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MD	Constance Mitchell	63
MD	Trevor Butcher	49
MD	Stephen Itschner	46
MD	Michael Powell	46
NJ	Miles Gray	28
NJ	Holly Hunsberger	48
OH	Makenzie Barr	55
OH	Emily Robinson	74
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TN	Aesha Peters	14
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France	Edson Borja	42
Taiwan	Wei-Teng Chang	67
Nepal	Sunita Mahat	59
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Adrienne Daniels	01
Zachary Douglas	02
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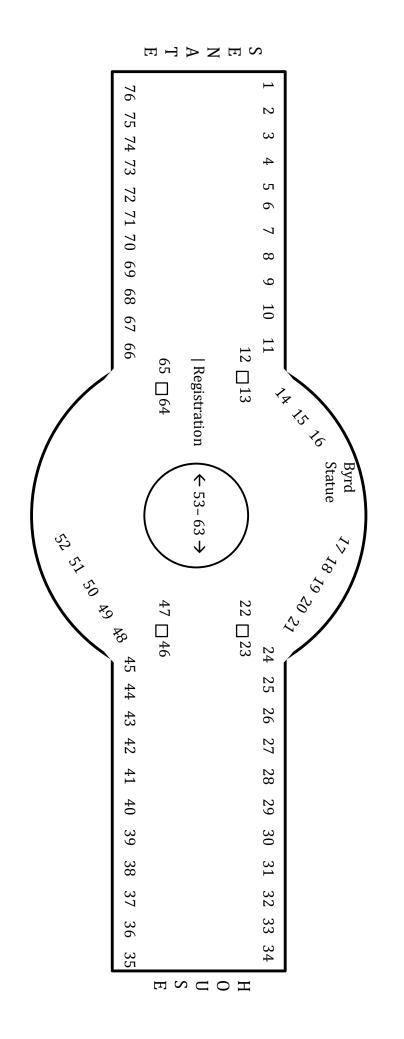
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Capitol Rotunda Layout, 2014 Undergraduate Research Day at the Capitol



#### **Gallic Acid Induces Apoptosis in Ovarian Cancer Cells**

#### **Adrienne Daniels**

Alderson Broaddus College Biology Yi Chen – Advisor

Ovarian cancer is the 5th leading cause of cancer deaths for women in America. Various pharmacological activities of gallic acid (GA) have been reported, including anti-inflammatory, antiatherosclerotic, anticarcinogenic, and antioxidant activities. Several studies have also demonstrated that GA selectively induced cancer cell death by apoptosis. In this research, the inhibitory effect of GA on ovarian cancers cells (OVCAR-3) was investigated. Apoptosis was visualized using a ZEISS fluorescence microscope after cancer cells were stained. Cell viability was analysed with a MTS-based Cell Titer 96 AQueous One Solution Cell Proliferation Assay. Expression of p53 and Bad was analyzed by Western Blotting. Our study showed that GA induced apoptosis of ovarian cancer cell line (OVCAR-3) and enhanced the Caspase 3/7 activities at 10  $\mu$ M. At 5  $\mu$ M, GA significantly inhibited cancer cell viability. GA increased the expression of p53 at 20  $\mu$ M and Bad at 10  $\mu$ M in ovarian cancer cells. Our results showed GA has great potential for angio-prevention and treatment of ovarian cancers.

#### Kaempferol Inhibits VEGF and HIF-1 Expression in Prostate Cancer Cells

#### **Zachary Douglas**

Alderson Broaddus Biology Yi Chen – Advisor

Prostate cancer is the second leading cause of cancer deaths for men in America. Kaempferol is a flavonoid widely distributed in edible plants and has been reported to inhibit angiogenesis in ovarian cancer cells. To investigate whether kaempferol holds similar potential for angioprevention in prostate cancers, we studied cell viability, cell necrosis, and expression of several genes in 2 prostate cancer cell lines, employing MTS-based assay, LDH assay, qRT-PCR, Western Blotting, and ELISA, etc. Kaempferol reduced viability of both prostate cancer cells, and no necrosis was observed by kaempferol treatment. Expression of VEGF and HIF-1-alpha proteins was inhibited in both cell lines, while p21 mRNA was up-regulated in PC-3 cells. mRNA levels in ERR-alpha was reduced in PC-3 cells, and secretion of IL-6 was inhibited in DU-145 cells. In general, we found that kaempferol effectively inhibits VEGF expression in prostate cancer cells through multiple pathways/mechanisms.

# Regulation of interferon $\beta$ expression by microRNA in human astrocytes: A novel therapeutic approach for multiple sclerosis.

#### **Brandon Kirby**

Bluefield State College Biology Tesfaye Belay – Advisor

Multiple sclerosis (MS) is a common neurological disease characterized by inflammation in the brain and spinal cord. Intravenous Interferon beta (IFNB) is currently the most successful therapy available to MS patients because of its antiinflammatory and neuroregenerative effects, but achieves suboptimal treatment due to limited access to the central nervous system. A receptor, astrocytic Toll-like receptor 3 (TLR3), is a key player in IFNβ production in MS lesions. Our lab has demonstrated that IFNB mRNA is rapidly degraded in receptor stimulated astrocytes. This degradation is coincident with the upregulation of several microRNAs that are enhancers of IFNB mRNA degradation. Therefore, we hypothesize that inhibiting these microRNAs will boost endogenous IFNB production by preventing degradation of its message and boost natural production of IFNB. For this study, human nervous system cells will be transfected with inhibitors (antagomirs) of the three microRNAs prior to the receptor stimulation. Culture medium will be analyzed for IFNB protein expression by ELISA. We expect that blocking these microRNAs will increase IFN $\beta$  production. This research is the first step in identifying a novel therapeutic approach for MS. (Supported by NIH Grant 5P20RR016477 to the West Virginia IDeA Network for Biomedical Research Excellence)

# Increased Infiltration of Leukocytes in the Regions of Genital Tract of Stressed during Chlamydia trachmatis Infection.

#### Sasha Richmond

Bluefield State College Biology Tesfaye Belay – Advisor

Chlamydia genital infection, a sexually transmitted disease caused by Chlamydia trachomatis, has high prevalence in populations of low socioeconomic status. The factors associated with the high prevalence are not well known, but stress is speculated to play a big role in enhancing infection. Research in our lab has shown that application of cold-induced stress results in decreased resistance to Chlamydia infection in the mouse model. The purpose of study was to examine whether increased susceptibility to infection was associated with high degree of pathology in the model. Hematoxylin-esoin stained histological sections of the genital tract was evaluated. During primary and secondary infections, acute inflammatory cells (neutrophils) in the cervix or uterus areas in stressed mice infected with chlamydia was more than two to three-fold increase compared to non-stressed mice. Infiltration of neutrophils in the oviduct of stressed and infected group was more than 100-fold increase in stress mice. These results suggest that the large number of infiltrating leukocytes is a sign of acute inflammation that may be enhanced by exposure to stress. Vaginal swabs from stressed different mice strains also showed inclusion bodies in large numbers compared to non-stressed mice confirming that stress exposure increases intensity of chlamydia genital infection.

# The Influence of Climate and Forest Disturbance on Eastern Hemlock Growth in Southwestern West Virginia

Josh Gelinas, Nathan Lawrence, and Mary Ryan
Concord University

Concord University Geography Tom Saladyga – Advisor

Climate and forest disturbance are important drivers in shaping forest composition, structure, and ecosystem function. Understanding the influence of these drivers on tree growth is crucial for informing scientifically-based management programs and predicting long-term forest dynamics. In southwestern West Virginia, temperatures have increased at a rate of 0.02°C per year since the late 1950's. In addition, widescale logging since the late 1800s has shaped contemporary forest landscapes in West Virginia. More recently, hemlock forests in the region have been invaded by hemlock wooly adelgid (HWA) an invasive forest pest that is contributing the rapid decline of eastern hemlock. Our research addresses the impacts of these factors on hemlock growth in southwestern West Virginia. Six permanent monitoring plots were established in July 2013 in Cabwaylingo State Forest in Wayne County. We collected tree core samples at each plot and used standard dendrochronology techniques to analyze relationships between climate, disturbance, and hemlock growth. Results indicate multiple growth disturbances during the 20th Century, most likely due to logging and the loss of American chestnut from Chestnut blight. Climate analysis indicates that hemlock growth was most consistently related to early summer precipitation. Future understanding and research of historic disturbance patterns and growth response to climate will be useful when applied to managing and predicting the impacts of HWA on these forest systems.

#### Ancient volcanic ash in faulted, fossil-bearing sediments near Summer Lake, Oregon

#### **Addison Hostetler**

Concord University Geology/Earth Science Stephen Kuehn – Advisor

Sediments deposited in an ice age lake near present-day Summer Lake, Oregon, contain an exceptional long-term record of explosive eruptions of Cascade Range volcanoes in the form of numerous layers of volcanic ash (tephra). Nearly all previous work in this area has been conducted in the northwestern part of the lake basin. We have studied additional exposures of tephra-bearing sediments from two main locations and several minor exposures in southeastern portion of the basin, including sediments that are far older than those known elsewhere. The southern main location exposes about 8 m of sediment, mainly on the upthrown (east) side of a north-south trending fault. The uplifted side yielded 8 rhyolitic tephras and 4 mafic to intermediate tephras. The most prominent layer is 30 cm thick and contains pumice up to 3 cm. This is exceptionally thick and coarse for a location that that is at least 55 km east from the nearest possible volcanic sources, and it indicates a very large and powerful eruption. The downthrown side yielded one rhyolitic tephra. Fish bones are abundant, and identification of one species (Ken Gobalet, written communication 2005) suggests that the uplifted sediments are more than 1 million years old. In one exposure, the fault juxtaposes young dune sand against the uplifted sediments, and another shows evidence for at least two distinct earthquake events. This suggests that the fault may have a long history, and it could still produce significant earthquakes. The second location exposes an additional north-south trending fault with about 6 m of sediment on the up thrown (east) side, and about 3 m of sediment on the down thrown side. At least six rhyolitic tephra layers are present ranging from 1 mm to 14 cm thick. We have chemically fingerprinted the tephra layers using the electron microprobe at Concord University. By comparing our data to a large database, we have been able to identify several layers. On the younger side of the main fault, two major regional marker layers, the Trego Hot Springs tephra and the Wono tephra are present. These have ages of 25 thousand and 29 thousand years, respectively. On the upthrown side of the fault, the main thick layer is chemically similar to layers found at Tulelake, California and in northeastern Oregon. These have ages of about 900 thousand and 2 million years respectively, similar to the range of ages suggested by the fish bones.

#### Differences in Reading Ability and Auditory Imagery during Silent Reading

#### **Julianna Phillips and Kimberly Cline**

Concord University Psychology Jessica Alexander – Advisor

Problems in reading ability can limit adult achievement in many ways, but the basic experience of reading may be different for good and poor readers. Auditory imagery (internally hearing what you read) during silent reading has been shown to be related to both text difficulty and individual differences in imagery ability. The current study examined individual differences in reading ability and auditory imagery for a speaker's voice during silent reading. After being familiarized with two speakers (one fast and one slow) in a casual conversation, participants silently read a passage "written" by one of the two talkers. Passage "author" influenced reading times when compared to a baseline passage, but only for readers who scored high on a test of reading fluency. Recent research has shown links between language ability and identification of talker's voice (Perrachione, Del Tufo, & Gabrieli, 2011), with dyslexic participants showing impairments in talker recognition. The current study builds on these findings, demonstrating differences in auditory imagery for talker's voice for good and poor readers more broadly. Literacy issues are especially important for impoverished populations, and understanding how reading ability and spoken language ability interact can help pinpoint how to best help those lacking in adult reading skills.

