyzing the various biomechanical factors that can affect an individual’s gait. As a result, the study of human movement is often implemented through the use of computer models. By using such models, scientists don’t have to worry about the limitations and complexities that arise when using human subjects. For example, if a clinician were interested in testing how different prosthetic leg masses affected an amputees gait, by using a computer model, the painstaking task of actually needing the amputee to be fitted for and to test each different prosthetic limb is avoided. In 3-dimensional modeling software, a technique known as forward dynamics is employed in order to predict the movement of a system. The user inputs the initial joint forces and torques and the program then outputs the accompanying kinematics for a later specified point in time. Within the software itself, the motion of the body segments is modeled by a set of differential equations that dictate how each segment changes in position over time. In order to then generate the kinematics, the model equations must then be solved. This is often accomplished by means of one or more numerical solution techniques. Often times, when modeling human movement, the system will be modeled in an extremely simplistic way. For the purpose of this paper, we will model the lower extremities as a double pendulum consisting of two segments, the upper thigh and the lower leg. We will then attempt to solve the double pendulum equations of motion by a numerical solutions method in order to analyze the movement of the pendulum through time.

P-14 Physical Sciences

An In Depth Examination of the Franck-Hertz Phenomenon in Mercury

Melissa Haire*, Gregory Gutgsell*, Alegra Aulie* | Gordon College

The Franck-Hertz experiment is used to demonstrate the discrete energy levels in atoms. During the experiment, electrons are accelerated towards isolated atoms. The collisions are generally elastic, however, at certain energy levels, the electrons will give their energy to the atom, leaving the atom in an excited state. In this excited state, the atoms emit a spectrum of light predicted by Bohr’s model. The Franck-Hertz experiment was able to show that Bohr’s model not only predicted the spectrum of light emitted by atoms, but also the quantized energy changes.
Design, Construction, and Analysis of Scale Model Pedestrian Truss Bridges

Ellen Lyman* | Gordon College

A truss bridge is a simple engineering structure made up of joints and straight members. Two common truss bridge designs are the Pratt and the Warren. One specific type of truss that will be explored extensively is the Pratt truss. Scale bridges were constructed using MicroRAX extruded aluminum members. Force versus deflection curves were measured using a PASCO bridge kit and a scale factor was determined to correlate between identical designs built using PASCO plastic-member bridges and extruded aluminum bridges. Analysis of the deflections and forces in these scale-model bridges allows me to test different designs and determine the most suitable structure for a pedestrian bridge.

The Chromatographic Evaluation of Febreze as an Odor Eliminator

Linnea Harrold*, Lauren Horsley*, Madeline Kong*, Chelsea Vogus*, Owen Williams*, Dwight Tshudy, Joel Boyd | Gordon College

Febreeze has been marketed to the public not only as an air freshener, but also as an “odor eliminator.” Both gas and liquid chromatography were employed to analyze the effect of Febreeze on the substances aniline, heptaldehyde, and toluene. The chromatographs were injected with measured volumes of these substances with and without Febreeze. Whether Febreeze has a masking or lifting effect on the substances was explored. The data from the gas chromatograph was inconclusive due to mechanical failure of the injector. Further experimentation on Febreeze’s effect was analyzed using liquid chromatography. The goal of this experiment was to create a reproducible lab procedure on chromatography for undergraduate chemistry students of Gordon College.

TAML Catalyzed Degradation of Red-40 and Orange II


One principle of green chemistry is that chemicals should be designed to break down into safe degradation products which do not persist in the environment at the end of their function. Recently designed TAML (tetra-amido macrocyclic ligand) is an environmentally friendly synthetic catalyst used as an alternative method for the degradation of organic dyes. TAML was used in combination with H2O2 to degrade two separate dyes, Orange II and Red 40. The purpose of the project was to obtain experimental values for the rate constants and orders of reaction for both dyes with TAML through spectroscopy and chemical kinetics.
Nano- and Micro-mechanical Properties of Zr57Cu15.4Ni12.6Al10Nb5 Bulk Metallic Glass as a Function of Annealing Time and Temperature

Jonathan Sheeks* | Gordon College

Bulk metallic glasses are metastable multicomponent alloys formed by quenching from the stable liquid at sufficiently high cooling rates so as to prevent crystallization, thus forming an amorphous solid. Master (crystalline) ingots of the proper composition were prepared by arc melting for later processing into amorphous form. Plates of the amorphous alloy were cut into samples then measured by nano-indentation on a Park Systems scanning probe microscope and micro-indentation on a Wilson microindenter. The samples were annealed systematically for different times and temperatures to study the effect of such "aging" on the mechanical properties of the alloy.

