Council on Undergraduate Research

18th Annual Posters on the Hill

April 29, 2014

Rayburn House Office Building
Washington, DC

The posters presented were supported by the generosity of many governmental and private funders, including:

Andrew W. Mellon Foundation
Davidson College
Department of Agriculture
Environmental Protection Agency
Grand Valley State University
National Aeronautics and Space Administration
National Institutes of Health
National Oceanic and Atmospheric Administration
National Science Foundation
Tennessee Center for Botanical Medicine Research
TriBeta
U.S. Department of Education
U.S. Department of Energy
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University of Nebraska Omaha - Summer Research Program
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Dear Posters on the Hill Participants:

I wish to congratulate all of our undergraduate researchers on your selection to participate in the 2014 Posters on the Hill. Your research project was selected from 587 applications. The Council on Undergraduate Research is very impressed by your accomplishments and is pleased that you have been able to come to Washington, D.C. to participate in this prestigious event. This is our 18th annual Posters on the Hill event and this year, it directly follows the fourth annual Undergraduate Research Week, which was held from April 14-18, 2014.

We are also very proud of our faculty members who serve as advisors and mentors to undergraduate researchers, and believe you and your students are stellar examples of the best in higher education. In addition, we are very pleased to partner with the American Chemical Society (ACS) for Posters on the Hill, and are deeply grateful to them for their support of this event. ACS, a premier non-profit organization, and the largest scientific society in the world, is a global leader in chemistry education, research, and advocacy. Since CUR's inception in 1978 (which was led by chemistry faculty at predominantly undergraduate institutions), CUR has benefitted from its association with the ACS and appreciates the opportunity to continue our connection through Posters on the Hill, as well as other endeavors.

We know that your undergraduate research experience has contributed positively to the value of your undergraduate education and that you will be better prepared as a result for graduate school, your career, and the future. You have had the opportunity to develop skills in analysis, critical thinking, problem-solving and innovation through your research project, all of which are important for future success, whichever path you may choose.

We wish you success as you continue your research and your studies. Perhaps someday you will be a member of the Council on Undergraduate Research and come to Washington, D.C. when one of your students presents his or her research at Posters on the Hill. Or maybe you will be a Member of Congress and attend Posters on the Hill!

Best Wishes.

Elizabeth L. Ambos
Executive Officer

The following posters will be presented April 29, 2014
5:30-8:00pm – Rayburn Office Building, B357

Student abstracts can be found on the page listed to the right.

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Alabama

STUDENT: Bliss J. Chang
INSTITUTION: University of Alabama at Birmingham
STUDENT HOME STATE: Alabama
DIVISION: Chemistry
FACULTY ADVISORS: Jamil Saad & Nickolas Bieser
POSTER TITLE: Structural Basis for Fas-mediated Apoptosis and Mechanism of Inhibition
DISPLAY AREA: 1A
SPONSORING AGENCY: University of Alabama-Birmingham Comprehensive Cancer Center
GRANT #: P30 CA013148
ABSTRACT: The inability of cells to undergo apoptosis (programmed cell death) is an underlying cause for various diseases. Fas is an apoptosis receptor that has been shown to be implicated in both osteoporosis and various cancers. Several findings have proposed that Fas binds Calmodulin (CaM), a ubiquitous and highly conserved calcium-binding protein. Previous studies have suggested novel roles of CaM in Fas signaling. As such, increased CaM levels have been shown to cause unregulated cell growth and thus suggests a regulatory role for CaM. Importantly, CaM antagonists have been shown to cause apoptosis in cancer cell lines. Furthermore, mutations in Fas have been discovered in various types of cancers. These mutations may cause alterations in structure and thus function. Mice with a mutation of Fas have been identified; importantly, these mice exhibit a deficiency in Fas-mediated apoptosis. Preliminary data has revealed that CaM binds to Fas in a 2:1 ratio and a major structural change occurs due to that mutation. These observations open up an interesting venue regarding the potential role of binding ratios in regulating Fas-mediated apoptosis and the possibility of the mutation disrupting a region of Fas critical for binding CaM. In this study, we characterize the structure of the mutant Fas and identify the binding characteristics between Fas and CaM using structural, biophysical, and biochemical techniques. Understanding of the structural basis of CaM-Fas interaction will lead to a means to identify pharmacological targets for intervention into complex disease mechanisms, such as cancer.

STUDENT: Casey L. Calamaio
INSTITUTION: University of Alabama in Huntsville
STUDENT HOME STATE: Vermont
DIVISION: Geosciences
FACULTY ADVISOR: Robert Griffin
POSTER TITLE: From Lindbergh to the International Space Station: 75 Years of Remote Sensing Land Cover Change in Panama
DISPLAY AREA: 1B
SPONSORING AGENCY: SERVIR Program NASA Smithsonian's Tropical Research Institute
ABSTRACT: The field of remote sensing has come a long way over the past century. Opportunistic pilots with handheld cameras have given way to mission specific space-borne platforms that can increasingly target features with high spatial and spectral resolution. The research presented here highlights the history of remote sensing through collaborative research I've undertaken with the Smithsonian Tropical Research Institute (STRI) and NASA's SERVIR Program (Regional Visualization and Monitoring System). I focus here on the region around Panama, occupying the narrow isthmus between Central and South America. This region is ecologically important, being a natural corridor for species between the continents. In addition, this region is economically important in that its largest public work, the Panama Canal, has a profound impact on global markets. Although satellite remote sensing has only been around since the 1970s, I have been able to examine the history of land cover change in Panama by digitizing and geolocating the Smithsonian's catalog of aerial photographs spanning much of the twentieth century, the earliest of which date back to Charles Lindbergh's flights over the Canal in 1927. These black-and-white aerial photographs present an interesting juxtaposition against my ongoing research working with the International Space Station SERVIR Environmental Research and Visualization System (ISERV) Pathfinder, a testbed camera system developed at and currently on board the ISS. In this poster I compare information derived from historic aerial photographs and the ISERV space-borne camera system to examine both ecological land cover change as well as the value of new remote sensing technologies.

Alaska

STUDENT: Sam Herreid
INSTITUTION: University of Alaska-Fairbanks
STUDENT HOME STATE: Alaska
DIVISION: Geosciences
FACULTY ADVISOR: Anthony Arendt
POSTER TITLE: First estimates of glacier melt rate reduction from rock debris cover for all Alaska glaciers
DISPLAY AREA: 1C
SPONSORING AGENCY: Cryospheric Sciences program, NASA Cooperative Institute for Alaska Research, NOAA EPSCoR Alaska Space Grant program NASA
ABSTRACT: Glacier shrinkage is an accepted indicator of climate change and contributor to global sea level rise. Recent global scale glacier melt models have shown the significance of mountain glaciers (excluding Greenland and Antarctica) towards a rise in sea level. While the first suite of global models incorporate the first-order variables needed to make sound estimates and predictions, we are now investigating variables that were initially neglected. One of these variables is the presence of rock debris on a glacier's surface, sourced mainly from valley wall erosion. Rock material above a thickness of about 2 cm will reduce the local glacier melt rate by regulating the solar energy available for melt at the ice surface (under the rock layer). We have collected 4 years of field data on Alaskan glaciers aimed at better understanding the relationship between the presence of rock debris and the melt response of the ice below. We have also developed a method to accurately map debris cover at regional or global scales. We have used this method to compile the first exhaustive digital inventory of debris cover on glaciers for the entire state of Alaska. Alaska hosts 12% of mountain glacier area on earth and our results show that 21% of Alaskan glacier area is covered by a layer of rock debris. We will use our field observations and Alaska wide debris cover inventory to make a first-order estimate of glacier melt rate reduction from rock debris cover, a factor previously unaccounted for in existing models.

Arizona

STUDENT: Araceli Olivas
INSTITUTION: Northern Arizona University
STUDENT HOME STATE: Arizona
DIVISION: Health Sciences
FACULTY ADVISOR: Meghan Warren
POSTER TITLE: Association of Motivation on Physical Activity in Middle School Boys and Girls
DISPLAY AREA: 1D
ABSTRACT: Physical activity in schools has shown to be indirectly associated with academic achievement including lower dropout rates, better classroom behavior, higher self-esteem and engagement in school. Self-determined regulation and motivation for physical activity (PA) has shown to correlate with leisure time PA among adolescents. The purpose of this study was to assess the relationship between self-determined motivation, and leisure-time PA, and describe differences between 7th grade boys and girls. 143 boys (51%) and 137 girls completed surveys at baseline as part of a physical education intervention study. The Behavioral Regulation in Exercise Questionnaire (BREQ-2) measures self-determined motivation for PA. The BREQ-2, a 19-question survey, consists of five subscales: Amotivation (no intention to engage), External regulation (unwilling motivation through external pressures, and unlikely to continue), Introjected regulation (self-pressure to act), Identified regulation (motivation through acknowledgement of PA benefits), and Intrinsic regulation (motivation from the enjoyment of PA). The PA score was calculated from a validated self-report instrument of weekly activity. The mean and standard deviation of each BREQ-2 subscale for the total sample, as well as by sex were calculated; means were compared with independent t-tests. The relationship between each BREQ-2 subscale and PA score was calculated with Pearson correlation. There were no statistical differences between boys and girls for any subscales. PA score and intrinsic regulation was weakly, but significantly correlated ($r=0.23$, $p=0.0002$). These results indicate that students with greater physical activity had higher scores of enjoyment motivating PA. There were no differences between boys and girls in PA motivation.

Arkansas

STUDENTS: Laura E. Strossner, Ryan J. Strebeck, Drake C. Hardy & Michael Sullivan
INSTITUTION: Ouachita Baptist University
DIVISION: Biology
FACULTY ADVISOR: Lori L. Hensley
POSTER TITLE: Using Spheroids, an Innovative Three-dimensional Tumor Model, to Examine the Effects of Cannabinoids on Pediatric Cancers
DISPLAY AREA: 1E
SPONSORING AGENCY: Arkansas INBRE Program National Institutes of Health
ABSTRACT: Ewing's sarcoma is a highly aggressive pediatric bone cancer with a 5-year survival rate of less than 30%. Our lab is interested in the microenvironment of these tumors, the cellular pathways that are altered to enable their aggressive behavior, and how the compound ajulemic acid interferes with these pathways. In order to investigate these issues, our lab has employed and optimized a new tumor model called spheroids. While two-dimensional cell culture has allowed for amazing breakthroughs in cancer research, these cultures have their limitations. Spheroids have been developed to make cellular interactions and behaviors of cells in the lab more closely mimic those that occur in tumors in the body. Previous studies in our lab have shown ajulemic acid, a non-psychoactive cannabinoid, can kill tumor cells both in vitro and in a novel bioluminescent mouse model. Because metastases or spread of the cancer significantly decreases survival rates, we investigated and demonstrated the ability of this compound to decrease migratory and invasive abilities of tumor cells as well the growth of new blood vessels to support tumor growth. Taken together, our data suggest we can kill Ewing's sarcoma cells and decrease the ability of any remaining tumor cells to spread. However, the mechanisms the drug is using to achieve these results are not understood. In order to elucidate how the drug is working, we are using this innovative three-dimensional spheroid model of tumors to identify differences in levels of key proteins known to regulate blood vessel growth and tumor cell invasion.