#### Effect of TRPV6 on Small Cell Lung Cancer Cells

#### Rebecca Martin, Cathryn Stevenson, William Rollyson

Davis and Elkins College Biology Shawn Stover – Advisor

Small cell lung cancer [SCLC] is an aggressive malignancy with a poor survival rate. Preliminary data in the laboratory shows that capsaicin [the active component of chili peppers] suppresses the growth of human SCLC cells in cell culture and animal models. The growth inhibitory effects of capsaicin were mediated by the transient receptor potential vanilloid 6 [TRPV6] receptor. However, the molecular mechanism by which capsaicin links to TRPV6 is not known. Data presented in this poster shows that capsaicin elevates the expression of TRPV6 in three human SCLC cell lines [DMS 53, DMS 114, and H69]. The treatment of human SCLC cells with 50  $\mu$ M capsaicin produces a two to three fold increase in TRPV6 levels. In contrast, the levels of TRPA1 stayed relatively constant upon treatment with capsaicin. Future studies in the laboratory will aim to investigate the mechanism by which capsaicin upregulates TRPV6 in human SCLC. (Supported by NIH Grant 5P20RR016477 to the West Virginia IDeA Network for Biomedical Research Excellence)

#### Development of a Method for the Quantification of Platinum-Bound Metallothionein in Human Blood Plasma

#### **Ryan Finnegan**

Davis and Elkins College Biology Shawn Stover – Advisor

Development of a Method for Quantification of Platinum-bound Metallothionein in Human Blood Plasma. Ryan Finnegan\*, Terence McManus\*\*, William Petros\*\*. \*Davis & Elkins College, Elkins, WV; \*\*Mary Babb Randolph Cancer Center/West Virginia University, Morgantown, WV Metallothionein (MT) is a small protein which helps protect against metal intoxication whose expression varies between individuals due to genetics and metal exposure. Metallic drugs such as cisplatin (CDDP) are important in the treatment of several malignancies, however they can be detoxified intracellularly by MT. We previously demonstrated that genetic variation in MT is associated with inter-patient variability in plasma CDDP. The purpose of this project is to develop a plasma assay to directly measure platinum-bound MT for interrogation of this detoxification mechanism. The method includes sample cleanup/extraction and quantitative analysis. Liquid and solid phase (SPE) approaches to extraction of the MT from plasma are being explored. Identification and quantitation of MT is determined by injecting extracted samples into a HPLC-MS-MS instrument. Injection of MT in mobile phase (100-1000 ng/mL) yielded a linear calibration curve with (r2 0.89). Protein perception using liquid extraction failed to recover a sufficient amount of MT. Initial attempts using SPE also produced poor recoveries (< 5%) and inadequate standard curve linearity (r2 0.63), however manipulation of eluting solution is producing recovery amounts (~45%) which should be sufficient for reproducible analyses. This work is a key component toward establishment of an individualized dosing technique for cisplatin. (Supported by NIH Grant 5P20RR016477 to the West Virginia IDeA Network for Biomedical Research Excellence)

# USING AQUATIC ORGANISMS TO ASSESS THE EFFECTIVENESS OF ACID MINE DRAINAGE REMEDIATION IN THE THREE FORK CREEK WATERSHED

#### **Zane Dennison**

Fairmont State University Environmental Studies Mark Flood – Advisor

How does acid mine drainage (AMD) affect aquatic species of the Three Fork Creek and its tributaries? In order to answer this question, native aquatic organism abundance and diversity will be assessed in addition to subjecting water fleas (Daphnia magna) to water collected from Three Fork Creek and its tributaries. Water is an integral part of life. In addition to the human body being composed mostly of water, this molecule covers nearly three-fourths of the Earth's surface, and is home to hundreds of thousands of species. The quality of the water in which an organism lives can either provide an advantageous environment that promotes life and reproduction or it can be toxic, hindering life and development. Water quality varies from location to location, and is commonly altered by human and industrial influences. The state of West Virginia has historically flourished in the coal industry. In recent times, coal mining has waned, leaving several abandoned mines in the state, particularly in North-Central West Virginia. These mines have been left to wreak havoc on the local environment. As rainwater and groundwater flow through these mines, acid mine drainage is formed, producing sulfuric acid. The addition of sulfuric acid to water sources lowers the pH of the water, affecting those species that rely upon the water for a habitat, for reproduction, and for sustenance. As a result, the aquatic life in the bodies of water, including Three Fork Creek and its tributaries, disappear, unable to survive in the altered environment. In particular, Daphnia magna is a model organism that is affected by AMD. Daphnia magna is a small, aquatic arthropod that serves as a food source for larger aquatic animals, namely fish. When acid mine drainage is present and the pH of the water lowers, Daphnia magna begins to disappear. The disappearance of Daphnia and other species of aquatic macroinvertebrate species leads to death or migration of larger species in the water source. In an attempt to rectify the chemical effects of acid mine drainage in the Three Fork Creek and its tributaries and to reverse the ecological damage due to it, the Save the Tygart Watershed Association monitors the local streams and works towards remediation of AMD. The current active remediation of acid mine drainage through 4 limestone dosers should result in the eventual repopulation of the Three Fork Creek and its tributaries with abundant aquatic life.

### **Does Local Marcellus Well Drilling Impact Water Quality In Streams?**

### **Dustin Spencer**

Fairmont State University Environmental Studies Mark Flood – Advisor

We will collect data from streams surrounding the Marcellus wells dug in the tricounty (Marion, Harrison and Taylor counties) area to monitor whether or not the fracking solution and ground disturbance are affecting the composition of the stream.

## The effect of water temperature on early response gene, c-Jun, in Aptasia Pallida

Morgan Scarpellini Glenville State College Biology Sara Sawyer – Advisor

Cnidarian bleaching results from the loss of the symbiotic dinoflagellate algae from their animal host. The underlying cellular mechanisms causing this beaching are not well understood, but previous research has shown that increased temperature changes the distribution of integrins, which are cell-substrate-adhesion molecules in the symbiotic anemone, Aiptasia pallida. Integrins are an important element of many different intracellular signaling pathways including those that determine cell survival in this anemone. We are investigating temperature-induced activation of signaling pathways by using real-time quantitative PCR (rt-qPCR). This method allows us to determine if temperature alters the expression of genes known to be used in cell survival signaling pathways. Our main focus is investigating whether increased temperature changes expression of c-Jun, an early response gene and a feature of the transcription factor AP-1. AP-1 is a transcription factor whose expression is activated through the MAP Kinase signaling pathway and together with c-Jun controls the balance between cell survival and cell death. We are investigating whether increased water temperature affects the expression of c-Jun in the tropical sea anemone, A. pallida. Anemones are heat shocked from 25o C to 30o C for periods of 1, 6, and 12 hours, then the expression levels of c-Jun are determined by rt-qPCR. The results of this study will aid in understanding the underlying cellular processes that result in temperature-induced coral bleaching.

#### **How to Tell If Your Honey Bee is Depressed**

#### **Judith Urbanic**

Glenville State College Psychology Alan Daniel – Advisor

Animal models of anxiety fall into three categories: innate behaviors, presentation of aversive stimuli (termed "physical pain"), and removal of appetitive stimuli (termed "psychological pain"). Despite the latter category being the most applicable to many human anxiety disorders, has received the least attention. The present study explored the behavior of honeybees during a surprising reward loss situation. The impact of reward loss was reduced by lowering expectations (Experiment 1) or by previous experience with loss (Experiment 2). Experiment 3 explored whether treatments that are known to influence physical pain in bees also affect psychological pain, and whether the underlying neurochemistry is shared. Together, these results provide strong evidence that the similarity between physical pain and psychological pain in bees is analogous to the relationship between physical and psychological pain in vertebrates.

# Investigating the timing of the onset of apoptosis and the alteration in integrin distribution during temperature shock in the symbiotic anemone Aiptasia pallida.

#### **Aesha Peters**

Glenville State College Biology Sara Sawyer – Advisor

Temperature-induced cnidarian bleaching is becoming an increasing problem on coral reefs threatening the health of coral ecosystems, but the cellular mechanisms that lead to collapse of the cnidarian-algal symbiosis are not well understood. Studies have shown that increased water temperature induces apoptosis in host and algal cells, and this is correlated to the loss of algae, but how temperature triggers apoptosis is not clear. We have shown that the distribution of the cell-substrate adhesion molecule, integrins is altered after a 12hr heat shock from 25°C to 30°C in symbiotic Aiptasia pallida but not in aposymbiotic anemones. This loss of integrin staining in symbiotic anemones is preceded by the initiation of apoptosis after 4 to 6 hr of heat shock, as determined by TUNEL staining. Apoptosis is not triggered in aposymbiotic anemones during a 5 to 12 hr heat shock. These results suggest that temperature-induced apoptosis and alteration of integrin staining in A.pallida are symbiotic phenomena. The signaling pathways that link apoptosis and integrin expression are being investigated

#### Effects of Free-ranging domestic Cats on Avian Parental Nest Visitation

#### **Adrian Patterson**

Glenville State College Biology Ross Conover – Advisor

Free-ranging domestic cats (Felis catus) are an introduced predator that represents a significant threat to North American songbird populations. The direct effect (e.g., predation) of domestic cats on songbird populations is well documented, but indirect effects (e.g., behavior) are less understood. Though it seems likely this threat is manifest through behavioral changes, little evidence exists to indicate what and how songbird behavior may be altered. Behavior is associated with productivity and hence, elucidating behavioral effects of free-ranging domestic cats will assist our understanding of songbird conservation. This study investigates the behavioral effects that cat presence has on parental nest visitation rates. This study was conducted during the 2013 bird breeding season by monitoring bird nest boxes on a 120 hectare forest in Gilmer County, WV. We estimated parental visitation rates by video recording nest boxes with 4-5 day old nestlings. Recording occurred under three treatments: 1) normal circumstances (no manipulation), 2) predator presence (taxidermy-mounted cat), and 3) a control group (taxidermy-mounted rabbit). We monitored eight nests, including Carolina Wren (n = 2; Thryothorus ludovicianus), Carolina Chickadee (n = 1; Poecile carolinensis), and Eastern Bluebird (n = 5; Sialia sialis). The parental nest visit totals were: no mount 89, cat 63, and rabbit 76. Overall, during the cat trial parent birds visited the nest 1.5 fewer times than during the no mount trial. An understanding of these effects may assist songbird conservation efforts and free-ranging cat management strategies throughout North America.

#### Resveratrol Protects Human Kidney Cells from Doxorubicin Toxicity

#### Linh Vu

Marshall University Biology Monica Valentovic- Advisor

Doxorubicin (DOX), or Adriamycin, is one of the most commonly used cancer chemotherapeutic agents for treatment of breast, ovarian, small cell lung cancer, acute and chronic lymphoid leukemia. Doxorubicin is toxic to the heart and kidneys. It is important to minimize doxorubicin-induced side effects as adverse reactions result in stopping doxorubicin treatment or reducing the dose and both of these scenarios will decrease doxorubicin efficiency in killing cancer cells. Resveratrol (RES) is a natural compound found in grapes, berries, and nuts. RES possesses antioxidant and anticancer properties. This study tested the hypothesis that RES will reduce doxorubicin cytotoxicity in human noncancerous renal proximal tubular epithelial cells (HK-2) and RES will attenuate doxorubicin mediated oxidative stress. HK-2 cells were grown for 48 h. Cells were next pre-incubated for 1 h with 0 (DMSO), 5, or 7.5  $\mu$ M RES followed by a 24 or 48 h co-incubation with 0, 1, or 2  $\mu$ M DOX. Cell viability was assessed using an MTT assay. Results showed that doxorubicin decreased cell viability in a concentration dependent manner and RES increased cell viability in cells exposed to doxorubicin. Protein carbonyls, an indicator of oxidative stress and detected by OxyBlot Western analysis, were increased by doxorubicin and reduced by RES. Additionally, RES decreased protein carbonyls in cells exposed only to RES. ADP/ATP assay determined RES preservation of cellular ATP following doxorubicin exposure. RES reduced doxorubicin cytotoxicity in HK-2 cells at doxorubicin concentrations that are clinically relevant.

#### **Storm Information Reporter Emergency Network (SIREN)**

#### **Shawn Cheeks**

Marshall University Computer Sciences Paulus Wahjudi, Kevin Law – Advisors

During active severe weather events such as tornado outbreaks and flash flooding, having eyes on the ground is an extremely valuable asset to the meteorologists responsible for issuing public alerts. SIREN is an Android application that allows its users to submit reports containing the specific information these meteorologists need in order to issue accurate and timely alerts. SIREN prompts users for information based on that which National Weather Service's SKYWARN spotters are asked to report. Once the report is complete, SIREN sends an email containing this information to the meteorologist, allowing the meteorologist to have another resource during these possibly life-threatening events. Before SIREN, these reports were submitted primarily by phone call, but also by social media sites such as Facebook and Twitter. A reporter making a call to the NWS office underwent an interview by a meteorologist. This interview allowed the meteorologist to confirm the accuracy of the report and to gain the information necessary, but it required the full attention of the meteorologist. As such, an office is limited in the number of reports it can take at any given time. The reports by social media are useful because they are usually include precise location information and a picture, but they rarely contain all of the information needed by meteorologists. During SIREN's development, meetings were held with the National Weather Service office in Charleston, WV, and these recommendations from the meteorologists there were incorporated into the development to ensure SIREN provides the information needed. These recommendations included an adaptive questioning technique where questions are determined based on previous answers, simulating the interview (for example, questions about a flood event are different from those about a tornado, hail, or wind event). SIREN also allows for the reporters' location to be included in the report, as well as pictures of the event. Currently, SIREN is undergoing field testing by the Charleston office and further development is in the planning stages.

#### **Borderline Personality Disorder and Attachment**

#### **Jessica Smith**

Marshall University Psychology Marc Lindberg – Advisor

Borderline personality Disorder (BPD) is a personality disorder discernible by unstable relationships, behaviors, moods, and self-image that hinder the person's social relationships and occupations and cause extreme emotional distress. Why do individuals develop this disorder? It was the purpose of the present investigation to answer this question. The participants are college students. We will test the students with survey methodology, they will complete measures of early adverse childhood events, attachments and clinical issues, and then measures of borderline personality disorder. Correlations will be calculated between these instruments to give answers to the question of why some develop this disorder. The results will be discussed in terms of clinical interventions.