Nuclear Spectroscopy and Half-Life of Ba-137m

William Bugden IV*, Nathan Bedell* | Gordon College

An examination of gamma-ray radiation spectrum emitted by a radioactive isotope of Barium using a thallium-doped sodium-iodide crystal scintillation detector. This detector is attached to a photomultiplier tube (PMT) that converts each photon into a small current, the individual currents combine to produce a larger current pulse that can then be measured. This pulse is converted into a voltage pulse whose size is in proportion to the gamma-ray's energy. The pulse data is then sent to a multi-channel analyzer that can process the pulses and sort them according to their energy. This spectrum can then be examined across a range of energies, or a specific range of energies can be examined over a period time. The first method is used in the identification of different substances by the gamma decay of the radioactive nucleus. The second can be used to record the gamma ray intensity as a function of time. This was used in the process of determining the half-life of the Barium-137m sample.

Comparing Acetaminophen and Caffeine Content in Excedrin and Midol. How many pills is an overdose?

Ariel Guiguizian* | Gordon College

This study will use High Pressure Liquid Chromatography (HPLC) to determine the concentration of Caffeine and Acetaminophen (paracetamol) in Midol and Excedrin. The amount of caffeine and acetaminophen in one pill will then be compared to the ingredients list on the bottle to determine if the dosage matches the quantity found in the pill. Both caffeine and acetaminophen can become toxic if consumed in large doses (10g paracetamol or .5g caffeine). How many pills must be consumed before the dosage is considered toxic?
The Photoelectric Effect
Jonathan Hamill*, Karen Craven*, David Fraats* | Gordon College

The photoelectric effect, discovered in the 1880s by Heinrich Hertz, shows that light can cause particles to eject from the surface of metals, depending on the light’s frequency, and metal’s binding energy. This is caused by the incident striking light having energy (hf), which overcomes the energy binding electrons in the metal to their nuclei, called the work function (φ). This surplus of energy ejects the electrons from the metal’s surface. We explored this phenomenon using a Mercury arc lamp as a light source to shine well defined frequencies of light onto a photodetector. In order to measure the maximum kinetic energy of the ejected photoelectrons, we applied a retarding voltage across the anode and the photocathode. Among the correlations we noted were (i) increase in frequency of incident light increases the maximum kinetic energy of the ejected photoelectrons, (ii) increase of frequency does not increase the photoelectric current detected, and (iii) increase of frequency does increase the stopping voltage of the photoelectrons.

HPLC Analysis of Allicin Found in Commercially Available Garlic Supplements
Luke Perkins* | Gordon College

Allicin is a molecule found naturally in garlic (Allium sativum). Research has shown this molecule to be an effective antimicrobial substance. Its effectiveness has led to the production of many forms of garlic supplements, the most popular being garlic tablets. The majority of these products are not regulated by the Food and Drug Administration, thus it is unknown whether the supplements do in fact meet the manufacturer’s claims. The lack of stability in the molecule raises concern on its abundance in the supplement. The instrument employed for this analysis was High Performance Liquid Chromatography (HPLC). This technique enabled the presence of allicin to be determined, as well as its abundance in a single tablet. Several different brands of garlic tablets were compared in this analysis. Results indicate that allicin is not present in the products.

Analysis of chlorophyll fluorescence using a fluorescence plate reader
Molly Guthrie* | Gordon College

Chlorophyll is a pigment that exists in plants and functions during photosynthesis; it also is responsible for the green coloring in plants. There are two separate types of chlorophyll: chlorophyll a is directly active in photosynthetic reactions whereas chlorophyll b helps chlorophyll a by providing energy. It thus follows that a plant with a darker green color would have a greater quantity of chlorophyll, and that the main component of that chlorophyll would be type a. Spinach and kale are both leafy vegetables with dark green leaves, which would signify
a large amount of chlorophyll. However, kale has extremely crumpled leaves and is slightly lighter in color. This project uses a microwell fluorescence plate reader and chlorophyll extracted using methanol from both kale and spinach to answer the question: is it possible to use chlorophyll fluorescence and a microplate fluorometer to determine the difference in chlorophyll levels between spinach and kale leaves, given their different shape and color.