California

STUDENTS: Vanessa Black & Aimee D. Miller
INSTITUTION: California State University-Dominguez Hills
DIVISION: Psychology
FACULTY ADVISOR: Mark Carrier
POSTER TITLE: Psychological Risk Factors for Becoming a Victim of Human Sex Trafficking
DISPLAY AREA: 1F
SPONSORING AGENCY: Research Initiative for Scientific Enhancement, National Institutes of Health
ABSTRACT: Human sex trafficking (HST) is the recruiting, transporting, harboring or receiving of a person who is then coerced into prostitution, forced labor, or slavery (FBI, 2011). The Internet has made the buying and selling of humans for sex more efficient and feasible for perpetrators (FBI, 2011). Traffickers use social networking sites and online classified advertisements to solicit new victims and buyers (Polaris Project, 2013). Adolescents who engage in risky online behaviors such as meeting people offline, giving out personal information and sending or receiving pictures are at greater risk for becoming victims of online crimes, like HST. To assess the likelihood of online HST victimization, participants (N=471) read a series of vignettes, simulating predatory and non-predatory communication online, and rated how they would likely feel and behave. Participants then completed an online survey assessing digital media usage, trust, self-esteem, depression, family satisfaction, life satisfaction, executive functioning and online skepticism. We hypothesized that participants with lower self-esteem would endorse more risky attitudes and behaviors when evaluating the vignettes. The results provide partial support for our hypothesis, suggesting that risky attitudes, but not behaviors, are predicted by self-esteem. Interestingly, deficits in executive functioning (i.e. attention, inhibition, planning, and organizing) best predicted one's likelihood of becoming an online victim of HST. These findings might better inform law enforcement and policy makers of the psychosocial factors that increase one's likelihood of being recruited by traffickers online. The findings also have preventative applications. Increasing adolescents' awareness and vigilance online reduces their risk of online victimization.

STUDENTS: Akash Patel & Sarah Barritt
INSTITUTION: University of California-Los Angeles
DIVISION: Health Sciences
FACULTY ADVISORS: Mark S. Cohen & Wesley T. Kerr
POSTER TITLE: Computer-Aided Diagnosis of Epilepsy Using Clinical Information
DISPLAY AREA: 1G
SPONSORING AGENCY: National Institutes of Health
GRANT #: R33 DA26109
ABSTRACT: Distinguishing between epileptic and non-epileptic seizures is a challenge. On average, the time from the first seizure to the diagnosis of non-epileptic seizures is 7 years; during which, a majority of these patients are misdiagnosed with epilepsy and inappropriately treated with anti-epileptic medications. This exposes patients to the serious, and potentially fatal, side effects of these medications. One of our laboratory's goals is to create an automated system that can aid physicians in distinguishing patients with epileptic and non-epileptic seizures. We accomplish this by inspecting the out-patient clinical notes from patients with medication-resistant seizure disorder that were later diagnosed with the gold standard diagnostic assessment: 72+ hour in-patient closed circuit video-electroencephalography (VEEG) monitoring. Using a combination of the known risk factors for epilepsy and non-epileptic seizures reported in 228 clinical notes, our decision tree achieved an accuracy of 65%. While this may appear low, it is comparable to the accuracy of neurologists prior to VEEG monitoring. The structure of our decision tree also provided meaningful information about the interpretation of each risk factor in each patient. For example, the risk factors for non-epileptic seizures may not be the same for women and men. This work may help diagnose, and thereby more effectively treat, these patients that are in need. In addition to serving patients with seizure disorder, the computer-aided diagnostic methods we develop here may be applicable to the diagnosis of other maladies in the future.

Connecticut

STUDENT: Eric S. Cerino
INSTITUTION: Eastern Connecticut State University
STUDENT HOME STATE: Connecticut
DIVISION: Psychology
FACULTY ADVISOR: Jennifer Leszczynski
POSTER TITLE: Investigating Subjective Age, Level of Activity, and Depressive Symptoms in Older Adults
DISPLAY AREA: 1H
ABSTRACT: Depression is one of the most prevalent diseases among the elderly (Monteso et al., 2012). Ample research has been done identifying specific factors that could lead to depression, but little research has been done investigating the collective and individual contributions subjective age (the personal belief and feeling of one's own age) and physical and mental activity have on depressive symptoms in older adults. It is hypothesized that the younger seniors feel and the more activities they are involved in, the lower the amount of depressive symptoms they possess. A sample of 62 older adults (15 men, 47 women, with an average age of 76.42 years), taken from the Trumbull Senior Center in Trumbull, CT, were recruited to take part in this study. Among the senior center members, there was a larger amount of mental activity (average of 8.67 hours/week) than physical activity (average of 5.46 hours/week). Nine of the participants were categorized as having Mild Depressive Symptoms, according to the Geriatric Depression Scale. There was a significant relationship found between the seniors' depressive symptoms and general subjective age and a subjective age subscale: "How old you feel"; meaning the younger a senior generally feels, the less depressive symptoms they tend to show. There was also a significant relationship found with regards to the senior's total physical and mental activity and the subjective age subscale: "How old are your interests"; meaning the older the seniors feel their interests are, the more senior center activity tends to take place.

Delaware

STUDENT: Stephen P. Krasucki
INSTITUTION: Delaware Technical Community College
STUDENT HOME STATE: Delaware
DIVISION: Biology
FACULTY ADVISORS: Virginia Balke & John V. McDowell
POSTER TITLE: Identification and Characterization of Bacteria Associated with White-Nose Syndrome Infected Wings from Little Brown Bats (*Myotis lucifugus*)
DISPLAY AREA: 1I

ABSTRACT: Bats are an important part of our ecosystem, having roles in insect population control, flower pollination, and seed dispersal. Populations of bats within the United States have been decimated by an emerging infectious disease known as white-nose syndrome (WNS). The disease, first identified in the United States in 2006, has led to the death of an estimated 5.5 million bats. Most WNS cases have been found along the eastern US but the disease is quickly spreading across the country. WNS is caused by the psychrophilic (cold-loving) fungus, *Pseudogymnoascus destructans*, although the specific mechanism has yet to be determined. Microscopy of WNS-infected wing tissue from little brown bats (*Myotis lucifigus*) revealed not just fungus, but also abundant rod-shaped bacteria. Bacterial isolates were obtained from swabbed infected wings, but no growth was observed from uninfected wings. Genetic analyses of the isolated bacteria indicated two predominant genera, *Pseudomonas* and *Sphingobacterium*, present on WNS-infected wings that were not present on uninfected samples. Optimal growth temperature, physiological assays, and fluorescent pigment production experiments were performed to characterize the cultured bacteria. To further compare the bacterial communities on infected and uninfected wings, techniques were used that did not require bacterial growth. DNA was extracted from bat wing tissue and sequence analysis indicates different communities of bacteria on infected wings when compared with uninfected wings. This indicates a correlation between the presence of specific types of bacteria and *P. destructans* and raises the possibility they contribute to disease progression of WNS.

Florida

STUDENT: Samuel Yacinthe
INSTITUTION: University of Central Florida
STUDENT HOME STATE: Florida
DIVISION: Engineering
FACULTY ADVISOR: Shawn Midlam-Mohler
POSTER TITLE: Hybrid Vehicle Sensitivity Analysis for Optimization of Efficiency and Performance
DISPLAY AREA: 1J

ABSTRACT: EcoCAR2 is an Advanced Vehicle Technology Competition (AVTC) sponsored by the U.S. Department of Energy (DOE) and General Motors (GM). This three-year student project explores electric vehicle technology with primary goals of maximizing energy efficiency and minimizing vehicle emissions, while maintaining consumer acceptability and safety. As the competition transitions into its third year, the goal is to refine and optimize the vehicle in this final stage of competition. This research study utilizes design of experiment (DoE) techniques to conduct a parametric analysis that identifies which vehicle parameters are most influential on the system efficiency. We simulate a model of the plug-in hybrid electric vehicle (PHEV) via Matlab/Simulink software, as this is a cost effective experimentation approach to considering all factors simultaneously. A cost model is also developed to determine associated resource cost for improving each parameter. With combinations of cost and parametric sensitivity, we find that the most effective approach for refinements is that given the amount of resources, efforts should focus on improving mass, then auxiliary load, followed by improvements in rolling resistance and aerodynamic drag. Hence, by establishing the relative importance of each vehicle parameter with an associated cost model, this study can guide the focus of areas that will be most beneficial in improving efficiency and performance of The Ohio State University ‘s EcoCAR2.

STUDENT: Sabrina A. White
INSTITUTION: University of Florida
STUDENT HOME STATE: Florida
DIVISION: Biology
FACULTY ADVISOR: Daniel Hahn
POSTER TITLE: Do modified atmospheres used in produce transportation make insect pests more resistant to irradiation as a phytosanitary treatment?
DISPLAY AREA: 1K
SPONSORING AGENCY: USDA-APHIS-PPQ Department of Agriculture
GRANT #: CA-12-8130-0159
ABSTRACT: Irradiation as a phytosanitary treatment (IPT) prevents the spread of invasive pest insects in agricultural products like blueberries and mangos. A current barrier to IPT is development of generic radiation doses that effectively kill or sterilize all pests across commodities. 400 Gy is a USDA-approved generic dose that can be applied to all insects except Lepidoptera pupae and adults, and 150 Gy has been approved for all Tephritid fruit flies. Development of additional generic doses <400 Gy will contribute to preserving commodity quality while helping to prevent irradiators with high dose uniformity ratios (DUR) from exceeding the current FDA limit of 1000 Gy for IPT. Many commodities are transported in modified atmospheres with low oxygen content. Irradiation in low oxygen may affect treatment efficacy, a potential challenge for developing generic irradiation doses. The effects of low oxygen on irradiation treatments of the cabbage looper, *Trichoplusia ni*, were tested. Larvae, early pupae, and pharate adults (late pupae) were irradiated at 50, 100, 150, 200, 400, 600, and 800 Gy under both anoxia (no oxygen) and normoxia (regular atmospheric air). Anoxia increased survivorship and adult emergence for all tested life stages and irradiation doses. However, for both normoxic and anoxic treatments, the fertility at high doses of radiation (>400 Gy) was negligible. Future work will involve irradiation in atmospheres with a range of reduced oxygen (0-20 kPa) and increased carbon dioxide (0-10 kPa) to mimic the range of controlled and modified atmospheres used in commodity packaging.