### Hot Spots for Deer Vehicle Collisions in West Virginia

### **Andrey Yanev**

Marshall University Computer Sciences Paulus Wahjudi

Deer vehicle collisions are very common in West Virginia. For six straight years, State Farm Insurance has ranked West Virginia as the #1 state in terms of probability of a driver hitting a deer. Because of this ongoing problem, the West Virginia Department of Transportation has funded a research project to identify hot spots for deer-vehicle collisions so that they can be investigated for possible mitigation. That study utilized statewide location data obtained from police crash reports that indicated a deer was involved in the crash. After a driver has hit a deer, the police often fill out a crash report and mark that a deer was the cause of the crash. The location information for each crash is reported, and the route and milepost to the nearest tenth of a mile are recorded. There were approximately 6,000 deer vehicle crash reports from 2008-2012. The analysis conducted for that study divided the roadway network into fixed \_ mile segments for analysis. For example, segment 1 on I-64 was from milepost 0.0 to 0.5, segment 2 was from 0.5 to 1.0, and so on. This is not the preferable method to use for identifying hotspots since the start and end points are fixed. Instead, it would be preferable to analyze all possible half-mile segments, from 0.0 to 0.5, 0.1 to 0.6, and so on. [needs a conclusion or summary statement]

#### **Agent-Based Modeling of Pandemic Influenza**

## Roger Estep, Robert Hughes, and Jessica Shiltz

Marshall University Mathematics Anna Mummert – Advisor

A striking characteristic of influenza pandemics, the most recent of which being the 2009 H1N1 Swine Flu pandemic, is the multiple peaks of infection. For example, the United States has experienced two peaks of infection in each of the past four influenza pandemics: one peak during the summer months and a second peak during the typical flu season. In contrast, the number of infected individuals peaks only once during seasonal flu. The mechanisms that cause the multiple peaks of infection during pandemic influenza seasons are not well understood. The goal of this project is to use agent-based modeling to investigate mechanisms that can generate two peaks of infection. We will describe the susceptible-exposedinfectious-recovered (SEIR) agent-based model developed in Netlogo for simulating the 2009 H1N1 influenza pandemic. The model is calibrated by matching known average daily contacts and key epidemiological quantities, such as the basic reproduction number, the number of new infections generated from one infectious person at the beginning of the outbreak. Also, we will discuss the effects of proposed mechanisms like waning immunity on the generation of multiple peaks of infection.

#### Validation of a Unilateral Heating Model to Increase Extremity Length in Mice

#### Jenna Vance

Marshall University Biology Maria Serrat – Advisor

Limb length inequality is a condition that sometimes occurs when the arms and legs grow to uneven lengths after a bone injury or infection in children. Studies show that differences as small as 3-4% can affect walking. Without proper correction, limb length inequality can cause disabling health conditions such as scoliosis, chronic back pain, and osteoarthritis. Leg length differences can be treated surgically, but this is typically painful and sometimes requires the patient to wear external braces that are drilled into the shorter limb. Other treatment options include drug therapies, which are not always successful because they affect the whole body and not just the stunted limb. I joined the lab as a research assistant to aid in a new project addressing bone growth in the extremities. The goal of our study is to evaluate whether applying heat locally could be used as an alternative to surgery in order to increase bone length. Using an experimental model with mice, my mentor's previous work showed that housing animals continuously at warm temperature increased bone length by 5%. Based on those findings, we developed a unilateral heating model in which we apply mild heat once per day to only one side of growing mice. We hypothesize that localized unilateral heat increases bone elongation rate on the heat-treated side. Working as part of a team, I have been highly involved in the analytical aspects of the project to validate this model. I have created quantitative data templates, collected bone mass data, and helped prepare histology slides to analyze bones microscopically. I am currently analyzing vascular densities in the extremities to determine the impact that heat has on the nutrients available to aid in bone growth. Here we present data that support our hypothesis and validate the unilateral heating model. We were able to develop consistent parameters for applying heat treatments with no adverse affects on mouse welfare. We show that localized heat increased bone length by almost 2% on the heattreated side. Having established this result, we can move forward to test additional hypotheses in future studies to determine how heat increases bone growth rate. These results are important to society because the application of heat could be a cost-effective strategy to increase bone length using simple, noninvasive techniques.

# Application to Evaluate the Performance of Vehicle Detection Systems at Signalized Intersections

## Jonathan McQuerrey and Allen Whitt

Marshall University Computer Sciences Paulus Wahjudi – Advisor

Transportation is a critical aspect of our society. The ability for motorists to move efficiently with minimal delay is more crucial now than any other time in recent history. With the number of vehicles on the road increasing, it is paramount that these people are safe, but able to get to their destinations quickly. With these issues in mind, traffic signals are one aspect of the transportation system that provides an opportunity to improve safety and efficiency. Most traffic signals utilize some sensor to detect vehicles at the intersection and change the lights accordingly. The two most common sensors are inductive loops in the pavement and video cameras above the intersection. Cameras work by drawing an area of interest in its field of view to trigger when an object moves into the section. Typically, there are one or two cameras installed per approach to provide maximum coverage. The inductive loops consist of wires coiled in the payement that are energized: the inductive field is activated when a car passes over it. Once the sensors detect a vehicle, they send a signal to the traffic signal controller to allocate green time. Aldis Corporation has developed a new camera that utilizes a fisheye lens that works on the same principles as the existing cameras, but is capable of seeing all lanes. There are considerable cost savings in installing and maintaining a single camera at an intersection, compared to four. In order for the WV Department of Transportation to consider using this new technology, they must evaluate its performance compared to the existing technologies. The purpose of this project is to develop an application to facilitate this evaluation.

# Using *Acanthamoeba* to determine the effect of environmental stressors on growing and dividing cells

## Laura Arnold, Alex Hunt, Anthony Workman

Marshall University Biology Wendy Trzyna – Advisor

Acanthamoeba spp. are members of a diverse genus of protists found ubiquitously in soil and aquatic environments. They are important ecologically because of their abundance, and because some strains are opportunistic pathogens causing human infections. Hundreds of strains have been described; many which display distinct physiological properties. Among the various properties of *Acanthamoeba* that make these microbes particularly interesting targets of investigation is their ability to form a resting stage. *Acanthamoeba* undergo encystment when they encounter overwhelming stress in their environment, which may include elevated temperature, hyperosmolarity, lack of nutrients, or chemical contaminants. Encystment is a cellular differentiation event that results in formation of a highly resistant cyst. Precise conditions have been defined in this laboratory for triggering encystment, and consequently we are able to manipulate this event *in vitro*. Moreover, cysts are readily distinguishable from the actively feeding trophic form. These features have been exploited in a simple plating assay that we have refined in this laboratory. In these experiments, we have shown that trophic amoebae respond to "stressors" that are added to the environment of the media. We have shown this effect through increasing osmolarity by the addition of NaCl to nonnutrient agar plates. *Acanthamoeba* cysts were inoculated on streaks of *E. coli*, and only excysted into trophic form at levels of NaCl suboptimal for triggering encystment. This rapid, cost-effective methodology was then applied to the evaluation of various environmental contaminants on growing and dividing cells. Current studies in this laboratory have shown the effect on cells of the herbicide, Atrazine, a chemical contaminant that is often found in rivers and streams. Acanthamoeba cysts were plated onto varying concentrations of Atrazine. At low levels, cysts excysted and began growing at rates similar to the controls. However, at increasing levels of Atrazine, proliferation of the trophs occurred more quickly. Interestingly, Acanthamoeba have also shown an apparent "adaptation" to these stressors and seem to retain the acquired properties over future generations. Further studies are underway to test the effect of a variety of environmental contaminants and their effect on growing and dividing cells, including their potential to cause stable, genetic alterations in *Acanthamoeba*.

## An Analysis of Criminal Behavior in College Students

#### **Claire Virgin**

Marshall University Psychology Marc Lindberg – Advisor

An Analysis of Criminal Behavior in College Students College students filled out measures of delinquent behavior, measures of early adverse childhood experiences and a 29 scale battery measuring attachments and clinical issues. The purpose was to perform a parallel analysis of criminals convicted for similar crimes and college students. Participants currently being tested are college students ranging from the ages of seventeen to twenty four and 293 female and 211 male prisoners in maximum security prisons. The dependent variable in the study is the total number of crimes committed. We will examine those factors most predictive of crimes in general and also if similar patterns are found between these different populations. These results will be discussed in terms of new approaches to dealing with prisoners to reduce rates of recidivism saving the state money and facilities by improving early release programs in this state.

#### **PinPoint: Indoor Positioning System**

#### **Keyur Patel and Daniel Davis**

Marshall University Computer Sciences Paulus Wahjudi – Advisor

The goal of this research project is to develop an Indoor Positioning System framework that will allow users to navigate an indoor environment by using a mobile device. This system will be a general framework that can be implemented by potentially any organization. As a proving ground for the system, an Indoor Positioning System will be developed using the Huntington campus of Marshall University. GPS navigation systems provide an excellent solution for outdoor navigation purposes, but their usefulness ceases when one enters the confines of a building. GPS satellites can only establish a location within a radius of 10 m. If one is outside of the radius, the target location is likely visible with that level of accuracy. The same cannot be said for indoor environments. Existing Indoor Positioning Systems require the retrofitting of buildings with strategically positioned Bluetooth beacons, which can cost a significant amount of money depending on the size of the organization. Furthermore, installing and maintaining these beacons would require a technical background to ensure that the positioning of the user was accurate. The Indoor Positioning System could be used to benefit individuals across a variety of areas. There are many situations when an individual would need to reach an indoor target destination in the most timely and efficient way possible. Potentially the most important navigational issue that could be solved by the use of an Indoor Positioning System is that of emergency medical service personnel. Seconds lost in trying to pinpoint a location of a person in distress could result in loss of life. In this situation, finding the most efficient path to an indoor destination is critical to success. The complexity of navigating a large airport is comparable to that of the U.S. Interstate highway system. This is a problem for those trying to quickly reach a pending flight. Finding one's way through the labyrinth of hallways of a hospital can be equally as challenging, especially for someone already in need of treatment. There is no greater aggravation to a sports fan or concert-goer than to miss the beginning of the event because they could not find their seat. Even the environment of a university campus can provide an overwhelming navigational experience for incoming students. All of these organizations could solve this problem by implementing an Indoor Positioning System. [states the problem but not an approach to address it]

### WIT: A Wearable Integrated Translator to Break Down Communication Barriers

## **Dylan Watson**

Marshall University Computer Sciences Paulus Wahjudi - Advisor

As a global society, we are becoming more interconnected everyday. Being so interconnected opens up new possibilities, such as global leaders working together to obtain peace or just expert scientists coming together to work on cutting edge research. We already have this, but with some troubles because there are often language barriers. This is often solved by having translators, which is very expensive and not practical for most. Another solution is for the person to learn another language, which is hard and can take years to fully be able to speak it. There needs to be a quick, cheap, and readily accessible way of translating languages. My project is to use Google Glass as an apparatus to break down these communication barriers between people who speak different languages. Using Glass's microphone, bone conductor, and display, I will develop an application that can translate to and from any language. When the Glass user is about to speak, they will tell Glass to listen. Then that Glass message will be sent to a server using my application, which is translated into the language specified by the other Glass user. That message is then pushed to other user's of Glass in their selected language where they will have the option of the message being read out loud and being displayed in Glass's display. This communication can be between one person and another who speak different languages, or a large audience of people who speak all different languages.

## Geo-Spatial Analysis of Police Reported Collision Location Information Accuracy to Facilitate Identification of Hot Spots

#### **Robert Denzie**

Marshall University Engineering Andrew Nichols – Advisor

Police crash reports provide important information for the insurance industry to handle claims resulting from crashes and for the judicial system to handle necessary charges and litigation. In addition to these common uses, crash reports also provide vital information for engineers to analyze crash trends and identify frequent crash locations (i.e., hot spots) to be investigated for mitigation. If the crash location information documented on the crash report is not accurate, hot spot analysis cannot be conducted with reliability. The purpose of this project was to evaluate and correct the locations of crashes in West Virginia using Geographic Information Systems (GIS). The crash records analyzed were limited to those flagged as deervehicle collisions during the period of 2007 to 2012. The information used to determine the location of the collision came from three possible fields in the crash report: GPS coordinates recorded in the officer's car, route number and mileposts (also known as a Linear Referencing System), and any additional description of the location provided by the officer (e.g., 1 mile south of Burger King). Inaccuracies can be caused by officers recording GPS coordinates of the location where they completed the report rather than the location of the crash, not knowing the milepost of non-interstate roads, and others. The GPS and LRS were sorted into two lists and plotted using GIS software, while the additional descriptions of the locations were in an Excel spreadsheet. The GPS and LRS data was compared based on county location, route type and route number, and the additional description of the location. The crash records were verified to match the existing GPS, verified to match the existing LRS, assigned a new location, or not verified due to insufficient information. The verified crash locations were compiled in the GIS program to be used in the hot spot analysis. Of the 7,192 data points analyzed, 80.2% were verified to match the original LRS data and 5% were verified to match the original GPS data. Only 0.3% of the crashes were assigned a new location, whereas 14.5% were not verified because there was no location data provided or the information was insufficient.

## Surface Modifications of Silicon Dioxide Nanoparticles Under Ambient Conditions

## Miles Gray

Marshall University Chemistry Rosalynn Quinones-Fernandez – Advisor

Silicon dioxide (SiO\_2) nanoparticles have unique surface properties that may be altered via surface modifications, which include semicondutivity or more specifically SiO\_2's photonic and electronic properties which attract great interest because of their use in solar cells and laser diodes. In this study, the organic acids octadecylphosphonic acid, 16-phosphonohexadecanoic acid, and 12-phosphonodecyl phosphonic acid in controlled concentrations were reacted with the SiO\_2 nanoparticles in order to form an alkylphosphonate monolayer on the entire surface. Infrared spectroscopy (IR) and Scanning Electron Microscope-Energy-Dispersive X-ray Spectroscopy (SEM-EDX) techniques were implemented in order to determine if the reaction was a success and to determine the degree of surface coverage respectively. Solid-state nuclear magnetic resonance (SS-NMR) techniques were used to analyze and determine precisely how the acids bind to the SiO\_2 surface. It was found that the degree of surface coverage varied with changing acid concentration and the phosphonic head groups of the acid were bound to the SiO\_2 surface in bidentate and tridentate manners.