Determination of hydrocarbons in a freshwater source using solid-phase extraction and Fourier Transform Infrared Spectroscopy

Jonathan Harris*, Dwight Tshudy | Gordon College

Motor oil that is commonly collected in parking lots can often be found in adjacent bodies of water due to runoff. These oils have been known to pose severe problems to sensitive aquatic wildlife. Previous literature has verified the benefits of performing a solid phase extraction to isolate those oils for determination. However, very little work has been done to identify motor oils using Fourier Transform Infrared Spectroscopy (FTIR). Samples were collected in various locations of Coy pond, specifically near the Jenks parking lot. A solid phase extraction was performed on these samples to isolate any oil present. Any oil collected was analyzed using an FTIR for identification purposes.

FTIR analysis of CO2 and CO levels in gasoline and diesel engine exhaust

Eric Lindemann*, Dwight Tshudy | Gordon College

Green house gasses are a very important topic right now because of the current state of our planet. Carbon dioxide (CO₂) and carbon monoxide (CO) are two examples of green house gasses that are emitted from our cars every time we drive. Because the emission of green house gasses is a big concern, I wanted to quantify the amount of CO₂ and CO different vehicles emit while idling after running for 5 minutes. Gasoline vehicles have a catalytic converter which uses a catalyst to clean the CO out of the exhaust along with excess hydrocarbons. Diesel engines do not have this because they burn with more O₂ in the process. By looking at the data we can see how efficiently the catalytic converter performs in a gasoline vehicle and compare the results a diesel engine. For this analysis I used a Fourier Transform Infrared Spectrometer (FTIR) and an infrared gas cell to measure the amount of CO and CO₂ in exhaust. I took samples from 3 gasoline engines and 2 diesel engines. And by the using a calibration curve, constructed with different partial pressures of each pure gas, I have calculated the amount of CO and CO₂ in the exhaust samples.
Nothing Really Mattress: NMR Analysis of Diphenhydramine Hydrochloride

Kelly Lavin* | Gordon College

A qualitative study on diphenhydramine hydrochloride was conducted to determine the purity of this chemical in over-the-counter sleeping pills by using NMR. This chemical is commonly used for treating nighttime pain and insomnia in America. The diphenhydramine was extracted from sleeping pills by dissolving the pill’s liquid in deionized water then evaporating the water. The pill’s diphenhydramine hydrochloride NMR spectrum was compared to a pure diphenhydramine hydrochloride NMR spectrum. The comparison showed the diphenhydramine hydrochloride was successfully extracted from the sleeping pill; however, the spectrum showed one new peak different from the pure diphenhydramine hydrochloride. The results concluded that there was another chemical in the gel capsule that affected the NMR spectrum.

Numerical analysis on Game theory

Hang Yang* | Gordon College

Linear programming (LP) is a tool for solving optimization problem. It deals with finding extreme values of linear functions when the variables are constrained by linear inequalities. Linear programming can be used to find the value and optimal strategies for Game theory, which is useful for making decisions in cases where two or more decision makers have conflicting interests. A particular type of game theory problem is the two-person zero-sum game. We use computer software and simple programs made using python to numerically compute the optimal solution. We also analyze the result of these numerical solutions and compare them with the real solution.

Over the Limit. Under arrest Would YOU pass the test?

Rachael Albury* | Gordon College

Police departments across the country use breathalyzers to determine the blood alcohol content (BAC) of drivers to decide whether or not they are driving drunk. Breath analysis is based on the presumption that the alcohol level in the lungs is in equilibrium with the blood alcohol content. There have been documented cases of defense attorneys claiming that a positive breathalyzer test came from other sources; bread and mouthwash for example. Breathalyzers use Infrared (IR) Spectrometry to analyze the absorbance of breath samples. This experiment will test the effects of mouthwash and bread on absorbance and see if it is comparable to the recorded BAC level that would not pass a Breathalyzer test. Breath samples will be collected and analyzed by IR to determine the unknown concentrations.
Gas chromatography determination of cocaine concentrations on currently circulated paper currency in the United States

Kenneth Preedom* | Gordon College

In this study, paper currency was analyzed to determine cocaine concentrations. According to recent studies, 92.8% of bills in the United States have detectable levels of cocaine (Negrusz et al. 1998). Paper currency can be contaminated by being used for snorting, or by coming into contact with it through hands or tables. It is then spread between bills at financial institutions. One, five, and twenty dollar bills were analyzed in this study to determine if certain denominations tend to have more cocaine present than others. A simple, non-destructive extraction procedure was employed, in which the bills were soaked in a methanol solvent and placed into a supersonic bath. The solution was then dried to release the cocaine from solution before resuspending it in acetonitrile. Analysis was performed using gas chromatography with a flame ionization detector (GC-FID).