Georgia

STUDENT: Faith M. Stokes
INSTITUTION: Dalton State College
STUDENT HOME STATE: Georgia
DIVISION: Biology
FACULTY ADVISOR: Marina Golding Smitherman
POSTER TITLE: Venom from Local Snake Species: A Potential Source of Antibacterial Treatment
DISPLAY AREA: 1L
SPONSORING AGENCY: Beta Beta Beta Research Award TriBeta
ABSTRACT: The recent rise in deaths and serious illness from antibiotic resistant bacterial strains is a major concern for medical researchers, health professionals and government agencies. The demand for new antibacterial agents is increasing and their development must occur alongside the evolution of pathogens. Snake venom has been identified as a possible source of antibacterial treatment. However, the make-up of venom is not homologous across species since each snake must have a unique biological recipe to combat the environment in which it lives. This study took the venom of five local snake species and tested them for antibacterial activity against three potentially pathogenic bacterial strains that local snakes and humans encounter. Four previously untested venoms, *Agkistrodon contortrix mokasen*, *Agkistrodon contortrix contortrix*, *Agkistrodon piscivorus conanti*, and *Crotalus horridus*, along with *Crotalus adamanteus* were tested for antibacterial activity against *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Aeromonas hydrophila*, the latter of which is a novel bacterial strain to venom studies. This study used whole venom that yielded exciting zones of inhibition by disk diffusion demonstrating effective antibacterial activity against the strains. Fractionation of the whole venom by Native PAGE and repeated disk diffusion will identify the functional antibacterial enzyme. Venom is primarily composed of proteins so the wealth of enzymes potentially represents a pharmaceutical gold mine to combat threatening bacterial strains. Identification of antibacterial venom could lead to the discovery of the specific antimicrobial enzymes that can then be isolated and tested as a potential new treatment for drug resistant strains.

STUDENT: Lydia C. Babcock-Adams
INSTITUTION: University of Georgia
STUDENT HOME STATE: Georgia
DIVISION: Geosciences
FACULTY ADVISOR: William Miller
POSTER TITLE: Deep Ocean Photochemistry: Reevaluating the Role of UV Radiation on the Global Marine Organic Carbon Cycle
DISPLAY AREA: 1M
SPONSORING AGENCY: Chemical Oceanography award National Science Foundation
GRANT #: OCE-1234388
ABSTRACT: Earth's increasing average temperature is linked to rising CO2 levels in the atmosphere, which currently contains about the same amount of carbon found in the ocean in the form of dissolved organic carbon (DOC). These two critical carbon pools are balanced globally by continual exchange, with small changes capable of large climatic effects. Interestingly, most oceanic DOC is "refractory" carbon (DOrC), meaning bacteria cannot consume it quickly, and this pool dominates the deep, dark ocean. Dated at 4000-6000 years old, DOrC has travelled through the entire ocean 4-6 times, spending hundreds of years in sunlit surface waters where photochemistry (reactions driven by sunlight) is known to break apart carbon-containing molecules, form CO (carbon monoxide), CO2, and other small molecules that allow rapid DOC removal. These findings raise the question: Is DOrC really photochemically reactive? Our research addressed this question with shipboard experiments on the RV Melville designed to determine the photo-reactivity of DOrC. Experiments were performed on seawater retrieved from the deep North Pacific where the DOrC pool is oldest. Long-term exposures in a solar simulator showed CO production falling almost to zero in deep and surface samples over 24-48 hours. This suggests that photo-reactive DOC initially present is rapidly lost, leaving DOrC which must be unreactive. When substantiated by our related studies, these novel findings that ~75% of the global DOC pool is NOT photo-reactive, will force a significant reevaluation of the role of marine photochemistry in DOC dynamics, the global carbon budget, and global climate change.

Idaho

STUDENTS: Paul Steven Powell, Kei Furukawa, & Jared Breakall
INSTITUTION: Brigham Young University-Idaho
DIVISION: Chemistry
FACULTY ADVISOR: David Collins
POSTER TITLE: Simultaneous Chromatography and Electrophoresis: Pressurized Chamber Apparatus Design
DISPLAY AREA: 1N
ABSTRACT: The Human Genome Project promised an improved understanding of serious health issues such as autoimmune diseases and cancer. However a map of DNA alone, provided by genomic research, lacked critical information for combating disease. In response, various other "-omics" fields have arisen in an attempt to map out the entirety of all cellular compounds; e.g., fats and oils, reaction intermediates, and cellular proteins (lipidomics, metabolomics, and proteomics, respectively). Consequently, the demand for more efficient and powerful separation of biological molecules in complex mixtures has increased. To help meet such demand we are developing the technique of simultaneous chromatography and electrophoresis. This separation method applies an electric field orthogonal to a traditional thin-layer chromatographic (TLC) separation. This novel, simultaneous approach eliminates the challenges associated with multiple separations occurring in series (i.e., the use of complicated instrumentation and procedures), and allows for separation in as few as five minutes. This technique recently produced repeatable results for the separation of amino acids, vitamins, and dyes. Currently the apparatus design is being investigated in an attempt to further improve separation efficiency, resolution, and repeatability. The present design under evaluation delivers mobile phase via syringe pump into a sealed pressurized TLC chamber. Controlling the flow rate in such a fashion can improve repeatability. It has been found that the mobile phase flow across the plate is affected by the material of the seal, the pressure of the system, and the dimensions of the apparatus.

Illinois

STUDENT: Samantha Jae Rinehart
INSTITUTION: Lewis University
STUDENT HOME STATE: Iowa
DIVISION: Chemistry
FACULTY ADVISOR: Jason J. Keleher
POSTER TITLE: Photo-active Biomimietic Nanocomposite Films for Next Generation Water Purification Applications
DISPLAY AREA: 1O

ABSTRACT: The importance of cost effective water purification systems in developing nations is growing because of the lack of resources to keep drinking water free from infestation of microbes, and other harmful contaminants. In this research, we take advantage of the sun's natural radiation as a renewable resource and investigate the ability for photo-catalytic particles, such as TiO_2, to degrade dyes and other organic molecules when incorporated into a polymer matrix for a next generation filter membrane. Photo-catalytic particles are activated when in the presence of ultra-violet light. Incorporating these molecules into a polymer creates an additional advantage because water can be filtered without the need for electrical energy. The cellulose-acetate polymer matrix used in this research is biomimetic and non-toxic which adds additional benefits for the natural environment by not emitting pollutant byproducts. Not only do these filters degrade organic molecules without electrical energy, but the photo-catalytic particles have been functionalized with silver (Ag) for additional antimicrobial properties, and widening the range of light activating the degradation process of harmful molecules. This concept takes full advantage of the sun's wide array of natural radiation. Initial experimentation proves that this polymer matrix is effective at reducing growth of both Escherichia coli and Staphylococcus aureus, while degrading organic dyes up to 50% in only an hour. Based on our experiments, biomimetic polymer systems infused with Ag coated TiO_2 can be used to effectively filter and remediate polluted drinking water of harmful organic molecules.

Indiana

STUDENT: Haefa Mansour
INSTITUTION: Purdue University
STUDENT HOME STATE: Ohio
DIVISION: Chemistry
FACULTY ADVISOR: Julie C. Liu
POSTER TITLE: Development of Surgical Adhesives Using Protein Engineering
DISPLAY AREA: 1P

ABSTRACT: Our project focuses on the development and characterization of a recombinant protein that functions as a surgical adhesive. Surgical adhesives provide a promising alternative to the stiff sutures and staples that often result in external tissue damage when used to close wounds. Ideal surgical adhesives are biocompatible, able to set well and remain sticky in moist conditions, possess strong adhesive and cohesive properties, and exhibit mechanical properties that mimic those of the surrounding tissue. Unfortunately, the commercial adhesives available today are unable to meet all of these criteria. We created a modular protein that combines the adhesive properties of mussel proteins, which are able to strongly adhere to nearly any surface, with the mechanical properties of elastin, a protein that provides flexibility to soft tissues in the body. Thus far, our protein was successfully cloned into *E. coli*, overexpressed, and purified. The pre-adhesive region of the purified protein was enzymatically converted to impart adhesive properties. We then used crosslinking chemistry to form hydrogels from a model protein and show that the gelation time and mechanical properties can be tuned by altering the crosslinker concentration and pH. The mechanical properties of protein hydrogels are being characterized using controlled-force tensile testing. Our preliminary results demonstrate that our model protein has a Young's modulus that is similar to that of soft tissues and may be of interest in surgical applications.

STUDENT: Kathryn Reinhart
INSTITUTION: Purdue University
STUDENT HOME STATE: Indiana
DIVISION: Biology
FACULTY ADVISORS: Dennis Minchella & Alyssa Gleichsner
POSTER TITLE: Competition in the Human Parasite Schistosoma Mansoni
DISPLAY AREA: 2A
ABSTRACT: Management of parasitic disease in humans, wildlife and livestock requires an understanding of basic parasite ecology. Parasites often coexist with other parasites within a host, and the interaction between these individuals can affect the intensity of disease, here referred to as virulence. The nature of the interaction can also affect the parasite's survival and reproduction, and thus the transmission of the parasitic disease. Kin selection theory predicts that closely-related parasites will be less competitive, will not exploit host resources as intensely, and will therefore have lower virulence than a population of unrelated parasites. Our experiment focused on the effect of competitive interactions on parasite virulence and transmission for the human parasite *Schistosoma mansoni*. *S. mansoni* has a complex life cycle: humans are the ultimate host, but larval stages live in Biomphalaria species snails. To investigate the impact of competition on parasite virulence, we infected 550 *B. glabrata* snails with ten different combinations of three genetically-distinct strains of *S. mansoni*. Each snail was infected by one or two strains, and then monitored for the duration of infection. Snail reproduction, mortality, growth and parasite reproduction were used to measure virulence and transmission. We then analyzed parasite genetic markers to investigate relative abundance over time. Our results support kin selection theory, in so far that snails infected with multiple strains have lower reproduction than singly-infected snails. Also, we discuss results that suggest parasite relatedness may impact host mortality and fluctuations in parasite abundance over time.