## **Cancer Research Performance Analysis**

#### **Matthew Baird**

Marshall University Computer Sciences Hyoil Han – Advisor

Past cancer research has been performed using multiple techniques with varying research results. This project will analyze cancer research techniques by downloading and parsing papers using natural language processing in order to identify the different techniques. Paper from the National Center for Biotechnology Information (http://www.ncbi.nlm.nih.gov/pmc/) will be processed in order to perform clustering and similarity algorithms on their research techniques and then to analyze similar findings between studies using similar research techniques in order to report on the performance of these techniques.

## **US Population Shifting and Growth Over Time**

### **Matt Nelson**

Marshall University Computer Sciences Hyoil Han - Advisor

This project will analyze populations of states and how they have changed over the course of the last thirty years utilizing United States census data. My goal is to find and predict areas of population growth for developing future population centers. I intend to use clustering and statistical analysis to process the data. Other data mining techniques, such as classification, may be used if necessary. The data will come from the United States Census Bureau, which is available at http://www2.census.gov/.

## Recomendation Software via Data Mining

#### **Derrick Paris**

Marshall University Computer Sciences Hyoil Han - Advisor

In general, recommendation software allows users to receive suggestions on new potential interests. Companies like Amazon and Ebay having been using customer data to find what other products that customer may be interested in. Recomendation software does not have to just apply to marketing though, recomendation software could even be built out to show people new topics that they may interested in. For my project I want to build out movie recommendation software that can analyze what movies a user has watched in the past, how they rated those movies, and recommend a new movie that the user may be interested in. This will require data mining techniques so that I can group movies and find what recommendations would be best to make to a user. Specifically, I will be using clustering techniques to create user groups who have a similar rating, and then use the result for further classification. The result of our recommendation research can be used for targeted advertisement and for increasing company revenue. I will be using the MovieLens dataset from grouplens.com. This dataset will provide me with up to 10 milion ratings from 72,000 users.

# Which Type of Aggregate of Alpha Synuclein Increases the Permeability of the Rough Endoplasmic Reticulum to Small Molecules?

#### Andrew Abrahamian

Shepherd University
Biology
William Wondelin - Advisor

Which Type of Aggregate of Alpha Synuclein Increases the Permeability of the Rough Endoplasmic Reticulum to Small Molecules Andy Abrahamian, William Wonderlin. Department of Biochemistry, Robert C. Byrd Health Science Center, West Virginia University, Morgantown, WV. The protein alpha synucelin (AS) has been observed to increase the permeability of the rough endoplasmic reticulum (RER) to small molecules. This increase could result in a loss of calcium homeostasis. This mechanism of cell death in neurons is believed to contribute to neurodegenerative diseases. The toxicity effect of AS is commonly believed to result from the formation of one or more types of aggregates. The goal of this research was to test the hypothesis that stimulation is caused by the colloidal aggregate. We expressed both a wild type and A53T mutant strand of AS in BL21 cells, which favor colloidal and amyloid aggregates respectfully. We then isolated the protein from the periplasm, via permeabilization, centrifugation and column chromatography. Fluorescence was then performed on permeabilized CHO-K1 cells to measure the effect of the protein on RER permeability. Assays were performed using concentrated fractions of both types of AS, certain fractions were heated for various periods to stimulate wild type colloidal aggregation and mutant fibrillar aggregation. AS was observed to cause sizable stimulation, but there was no difference in stimulation between either type of AS. We will continue with biochemical assays in order to verify which aggregates were formed from each strand.

# Two Dimensional Versus Three Dimensional Cell Culture of B16 Melanoma Cells

**Logan Lyda** Shepherd University Biology

Qing Wang – Advisor

During the growth of melanoma cells in the mice, the cells grow in a three dimensional state. Understanding the behavior of B16 cells, a mouse melanoma cell line, in a more natural state could lead to a better understanding of how these cells grow in vivo and at what rate. These experiments attempt to show the difference between growth in routine two dimensional cell culture and growth in a three dimensional extracellular matrix, which more closely mimics in vivo growth. The growth of the cells is measured using the MTT assay. Comparison of growth rates allow us to better understand the parameters for a cell growth and may help in developing a model of growth of tumor cells in vivo. Supported by the NIGMS of the NIH grant as part of the WV-INBRE (P20GM103434).

# The role of the erythrocyte cytoskeleton during invasion by Francisella tularensis

## **James Birch**

West Liberty State College Biology Joseph Horzempa – Advisor

The causative agent of tularemia, Francisella tularensis, is highly infectious in nature. Fewer than ten bacteria can lead to a severe disease thus classifying this organism as a category A bioterrorism agent by the Centers for Disease Control and Prevention. A novel pathogenic feature of F. tularensis is its ability to invade erythrocytes, however the mechanism of entry into these host cells is unknown. Research has shown that cytoskeletal rearrangement of other cells such as macrophages and hepatocytes was required for entry of F. tularensis. Therefore, in this study, we evaluated the role of the erythrocyte cytoskeletal constituents for red blood cell invasion by F. tularensis. To test this, cytoskeletal inhibitors such as cytochalasin D and mitoxantrone, which affect actin filaments and phospholipid – spectrin ladder interactions, were added during the course of infection. Equivalent numbers of F. tularensis bacteria were found in erythrocytes treated with and without inhibitors suggesting that neither actin polymerization nor membrane-spectrin interactions were involved in bacterial entry. We are currently confirming these findings through alternative methodologies.

# Francisella tularensis is more sensitive to harmful compounds at mammalian body temperature relative to ambient temperature.

## Jesse Hall

West Liberty State University
Biology
Joseph Horzempa – Advisor

The World Health Organization estimates that approximately 14,000 deaths each year are due to antibiotic-resistant microorganisms. Because of the prevalence of antibiotic resistance, it is essential that we understand the mechanisms behind this phenomenon. Our laboratory has shown that various bacterial species, including Francisella tularensis, are more resistant to antibiotics at ambient temperature compared to mammalian body temperature. F. tularensis is a highly infectious microorganism that causes the potentially lethal disease tularemia. We hypothesize that this temperature-mediated difference in resistance is due to changes in expression of multi-drug efflux pumps. Therefore, we wanted to test whether F. tularensis exhibited this differential resistance to other harmful substances. Lysol was selected for this study since it effectively inhibits growth of F. tularensis. Various concentrations of Lysol were tested in order to determine an optimal dose that would decrease countable numbers of viable colony forming units but not completely eradicate this bacterium. Once identified, this concentration was tested at the different temperatures. There was more killing of bacteria from the Lysol at the mammalian body temperature compared to the ambient temperature supporting the hypothesis that multi-drug efflux pumps may be mediating the enhanced resistance at the lower temperature.

## Determination if erythrocyte invasion by Francisella tularensis increases colonization of ticks

#### Leanne Mazzella

West Liberty State College Biology Joseph Horzempa – Advisor

Francisella tularensis is a highly infectious bacterium that causes the severe disease tularemia. Humans acquire tularemia through inhalation, oropharyngeal exposure, or tick bites. A unique feature of F. tularensis is its ability to invade erythrocytes. In this study we investigated if red blood cell invasion enhances colonization of ticks, which could lead to increased transmission of disease. To test this, we used a predominant vector for this bacterium, Dermacentor variabilis. Ticks become infected with F. tularensis as nymphs and bacteria are maintained until adulthood. Subsequently, F. tularensis is transferred to humans during a blood meal. First, we sought to inoculate D. variabilis nymphs and adults in vitro through capillary feeding. Our experience was consistent with reports that indicate these ticks do not actively feed from capillary tubes, and require a live animal host to initiate feeding. Therefore, an alternative tick species, Ixodes scapularis was used as a model for this experiment since these ticks can also transmit F. tularensis and actively feed from capillary tubes. Currently, we are focusing on whether red blood cell invasion increases bacterial colonization of I. scapularis. The ticks will be fed infected red blood cells that are either intact or lysed prior to tick feeding.

## Removing Harmful Mercury from Coal

## **Stefanie Thompson**

West Virginia Institute of Technology Chemistry Richard Squire – Advisor

Mercury is present in nature in a number of forms, several of which act as a cumulative poison in livings species. In West Virginia fish consumption is the most likely source of ingestion to an individual. Mercury, found in coal, is emitted into the environment in multiple ways when used in a coal-fired electric power plant. This poster discusses a method of completely capturing and isolating mercury produced by coal-fired electric power plants. The method is possible by an indigenous bacteria complex that reduces mercury (+2) to its elemental form, making it less harmful and containable. Since there are no two power plants configured the same way adding an extra step would seem difficult. However, this step to remove mercury is low cost, and can be easily fitted to any coal fired plant just prior to the stack. By implementing this step we can not only improve our environment, remove a major issue, but also continue to utilize a valuable abundant resource.

#### **Maximizing Small Dam Hydroelectric Plants**

#### **Jordan Cox**

West Virginia Institute of Technology Engineering Farshid Zabihian – Advisor

West Virginia is known for its abundance of natural resources that can be used to produce power. Most people relate this to the state's long history of coal and growing natural gas industry. However, coal and natural gas are not the only resources available within the state to produce power. The Mountain state has an abundance of fresh water flowing through the streams and down the slopes. This water can be applied to produce hydroelectric power by using small dam hydroelectric plants. Hydroelectric plants, such as the one located at the Summersville Dam, take advantage of what West Virginia has to offer. In order to produce hydroelectric power a dam is usually required. The dam creates a reservoir to store the water to be used. However, dams are expensive to build and maintain. Many of the best locations for dams have already been used by organizations such as the United States Army Core of Engineers (USACE). Although these dams are owned by other organizations, they can still be used to bring business to West Virginia. The hydroelectric plant at Summersville Dam is a prime example of this. The Dam is owned by the USACE and the hydroelectric plant (hydro) is owned by Gauley River Power Partners (GRPP). However, hydro's power production is limited by strict water control regulations or technical orders established by the USACE. For over a year, I have been conducting research and investigating why technical orders are required to be so strict and limiting. I have searched for ways to negotiate with the USACE. I am currently using data collected from hydro to construct a model of current water control practice and power production. Once this model is complete, I will simulate the effects of improved water control techniques. My objective is to establish increasingly hydroelectric friendly technical orders. Congress has been working on a piece of legislature that will encourage small dam hydroelectric plant construction. Once this takes effect, many new opportunities will be available within West Virginia, not only to construct new plants, but to improve existing plants as well. The goal of this research is to find new ways to maximize the power production at hydro. This information will increase the feasibility of adding hydroelectric plants to other dams, not only within West Virginia, but across the United States. As a result, new methods for maximizing power will be explored and presented.

#### **Hydrogen Enhancement System**

#### **Steve Smith**

West Virginia Institute of Technology Engineering Farshid Zabihian – Engineering

Today's need for a renewable resource fuel has greatly increased since the 1970s. Gasoline and diesel fuel prices have skyrocketed from \$0.97 in February 1999 to \$3.41 in October 2013, that's a \$2.44/ gallon jump in a little over 10 years. This massive increase calls for a major change in the world of energy. Since the early 1970s, the Department of Energy and many other government and private companies have been researching different forms of renewable energy sources. Though NASA deemed it feasible to use hydrogen to enhance the fuel economy, environmental characteristics, and reduction of waste heat output for a high compression gasoline engine, the fuel has still not been implemented into widely used systems. Using hydrogen as a proprietary fuel has been proven improbable, but using it as a substitute for gasoline in small amounts is possible. The volume of hydrogen in an uncompressed form is the main reason for its unlikely use as a primary fuel source. When hydrogen is compressed it loses up to 40% of its power, not to mention that the pressure and temperature needed to facilitate the liquid state is incredibly high and low respectively. The idea using hydrogen in an Internal Combustion Engines has been around since the early 1900s. So what makes this project worthwhile? Typically an onboard hydrogen generator is powered by the vehicles power system i.e. battery or alternator. This version of an HHO Generator will incorporate a set of thermoelectric cells that will harness the waste heat coming from the exhaust of the engine. This energy is usually wasted making the thermal efficiency of the gasoline or diesel engine very low, typically between 26% and 32%. Over the past 5 years thermoelectric technology has come a long way moving from \$3000-\$4500/ kW down to \$300-\$450/kW, which makes them much more economical and feasible in low budget applications such as this one. This system will reduce emissions (CO by approximately 32%, CO2 by approximately 30%, and NOx by approximately 19%) and increase fuel efficiency by an estimated 3% to 4%. This will give an overall economic savings of roughly \$120-\$160 per 1000 gallons of fuel. The figures produced are from typical HHO dry cell systems running on the vehicles power system so gains with a thermoelectric power source can be expected to give higher yields and savings.