The Separation and Quantification of Aluminum-zirconium octachlorohydrex-glycine from Antiperspirants

Spencer Lord*, Dwight Tshudy | Gordon College

Aluminum possesses antimicrobial properties and when combined with zirconium there is increased efficacy in the complexes function. While aluminum complexes are great antiperspirants, aluminum toxicity is often associated with renal and neurological disorders and is associated with the earlier development of breast cancer in women. Research indicates that it is the frequency of antiperspirant use that correlates with the increase in the prevalence of these diseases. With this in mind, researchers have investigated that while the body is able to readily excrete aluminum from the body, safe aluminum exposure must be less than 5 ug/kg body mass/day. Therefore this research will focus on determining how much aluminum typical people apply to themselves using an antiperspirant gel. The concentration of aluminum will be determined by UV-vis absorbance. The expected results should show concentrations greater than 5 ug/kg body mass/day.

Finding Eigenvalues Using the Power Method and Inverse Power Method

Clara Baker* | Gordon College

Solving systems of linear equations has proven to be something very vital to lots of physical applications such as physics, social sciences, or economics. Many times a set of differential equations are used to model some phenomena which can be solved by finding eigenvalues and eigenvectors. Many times these physical problems can be solved by using matrices. In an n by n matrix there are exactly n eigenvalues, which do not all have to be different some can repeat.
These eigenvalues can be solved by finding the roots of the polynomial of this form, \( p(\lambda) = \det(A - \lambda I) \). The polynomial \( p \) is called the characteristic polynomial. Many methods for finding eigenvalues use this characteristic polynomial and solve. This is a common notion of finding eigenvalues. This seems to be sufficient because finding roots shouldn’t be that hard, but really it ends up being time consuming with higher orders of the polynomial and you also end up with rounding errors which are also not sufficient. These eigenvalues also have corresponding eigenvectors. These eigenvectors also have the property of being linearly independent. Finding different methods for finding eigenvalues and eigenvectors have come to be very helpful. Many programs and algorithms have been developed to find these eigenvalues without using the characteristic equation. The power method and the inverse power method are just a few that are simple and sufficient for certain cases. The power method and inverse power method have really good precision which might be difficult to obtain with other methods so a common use of these two methods is after using a different method to get a good approximation of the eigenvalue then the power method and inverse power method are used to refine the answer. These two methods will be discussed in my following projects. I will research how well the power method and inverse power method works and when they don’t work well.

P-32 Physical Sciences

Probing For Plasticizers

Samuel Maldonado* | Gordon College

Three common household products were examined to determine the presence and concentration of phthalate plasticizers via Gas Chromatography Flame Ionization Detection (GC-FID) and Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR-FTIR). Out of the three plastics examined, two contained significant levels of phthalates (>0.01%) and may be a route of exposure to infants and children.

S-05 Social Sciences

The Three Stooges or Mozart? The Effect of Humor and Music on Stress Levels

Erika Sandwick*, Alexis Rao*, | Gordon College

Stress is a major problem in the world today, and consequently stress relief is an important topic to be researched and explored. Among a plethora of modes of stress relief lies both music and laughter. These broad topics can be broken down even further: aggressive and soothing music have been said to affect stress differentially, as have adaptive and maladaptive humor. The extent to which these differences in stress relief occur was explored among 34 Gordon College students using the Stress-Arousal Checklist. The students were assigned to one of the 5 conditions, and the stress survey was presented to the participant before and after they were exposed to the music, humor, or silence condition. The researchers found that stress levels decreased from pre-test to post-test under the conditions of adaptive humor, maladaptive humor, classical music and silence. Stress levels increased from pre-test to post-test under the heavy metal music condition. Future studies would benefit from a larger sample size in order to decrease a possible floor effect and increase power.
Responses To Rejection

Jenna Meisenhelder* | Gordon College

Attribution theory focuses on how an individual perceives a cause to a situation. One such situation that can be perceived in various ways is interpersonal rejection. Research has shown that rejection elicits many different responses, including negative state mood. Depending on attribution style, the perception of rejection can specifically elicit negative state mood. In this study 26 Gordon College students filled out a mood questionnaire, wrote about a recent time when they were rejected, and took a mood questionnaire again along with an attribution questionnaire. Lastly, they were asked to write from another prompt about happier times. In this study the participants scored global and stable attribution styles which made their moods more negative. Both attribution styles being tested, global/specific and stable/unstable were strongly correlated with each other. Further research with more participants and a different method of rejection are suggested.