Kansas

STUDENT: Guadalupe Del Socorro Gonzalez
INSTITUTION: Bethel College
STUDENT HOME STATE: Kansas
DIVISION: Psychology
FACULTY ADVISOR: Dwight Krehbiel
POSTER TITLE: Event-Related Potential and Reaction Time Differences in Processing of Words Acquired in Early and Late Childhood
DISPLAY AREA: 2B
ABSTRACT: Previous research has demonstrated that the left hemisphere specializes in language processing, while the right hemisphere specializes in emotional and spatial processing. However, a recent study found that words acquired in early childhood (3-4 years) are processed faster by the right hemisphere whereas, words acquired in late childhood (7-8 years), are processed faster by the left hemisphere (Bowers, Bradley, & Kennison, 2013). In addition, there was an overall difference with early-acquired words processed faster than late-acquired words. The present research obtained reaction times (RTs) and event-related potential (ERP) recordings to investigate how words with different ages of acquisition are processed. Participants included seventeen undergraduates (9 males, 8 females) enrolled in psychology courses at Bethel College. Based upon the results of Bowers et al., we hypothesized that there would be different hemispheric ERP asymmetries for early than for late-acquired words. Findings indicated that participants responded faster to early than late-acquired words $F(1,16)=5.43$, $p=.03$. Late-acquired words presented on the right produced a significantly more positive ERP ($p<.05$, corrected for multiple comparisons) than those presented on the left for almost all right hemisphere electrodes, while such differences are considerably less pronounced for early-acquired words. Instead, there is significantly greater positivity on left parietal and occipital sites for early-acquired words presented on the left. Overall, our research suggests that language processing may also be a right hemisphere process. A follow-up experiment is being conducted with a larger sample size with the goal of finding ERP and RT asymmetries within a single study.

Kentucky

STUDENT: Yen Hai Tran
INSTITUTION: Morehead State University
STUDENT HOME STATE: Kentucky
DIVISION: Social Sciences
FACULTY ADVISOR: Ali Ahmadi
POSTER TITLE: Impacts of Economic Reform on the Expansions of Middle Classes in Southeast Asian Countries
DISPLAY AREA: 2C
ABSTRACT: This study investigates whether or not the economic reforms and progress have had a positive effect on the size of the middle-class of eleven Southeast Asian countries. The study presumes the middle class has an important role in bringing about political and economic stability of a country. Economic data from World Bank, government websites of these countries, and others were analyzed and various measures of economic development were tested to achieve the results of this study. Results of the study indicate, despite reduction of the poverty and heterogeneity of the patterns for these countries, in general, these reforms have not led to the expansion of the middle class relative to the other socioeconomic classes.

Louisiana

STUDENT: Miguel Angel Velasquez
INSTITUTION: University of New Orleans
STUDENT HOME STATE: Louisiana
DIVISION: Psychology
FACULTY ADVISOR: Elizabeth A. Shirtcliff
POSTER TITLE: Reciprocal relation between psychophysiological patterns of stress responsivity and sleep.
DISPLAY AREA: 2D
SPONSORING AGENCY: National Institute of Mental Health, National Institutes of Health, Stimulating Competitive Research SCoRE UNO Summer Research Program
GRANT #: MH077687
ABSTRACT: Contemporary understanding of the brain indicates that a reciprocal relationship exists between mind and body. Biological functioning adjusts to the consequences of our behavior and our behavior is influenced by our biology. This is the case with the stress responsivity system. The stress hormone cortisol follows a biologically-predetermined daily cycle of secretion (controlled by circadian rhythm) that correlates with expected activity throughout the day, however this cycle can accommodate to different environmental changes that can occur. It has been noticed that individuals who report stress problems also report sleep problems (Lavie, 2001). I hypothesized that sleep quality can influence maladjustments in cortisol's rhythm. All participants provided saliva samples and had to take the Pittsburgh Sleep Quality Index (PSQI). Saliva was enzyme-immuno-assayed for cortisol. I analyzed the data for two independent studies: (1)12 samples were taken for basal and lab days in 65 individuals. People who scored worse in total PSQI showed decreased stress reactivity (γ=-.02, t(63)=-2.27, p=0.026). (2)6-8 samples per day across 5 days in 120 maltreated or control adolescents. I used a 3-level hierarchical linear model to examine rhythms within each day and within each individual. The cortisol rhythm was flattened on days when adolescents had poor sleep latency (β=.013, p=.025 for time-since-waking, β=-.0008, p=.039 for quadratic time-since-waking). Stress (Graham, 2006) and sleep (Deborah, 2001) problems are related to cognitive and physiological issues; finding an appropriate connection between them can be elemental in preventing problems.

Maryland

STUDENT: Erika Gerhold
INSTITUTION: Salisbury University
STUDENT HOME STATE: Maryland
DIVISION: Mathematics/Computer Science
FACULTY ADVISOR: Donald Spickler
POSTER TITLE: The Multiplicative Structure of the Group of Units of Polynomial Quotient Rings
DISPLAY AREA: 2E
SPONSORING AGENCY: Bridges for SUCCESS, National Science Foundation
GRANT #: 969428
ABSTRACT: Since the discovery of public key cryptography in 1976, cryptography has relied extensively on algebraic number theory, specifically on the properties of rings and fields. The world's e-commerce system would not exist without the RSA algorithm, the most commonly used encryption and authentication algorithm, which utilizes these algebraic structures. Furthermore, the Advanced Encryption Standard (AES), one of the most common symmetric cyphers, attributes its speed and security to the structure of factor rings, similar to those we have studied. While these methods are secure by today's standards, with the ever increasing computational power of the computer, they will eventually need to be replaced. Research by Nobel Prize winners, David J. Wineland and Serge Haroche, suggests that if the quantum computer is successfully built then new cryptographic algorithms must be found. In short, none of the current cryptographic methods currently used in practice will stand up to the computational power of the quantum computer. With this realization, there is a substantial amount of research being done on post-quantum cryptography; cryptographic methods that will not succumb to the power of the quantum computer. Many of the most promising methods being developed utilize the multiplicative group of units in ring structures, such as the ones we have studied. My research has produced concise formulas for determining the cyclic group decomposition of the multiplicative group of units for a large class of quotient rings closely related to those currently being used and those that are proposed for future cryptographic methods.

Massachusetts

STUDENT: Robert Guillette
INSTITUTION: Bridgewater State University
STUDENT HOME STATE: Massachusetts
DIVISION: Mathematics/Computer Science
FACULTY ADVISOR: Irina Seceleanu
POSTER TITLE: Modeling the Retreat of Glaciers in a Changing Climate
DISPLAY AREA: 2F
ABSTRACT: Glaciers across the globe have been increasingly losing mass over the last century. The melting of glaciers offers tangible evidence of broader environmental changes as they respond directly to long-term trends in temperature, precipitation and solar radiation. Since glacier retreat provides a barometer of climate change, it is important to better understand the effects of climatic factors on glaciers. In this project we created a mathematical model of glacier retreat, which we applied to the Folgefonna glacier in Norway. Using multiple linear regression we studied the effects of temperature, precipitation, insolation, wind speed and the North Atlantic Oscillation on the area of the glacier, and found that within our model these factors explained 82.7% of the total variation of the Folgefonna glacier area. Moreover, based on different projections of global temperature over the next century, we simulated the evolution of the area of this glacier under these scenarios and obtained prediction intervals for when the glacier will completely disappear. Our study showed that future climate change will lead to a dramatic retreat and, potentially, to a complete loss of the Folgefonna glacier over the course of the next century. Our model can be applied to other glaciers across the world and is of interest to governments because of the socio-economic impact of glacier retreat. Given that one-sixth of the world's population depends on glacier and snow melt for its water supply, a mathematical model predicting the future of glaciers can help governments adapt to the realities of a changing climate.

STUDENT: Janelle Marie Roberts
INSTITUTION: Bridgewater State University
STUDENT HOME STATE: Rhode Island
DIVISION: Social Sciences
FACULTY ADVISOR: Jennifer Manak
POSTER TITLE: Exploring the American Revolution from Multiple Perspectives through Critical Literacy Discussions in a Fifth-Grade Classroom
DISPLAY AREA: 2G
ABSTRACT: The Massachusetts Curriculum Frameworks require that the American Revolution be taught in fifth-grade classrooms. Unfortunately, many teachers must resort to utilizing textbooks that are unappealing to students and that share history from just one point of view. Incorporating quality children's literature into the social studies curriculum can provide a more well-rounded view of historical events. Furthermore, critical literacy discussions encourage children to question what might be missing from the text, and understand content from multiple perspectives. This naturalistic, descriptive study conducted in a fifth-grade classroom in a multicultural, suburban school in southeastern Massachusetts, examined how reading children's literature about the American Revolution influenced students' understanding of historical events. Students were guided by their teacher to read their textbook critically, explore an educational website, and read quality children's literature about various groups that participated in the Revolutionary War. Findings suggest that reading and reviewing various sources versus a single history textbook led students to develop a better understanding of the American Revolution. Students' initial beliefs that only white males were involved in the Revolution gave way to new understanding of the important roles of white women, male and female African slaves, Native Americans, and children. This study shows positive outcomes of integrating critical literacy in social studies instruction, helping students develop a more comprehensive understanding of historical events.

STUDENT: Jillian Bolinger
INSTITUTION: University of Massachusetts-Dartmouth
STUDENT HOME STATE: Massachusetts
DIVISION: Physics/Astronomy
FACULTY ADVISOR: Robert T. Fisher Jr.
POSTER TITLE: Predicting the Signature of Thermonuclear Supernovae Resulting from Merging White Dwarf Stars
DISPLAY AREA: 2H
SPONSORING AGENCY: NASA Space Grant
ABSTRACT: As one of the brightest objects in the cosmos, a thermonuclear supernova releases as much energy over the span of several seconds as the sun does in its entire lifetime. Different thermonuclear supernovae have particularly consistent energy outputs, and therefore have been used as "standard candles" to measure cosmological distances. The relationship between their distances and redshifts provided evidence of the universe's accelerating expansion and lead to the discovery of dark energy. However, their stellar progenitors remain a mystery. One leading model for thermonuclear supernovae consists of two white dwarf stars in a binary system being drawn together by gravitational radiation, leading one to be disrupted by gravitational tides, torn apart, and forming a hot accretion disk. When the combined mass exceeds a critical limit a detonation occurs. Using a two-dimensional computer simulation of the first moments subsequent to the white dwarf merger, the goal of my research is to predict a "smoking gun" observable optical and X-ray signature of this class of merging white dwarf model. My prediction of a characteristic precursor to the supernova event is the first of its kind. Current and future telescopic surveys, including NASA's WFIRST and the NSF/DOE LSST optical survey instruments, as well as the ESA ATHENA X-ray space telescope, will allow for pre-explosion images to be compared directly against my predictions. These findings will either help validate or rule out the merging white dwarf model and facilitate a deeper understanding of this supernova and the nature of dark energy.