#### Applications of UAV's in West Virginia

#### **Derek Burdette and Jordan Cox**

West Virginia Institute of Technology Engineering Farshid Zabihian – Advisor

A group of three mechanical engineering students from West Virginia University Institute of Technology have come together to design and construct an unmanned air vehicle or UAV. UAV's are not a new technology. However, recently there has been a major interest in this area of development. There have been vast improvements to these vehicles to make them more efficient, diverse, cost effective, and available. West Virginia could benefit from this type of technology in many aspects. One major benefit is the ability to keep human beings out of a dangerous situation. There are many jobs within the state of West Virginia that have high levels of risk. Some of these high risk jobs include but are not limited to construction, emergency services (police, fire fighters, and various different task forces), coal mines, chemical plants, and severe weather teams. UAV's can help in these fields. For example, in the construction field, UAV's could be used to direct crane operators instead of putting human life in the way of the piece being set. UAV's can have many different uses in the emergency services fields. Police could use UAV's to go into a hostile situation to better prepare them for the scenario. Fire fighters could send UAV's into a burning building to perform a sweep to check for people trapped inside. Park rangers could use UAV's to search for a missing person more effectively. Specialized task forces could use UAV's for recon or surveillance use. The coal mining industry could use UAV's to monitor their mines by checking for methane gas, performing routine inspections for stress fractures on the ceilings or walls of the mines, and also analyzing various supports and mining equipment. The main goal with this technology is to be able to keep people out of danger zones as much as possible. Our UAV will be used to represent WVU Tech at the American Society of Mechanical Engineers (ASME) regional UAV competition. Our team has designed a light weight UAV frame that meets ASME specifications. We have also selected the required electronics to construct a working UAV. It has been designed to carry a two kilogram payload. This allows the UAV to carry thermal imaging or other sensory equipment. Our proposed UAV will not only be affordable and durable. It will also be versital. This competition will be an opportunity to show others what wild and wonderful things we can design.

## Feasibility of Improving Hydroelectric Power Production at London Lock and Dam

## Michael Perrow, Mario Paz, Raul Torres

West Virginia Institute of Technology Engineering Farshid Zabihian – Advisor

In recent years the mining and use of coal has been handicapped nationwide. In a state primarily powered by coal-fired electric plants the need for alternative energy sources is imperative to diversify West Virginia's energy production and prepare for possible future changes. There already are several hydroelectric power stations across West Virginia, (Hawks Nest Power Station, Summersville Power Station), which provide a source of renewable energy to the state of West Virginia. However, there are some smaller hydroelectric stations that much of the public is not aware of. The Locks and Dams located along the span of the Kanawha River are all equipped to produce electricity through the use of turbines. The primary purpose of these lock and dams were not to produce energy but to allow movement of large ships from one section of the river to another by raising the level of water. Therefore energy production is minimal because it was not the primary purpose for construction. Through our project we have isolated one Lock and Dam and studied it to find several ways of improving the production of renewable hydroelectric power. The London Lock and Dam located in London, West Virginia was the subject of this study. This particular facility produces 14.4 megawatts and a flow of 75,000 gallons of water per second is needed to generate the full output (US Army Corps of Engineers). We believe with the repair of several of the gates located along the dam part of the structure, a greater flow can be directed to the turbines which are operated and owned by American Electric Power. The increased flow could be enough to either allow for the implementation of more turbines or to maximize the production of the current turbines in place. There is an area inside the structure itself where a turbine was supposed to be installed but never was, if the turbine was successfully installed energy output would be increased. Turbines could also be placed where the water exits the locks when ships are raised and lowered. These optimization processes could raise energy production within the facility 10 to 25%. This however small it may seem when applied to all lock and Dams along the Kanawha River could be very significant. This could help alleviate the energy dependence from coal in a small but renewable way.

### **Human Powered Vehicle Challenge**

### **Edson Borja and Juan Suarez**

West Virginia Institute of Technology Engineering Farshid Zabihian – Advisor

Motored vehicles are the most popular means of transportation in most parts of the world. However, there have been big developments in human powered vehicles. These types of vehicles are always in consideration because they are considered being part of the ongoing green movement, which helps to reduce the global warming, because it generates no pollution. The way these vehicles work is using the mechanical energy that a user will provide by doing physical work. This energy will allow the vehicle to move. The ASME, American Society of Mechanical Engineers has been sponsoring and hosting an annual challenge where students need to design and manufacture a human power vehicle (HPVC). This competition consist in 3 events: the sprint event in which the acceleration and top speed is tested, the endurance test in which the rider has to go through different obstacles, and finally the innovation event in which the teams will be judge on the design and demonstration of a technical innovation related to their vehicles. Two senior students in Mechanical Engineering, Edson Borja, and Juan Suarez will be competing in the ASME Human Powered Vehicle Challenge (HPVC), which is going to be held at UCF (University of Central Florida), between April 11 and April 13, 2014. This competition requires the competing teams to design and manufacture a human powered vehicle able to meet certain requirements established by ASME. The students are also looking at a way to "complete" their vehicle by implementing an energy storage device located behind the back seat.

#### **Going Negative: Immigration Rhetoric in Congressional Hearings**

#### Richard Anderson, Jordyn Reed, and Derek Taylor

West Virginia State University
Political Science
Damien Arthur – Advisor

During the last decade, the political rhetoric regarding immigration has increasingly become more negative (Arthur & Woods, 2013; Golash-Boza, 2009; Beasley, 2006; Segovia & Defever, 2010). In fact, there is research that suggests certain conditions can predict an increase in the negative presidential rhetoric regarding immigration (Arthur & Woods, 2013). Similarly, this study seeks to ascertain if the context surrounding congressional hearings can compel members of Congress and immigration experts to use and entertain negative immigration narratives. In building a comprehensive database on the discussion of immigration, we address the pertinent variables that shape immigration rhetoric. Coding remarks from every congressional hearing regarding immigration from the 103rd Congress (1993-1994) through the 113th Congress (2013-2014) allowed us to ascertain if external factors predict negativity. Moreover, this enabled us to map-out the trends in the tone of immigration rhetoric, which exemplified how congressional leadership on immigration has changed over time and across various controls. Such an analysis provides insight into the externalities and contexts that shape congressional leadership. Rather than determining if congressional attention to immigration is capable of effecting change in the policy narrative, as an entrepreneurial mechanism of power, we think that understanding the dynamic as a way for members to capitalize on the public mood provides a better assessment of congressional leadership and decision-making—which, in turn, offers a more enriching analysis of the immigration discussion.

# ID2 Over-Expression Effects on Other Genes that are Dysregulated in Meningiomas

## **Stephen Heywood**

West Virginia State University Biology Gerald Hankins – Advisor

Although meningiomas are common primary central nervous system tumors, their pathobiology is poorly understood. Meningiomas are over twice as frequent in women as in men. Therefore the female sex steroid hormones progesterone and βestradiol are suspected factors in meningioma tumorigenesis. Better understanding of gene expression changes in meningiomas may help in the diagnosis, prognostics, and treatment of these tumors. We previously found that after treatment of meningioma cells with the histone deacetylases trichostatin A and sodium butyrate, expression of the Inhibitor of DNA Binding 2 (ID2) gene was up-regulated while expression of Transmembrane 4 L Six Family Member 1 (TM4SF1) was downregulated. TM4SF1, also known as Tumor Associated Antigen L6, is highly expressed in some carcinomas. We hypothesized that the up-regulation of ID2 gene expression could be responsible for the down-regulation of TM4SF1 while possibly also effecting the expression of other steroid-responsive genes that are dys-regulated in meningiomas. ID2 was transiently over-expressed in CH157MN meningioma cells using transfection with an ID2 expression vector. Effects on gene expression were evaluated using real time reverse transcription PCR. Although ID2 expression was up-regulated by over 100,000 fold, there was no significant change in TM4SF1 expression; therefore the results do not support our initial hypothesis. However, we observed significant up-regulation of expression of the growth factor, FGF2 (fibroblast growth factor 2) and a slight further down-regulation of NF2 (the neurofibromatosis type 2 gene). Fibroblast growth factor signaling has been implicated as important by our and other labs while down-regulation of NF2 is the most common known molecular change in meningiomas. Therefore, these results merit further investigation.

#### Over-utilization of Ultrasound in Suspected Deep Vein Thrombosis Patients

#### **Obadah Moushmoush**

West Virginia University Biology Albeir Mousa – Advisor

Background: Deep Vein Thrombosis (DVT) is the formation of a blood clot in one of the deep veins of the body. Pulmonary embolism is a fatal complication that can arise from DVT. DVT can be diagnosed using ultrasound, CT scan or MRI. A D-Dimer test can aid physicians in determining whether or not a patient should undergo an ultrasound to test for DVT. An ultrasound costs between 1200 to 1400 dollars and a D-Dimer test costs about 45 dollars. Objective: To examine the role of D-Dimer in reducing the over-utilization of Ultrasound testing in patients with suspected DVT. Methods: We reviewed the medical charts of 270 patients. Patients at Charleston Area Medical Center who were suspected to have DVT and an ultrasound test was performed from June 2012 to July 2012 were retrospectively included in the study. Results: 234 (86.6%) of the patients suspected to have DVT and an ultrasound test was performed a D-dimer test was not. Only 44 (18.8%) of these patients tested positive for DVT on ultrasound. Moreover, out of 7 patients who had a negative D-Dimer test, none had DVT on ultrasound. Out of 29 patients who had a high D-Dimer value, 4 tested positive for DVT on ultrasound. Conclusion: The D-Dimer test is being underutilized in patients suspected of having DVT. Patients should be considered for D-Dimer testing based on their clinical presentation and score on the Wells criteria. An ultrasound may not be necessary for patients with low clinical suspicion, low Wells score, and a negative D-Dimer. The study result can help reduce unnecessary testing and cost.

## Optimization of Liquid Spray Cooling in a Variable Gravity Environment

#### Michael Powell and Stephen Itschner

West Virginia University Engineering John Kuhlman – Advisor

The following describes the West Virginia University Microgravity Research Team's experience as a part of the NASA Reduced Gravity Education Flight Program. The proposed experiment examined spray cooling in a low gravity environment to determine the effect a gravitational force has on producing heat transfer, we also hoped to develop a characteristic equation between heat extraction and coolant flowrate. A closed loop flow system was developed to pump distilled water through an atomizing nozzle to shower an aluminum billet heated by a thin copper heater. A computer data acquisition (DAQ) system was employed to record temperature data from embedded thermocouples and the electrical power supplied to the aluminum billet. The collected data suggests that the removal of gravity has no discernible effect on spray cooling's ability to remove heat transfer, so optimization of such a cooling system would mimic that of terrestrial testing. Additionally, the successes and obstacles encountered by the team throughout the course of the program are discussed, and a summary is given of the community outreach conducted prior to flight week.

## Segregated Innervation and Nuclear Eccentricity in Calyx of Held Neurodevelopment

#### Kartik Motwani and Paul Holcomb

West Virginia University Biology George Spirou – Advisor

The positioning of nuclei inside of an animal cell is essential for its proper development and cellular migration, and is known to be functionally important for certain tissue types including cell layers in the cochlea and visual photoreceptors. However, little is known about the role of nuclear position in the development of other, non-layered systems after appropriate migration. A group of cells in the brainstem involved in auditory processing, called the medial nucleus of the trapezoid body (MNTB), seems to demonstrate the eccentricity, or the preference to one spherical pole, of the nucleus in mouse cells. These cells are innervated at maturity by perhaps the largest nerve synapse in the mammalian brain—the calyx of Held—which appears to respect cell polarity, as visualized by biochemical markers, by growing preferentially on the cell surface opposite the nucleus. To quantify cell polarity in the process of synapse formation, a novel method of electron microscopy using serial block-face sections at nanoscale resolution and 3D reconstruction of MNTB cells was applied at key time points in calyx development (2-9 days after birth). Two hemispheres of the cell—nuclear and non-nuclear were defined by a plane passing through its center of mass, referencing perpendicularly from the cell and nucleus centroids. Nucleus and synapse location on MNTB neurons were quantified by area using CAD techniques. Nuclei were eccentric (p<0.05, n=45) within the cell, and cell growth and synaptic terminal development were directed away from the nuclear pole. These data may reveal novel synaptogenic mechanisms with general applicability across developing neural systems. Potentially relevant developmental disorders include as genetic hearing loss, autism, schizophrenia and epilepsy. These disorders involve diverse abnormalities in synaptic connectivity in spatial and temporal dimensions, and a greater understanding of neural development provided by three-dimensional analysis may lead to early diagnosis and effective treatment.

## Type II diabetes and leptin resistance: Implications for Alzheimer's disease

## Kristen Schoonover, Holly Hunsberger, and Carolyn Rudy

West Virginia University Psychology Miranda Reed – Advisor

Diabetes causes cognitive impairments and increases the risk for Alzheimer's disease (AD). Using a diabetic mouse model (db/db mice), we compared the levels of two receptors, S-NMDARs and E-NMDARs, which have opposing effects on learning and memory. Synaptic NMDA receptors (S-NMDARs) are beneficial and facilitate learning and memory, whereas activation of extrasynaptic NMDA receptors (E-NMDARs) negatively impacts learning and memory function. We hypothesize that db/db mice will exhibit an increase in E-NMDARs and a decrease in S-NMDARs compared to littermate controls, providing a possible explanation for why diabetes causes cognitive impairment and increases the risk for Alzheimer's disease.

## Novel earth-abundant metal compounds with a modifiable outer sphere: Synthesis, characterization, and application to hydrogen-fuel generation

### **Trevor Butcher**

West Virginia University Chemistry Brian Popp – Advisor

Hydrogen gas remains one of the most attractive energy sources primarily because of its high energy-to-mass ratio and its environmentally benign side product, water. The fact that hydrogen gas produces only water when burned is an especially important feature when it is compared to the harmful carbon, nitrogen, and sulfur oxides formed when utilizing other energy sources. Furthermore, hydrogen is a valuable resource in its own right because, among other uses, it can be used to convert organic compounds into valueadded materials useful in everyday life. Despite the overwhelming advantages of hydrogen fuel, one of the main issues hindering its widespread use is the difficulty in making hydrogen in an efficient manner. In this study, we prepare and characterize a set of earth-abundant metal complexes (Mn, Fe, Co, Ni, Cu, Zn) and investigate their ability to catalyze hydrogen gas production from an acid source. These studies may lead to catalysts that can generate hydrogen fuel from low-power energy sources such as sunlight—a discovery that would be a major step in the development of sustainable fuels. Particularly important is that because these compounds can be modified in diverse ways, studies of their reactivity should lead to the identification of the best structure for a hydrogen-gas-forming catalyst. Such a development will provide important information not only to our efforts, but to all efforts in the field of catalytic hydrogen gas production.