Media Violence and its Effects on Young Adults

Rob Hinckley* | Gordon College

This experiment was performed to determine how males and females each respond to performing an aggressive task, since males seem to be more aggressive by nature. Violence in the media has become increasingly prevalent in recent years, with video games leading the way. Using a video game is more influential than watching a movie clip because the participant is forced to identify with the video game character. In the present study, each participant filled out an anger questionnaire before-hand, performed the task, and then re-took the questionnaire. Twenty-six college students (13 males and 13 females) were recruited, and each participated in the study separately. On average, each sex became more aggressive as a result of performing the task. Males became somewhat more aggressive than females; however the difference was not enough to be considered statistically significant. Almost half of the variability in anger was due to the aggressive task, while only 3.7% could be accounted for by the interaction. These numbers seem odd due to the clear difference in the magnitude of change between males and females. However, it is possible that the change between groups could be explained by some other unknown factor. In any event, it was found that there was not a significant difference in the magnitude of change in aggression levels between males and females.

Face-to-Facebook

Abigail Wojtowicz* | Gordon College
As human beings we are well aware that judging one another is a part of our fallen nature and that judging often plays a role in first impressions. Looking into this further, this experiment tested participant’s confidence levels and feelings after meeting a new person in two different settings: face-to-face and through the internet. Each of the thirty women who participated in this study was assigned to take part in either a face-to-face interaction or an interaction that took place over the internet. They then completed a survey about their feelings about the interaction and returned it to the researcher. The researcher found no difference in confidence levels between the two interaction groups. One of the main changes that the researcher wishes she had incorporated in this study is qualitative data.

Does This Magazine Make Me Look Fat?

Karis Sawyer* | Gordon College

The issue of the media and its effect on body image and self-esteem in females has been studied by a number of researchers in a variety of contexts. Several connections have been found between the influence of the media and female body image and self-esteem. The current study for addressing this issue tested 18 female participants. Participants were given a series of surveys to assess magazine reading habits, body image, and self-esteem. It was hypothesized that those who regularly read fashion magazines would have a more negative body image and lower self-esteem than those who do not read such magazines, and that those who took a body-image survey before a self-esteem survey would have affected self-esteem results. The results did not necessarily prove the hypothesis, but they did show some interesting findings. It was found that the type of magazine read does not have an effect on participants’ body image, but that reading neutral magazines is associated with having higher self-esteem. In future research, it will be important to have solid operational definitions for all variables, something this study lacked.

To Help or not to Help?

Colby Esposito*, Tim DeVries* | Gordon College

This study was designed to test the good behavior that is within people through events that encourage helping behavior. The study observed the helping behaviors of people as it is compared to the attractiveness of the person being helped. The Bystander Effect was tested by two confederates, male and female, who wore clothing that altered their appearance (gym clothes versus business attire). By dropping a file of papers, a situation where help was needed was set up; it was assumed that the people in business attire would acquire the most help. Results show this to be true; particularly for men. Through the Gordon college campus it was expected that a high percentage of students would help in all situations; however, that was not always the case.
Studying: Should We Really Turn The Music Down?

Sam Senna*, Ryan Daley* | Gordon College

It is generally held that silence is the best condition under which to study. There are however, some individuals who do not find studying in silence the best learning environment. Many students claim listening to music is more helpful when studying while others find it impossible to concentrate with anything but silence. In an attempt to find where these discrepancies hold true, a memory test was administered to 21 Gordon College undergraduate students under three noise conditions (silence, music with lyrics, and music without lyrics), along with an extraversion and introversion survey. The study produced a small to medium power of .44. Although the hypotheses predicted that extraverts would perform better with music playing in the background and musicians would have a harder time concentrating while music played in the background, the results did not show a great enough effect to accept that hypothesis. This is mainly due to the small sample size. Also, due to Gordon College’s status as a liberal arts college, most of the students are well rounded. Thus, it was difficult to find participants who had no music experience. Also, due to the participant backgrounds, there may have been confounds due to past psychology class experiences. As most of the students were recruited from psychology classes, it is possible that they better understood how to take memory tests than the other participants. Overall, the three different background noises did not have an effect on the participant’s memory test scores.

Are You Attracted to the Babysitter?