Michigan

STUDENT: Garrett Hisler
INSTITUTION: Grand Valley State University
STUDENT HOME STATE: Michigan
DIVISION: Psychology
FACULTY ADVISOR: Amanda Dillard
POSTER TITLE: Effects of information processing style and health message format on skin cancer risk perceptions and behavioral intentions
DISPLAY AREA: 2I
SPONSORING AGENCY: Ronald E. McNair Postbaccalaureate Achievement Program, U.S. Department of Education and Office of Undergraduate Research and Scholarship, Grand Valley State University
ABSTRACT: Previous research has found inconsistent effects regarding whether health information presented in a narrative message may be more effective than this information presented in a standard health message in increasing risk perceptions and motivating health behaviors. One possibility is that these inconsistencies relate to the information processing style people use when reading these messages. While some people may process information rationally based on logic and reason, others may process the information experientially, based on current feelings and past experiences. In this experiment, we examined how message format would interact with information processing style to influence risk perceptions and behavioral intentions related to skin cancer. Participants included 147 female college women who reported regular use of tanning beds. Participants were randomly assigned to read either a narrative or a factual message about the risks of skin cancer. Before reading the message, participants were randomly assigned to read instructions that would activate either an experiential or rational information processing style. After the message, risk perceptions of skin cancer, worry about cancer, and behavioral intentions were assessed. Results revealed significant interactions between processing style and message format for three types of risk perceptions and worry. In each case, a pattern emerged showing that risk perceptions and worry were highest when participants read the narrative message with an experiential processing style. The present study qualifies inconsistencies in previous research by suggesting that narratives may be a promising route for increasing risk perceptions when they are processed experientially.

STUDENT: Allyson I. Hoffman
INSTITUTION: Hope College
STUDENT HOME STATE: Michigan
DIVISION: Arts & Humanities
FACULTY ADVISOR: Courtney Werner
POSTER TITLE: The Passing of the Test is Inconsequential: The Relationship Between AP English Literature and Composition Courses and First-Year Composition Courses
DISPLAY AREA: 2J
SPONSORING AGENCY: Hope College Mellon Scholars Andrew W. Mellon Foundation
ABSTRACT: Through the College Board's Advanced Placement (AP) English Literature and Composition program many high school students can waive college requirements and earn credit for college courses if they receive passing scores on the AP examination. However, rather than receiving credit for a college literature course as the College Board recommends, many students with passing AP Literature and Composition exam scores receive credit for a first-year composition (FYC) course, which is a standard general education requirement for undergraduate students. While some institutions are altering their AP acceptance policies, because many students are still testing out of FYC courses, these courses and their corresponding AP courses and exams should be explored for content comparability. The speaker discusses the results from a case study of high school AP English Literature and Composition courses and two- and four-year college FYC courses in Western Michigan. The extreme differences in course goals and writing assignments between the high schools' and colleges' courses suggest that AP English Literature and Composition courses are not equivalent to FYC courses. Furthermore, the AP English Literature and Composition examination tests writing skills that are not taught in FYC. Therefore, students who pass the AP English Literature and Composition exam should not receive credit or exemption from FYC courses. Instead, the speaker offers alternative actions colleges can take based on passing AP exam scores, such as changing their AP score acceptance policies and offering advanced or honors FYC classes for AP English Literature and Composition students.

STUDENT: Eric Greve
INSTITUTION: Hope College
STUDENT HOME STATE: Illinois
DIVISION: Chemistry
FACULTY ADVISOR: Graham Peaslee
POSTER TITLE: Presence and Absence of Halogenated Flame Retardants in Polyurethane Automotive Seating Foams
DISPLAY AREA: 2K
SPONSORING AGENCY: Evironmental Protection Agency, National Science Foundation, and U.S. Department of Energy
GRANT #: GL00E01116-0 / RUI 1306074 / SC0007352 / RUI 0969058
ABSTRACT: The widespread use of toxic halogenated flame retardants has been detected in polyurethane foams found in juvenile products, upholstered furniture, and other consumer goods. Particle-Induced X-Ray Emission (PIXE) and X-ray Florescence (XRF) spectroscopy were utilized as novel methods for the rapid detection of halogenated flame retardants in polyurethane foam automotive seating units. While PIXE and XRF were shown to be comparable methods for this purpose, PIXE proved to identify halogenated flame retardants more accurately. PIXE analysis of over 790 samples of polyurethane seating foams taken from 406 post-consumer automobiles revealed over 90% of cars in the study had seating units that tested positive for the presence of one of more halogenated flame retardants, with chlorinated flame retardants being more commonly detected than their brominated counterparts. Halogenated flame retardants were also more frequently detected in the seats' thin, external covering foam layers than in a their main bulk foam components. While significant differences in flame retardant use were observed in cars depending on their country of manufacture, the absence of definite trends associated with flame retardants chemicals suggest that their use is likely specified by individual component suppliers in the automotive supply network instead of automobile manufactures and assembly plants. Depth studies using SEM/EDS suggest flame retardant chemicals can leach from treated covering material into surrounding, untreated foam components. This study sheds light on national and industrial trends associated with toxic flame retardant use, demonstrates the motility of these chemicals in different media, and confirms their overwhelming ubiquity in consumer goods.

Minnesota

STUDENT: Emily Susan Kolenbrander
INSTITUTION: Carleton College
STUDENT HOME STATE: Massachusetts
DIVISION: Biology
FACULTY ADVISOR: Jennifer Wolff
POSTER TITLE: Transcription Factor RNAi Screen Identifies Regulators of Sex-Specific Ventral Cord Neuron Fate in *Caenorhabditis Elegans*
DISPLAY AREA: 2L
SPONSORING AGENCY: National Science Foundation
GRANT #: IOS-1021705
ABSTRACT: Research in the model organism *C. elegans* has led to many discoveries that have changed the way scientists approach biological problems. A classic example is the discovery of RNA interference (RNAi), a gene-silencing pathway that was discovered in *C. elegans*. RNAi has since been widely exploited for its genetic applications and therapeutic promise in diseases such as macular degeneration. Therefore, it is important to recognize the significance and potential impact of researching fundamental biological processes in *C. elegans*. My research focuses on the development of sexually dimorphic neurons in males and females of the same species. The ventral cord neurons (VCNs) of *C. elegans* provide an excellent model of sexual specialization: initially indistinguishable neuronal precursors undergo cell division, death, and differentiation to generate distinct sets of neurons that control reproductive behaviors in each sex. How does sex-specificity of these key events in VCN development arise? We have used RNAi as a technique to identify new genes regulating VCN development. Our assay used a toolkit of fluorescent neuronal labels to visualize specific aspects of VCN fate. So far, the screen has expanded our understanding of the roles of conserved patterning genes (Hox genes) and their cofactors. It has also brought to light potential new genes of interest, such as the transcription factor UNC-4, for further study. Our findings are important for understanding this fundamental aspect of reproductive biology, and the answers will surely propel future scientific advances with applications beyond *C. elegans*.

STUDENT: Michael R. Doyle
INSTITUTION: Minnesota State University-Mankato
STUDENT HOME STATE: Minnesota
DIVISION: Engineering
FACULTY ADVISOR: Kuldeep Agarwal
POSTER TITLE: 3D Printing of Stainless Steel for Engineering Applications
DISPLAY AREA: 2M
ABSTRACT: 3-D metal printing has the potential to solve problems in the medical, prototyping, automotive, aerospace, defense, and other engineering industries. To reach the potential of any manufacturing process, the final product's material characteristics and how the process affects those characteristics must be understood to meet the demands of industrial applications. There is a gap in standard testing information regarding metal based 3-D metal printing processes. The purpose of this project is to fill that gap of valuable information for this manufacturing process, so that its principles can be used to design better products. Fundamental tensile and compression tests were executed using American Society for Testing and Materials standard methods on printed parts whose process variables were adjusted independently. Heater power temperature per metal powder layer, layer thickness, and printing orientation of the part were changed to understand how varying the process affects the strength when elongated or compressed. These tests and factors were setup using a design of experiments method to reduce the fundamental research's complexity and waste while retaining quality statistical results. Our research shows a strong interaction between the process variables and the resulting mechanical properties. This data can be utilized to design better quality parts.

Mississippi

STUDENTS: Candace Chambers, Deabra Gray, Crystal Killingsworth, Darnishia Spraggins & Tasha Thigpen
INSTITUTION: Jackson State University
DIVISION: Social Sciences
FACULTY ADVISOR: Candis Pizzetta
POSTER TITLE: Characteristics of Traditional and Non-traditional Students that Influence their Preference for Online Classes
DISPLAY AREA: 2N

ABSTRACT: Our study involves the development of a survey designed to measure student perceptions of online learning. The survey will incorporate both questions on the online environment and demographic questions important to understanding the environment outside the classroom. The research project will evaluate how the level of faculty-student interaction affects student engagement in the online classroom, how students perceive the effectiveness of online learning, the correlation between the students' characteristics and engagement, the student's perceptions of course requirements, and which strategies for online collaboration were most effective. The study will use an adapted National Survey of Student Engagement (NSSE 2011) to focus on the online environment and to measure the effect of faculty-student interaction on student engagement in the online setting. The research hypothesis suggests that a student's demographic characteristics, a student's level of engagement in non-academic activities, the frequency of student-faculty interaction, and the amount and quality of collaboration in the classroom all will have a measurable impact on the level of student engagement in the online classroom.

Montana

STUDENT: Michael Samuel Fast Buffalo Horse
INSTITUTION: Montana State University
STUDENT HOME STATE: Montana
DIVISION: Social Sciences
FACULTY ADVISOR: Jioanna Carjuzaa
POSTER TITLE: Language Revitalization in Montana's Native American Communities
DISPLAY AREA: 3A

ABSTRACT: Languages are dying at an alarming rate and the languages spoken by Native American tribes in the United States are especially vulnerable. Of the 300+ languages that were spoken on this continent before European contact, only half remain. The tribal languages of Montana's Indigenous nations were harshly suppressed historically, through restrictive governmental policies, cultural prejudices, and forced assimilation. These languages are vital to the continued existence of these peoples, their cultures, and the unique perspectives that they can offer to the rest of the world. Our research takes a snapshot of some of the efforts taking place to revitalize these tribal languages. We examine the historical underpinnings of how these languages came to be endangered and why preserving these languages today is such a daunting task. Our research also focuses on the role education has and continues to play in the health of these languages from suppression in federally backed boarding schools to the rise of new speakers in tribal language immersion schools. Through interviews with tribal educators and visits to Montana's reservations we also wish to present the human side of tribal language revitalization and maintenance by describing the successes and struggles that people have shared with us. It is our hope that our research can offer a more complete look at Montana's tribal people and their experiences with revitalizing and maintaining their languages in the wake of a harsh recent history and in the face of a rapidly changing future.