#### **Electrostatic Charging in Gas-Solid Fluid Systems**

#### **Jonathan Tucker**

West Virginia University Physics Mark Koepke – Advisor

Electrostatic charging in the gas-solid systems (i.e. grain silos, plastic manufacturing, powder handling, etc.) can have adverse effects on performance and may also create safety hazards such as electrostatic discharges and explosions. A fundamental-level investigation of electrostatic charging behavior was conducted in an attempt to quantify and model the influence of granular charging on fluidized beds. The investigation focused on the effects of the materials and operating conditions on the particle charging. Conversely, the impact of the charged particles on the hydrodynamics of the system was also studied. A pair of fluid beds were constructed, operated and monitored independently and simultaneously in the fluidized states. Electrostatic potential difference, charge flux, particle size, particle electron affinity, pressure drop, and air flow were recorded. The recorded data was used in conjunction with general observations and discrete element modeling (DEM) computer simulations in evaluating the results of this investigation. Evidence collected in this investigation was consistent with the triboelectric mechanism being responsible for granular charging. Speculation of the work functions that are presumed to govern charge magnitude are presented from the data collected. A secondary focus of this study was evaluating methods to reduce or utilize the charges generated by the system. Natural dissipation of the charge built-up during the fluidized state was observed to occur at rates on the order of months. However, discharging took place in the presence of ultraviolet light. Results also indicated that both AC and DC current could be generated during the fluidized state to utilize the charge as it was generated.

### **Compassion Meditation Increases Positive Perceptions of Difficult People**

#### Arpan Prabhu

West Virginia University Psychology Julie Brefczynski-Lewis – Advisor

Numerous studies have shown that interpersonal stress consistently ranks among the top sources of stress in personal and work life for Americans. Encountering personally disliked people can cause great aversion and stress, though little research on the neural consequences exists. There is also a gap in understanding how best to cope with this relatively common stressor. Compassion meditation training is a potential therapy that has proven to decrease stress responses and increase empathy. In this study, 13 participants (age 45.4 years, range 26-63 years, 11 females) completed compassion meditation or relaxation training (control) exercises for 7 days. Brain activation was observed via fMRI and EEG for familiar disliked faces in comparison to viewing familiar liked faces and unfamiliar faces. Results showed increased right amygdala activation (emotion-related region) for disliked vs. liked faces and decreased activation after compassion meditation. Visual face-related regions such as bilateral fusiform (cognitive-related region) showed activation suppression below baseline for disliked faces. This suggests that compassion meditation may alleviate stress toward disliked others by reducing emotion-related and face-related neural responses. A long-term goal of the study is to extend our findings to persons with health disorders aggravated by stress who could benefit from compassion meditation training.

### Analyzing solar storms from MENA on the IMAGE satellite

#### Tessa Maynard

West Virginia University Physics Amy Keesee – Advisor

The Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite was launched in the Earth's magnetosphere in 2000 with the Medium Energy Neutral Atom (MENA) instrument attached. MENA is a slit-analyzing device that looks at neutral atoms and ions, and then calculates their velocities, incident angles, and temperatures as they pass through the magnetosphere. By doing such, images can be produced with spatial and temporal resolution. The data and images collected by MENA during geomagnetic storms are being analyzed. The data analysis will result in in graphs mapping the ion temperature in relation to time and position. Geomagnetic storms can be powerful and dangerous, knocking out power grids and satellites. Looking at the storm data will give us a better understanding of the dynamic relationship between the Earth's magnetosphere and the geomagnetic storms. Other scientists will benefit from this research as they can be better informed of the space weather conditions and type the of endurance and protection sophisticated technologies need when they must deal with the heavy bombardment of particles emitted from the sun.

### Assessment for Forecasting Earthquakes: L'Aquila Case Study

#### **Caitlin Ahrens**

West Virginia University Geology/Earth Science Thomas Wilson – Advisor

Whenever an earthquake happens, its primary waves (P-waves) produce shadow zones, or locations on the earth where the P-waves are not detected. Wherever those shadow zones intersect a fault line or tectonic plate edge, there is also the probability that earthquakes on those rings will occur within a limited time following the earthquake of interest. The research evaluates earthquakes from around the world that occur on the P-ring shadow zones associated with earthquakes detected in the L'Aquila, Italy seismic regions of 2009. The study compares the characteristics of ring events with those observed from the L'Aquila regions. The analysis examines earlier recorded data that suggests main and ring events may have a relationship on a general globalized scale. The results of the study will document past hazard assessments for this L'Aquila region and provide insight for possible future methodologies to use for early warning systems.

# Theoretical study of the interaction between gold surface and CysAlaAla (AlaAlaCys) peptides.

## Nancy Isner and Jessica Carr

West Virginia University Chemistry Hong Wang – Advisor

It has been established that gold nanoparticles present remarkable features for biosensor and biomedicine applications. Peptides, as the building blocks of proteins, have essential roles in these applications, as they can govern the biocompatibility or biofunctionality of the gold nanoparticles. In this study, we use the gold surface to mimic gold nanoparticles on a larger nanosize scale, which usually presents flat facets in certain orientations. By attaching two small peptides on the gold surface, we are focusing on the interaction between the gold surface and the small peptides. A Density Functional Theory (DFT) approach called FIREBALL is being used to investigate these interactions through computer modeling. Using DFT, we are able to determine the most energetically favored adsorption sites and orientations for the two peptides. Further, we analyzed the electronic properties of the systems. Results confirmed that for a periodic gold surface structure, optimal attachment of the peptide occurred when laying down across the surface. These results not only confirm but are consistent with previous theoretical studies of gold nanoparticles in smaller size scale.

#### Self-Efficacy in Blood Glucose Monitoring, Smoking Cessation and Breastfeeding in Rural Appalachian Women with Gestational Diabetes and Existing Diabetes during Pregnancy

#### Makenzie Barr

West Virginia University Psychology Melissa Olfert – Advisor

Introduction: Pregnancy alters hormonal balance in a women's body during the nine-month period, which can lead to increased insulin resistance. There are no formal education programs targeting lifestyle behaviors and self-management of blood glucose for Gestational Diabetes Mellitus (GDM) or pre-existing Type 2 Diabetes Mellitus (T2DM) in the state of West Virginia. The purpose of this study is to develop and implement a lifestyle education intervention measuring self-efficacy in behaviors of GDM or T2DM women in the rural setting of Appalachia. Methods: The first phase will be conducting focus groups (FG) during a woman's postpartum clinic visit in five settings to identify barriers of self-management in diabetes, knowledge level of diabetes and readiness to change. Followed by a second phase based on the information gathered from the FGs, a 1.5-hour lifestyle education intervention will be given to pregnant women with GDM or T2DM (n=45) over a three-month period. The intervention targets 1) self-management strategies in blood glucose control, 2) smoking reduction/cessation, and 3) breastfeeding promotion. Pre- and post-intervention surveys will be collected to measure changes in self-efficacy and knowledge as well as smoking and breastfeeding behaviors. The expected outcome for this study is a 75% improvement in diabetes selfmanagement, 50% attempt to decrease exposure to first-hand and second-hand smoke, and 50% improvement of breastfeeding self-efficacy. Conclusion: Rural Appalachia ranks high in the nation for rates of diabetes, smoking, and poor breastfeeding results. Educational programs delivered to these target populations can improve outcomes of a healthy pregnancy followed by continued self-efficacy to change behaviors in glucose control, smoking cessation and breastfeeding.

## Do Vitamin D serum levels modulate in men with prostate abnormalities, especially prostate cancer?

#### **Kayla Lantz**

West Virginia University Biology Rajesh Naz – Advisor

BACKGROUND. Vitamin D is a pre-hormone vital for growth and development. Recently, it has drawn considerable attention, especially for its role in carcinogenesis. The involvement of vitamin D in men with prostate abnormalities (prostatitis (PT)/benign prostate hyperplasia (BPH)/prostate cancer (PC)) has not been investigated. METHODS. The present study was conducted to examine its role in prostate abnormalities, especially prostate cancer. The levels of vitamin D and its binding protein were measured in the sera of men [PT (n=20), BPH (n=30), PC (n=30)] with various prostate abnormalities and compared with those in normal men (n=20). Vitamin D levels were measured using mass spectrometry and binding protein levels were measured using sandwich enzyme-linked immunosorbent assay (ELISA). RESULTS. Vitamin D levels were found to be significantly lower (p<0.05) in all prostate abnormality patients. The significantly lower levels in prostate cancer patients was confirmed using an ELISA. Binding protein levels were significantly (p=0.0024) lower in patients with BPH when compared to prostate cancer. CONCLUSION. These findings indicate that vitamin D may be involved in development of prostate abnormalities, namely prostate carcinogenesis. A clinical trial on vitamin D supplementation in patients with prostate abnormalities is warranted. KEY WORDS: prostatitis, benign prostate hyperplasia, prostate cancer, vitamin D binding protein, 25-hydroxyvitamin D

#### **Cysteine interactions on Gold nano particles and Gold Clusters**

#### **Brendan Wilson**

West Virginia University Chemistry Terry Gullion – Advisor

Gold nanoparticles have found a widespread use in biomedical and nanotechnological fields due to their unique optical and electronic properties and biocompatibility. Gold clusters are another unique material with astounding physical properties. Clusters are smaller than nanoparticles and contain few gold atoms. Solid State Nuclear Magnetic Resonance (SSNMR) spectroscopy provides a robust method for investigating the structure and dynamics of biological molecules in the solid state. SSNMR is performed to characterize the interaction of cysteine on Our group has developed a study of the differences in how various gold surfaces. organic biomolecules, amino acids, behave on the surface of both gold nanoparticles and gold clusters. Nanoparticles and clusters were synthesized and then cysteine was added so that it would attach to the surface of the nanoparticles and the clusters by a thiol-gold interaction. To examine the effects of attaching cysteine to the surface of nanoparticles and clusters SSNMR was preformed and the results were compared with the SSNMR spectrum of L-cysteine (cysteine that had not been attached to gold). Earlier work with cysteine on 6 nanometer (nm) gold nanoparticles showed that cysteine forms a bilayer, the inner layer is chemisorbed to the gold surface and the outer layer is hydrogen bonded to the inner layer. Gold 38 clusters have a diameter of 1.1nm and when cysteine is attached the resulting structure is different than that when cysteine is attached to the 6nm gold nanoparticles. Solid-state 13C NMR results will be presented for cysteine on 6nm gold and gold 38 clusters, as well as molecular structures.

## Assessing Forest Damage from Superstorm Sandy: effects of tree size, species, and spatial location

#### Dara Erazo and Ty Heimerl

West Virginia University Environmental Studies Brenden McNeil – Advisor

Forests provide large economic and environmental benefits. With the increased frequency of severe weather in a changing climate, it is important to understand how severe weather impacts forest health and regeneration. On October 30, 2012, Superstorm Sandy dumped over three feet of wet, heavy snow onto many forests in WV. In the short term, this forest damage caused widespread power outages and road closures, but this damage is also likely to have a long-term impact on forest health and regeneration. To understand the size-, species-, and location-specific effects of storm damage, we made visual observations of damage on 3550 individual trees located on 28 permanent plots in the Fernow Experimental Forest near Parsons, WV. As we expected, snow loading led to greater damage in smaller trees (damage rates of 31% of all the canopy trees and 56% of the understory trees), in species like American Beech that had not yet dropped their leaves (damage rates of 14% in tulip-poplar, compared to 50% for American beech), and within steep, drainage bottom areas that likely had greater snow loading from Sandy. These size-, species-, and location-specific rates of forest damage have important implications for managers trying to maintain economic and environmental benefits from forests under climatic change.

## Regulation of survivin expression in cancer cells with antisense-DNA coupled superparamagnetic iron oxide nanoparticles (SPIONs)

#### **Sunita Mahat**

West Virginia University Biology Peter Gannett - Advisor

Cancer is a broad group of diseases involving uncontrolled and unregulated cell growth. According to WHO, deaths from cancer worldwide are anticipated to continue rising, with an estimation of 13.1 million deaths in 2030. Cancer treatment options cause many dose-limiting side effects. It acts non-specifically on all rapidlydividing cells. Side effects dramatically reduce patient quality of life during, and sometimes after, treatment. Metastases are particularly hard to identify and treat, and as a result they are the cause of more deaths than the primary tumors Improvements to cancer treatment: make therapy selective for just cancer cells. We conduct this by targeting survivin expressing cells. Survivin, an anti-apoptotic protein found primarily on fetal tissues and human tumors, has been targeted for cancer therapy. Superparamagnetic iron oxide nanoparticles (SPIONs) have the ability to function both as drug delivery platforms and as MRI contrast agents. Antisense oligonucleotides prevent protein synthesis. Survivin antisense agents have been used to decrease survivin protein levels of cells in culture, resulting in increased cancer cell death without any effect on non-cancer cells. Antisense agents targeting survivin have previously been tested in vivo but were largely ineffective due to rapid clearance; antisense survivin can be conjugated to SPIONs to improve in vivo delivery to tumors. The objective of this project is to determine the effects of antisense survivin coupled SPIONs in breast (low survivin) and lung (high survivin) cancer cells. Antisense-coupled SPIONs are capable of entering cancer cells; fluorescent microscopy imaging will be used to determine intracellular localization. Cell lysis and metabolic viability will be measured, as will cellular survivin levels. The data will be used to determine the toxicity of antisense survivin-coupled SPIONs toward cell lines with differing levels of survivin expression. A therapy able to act only on survivin-expressing (cancer) cells can be used clinically to reduce the adverse effects associated with cancer treatments. In addition, the SPION-based platform will allow for improved diagnostic imaging, increasing the ability of clinicians to detect and treat metastases. After the in vitro effects of antisense survivin-coupled SPIONs are elucidated the formulation will be tested in vivo.