Shannon O’Leary*, Megan Grant* | Gordon College

This study focuses on how college students attribute personality traits such as humor and intelligence in future love and what qualities students find to be the most important. The main quality this study examines is parenting, and how attractive parenting looks towards others of the opposite gender. Research studies considered, were considerably different from the hypothesis, they looked more at traits within marriages and within parenting relationships. Twenty-three male and female students ranging in age from 18-22 were all either single or in a relationship ranging in amount of time in that relationship. Participants took a pre and post survey after watching a video of an actor of the opposite gender either playing with or ignoring a child. The study concluded that there was no difference in how attractive parenting was between males and females. The difference was shown in the type of play. Playing with the child was considered more attractive than ignoring the child by both males and females. These results open up discussion for future research in how individuals rate other traits of potential future spouses.
La Vida vs. Discovery

Ethan Bravo* | Gordon College

Abstract  This study took a look at how two different Outdoors Educational programs at Gordon College, the La Vida experience and the Discovery program, develop community within these groups. Going beyond that, the study also tested whether recollection of these programs is better in a classroom or in the outdoors where the two programs actually took place. There were surveys given and filled out in both locations, inside and out, to La Vida and Discovery participants. The surveys asked questions about the level of community developed on these trips and how much of that built community still exists and was retained from the actual experience. All participants were Gordon College students that have completed either a La Vida or Discovery program. In the end the study had 22 participants with about half doing either La Vida or Discovery. The results upon analysis showed that there was a slightly higher community developed within the participants of La Vida. Though, due to the small sample size there is no solid evidence of this. For future study in this area the most important advancement would be to increase the number of participants.

How Close Are They?

Sung Eun Chung* | Gordon College

Illegal immigrants have been an issue for a long time in the United States. Recently, crossing the border from Mexico to the States has been increasing and it brought up many issues such as lack of jobs for Americans, how taxes are used, etc. In this study, Americans’ views of Latino illegal immigrants were measured with Bogardus scale of social distance measurement. 14 Gordon College students were recruited, 11 people signed up voluntarily from intro psych classes and the other 3 were asked to participate. Participants were exposed to two biased videos from Youtube, each video for two minutes: one group watched the negative biased video first and then the positive video, and the other group watched the positive biased video first and then the negative one. The negative video is CNN news which is reporting how the Americans’ taxes are spent on illegal immigrants, and the positive video is a documentary which is talking about how Latino illegal immigrants are struggling in the States, why they are here, etc. The result says, however, exposure to media does not have any effect on social distance. The range of social distance for the first group was from 1.00 to 5.71, which is wider, and the other group was from 2.42 to 5.00, which is narrower. In further study, it would be interesting to see if religion or the participants’ personal rejection or acceptance experiences have an effect on the social distance toward the other group.
The Effects of Hunger on Perception of Quantity

Rebecca Nyenhuis*, Michelle Lee, Beth Crandall | Gordon College

Previous research suggests motivations and desires influence perception. Hunger, a known motivation, is known to cause people to perceive distances in motivated ways (i.e. thirsty people perceive a bottle of water as closer). We hypothesized that hunger should have an effect on people’s perception of food quantity. To test whether people’s perception of quantity is really affected by hunger, we showed subjects two separate glass jars filled with M&M chocolates and marbles and asked them to guess the number in each. Our results indicated that having eaten caused the participants to report higher guesses on both the M&M chocolates and the marbles. We conclude that a lack of hunger creates a positive perception of quantity with both food and non-food items.

Subliminal smells: effect on cognitive functioning and alertness

Faith Clasby*, Madison Ketchum, Amanda Ayers | Gordon College

Previous research conducted by Hooland, Hendricks and Aarts, has shown that mere exposure to a clean scent increases cleaning behaviors. The purpose of this study was to determine if a subliminal level of coffee would increase cognitive function and alertness. Twenty-three Gordon College undergraduate students were exposed to either a noticeable, subliminal, or no coffee scent. Each group was required to complete two tasks. Task one required participants to watch a brief film clip, “The Cat’s Meow,” and then complete a short questionnaire asking about the details of the film as a measure of attention. Next participants were required to read a short passage and answer a few multiple choice questions related to the passage in order to measure verbal reasoning. After completing the study, results were analyzed using a one-way ANOVA. The study found no correlation between noticeable or subliminal levels of coffee scent and cognitive function and alertness.