Nebraska

STUDENT: Samantha Rae Woracek
INSTITUTION: University of Nebraska at Omaha
STUDENT HOME STATE: Nebraska
DIVISION: Social Sciences
FACULTY ADVISORS: Gina S. Ligon & Katy Ann Conealy
POSTER TITLE: A Case Study of Marketing and Management in Two Violent Extremist Organizations
DISPLAY AREA: 3B
SPONSORING AGENCY: U.S. Department of Homeland Security
GRANT #: 2010-ST-061-RE0001
ABSTRACT: Violent extremism is a complex issue that demands examination from multiple frameworks. By applying empirical research from marketing and management literature to two historical cases of violent extremist organizations, we were able to understand much more about the business of violent extremism. Although knowing what keeps violent extremist groups going is important, uncovering what led to their downfall is equally, if not more, important. In this study, we used a dataset of historical information previously collected through a grant funded by Department of Homeland Security to add to our own research into the Weathermen Underground and the Japanese Red Army. Using a case study design we applied notoriety (i.e., firm reputation) variables to these violent extremist organizations to determine the similarities and differences in their rise and fall from their height of power. For both organizations, we found that organizational branding was the greatest source of success; however, by creating a highly centralized structure the Japanese Red Army was better able to direct members to a strategic goal. Ultimately, the deterioration of their organizational structures led both groups to collapse. By examining these organizations, we determined that organizational strategies such as creating a unique "brand," as well as hierarchical structure of operations play significant roles in the overall success of a violent extremist organization.

Nevada

STUDENT: Ivón Padilla-Rodríguez
INSTITUTION: University of Nevada-Reno
STUDENT HOME STATE: Nevada
DIVISION: Arts & Humanities
FACULTY ADVISOR: Emma Sepúlveda Pulvirenti
POSTER TITLE: Redefining Traditional Mixed-Status Latino Families in the United States: Would Immigration Reform Separate or Unite Families?
DISPLAY AREA: 3C
SPONSORING AGENCY: Office of Undergraduate and Interdisciplinary Research, University of Nevada, Reno
ABSTRACT: The United States' most recent immigration flux has created a large undocumented, immigrant population that encompasses millions who currently reside in America. Today, of the estimated 12 million undocumented individuals who live in the United States, 8 million are of Latin American descent (Pew Center). The undocumented are constantly faced with legal barriers such as the inability to acquire driving documentation in most states or healthcare. Equally deterring is the fear of reporting crimes because of possible deportation—a risk become reality due to the Secure Communities legislation. The Obama administration's unprecedented 1.5 million deportations have also reinforced a need in the community for immigration reform (U.S. Immigration and Customs Enforcement). Currently, S. 744, the "Border Security, Economic Opportunity, and Immigration Modernization Act," proposes to give lawful status to the U.S. undocumented population, enhance border security, and make various changes to visa allocations. Similarly, H. R. 15, which bears the same name as S. 744, also aims to reform the United States' immigration policies, but with less of an emphasis on border security. These comprehensive immigration reform bills are awaiting action in the U.S. Congress. If either of these bills are ultimately made law, the rights of Latino immigrants will still necessitate future protection and advocacy due to their logistical implementation shortfalls such as weighing enforcement principles against family unity and accurately defining what constitutes a "family," considering the traditional, nuclear family composed of two opposite-sex parents with their own biological children is slowly becoming an anachronism (U.S. Census Bureau).

New Hampshire

STUDENTS: Amanda J. Kimball & Norah Snow
INSTITUTION: Colby-Sawyer College
DIVISION: Health Sciences
FACULTY ADVISOR: Kerstin Stoedefalke
POSTER TITLE: Are the ACSM Metabolic Calculations for Walking Accurate for College Aged Females?
DISPLAY AREA: 3D
SPONSORING AGENCY: New Hampshire IDeA Network of Biological Research Excellence (NH-INBRE) and National Institutes of Health National Institute of General Medical Sciences
GRANT #: 5P20RR030360-03 / 8P20GM103506-03
ABSTRACT: It is well known that the incidence of obesity is on the rise in the United States. As a result, there is great interest in helping people lose weight. Increasing one's physical activity has been shown to help people lose weight. Therefore, exercise prescriptions are often targeted at increasing ones caloric expenditure. The American College of Sports Medicine has provided calculations to determine how many Kcals (kilocalories) are being burned during exercise. Exercise equipment such as treadmills, cycles and ellipticals, have the equations preprogrammed into them so that people can determine the number of Kcals they used during exercise. However, there is limited research to show whether or not the Kcal calculations are accurate. To answer this question, we tested 100 college aged females. All volunteers walked on a motor driven treadmill at three different elevations. The speed was held constant at 3.2 mph. To determine Kcal cost, we continuously measured oxygen utilization while the subject walked on the treadmill. The rationale behind this is that one liter of oxygen utilized is equivalent to 5 kcal. The results of our study showed that the published ACSM calculations for Kcal utilization overestimate the actual cost of walking on a treadmill. The importance of these findings is that exercise prescriptions, targeted at weight loss, may be underestimating the amount of energy that people are using during their exercise sessions.

STUDENT: Stephanie Winn
INSTITUTION: University of New Hampshire
STUDENT HOME STATE: New Hampshire
DIVISION: Health Sciences
FACULTY ADVISOR: Gene Harkless
POSTER TITLE: Quality of Postnatal Care for Mothers and Babies in Nepal
DISPLAY AREA: 3E
ABSTRACT: In Nepal, the infant mortality rate is 43 per 1,000 live births, and the maternal mortality rate is 170 per 100,000 live births. Many of these deaths could have been prevented if adequate care was provided during the period after giving birth. The aim of this study is to determine the quality of care that new mothers in Nepal are receiving during the postnatal period. There is currently very little information regarding postnatal care in Nepal, and no previous studies have investigated the quality of care. Qualitative and quantitative data were collected through 30 structured interviews. 10 new mothers were interviewed in 3 villages in the Kathmandu Valley: Thaiba, Godawari, and Harisiddhi. According to the World Health Organization, there are 15 key aspects of postnatal care, and these guidelines were the basis of data analysis. No mother received all 15 aspects of care. One mother received 11 aspects of care, while 3 women only received 2 aspects. There are serious gaps in the postnatal care that women in Nepal are receiving, both in terms of assessment, as well as accuracy and effectiveness of teaching. As Nepal is a developing nation, it can be assumed that other developing countries have poor postnatal care as well. The maternal and infant death rates could be vastly improved if the quality of postnatal care improves globally.

New Jersey

STUDENTS: Anthony McFarlane, Christina Leedy, Michael J. Collins & Stephanie Valente
INSTITUTION: Kean University
DIVISION: Arts & Humanities
FACULTY ADVISORS: Shane Derris, Jonathan Mercantini & Elizabeth Hyde
POSTER TITLE: Remember Me To...The Newark State Teachers College World War II Letter Collection
DISPLAY AREA: 3F

ABSTRACT: As the Newark State Teacher's College librarian during World War II, Nancy Thompson preserved over four hundred letters from students serving in the war and noted in her scrapbook, "It is the story of the war itself, and of how these men and women came back to our country's children to teach the meaning of freedom." As the hub of a communications network that foreshadowed modern social media, this project consisting of our transcriptions, digital preservation, and analysis of the scrapbook, reveals how a local community was changed by a global event. By mapping this network 70 years later we re-capture the movement of hundreds of people and ideas across the country and around the globe. With the sun setting on the Greatest Generation, this project proudly shares their stories for posterity, but more importantly demonstrates how WWII changed American society. We follow these men and women as they take part in the greatest mass mobilization in American history, from their initial processing at Fort Dix and everywhere between Tokyo and Berlin. The project bears witness to the raw emotions of a generation at war, ranging from the mundane to the momentous; and in telling their hundreds of personal stories, the letters collectively reveal these service men and women wrestling with conflicting values of religious freedom, gender roles, race relations, and other socially sensitive topics. While much has been written on WWII history, Nancy Thompson's scrapbook is one of the last untold stories of WWII.

New York

STUDENT: Laura Parisi
INSTITUTION: Rochester Institute of Technology
STUDENT HOME STATE: New York
DIVISION: Chemistry
FACULTY ADVISOR: Matt Miri
POSTER TITLE: Plastic Produced With A Renewable Material: Eugenol
DISPLAY AREA: 3G

ABSTRACT: In the current economic, political, and environmental climate continued dependence upon fossil fuels to synthesize commodity plastics raises serious concerns including the repercussions of foreign oil dependence and environmental damage. As such, research for creating plastics from renewable resources is necessary and has become a field of great interest. Several major plastic manufacturers have employed methods to create polyethylene (a polymer made primarily from ethylene) from sugar cane. Using ethylene from this renewable source to create ethylene-based copolymers (polymers with two or more constituent compounds) with other renewable compounds could lead to a variety of completely renewable plastics with diverse applications. In this study, the synthesis of copolymers of ethylene with the renewable compound eugenol, which is found in clove oil and in a variety of other plants, was investigated. Compared to other compounds studied, eugenol was found to have a high rate of commercially practical incorporation (up to 5% with little loss in polymerization efficiency). The products have sufficiently high melting points for them to be applied in processing. Eugenol has been employed previously in the hygiene and dental industries for its antiseptic properties; as such, ethylene/eugenol copolymers like those synthesized in this study have potential for food and medical packaging and other applications.

STUDENT: Tonisha D. Kerr
INSTITUTION: St. Lawrence University
STUDENT HOME STATE: New York
DIVISION: Social Sciences
FACULTY ADVISOR: Keith Evans
POSTER TITLE: Trends of Economic Development & Environmental Quality in China: An Application of the Environmental Kuznets Curve using CO_2
DISPLAY AREA: 3H
ABSTRACT: The Environmental Kuznets Curve (EKC) hypothesis proposes that there is an inverted U-shaped relationship between per capita income and pollution. It describes a situation where growth in per capita income leads to increased pollution at early stages of economic development, but improved quality at later stages. This paper uses the EKC hypothesis to analyze the economic development and environmental quality of China over the past forty years. As the number one producer and consumer of coal, China emits large quantities of carbon dioxide (CO_2) each year. Consequently, the country faces many difficulties with environmental degradation and sustainability. This paper seeks to determine if the relationship proposed by the EKC hypothesis holds within China for CO_2, and whether this relationship is unique to China because of its policy of energy self-sufficiency, or if CO_2 exhibits the same type of relationship across countries. Using a simple statistical analysis, I assess how the relationships may differ between China, India, and the United States, and between carbon dioxide and sulfur dioxide. Results suggest that the relationship does not hold for China's CO_2 emissions, but that it does hold for other pollutants and countries. Years of deterioration of environmental quality have made the future state of the environment a major point of concern. By gaining a better understanding of the relationship between economic development and environmental quality, we can further understand how to create policies that facilitate the enhancement of the economy while limiting environmental degradation.