#### Effects of weight loss on lipid metabolism in obese horses

#### Morgan Bush, Emily Hoblitzell

West Virginia University Agriculture Kimberly Barnes – Advisor

Morgan L. Bush1, Kimberly M. Barnes1, Jennie L. Zambito1, Holly S. Spooner 1Davis College of Agriculture, Natural Resource and design, West Virginia University, Morgantown, WV 26505, 2School of Agribusiness and Agriscience, Middle Tennessee State University, Murfreesboro, TN 37129 Obesity currently affects over half of the nation's horses, and causes concern as it poses increased disease risks and impairs various metabolic functions. Weight-loss is considered a viable option to correct any maladies. This study was conducted to determine if weight-loss affected markers of lipid metabolism. Eight, mixed sex horses (5-12 yr) were kept at obese body condition (7-8 out of 9) for two weeks, then entered a six week period of 30% caloric restriction and light exercise to reach moderate body condition (5 out of 9). Blood samples collected weekly were analyzed for nonesterified fatty acid (NEFA) and triglyceride concentration. Neck fat biopsies were also collected, immediately underwent a lipolysis assay and were later analyzed for NEFA and free glycerol. Preliminary results indicate as horses lose weight, NEFA concentration in blood and lipolysis media demonstrates a decrease, while triglyceride decreases in blood, but free glycerol is variable in media. Further statistical analysis needed to determine significance. This study is unique in showing effects of weight loss on obese horses, rather than effects of obesity.

#### **Electronic Book Review Abstract**

#### **Keelin McGill and Margaret Kinder**

West Virginia University English Sandy Baldwin – Advisor

The WVU Department of English hosts Electronic Book Review (electronicbookreview.com), a scholarly, peer reviewed journal, which publishes essays on emerging digital literature. Morgantown has long been the center for academic development in West Virginia and EBR furthers this academic status. EBR publicizes digital literature and makes it well known and accessible to any person with Internet access. As copy-editors we help to maintain the website, publish essays, and keep in contact with contributors. Working on the website in itself enables us to become a part of a larger academic discussion. One workflow worth emphasis is the peer-to-peer reviewing process. In this workflow over 800 peers are able to review the essay. This is unique in part because anyone interested can become a reviewer and contribute to the publishing process. Receiving several reviews allows for EBR to gain substantial feedback about what the general public thinks of the essay. If the essay is accepted, this particular process enables the essay to receive more credibility. Our job in this process as editors is to also review the essay and to decipher the reviews posted by others. If revision is needed or suggested, we communicate this to the author. A separate, long term project we've been working on this semester is focused on improving the functionality of tags on EBR. The goal of this is to format tags so they will be more effective as a tool for people viewing the website. For example, when someone clicks on a tag, it will guide them to other essays on similar subject matter or by the same author. On a larger site like twitter, tags are used so often and by so many people that even misspelled tags often reoccur. On a smaller site like EBR, however, a more refined set of tags is necessary in order to be effective. The main edits we're making right now involve checking that tags are spelled correctly, enacting straightforward rules like including full names rather than just last names, and making sure that the tags are relevant to the essays they're attached to. Both of these processes aid in the publication and quality of essays on Electronic Book Review, and by observing them we hope to reflect upon the emergent field that is digital literature. Although our status as interns determines what our contributions can be, our observations are substantial.

#### **iMade**

#### Margarita Castaneda and Richard Nolan

West Virginia University Psychology Peter Giacobbi – Advisor

Physical activity (PA) and dietary behavior are important determinants of obesity. In the United States, 67% of adults are overweight or obese with annual economic costs of 82 billion dollars. In West Virginia, the percent of overweight and obese adults is among the highest in the country. Finding practical and cost-effective ways to help individuals maintain energy balance is an important public health challenge. Imagery of diet and exercise (iMade) is a phone-based waiting-list randomized controlled trail (WLRCT) using mental imagery as a behavior change mechanism. Mental imagery is a quasi-sensory or quasi-perceptual experience that allows individuals to create, or recreate, experiences in one's mind at any time or place. It involves the use of one's memories and emotions to relive events experienced in the past or to imagine future possibilities such as one's health-related goals. The purpose of the iMade project is to test the impact of mental imagery on the PA behaviors and food cravings of overweight and obese adult women. Approximately 44 adult women will be recruited to participate in the 5-week intervention. After pre-testing and randomization to the active treatment, participants will co-create individualized mental imagery scripts with trained health educators focused on diet and exercise. The participants will be asked to read and practice their scripts for 35 consecutive nights while maintaining weekly telephone contact with the health educators. The creation of the scripts and telephone conversations between health educators and participants will be guided by self-determination theory (SDT: Deci & Ryan, 1985). SDT predicts that individuals have three basic psychological needs. Health educators will nurture these needs by facilitating the creation of individualized mental imagery scripts and suggesting various PA and dietary choices (autonomy). Participants will also be given informational feedback about diet and exercise (perceptions of competence) while the creation of meaningful and professional relationships will nurture the need for relatedness. The main outcomes for iMade are exercise behavior and frequency of food cravings while secondary outcomes include cardio-respiratory fitness, exercise and dietary motivation. The validated measurement protocol includes the use of tri-axial accelerometers to assess PA behavior and the Trait Food Cravings Questionnaire (primary outcomes); the secondary outcomes will be measured with the Queen's College Step Test of cardio-respiratory fitness and measures of motivation for engaging in exercise and healthy eating. Pending our results, mental imagery could prove to be a practical and cost-effective way to address concerns about energy balance.

#### **Cytokine Correlation Under Stress**

#### **Constance Mitchell**

West Virginia University Chemistry Jonathan Boyd – Advisor

Background: One of the aims of this study was to correlate cytokines to one another while the host was under stress. Cytokines are chemical messengers that are released so immune system cells can communicate with one another. Each cytokine triggers a different response in the body. Sixteen subjects were sent individually into a house that they were told belonged to a "terrorist organization" to rescue a hostage. Each subject performed the task three times. The first time, the subject was told simply to find the unconscious hostage (a body bag) and bring it back to the base. Without being told his or her time, the subject then was informed to do the task as quickly as possible. The final time, while the person was rescuing the hostage, an air horn was blown, and the subject was notified that the terrorists were returning the house in one minute. Methods: Saliva samples from Granulocyte macrophage colony-stimulating factor (GM-CSF), interleukin-1 beta (IL-1β), interleukin 2 (IL-2), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL-6), interleukin 8 (IL-8), interleukin 10 (IL-10), tumor necrosis factor alpha (TNF- $\alpha$ ), and interferon gamma (INF-γ) were measured four times during the study to determine their interrelatedness. Saliva was measured when the subject began the study and the after each mission. Looking primarily at Time Point 3, which was directly following Mission 2, a multivariate analysis was performed to see if there were any correlations between the cytokines. Results: After analyzing the data, GM-CSF was strongly correlated to IL-10, IL-5, INF-y, Il-2, and Il-4. Il-5 was strongly correlated to Il-10, Il-2, INF-γ, and Il-4. INF-γ was strongly related to Il-10, Il-2, and Il-4. Il-10 was strongly correlated to Il-2 and Il-4. Il-2 and Il-4 were also significantly related. Conclusion: From the data collected during the study, it can be said that certain cytokines are correlated during stressful activities.

#### Genetic differentiation of lake sturgeon (Acipenser fulvescens) in the St. Lawrence Estuary

#### **Lucas Price**

West Virginia University Biology Amy Welsh – Advisor

Lake sturgeon are an ancient species that date back to the dinosaurs, but their numbers have been dwindling. In the Great Lakes water basin, lake sturgeon are at less than one percent of their historic population sizes. Most live in freshwater; however, the population being studied lives in a brackish estuary environment. This population could possess special adaptations that need to be conserved to maintain the genetic variance of the species. Lake sturgeon samples were taken from the St. Lawrence River at the mouth of Chaudiere River (south shore of the St. Lawrence River) and the mouth of the Montmorency River (north shore of the St. Lawrence River). These sturgeon reside in more saline water than other sturgeon populations in the St. Lawrence River. Lake sturgeon were captured using gill nets consisting of stretch mesh of 8, 9 and 10 inches. DNA was extracted from collected tissue samples. The extracted DNA was quantified and certain regions were amplified using polymerase chain reactions (PCR). These regions, or microsatellites, were analyzed using capillary electrophoresis. Lake sturgeon samples were then compared to previously analyzed populations from farther upstream on the St. Lawrence River. Genetic differentiation was calculated between the two groups. Lake sturgeon in the saline estuary are genetically different from lake sturgeon in the freshwater portion of the St. Lawrence River, which could mean reproductive isolation of the sampled population. This population might need to be additionally protected as an Evolutionarily Significant Unit to conserve this important adaptation to a new environment. The society in this region uses the larger populations of lake sturgeon in the area for commercial fisheries. To benefit the society, and the lake sturgeon, sustainable fishing could be allowed and monitored. Lake sturgeon were found in West Virginia waters until several years ago, and might now be extirpated. If lake sturgeon were to be introduced back into the state, the population in the St. Lawrence estuary should not be translocated due to their locally adapted DNA.

#### Solid oxide and direct carbon fuel cell design, structure, and operation

#### Christopher Gates, Areej Kuzmar, and Andrew Radcliffe

West Virginia University Engineering John Zondlo – Advisor

Fuel cells are being developed as a new way to generate electricity that has both higher efficiency and sustainability. Two types of fuel cells that are currently being explored at WVU for alternative energy are solid oxide fuel cells (SOFCs) and direct carbon fuel cells (DCFCs). While both use redox reactions to create electron flow, SOFCs use gaseous fuels (mainly hydrogen) and DCFCs use biologically-derived fuels such as poplar, switchgrass, and corn stover. Both cell configurations are planar, with multilayer cathodes and anodes supported by an yttria stabilized zirconia electrolyte. SOFCs are tested using hydrogen gas. These cells are the precursor to DCFCs and could help provide insight into improving the DCFC design (mainly by preventing cracks in the electrolyte). Overall, the electrolyte and cathode design and fabrication will be kept constant for both types of cells. For an alternate anodic structure, the nickel oxide layers from the SOFCs will be replaced with dense and porous layers of gadolinium doped ceria in the case of DCFC to accommodate solid state fuels as opposed to gaseous forms.

Open circuit voltage, varying current, and static load tests are used for performance evaluation. Currently, our studies have shown that SOFCs made inhouse and fed with hydrogen have around  $145~\rm mW/cm^2$  maximum power density and can load up to  $600 \rm mA/cm^2$ . In addition, fuels containing carbon black, pyrolyzed switchgrass, and torrified switchgrass have been produced for testing in the DCFCs when updated electrolyte designs are fabricated. For DCFC tests, various catalysts, anode designs, and reactive gasses could be used in the future to optimize the power output.

The ultimate goal for the DCFC project is to design and fabricate anodesupported structures which will yield higher outputs from coal and sustainable bioderived fuel sources.

#### FORMATION OF A 3-D NETWORK IN ALGINATE SPHERES

#### Paula Pacurari

West Virginia University Engineering Robin Hissam – Advisor

A current challenge in the study of cancer is the development of 3D models for cell growth. Growth of cells on flat surfaces may not allow for proper signaling or migration, yielding results that may not mimic the actual behavior of cancer cells in vivo. With a focus on leukemia, a material that will mimic the bone marrow microenvironment can serve as a new model for the study of leukemic stem cells. Alginate is an immunocompatible biopolymer that is capable of immobilizing viable cells and bioactive factors and is a common biological material used in drug delivery and biomaterial applications. Upon the addition of CaCl2, alginate forms a hydrogel which can be modified into different 3-D structures. The bone marrow microenvironment is highly porous, and this project was to develop alginate structures that mimic the bone marrow microenvironment and can be used as a 3-D model. Alginate beads were formed using different solution concentrations to create materials of varying microstructures. Swelling ratio tests were performed to determine the porosity and diffusion rate of fluid into the material. In addition, the morphology of the beads was characterized by scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were be used to characterize the structure of the 3-D networks. The bead structures were also compared to a bulk gel structure, which indicates the production of beads results in more porosity on the surface.

#### Tools for analyzing real-world wireless networks

#### **Wei-Teng Chang**

West Virginia University
Engineering
Matthew Valenti – Advisor

Mobile phones and wireless devices have become a part of everyday life around the world, and the ability to place base stations and hotspots efficiently has proposed many challenges for wireless networking companies. The Wireless Communications Research Laboratory(WCRL) at West Virginia University( WVU) has developed a new approach to simulate real-world communication systems and optimize the efficiency of the systems. The new analysis accurately accounts for the fading and interference. However, such tools are complicated and only used by WCRL for now. The tools were better packaged and documented for easier use for the public. Also, a similar simplified tool has been developed for the Wireless Networking course at WVU, but it does not account for the fading. The purpose of this research project was to add the new software, impact of fading, into the existing tool. This would give more accurate results since it is more realistic due to the fading, and will help students learn about wireless networks. Furthermore, the computational time required to analyze wireless networks is reduced by using a computer cluster.