The Effects of Time and Type of Emotion on Memory Perspective and Field of View

Nathan Josephs*, Caitlin Wheeler, Aaron Noga, Joel Habrial | Gordon College

Our emotions seem to be affected by the distance of the memory and the type of emotion recalled, be it positive or negative. Furthermore, recent research has shown that memories, when recalled in observer perspective, have lower levels of emotion than when recalled in field perspective. The research project attempted to show the effects of type of emotion and temporal distance on the emotional strength of recalled memories and the field of view. 85 participant filled out PANAS X scale of emotion after being directed to recall either positive or negative memories. It was found that field of view was significantly affected by temporal distance; older
memories tended to be in observer perspective more often than recent memories, $X^2 = 3.717$, $p = 0.054$. The type of emotion had a significant effect on emotional strength ratings.

S-18 Social Sciences General

**Sibling Rivalry: The Link Between Birth Order & Leadership Styles**

Stephanie Eastman* | Gordon College

Since the dawn of its investigation, the concept of how family dynamics-- birth order in particular-- can affect personality has remained nearly unanswered. Despite efforts to reach conclusions on the matter, there simply are too many factors to make a concrete inference. In this study, 17 Gordon College undergraduate students of various birth orders were surveyed on their perceived roles within their families and leadership styles/preferences, and were observed while completing a task in a leadership inducing activity. It was hypothesized that first borns would dominantly take on stronger leadership styles and roles in comparison to middle and last borns. A one way ANOVA test was conducted to compare the effects that birth order has on one’s ability to exercise leadership skills. Results revealed that first and last borns took on equal leadership roles and styles, and that middle borns were the most outgoing and bold of the three groups.

S-19 Social Sciences General

**An Analysis of Factors Influencing Conformity Effects in a Real-World Asch-Type Situation**

Levi Miller*, eric Turner, Charlie Prugh, David Kang | Gordon College

The project being proposed is an extension of the original Asch conformity experiment conducted in 1955 by Solomon Asch. The study used a real-world situation presented in a survey format involving three variables simultaneously. The variables under study were the size of the group, the number of compatriots, and the level of controversy of the topic of conversation. The study found general trends in the data showing that people needed more compatriots before voicing their opinion in larger groups regardless of the level of controversy for the topic of conversation. This study could form the foundation for a future exploration of the topic through experimental methods.

S-20 Social Sciences General

**Does a Label Lead to Social Distance?**

Maggie Helfrich* | Gordon College

This study looked to see if the label, “Asperger’s Disorder”, had an impact on a person’s desire for social distance. It was assumed that the label would have an impact on the desire for social distance. Gordon College students (N=28) read a story about a fictional man. Half were aware that the man in the story had Asperger’s Disorder, while the other half were not. To measure the
amount of social distance desired from this man, all participants filled out a modified Social Distance Scale. The study concluded that more social distance was desired without the presence of the label. The results were not in support of labeling theory, and show that it is the behavior that leads to stigmatization. However, the close conclusion calls for more research on the subject.

S-21 Social Sciences General

**Does Attachment Shape Morality: Religiosity as a Mediator**

Ashley Moulton*, Landon Ranck, Claire Lawes, Tor Ekstrom, Faith Clasby | Gordon College

Using data from the larger “Transitions to emerging adulthood” project under the direction of Dr. Kaye Cook, we explored the relationships among morality, religiosity, and attachment. Kohlberg and Diessner (1991) proposed that attachments with others shape the moral self. Two earlier studies found little support; nevertheless, connection between attachment and morality makes theoretical sense. Using surveys and interviews at Gordon College collected from 30 first year and 30 senior students, generally strongly religious participants, we explored whether attachment predicted morality and religiosity. We measured parent and peer attachment and aspects of religiosity: Christian Orthodoxy, Intrinsic and Extrinsic Religiosity, Quest, Religious Identity and Coping, as well as an overall religiosity score derived from these measures. We also measured Moral Identity, the component of one’s identity that consists of moral characteristics, and Moral Centrality, the degree to which one’s sense of one self as moral is central to one’s sense of self. Overall, peer attachment predicted moral identity and mother attachment approached significance in predicting moral centrality. Surprisingly, father attachment approached significance in predicting quest and overall religiosity. Earlier work reported by the second author documented that religiosity mediates the relationship between attachment and morality. Thus, in the current sample, peer attachment predicted morality for those low in religiosity, and mother and father attachment predicted moral centrality for two religiosity measures. In other words, when strong religiosity is present, individuals with strong parental attachments structure their identity around religiosity. When it is not, attachment better predicts morality, as is widely accepted in the literature. It is important for the literature to recognize the role of religiosity in development and explore multiple models for the development of morality.