North Carolina

STUDENT: Edward A. Palumbo
INSTITUTION: Davidson College
STUDENT HOME STATE: North Carolina
DIVISION: Chemistry
FACULTY ADVISOR: Nicole L. Snyder
POSTER TITLE: Novel Trehalose-based Oligosaccharide Conjugates for the Diagnosis and Treatment of *Mycobacterium tuberculosis* (MTB)
DISPLAY AREA: 3I
SPONSORING AGENCY: Davidson Research Initiative, Davidson College
ABSTRACT: It is believed that one third of the global population is infected by *Mycobacterium tuberculosis*. *M. tuberculosis* (MTB) is a pathogenic bacterium that affects the respiratory system of mammals. First discovered in 1882, *M. tuberculosis* is unlike most strains of bacteria because of the odd, waxy coating that appears on its cell surface. This coating makes both detection and treatment a significant challenge. Recently, there has been a rise in the use of carbohydrate-based therapeutics for the detection and treatment of *M. tuberculosis*. More specifically, derivatives incorporating trehalose, a disaccharide first isolated in 1832, have recently gained particular attention since derivatives of these oligosaccharides have been shown to be involved in several biosynthetic pathways of MTB cell surface glycans. In this poster, we present the chemical synthesis of a series of trehalose-based oligosaccharide conjugates which we plan to use as probes to study cell surface glycan biosynthesis in order to design more selective and effective diagnostic and treatment options for MTB infections.

North Dakota

STUDENT: Kowan T. O'Keefe
INSTITUTION: Minot State University
STUDENT HOME STATE: North Dakota
DIVISION: Chemistry
FACULTY ADVISOR: Mikhail M. Bobylev
POSTER TITLE: Novel Approach to the Synthesis of Benzylamine Fungicides
DISPLAY AREA: 3J

ABSTRACT: Fungal diseases range from fairly benign topical infections to dangerous systemic infections. They become the primary cause of death for patients with compromised immune systems, including cancer patients undergoing radiation or chemotherapy, organ transplant patients, and AIDS patients. Benzylamines comprise one of the most important groups of antifungal medicines that include naftifine (Naftin), terbinafine (Lamisil), and butenafine (Lotrimin Ultra). Fungal infections are also very common in the plant world, and cause a significant loss of crop production in any regular year. Sometimes, they result in a catastrophic loss of the entire harvest, which may cause famine and loss of lives for entire nations, like the Great Famine in Ireland of 1845-1852. Benzylamines were shown to have a significant antifungal activity against agricultural fungal pathogens, and were patented as agricultural fungicides. Benzylamines were also patented as industrial fungicides that could be used to protect various materials from destruction by molds. Recently, we developed an instant procedure for the synthesis of simple benzylamines that could be used as precursors in the production of benzylamine antifungal medicines and agricultural fungicides. In the current work we investigated the possibility of using the same procedure for a direct synthesis of benzylamine fungicides themselves. The reaction was conducted on 10 mmol scale at 200ºC. Column chromatography was used for the isolation of the reaction products. NMR-spectroscopy and elemental analysis were used to determine the structures of the products. The reaction was completed in 1 minute and produced a model benzylamine compound as the major product.

Oklahoma

STUDENTS: Sean Smith & Wenxi Zeng
INSTITUTION: University of Central Oklahoma
DIVISION: Mathematics/Computer Science
FACULTY ADVISOR: Jicheng Fu
POSTER TITLE: A Research and Training System for Young Children with Severe Motor Impairments
DISPLAY AREA: 3K
SPONSORING AGENCY: Oklahoma Center for the Advancement of Science & Technology (OCAST), The Oklahoma IDeA Network of Biomedical Research Excellence (OK-INBRE), and National Institutes of Health
GRANT #: OCAST HR12-036 / 8P20GM103447

ABSTRACT: Lack of independent mobility exposes young children with severe motor impairments to a greater risk for secondary impairments in the development of social, cognitive, perceptual, and motor skills. To acquire independent mobility and reduce the risk of secondary impairments, power wheelchairs are advocated as a part of early intervention programs for children. However, the steep learning curve, safety issues, and high cost of pediatric wheelchairs may prevent young children from using wheelchairs at an early age. In this research, we are developing a 3D wheelchair simulation system using a game engine, which will allow children aged 2 to 5 years with severe motor impairments to practice the fundamental skills required to safely control a joystick-operated wheelchair. The physics of the simulation will mimic the real world so that the data we collect will be useful and relevant. State-of-the-art artificial intelligence techniques will be employed in this research. We will use the simulation system as a test bed to evaluate numerous algorithms, such as path finding algorithms, navigation algorithms, maneuvering control algorithms, etc. These algorithms can be used to help the young children safely control their wheelchairs. Since young children typically think in a linear manner when attempting to reach a goal, we will utilize this characteristic to develop heuristics that will help determine where the child intends to go. In sum, our research system will overcome the limitations associated with real wheelchairs meanwhile provide a safe, affordable, and exciting environment to train young children and test various artificial intelligence algorithms.

Oregon

STUDENT: Jordan S. Lum
INSTITUTION: University of Portland
STUDENT HOME STATE: Hawaii
DIVISION: Engineering
FACULTY ADVISOR: Heather E. Dillon
POSTER TITLE: In-Situ Analysis of a Photovoltaic System in Portland Oregon
DISPLAY AREA: 3L

ABSTRACT: The cost of photovoltaic systems has decreased steadily in the last 5 years, reaching costs that make it more attractive in areas not considered optimal for installation in the past. To optimize the size of future installations and determine the return on investment performance, studies of installed systems are important. A detailed analysis of the performance for a photovoltaic system in the Pacific Northwest has been conducted using data since installation in 2011. Data collected over two years was used to determine the greatest and least energy producing days of the year, to generate average monthly performance and annual energy plots, to quantify correlation between outside temperature and the photovoltaic system performance, and to compare actual performance of system to the expected performance for a maximum AC output of 4,675 W and annual energy production of 4,898 kWh. The greatest energy producing day was July 11, 2013 with total energy production of about 35 kWh. The least energy producing day was January 16, 2013 with total energy production of about 1 kWh. According to calculations and analysis, the actual performance of the photovoltaic system reaches an efficiency of around 12.3%. Expected system performance has been estimated as 14.9%, resulting in a 2.6% decrease from expected performance. From the analysis conducted so far, the given photovoltaic system has been found to be performing in the range expected for a system of this type. These findings are significant for helping consumers understand cost effectiveness of photovoltaic performance in the Pacific Northwest.

STUDENT: Kylie E. Leffler
INSTITUTION: University of Portland
STUDENT HOME STATE: Oregon
DIVISION: Biology
FACULTY ADVISOR: Amelia J. Ahern - Rindell
POSTER TITLE: Sequence Analysis of Exons 13 and 14 of the PPBG gene from Normal and GM1-Gangliosidosis Affected Sheep
DISPLAY AREA: 3M
SPONSORING AGENCY: Murdock Charitable Trust

ABSTRACT: Inherited metabolic disorders account for approximately 20% of newborn genetic conditions. GM1 Gangliosidosis (GM1) is one of these fatal disorders for which there is no cure. Its onset is marked by early psychomotor degeneration and severe facial and skeletal abnormalities. The wide range of progressively worsening symptoms can lead to misdiagnosis and treatment is limited to relieving symptoms. GM1 is caused by a mutation in the GLB1 gene, which leads to production of a faulty enzyme (beta-gal) and subsequent neurodegeneration. Animal models are often used for characterizing these heritable conditions like GM1 and for the development of potential therapeutics. GM1 has been identified in various mammalian species including dogs, cats, and cattle that serve as suitable models for study. Our lab is characterizing a unique sheep model of GM1 to better understand the underlying molecular basis of the disorder. My project focuses on sequencing a gene (PPBG) that codes for a protein whose protective functionality is critical for beta-gal's structural integrity and catalytic activity. We hypothesize that an altered PPBG gene sequence (a polymorphism) may contribute to the unique phenotype observed in our inbred sheep. We isolated genomic DNA from normal and GM1 affected sheep, purified, and amplified it using Polymerase Chain Reaction (PCR), which clones targeted regions of a gene. The resulting PCR products were separated using gel electrophoresis and sequenced to look for differences. We are in the process of analyzing sequence chromatograms that should provide evidence to support or refute our hypothesis and lead to additional research.

Pennsylvania

STUDENT: Michael D. Koerner
INSTITUTION: Drexel University
STUDENT HOME STATE: Pennsylvania
DIVISION: Engineering
FACULTY ADVISOR: Andrew R. Cohen
POSTER TITLE: Haptic Exoskeleton Interface for Five Dimensional Stem Cell Movies
DISPLAY AREA: 3N

ABSTRACT: Time lapse microscopy data showing live neural stem cells together with blood vessels allows biologists to quantitatively analyze the dynamic properties of stem cells in intact tissue, providing insight into fundamentally important questions in regenerative medicine and cancer therapeutics. These image sequences (movies) consist of the three spatial dimensions plus time, along with a 5th dimension containing distinct biological imaging channels such as stem cells and blood vessels. These movies are uniquely challenging to interact with. Using only keyboard and mouse makes navigation difficult and imprecise. For this interdisciplinary project, we developed a new approach to interacting with 5-D microscopy movies. A haptic exoskeleton-based force feedback glove together with a tonal audio component allows the user to perceive spatiotemporal relationships in the data that simple visualization cannot display. The exoskeleton mimics the flexor and extensor tendons of each finger, reacting accordingly when a change in fingertip intention is detected. It also eliminates the need for keyboard and mouse by acting as a three dimensional pointer with built in keyboard touch points. The exoskeleton's position above the workspace is optically tracked with millimeter accuracy and translated into the stem cell visualization application. The exoskeleton includes an array of six vibrating coin motors that relay texture data. The glove allows blood vessels and stem cells to be grasped virtually, providing force, audio and texture feedback. Interdisciplinary applications include: 1) a rehabilitative device for physiotherapy, 2) an assistive device for human strength augmentation, 3) a master or slave device for tele-operation.