#### BioNano Enzyme Conjugates with Bacterial Decontamination Capabilities

#### **Andrew Maloney**

West Virginia University
Engineering
Cerasela Zoica Dinu – Advisor

Outbreak of severe infections due to unsuccessful decontamination of surfaces could affect both civilians and infrastructures leading to unfavorable socio-economic impacts. The development of the next generation of decontaminants will need to account for reduction of the logistical burdens associated with infection prevention through use of green technologies. In this work, we seek to create environmentally-friendly, self-sufficient, self-cleaning, enzymatic decontamination bionano conjugates that could be incorporated into fabrics and paints to reduce the operational burdens associated with usage of harsh decontamination agents to prevent infectious outbreaks. Our technology uses two enzymes, namely glucose oxidase and chloroperoxidase, attached to a nanosupport to generate a potent decontaminant, hypochlorus acid (HOCl). The mechanisms of HOCl generation as well as the conditions that ensure enzyme immobilization, activity and stability at the nanosupports, have been investigated to determine the optimum circumstances that lead to maximum catalytic behavior at the nanointerfaces. This optimization is important for future works in which the conjugates will be used to decontaminate bacteria such as E. Coli and B. Cereus spores.

#### The Implementation of a Virtual Reality System to Aid Neuroscience Research

#### Quinn Jones, Jared Blatt, and Tamunotony Iyalla

West Virginia University Computer Science Gianfranco Doretto – Advisor

The study of neurological systems is essential to unlocking the cure to diseases and disorders of the human brain. To this end, it is crucial to study three-dimensional reconstructions of neurons in order to inspect the effect of the spatial relations between cell structures. The high degree of complexity in neuronal structure is often too elaborate for comprehension while projecting three-dimensional shapes onto two-dimensional screens. Furthermore, as larger visual data sets are compiled, information crowding quickly overwhelms the viewer. We propose a virtual reality environment for the visualization and modification of high-resolution neuron model scenes. To implement a system useful to neuroscientists, we have developed the NeuroView system - a suite of software applications suited for the organization, rendering, visualization, and manipulation of neuron model scenes. A CAVE (Cave Automatic Virtual Environment) system provides high vertex count rendering of three-dimensional data representing neuronal tissue. A unique user interface based on a tablet and on a three-dimensional browser, enables a quick manipulation of the scene, while a head-and-hand motion tracking system allows the user to freely adjust his/her viewpoint. The system has already provided insights into the organization of neural structures, but will continue to improve through further development.

#### **Accounting for Early and Late Penalties in Stochastic Shortest Paths**

#### **Rachel James**

West Virginia University Engineering Avinash Unnikrishnan – Advisor

The stochastic shortest path (SSP) problem is a type of network flow problem in which the objective is to find the quickest route through a network where the arc costs are not known with certainty. The SSP problem is applicable for when trying to find the quickest route from one point to another, routing hazardous materials and emergency vehicles, and mapping the spread of diseases across a population. For this project, a simulation based approximation algorithm was developed to determine the shortest path in a stochastic network with correlated normal arc costs. The performance measure developed was a linear combination of expected travel time and deviation from a specified arrival time; among the deviations, different penalties were imposed for capturing early and late arrival preferences. This project examined three different scenarios on a small test network - (i) when a user is heading to catch a plane (large late penalty), (ii) when a user to heading to class (penalties on both early and late deviation, but a larger deviation on late arrivals), (iii) and when a user is making a delivery at a predetermined time (equal penalties on both deviations). The observed variability in the calculated shortest path when different penalties are placed on early and late arrivals shows the potential for improvement in this domain when user disutility is better captured.

## Non-Intrusive Monitoring of Civil and Mechanical Structural Deflection: A 3D Imaging Approach

#### **Eric Rogers**

West Virginia University
Engineering
Fei Dai – Advisor

Construction projects are some of the most complex and costly undertakings that consumers and governments make everyday, and there is always a deadline and budget for them. This makes cutting costs and making efficient use of time a crucial element in the construction management. A particularly expensive fix is when the structure that is put up doesn't meet the specifications that were planned. This is designated as differences between as-built and as-designed plans. This can cause threats to level of service, leaving the structure standing but unsafe to operate. Using photogrammetry, or the technique of using images from multiple angles and matching them to measure distances, we are able to measure the deflection that members make in a structure. This is done utilizing modern computer programs such as Photomodeler and MATLAB that analyze the three-dimensional (3D) coordinates and measure the differences of the points in the photos. This is done by matching similar points on different photos, which turns the 2D photos into a 3D model. The beauty in it is it only requires off-the-shelf cameras, compared to other measuring techniques requiring expensive equipment and/or many man hours. It also only requires a handful of photos that can be taken free handed or by quickly setting up a tripod. The overarching goal is to advance the research in structural quality control, assurance, and analysis in the fields of civil, construction, and mechanical engineering. Two experiments, one in the lab and one in a field environment, have been conducted on campus in this on-going project. The results of these experiments verify the accuracy of the photogrammetry proposed, which is arguably the most attractive option among other techniques.

## Examining the effects of thermally-degraded nanoclay enforced polylactic acid composite on cellular systems

#### **Savannah Sims**

West Virginia University Engineering Cerasela Dinu – Advisor

Polylactic acid (PLA), a naturally hydrophilic polymer, has been widely used in food packaging applications because of its biocompatibility and non-toxic degradation. However, the mechanical properties of PLA alone when used in such applications can be altered upon environmental exposure. PLA reinforced with nanoclays has been proposed as an alternative to reduce PLA. The nanoclays have been shown to impact the polymer's mechanical properties by improving strength, heat resistance, percolation properties, and increasing its thermal stability. However, before nanocomposites are used in food packaging, the environmental exposure, disposal, and residue impact on biological systems must be assessed. This research focuses primarily on examining the effects of nanoclay-enforced PLA nanocomposite on cellular systems. For these experiments, PLA was mixed with nanoclay and thermally degraded at different conditions. Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDX), and solubility tests were used to analyze the physical and chemical properties of the nanocomposites upon thermal degradation. The biological effects of nanocomposites and their thermally degraded counter parts were studied in relation to human lung epithelial cells (BEAS-2B). Measuring the cellular viability, proliferation, and changes in cellular morphology at varying time points showed that the thermal degradation of the nanocomposites drastically impacted the cellular systems. This research can provide insights into the biodegradation of nanocomposites and the effects of such degradation on the environment and help establish regulation standards for nanocomposite integration into food packaging applications.

## Biometric technology for the enhancement of rapid analysis methods for degraded DNA

#### **Jordan Drew**

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Rapid DNA (R-DNA) analysis methods are currently emerging as a means of producing an STR profile in less than 1 hour in booking stations and battlefield forensic scenarios.1 The most current iterations of R-DNA systems are designed to handle pristine samples and do not operate efficiently on low copy number (LCN) samples such as touch DNA, usually involving skin cells recovered from fingerprints, or even detonated explosives. These cases often involve samples that contain small amounts of obtainable DNA or where DNA may have degraded over time due to a variety of elements, such as heat or exposure to sunlight. While we are aware that certain procedures can be altered, such as increasing the number of PCR cycles, during processing in a lab to improve LCN profiles, R-DNA systems' generation of profiles is fully automated and without human intervention. This system mimics STR typing entirely by inserting a biochip that contains all reagents so that employees in booking or forensic battle stations, without technical training, are able to use the system with ease. Previous research has shown a successful application of an algorithm characterized by adaptive amplitude and slope thresholds for the detection of additional peaks compared to the current gold standard for DNA typing used by most forensic labs, Applied Biosystems Genemapper ID.3 Our primary focus here is to develop software tools that can interpret data from highly degraded samples to produce a profile with high match probability. In this research effort, samples of gum and blood were degraded using UV light for time periods ranging from 15-150 seconds at an optimal exposure of 120 µJ/cm2. Other samples were exposed to heat at 37°C, 56°C, or 75°C for a time period not exceeding 24 hours, or an uncontrolled exposure to the environment. The profiles obtained from our LCN samples using conventional instrumentation such as the Applied Biosystems 3130 Genetic Analyzer, contain substantial stochastic noise relative to DNA signal that make it difficult to differentiate true and false peaks, as well as determine where peaks may have dropped out. Using our algorithm, as well as our degradation model and intra-variability analysis, we were able to reduce noise, recover STR peaks that have dropped out, and enhance the DNA's signal. As we progress, we can use our understanding of LCN and degraded DNA typing to enable the R-DNA analysis system to account for these sample types.

# THE EFFECTS OF SOCCER BALL HEADING FREQUENCY AND INTENSITY ON NASAL INSPIRATORY AND EXPIRATORY FUNCTION AS MEASURED BY RHINOLOGICAL PATENCY

#### Emily Robinson, Kristen Custer, and Killeen Schlegel

Wheeling Jesuit University
Psychology
Bryan Raudenbush – Advisor

Past research shows that soccer ball heading has detrimental effects on memory, reaction time and impulse control, as well as scent identification ability and olfactory functioning. The current study examined the effects of soccer ball "heading" frequency and intensity on nasal functioning. Thirty-nine undergraduate soccer players (21 men and 18 women) completed a brief survey about their soccerplaying history and underwent inhalation and exhalation assessment. Independent samples t-test were conducted on the data, after dividing the participants into "low frequency heading" and "high frequency heading" groups. Results indicated that those athletes who headed the ball with greater frequency or intensity had significantly lower inhalation and exhalation performance than those athletes who headed the ball with lower frequency or intensity. Such performance is indicative of damage within the nasal cavity. Soccer players should consider this research in order to educate and prevent future damage to the nasal cavity. Future research should assess whether such damage is permanent or reversible.

### EFFECTS OF WEIGHT FEEDBACK AND DISORDERED EATING ON FOOD CHOICE IN A MOCK CAFETERIA BUFFET

#### Patrick Dwyer, Stepehen Saldanha

Wheeling Jesuit University
Psychology
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The purpose of this study was to investigate the effects of being weighed vs. not weighed prior to making food choices. In addition, level of disordered eating was determined using a variety of assessment inventories, such as the Food Neophobia Scale, Eating Attitudes Test, Eating Disorder Inventory and Revised Restraint Scale to determine any interaction effects. Fifty-six participants were either weighed or not weighed prior to them being presented with a mock cafeteria buffet and asked to choose those items which would make up a typical meal. This buffet contained 75 food and beverage products from which to choose in each of the RDA food groups. A series of multivariate analyses of co-variance (MANCOVAs) were performed, using current level of hunger as a covariate. Participants who were weighed prior to choosing their foods showed a decrease in food weight, overall food calories and calories from fat. This effect was even more pronounced in females and those who were classified as food neophobics (those individuals unwilling to try new foods). The implications of this study could be impactful, taking into account the growing issue of overweight citizens in the United States. Dieticians could apply these results to their own practice, instructing their clients to weigh themselves before every meal so as to encourage more healthy and moderate food consumption.

#### Shirt Color and Sex Impact Perceptions of Egineering Job Candidates

#### Ryan Naumann, Kristen Custer, and Justin Amos

Wheeling Jesuit University Psychology Debra Hull – Advisor

The purpose of our research was to investigate college students' evaluations of a potential male or female job candidate applying for a position in a stereotypical masculine profession—engineering—described as wearing a shirt of a stereotypical feminine, masculine, or neutral color—violet, gray, or white. A convenience sample of 120 undergraduate volunteers (71 men and 49 women; mean age = 20.5) from a small, private university were asked, individually, to imagine that they were a member of a hiring committee while reading one of six paragraphs that differed in the sex of the job candidate and in the color of the shirt the candidate was described as wearing. Ratings given each item were analyzed using separate 2 (sex) X 3 (color of shirt) factorial design ANOVAS, with Tukey tests used to evaluate significant main effects and interactions. There were three main effects for sex. Female job candidates were judged to be significantly more qualified (F (1,114) = 5.01, p. = 0.027) hirable (F (1,114) = 7.20, p. = 0.008), and agreeable (F (1,114) = 6.91, p. = 0.010) than were male job candidates. Four items showed significant sex x color interactions, each involving the color violet. Men wearing a violet shirt were rated significantly least conscientious, F (2,114) = 4.052, p. = 0.020, and serious-minded, (F(2/114) = 8.119, p = .001). Women wearing a violet shirt were rated significantly most agreeable, F = (2, 114) = 3.81, p. = .025, and intelligent, F = (2, 114) = 11.612, p. = .001. Based on our results, we conclude that shirt color has a rather powerful impact on job candidate ratings. The color of the shirt was mentioned only once in the paragraph and was embedded within many other details. Men wearing a stereotypical feminine color when applying for a position in a stereotypical masculine area may be judged less well, at least on certain dimensions directly related to job performance—conscientiousness and serious-mindedness. Women, on the other hand, when wearing a stereotypical feminine color may be judged more positively on the personality dimension of agreeableness, perhaps not directly related to job performance, and on intelligence, arguably more directly related to job performance. In the future, we intend to continue this work, looking at the influence of color on other kinds of occupations, those considered stereotypically feminine and neutral.

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