S-22 Social Sciences General

**Psychology of the Self: Conceptualizing the Self and Its Relation to Abnormal Psychology**

Dong Gun Sim* | Gordon College

What is the self? How do we conceptualize the notion of self? The research first examined the characteristics of the self and how self can be conceptualized. The self can be characterized by 1) the holistic sense of human person, 2) dialectic tension between the private self and the relational self, and 3) its changeability. Essential to the notion of self are the dialectical tension between the private self and the relational self and the contradiction of the most private term representing the contexts of shared meaning in the public. The significance of the self is well
captured in the theoretical frameworks by Kohut and Winnicott who illustrated the dynamics and changeability of the self. Both theorists emphasized the importance of relational self in development of the healthy functioning self. Their theories of the self have provided the tool and the language that help us explore and understand the behaviors displayed in personality disorders such as borderline and narcissistic personality disorders. Furthermore, their theories are found to be helpful in clinical settings; for instance, Arthern and Madill (2002) showed how Winnicott’s transitional objects are used in therapeutic settings to develop a new sense of self and to address experiences of shame and Spiegel et al (2000) found that the empathic attunement which is derived from Kohut’s framework has been identified as the single critical variable for a successful outcome in therapeutic settings. This project reviews the literature on psychology of self and demonstrates that the notion of the self is one of the important fundamentals of psychology. It suggests that with different theoretical frameworks, the self can be studied more empirically in the fields of social and developmental psychology in particular. In addition, abnormal psychology has largely benefited from these frameworks in terms of conceptualizing certain mental disorders thus providing effective treatments for the patients.

S-23 Social Sciences

**Freedom within the framework of faith: What changes in faith, ego identity, and attachment happen during college and post graduation?**

Claire Lawes*, Ashley Moulton, Landon Ranck | Gordon College

Christian college undergraduates (first-year and senior, total n=60) were compared with alumni (recent, 2-year, and 4-year, n = 772) who participated in the same surveys and interviews under the direction of Dr. Kaye Cook. Expecting that seniors would show growth in various selected religious variables, we were surprised to find that the majority of first-years came into Gordon already scoring high among these religious factors. Consequently, both first-years and seniors were found to score highly in the conventionality of their beliefs (Christian Orthodoxy), maturity and internalization of faith (Intrinsic Religiosity), and the degree to which one is motivated to have faith because of those around them (Extrinsic Religiosity). Only one significant difference was found between the classes, as seniors tended to raise more questions about their faith than first-year students (Quest). In comparing undergraduates to alumni, longitudinal analyses revealed that seniors were higher religious questors and explorers in ego identity. First year students and students immediately post-graduation experienced the greatest stress. Nevertheless, students immediately post-graduation perceived less stress than first year students. Perceived stress peaked with first-years, subsequently decreasing from seniors, to recent graduates, and finally alumni. The longitudinal sample also revealed several gender differences, as females showed higher intrinsic religiosity and religious coping, and stronger peer attachments. Surprisingly, females’ higher coping abilities over males did not lead to them showing lower stress levels than males. With a sample that shows an increase in questing during the college years, while maintaining high religiosity, we argue that Gordon College does indeed provide “freedom within the framework of faith”.

Undergraduate Research Symposium 2011

We want to thank all those who made this event possible.

This event is for all Gordon College students who show the skill, the tenacity, and the dedication to work on the research projects and then to organize the findings into posters that are presented to the College community. We also recognize the contributions of the many faculty advisors who guide the projects.

We want to recognize the contributions of our judges who volunteer their time to meet with the students and evaluate their research.

   Dr. Russell Camp, Professor Emeritus of Biology at Gordon College
   Dr. Jack Haas, Professor Emeritus of Chemistry at Gordon College
   Dr. Randy Isaac, Executive Director of the American Scientific Affiliation
   Dr. Alefiya Albers, Assistant Professor of Psychology at Endicott College

Thanks also go to:

   • Dan Russ and the Office of the Academic Dean, for generous contributions that make refreshments possible
   • Gordon College Physical Plant, for setting up and organizing the poster presentation space.
   • Chemistry ACS Student Chapter and the Biology Club, for helping in set up and take down of the posters and general all-around assistance.

The 2011 Organizing Committee,

   Suzanne Phillips, Psychology (chair)
   Dwight Tshudy, Chemistry
   Mike Veatch, Mathematics and Computer Science
   Jessica Ventura, Kinesiology