STUDENT: Emily M. Crossette
INSTITUTION: Lafayette College
STUDENT HOME STATE: Pennsylvania
DIVISION: Engineering
FACULTY ADVISOR: Arthur D. Kney
POSTER TITLE: Calculating our Estrogen Footprint: Testing a Procedure to Quantify the Estrogenic Compounds Released by Wastewater Treatment Plants
DISPLAY AREA: 3O
SPONSORING AGENCY: Environmental Protection Agency
GRANT #: MA-91757101-0

ABSTRACT: This research project evaluated a test to measure both inactive and active estrogenic compounds (ECs) in water samples. This test will enable scientists to understand the rate of biological deactivation of ECs in sewer networks as well as the fate of active and inactive estrogenic compounds in municipal treatment facilities. With this information, scientists can better understand the overall EC footprint on our surface waters. ECs enter surface water via runoff from pesticide treated farmland, factory effluent and wastewater treatment plants. Human exposure to estrogenic compounds has been linked to increased cases of male reproductive disorders over the past 50 years. Studies globally have found a rise in cases of intersex fish, which many scientists attribute to ECs. At this time, there is no practical test available to wastewater treatment facilities for measuring both active and inactive ECs. Currently, most tests to quantify ECs in wastewater samples only measure active ECs, those that interact with cells and cause adverse health effects. However, most ECs released by humans are inactive and inactive ECs can reactivate in the presence of bacteria and other species in the wastewater stream. Just how many ECs have reactivated when they reach treatment plants and after treatment remains uncertain. Studies of concentrations of ECs before and after treatment have found higher concentrations of ECs in discharge, suggesting that it is important to quantify inactive ECs. Preliminary data has suggested this procedure has the potential to serve as a reliable, practical, and important test for wastewater treatment plants.

STUDENT: Kasey L. Lynn
INSTITUTION: Marywood University
STUDENT HOME STATE: Pennsylvania
DIVISION: Arts & Humanities
FACULTY ADVISOR: Erin A. Sadlack
POSTER TITLE: The Struggle for Power: Politics and Self-Fashioning in the Rhetoric of Evita Peron and Hillary Clinton
DISPLAY AREA: 3P
ABSTRACT: This project explores the rhetoric of women in politics to consider how they fashioned themselves to achieve positions of power. I examine two prominent twentieth-century women as case studies: Evita Peron and Hillary Rodham Clinton. Upon examining these women's speeches and writings, it becomes clear that each developed a sophisticated public self that each maintained through rhetoric. Peron, the First Lady of Argentina, broke the boundaries of her country and time period by standing up for her beliefs in the power of the people and women, helping to give women the right to vote. Clinton has helped to change America and the world, especially in the Middle East, in terms of women's rights, giving hope and tools for change to many women. My research demonstrates that each woman had success because she was able to employ complex rhetorical strategies that helped her master her surroundings in her own political realm and create an image or persona that society would accept. It is through each woman's persona that she was able to effect change and to have success in politics. My research considers why women must create these personae in order to have such success. It also poses the question of how women's voices change a political realm still so dominated by male voices. By examining Clinton and Peron's persuasive strategies and rhetorical self-fashioning, we can gain a better understanding of women's paths to political power.

South Carolina

STUDENTS: Tyler Ovington & Alex Devon
INSTITUTION: Clemson University
DIVISION: Engineering
FACULTY ADVISOR: Delphine Dean
POSTER TITLE: Innovative Medical Devices for Resource Poor Settings
DISPLAY AREA: 4A
SPONSORING AGENCY: National Heart, Lung, Blood Institute National Institutes of Health
GRANT #: K25 HL09228
ABSTRACT: Healthcare systems in resource-poor settings often depend heavily on donated medical supplies to offset the costs of medical devices designed for developed markets. The goal of our work is to provide Tanzania and similar markets affordable, robust, and sustainable alternatives to complex donated equipment, which is prone to malfunction and disrepair. For the past three years, our design team has been working with contacts in Tanzania to design two medical devices: a neonatal monitor-incubator system and a low-cost glucometer for diabetics. Students have traveled on three separate occasions to Tanzania to gather design constraints for the devices to ensure they can be built, used, and repaired in country. On our most recent visit (this past January) we presented our devices to clinicians in Dar es Salaam, Tanzania and representatives of the Tanzanian Ministry of Health. This meeting was very positive, and our Tanznania collaborators are very excited to help us bring our devices to market. With their help, we aim to complete a pilot study of the neonatal monitor-incubator system in Dar es Salaam during the coming year. For the glucometer project, we have submitted an Institutional Review Board approval to initiate testing of the device on human blood.

STUDENT: Jenny L. Tumas
INSTITUTION: Clemson University
STUDENT HOME STATE: New Mexico
DIVISION: Social Sciences
FACULTY ADVISOR: Jeffrey A. Fine
POSTER TITLE: Evaluating Nutrition Labels: Effects of Letter Grades on Behaviors and Perceptions
DISPLAY AREA: 4B
ABSTRACT: Considerable research has measured consumer use of nutrition labels across demographics, and results have indicated that nutrition labels are confusing to consumers. Current literature on nutrition labeling suggests that simplified information and interpretive aids would allow consumers to more easily assess the value of given foods in their overall diet. This study expands current literature on nutrition labeling by using experimental design to measure respondents' (1) likelihood to purchase and (2) perceived healthiness of a box of crackers when exposed to letter grades, like those received in school, as a means of labeling on the front of the package. Data was gathered by surveying a random sample of university students and community members. Results indicate that respondents pay little attention to nutrition labels, but a new front of package letter grade label significantly affects respondents' perceptions of a depicted food. These results suggest that further policy changes to simplify nutrition labels may have significant impact on consumers' nutritional choices. The positive relationship between education and understanding/ use of nutrition labels suggests that simplification of nutrition labels has potential to reduce nutritional disparity related to socioeconomic status and education level.

South Dakota

STUDENT: David T. Christianson
INSTITUTION: University of South Dakota
STUDENT HOME STATE: South Dakota
DIVISION: Chemistry
FACULTY ADVISOR: Grigoriy Sereda
POSTER TITLE: Design of Nanoscale Compositions for Remineralization of Human Dentin
DISPLAY AREA: 4C
ABSTRACT: There are currently two materials on the market for tooth remineralization, which function by supplying hydroxyapatite to the tooth surface with a phosphate-functionalized compound. These existing compounds are delivered by a variety of methods, which includes rinsing with mouthwash, brushing with toothpaste, chewing gum, and drinking milk enriched with remineralization components. As often times the origin of dental caries is at or slightly below the gum-line, we propose to introduce new methods of monitoring and maintaining healthy human dentin through the development of functionalized silk flosses, which when used properly, are uniquely able to deliver remineralizing compounds to "at risk" dental sites, and to identify sites with a predilection for caries based on indication of local conditions such as pH. Our group has focused on placing hydroxyapatite and calcium citrate crystals on silk floss to be deposited on human dentin while cleaning teeth. Our group has further developed covalent chemical methods of functionalizing silk in order to bind pH sensitive dyes that are able to detect areas of the mouth where demineralization is most likely. Our research group is fine-tuning morphology and surface chemistry of the new nanomaterials to enable their use in toothpastes and other dentifrices as remineralizing and desensitizing agents due to their ability to deliver minerals to the tooth's surface and occlude dentin tubules. Expansion of the pH-sensitive dyes to other color chemical sensors will allow for fast diagnostics of non-dental diseases, for instance by detection of cancer markers in saliva.

Tennessee

STUDENT: Rance Solomon
INSTITUTION: Middle Tennessee State University
STUDENT HOME STATE: Tennessee
DIVISION: Physics/Astronomy
FACULTY ADVISOR: Daniel Erenso
POSTER TITLE: Alternative New Approaches to Early Detection and Effective Treatments of Cancer
DISPLAY AREA: 4D
SPONSORING AGENCY: Mathematics as a FirstSTEP to Success in STEM National Science Foundation and Tennessee Center for Botanical Medicine Research
GRANT #: 969571
ABSTRACT: We present studies demonstrating alternative approaches for detection, measuring chemo therapy efficacies, and precise dose determination in radiation therapy of cancer. Cancer cells become more elastic compared to normal cells when it reaches to malignancy and in fact that is how it can spread in the body. The relative comparison of the elasticity of cancerous vs. normal cells can be extremely useful in early detection of cancer. We have conducted such comparison in cancerous and normal breast cells using a linear laser trapping system suitably known as laser tweezers (LTs). LTs are able to apply a small centralized force on appropriately sized dielectric materials including living cells. We use this force to compress and induce elastic deformation in individual cells. The cells are then released and left to relax back to their equilibrium states. The relative contraction and relaxation rate of the cells are analyzed and studied for normal and cancerous breast cells. A similar procedure and analyses are also used on breast cancer cells treated by a specific Chinese botanical chemo therapy to measure the efficacy of the treatment. The application of LTs for precise dose determination in radiation therapy is demonstrated by capturing a cancer cell at high power until the cell become ionized and escaped from the trap. From the measurement of power and time the minimum energy needed to ionize the cell is determined. Using this energy and the mass of the individual cells the radiation dose needed to ionize is calculated.

STUDENTS: Mark E. Sellers & Philip L. Spinolo
INSTITUTION: Rhodes College
DIVISION: Physics/Astronomy
FACULTY ADVISOR: Brent K. Hoffmeister
POSTER TITLE: Diagnosing osteoporosis: a promising new ultrasonic technique
DISPLAY AREA: 4E
SPONSORING AGENCY: National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health
GRANT #: R01AR057443
ABSTRACT: Osteoporosis is a major public health problem. According to the National Osteoporosis Foundation, approximately one in two women and up to one in four men age 50 and older in America will break a bone due to osteoporosis. Researchers are exploring ways to use ultrasound to improve the diagnosis of osteoporosis. One approach measures ultrasonic “backscatter” from bone that arises from the interaction of an ultrasonic wave with the porous microstructure of bone. A new technique has been introduced recently that measures the power difference between two portions of a backscatter signal. Theoretical predictions indicate that the technique will minimize errors caused by tissues that lie between the ultrasonic probe and the region of bone that is measured. The goal of this study is to test this prediction experimentally. Ultrasonic backscatter measurements were performed on 25 excised specimens of human bone in a water tank. Measurements were repeated with materials positioned between the ultrasonic probe and bone specimen to simulate tissues that would be present during an actual clinical examination of a patient. Statistical analysis using the analysis of variance (ANOVA) indicated that the presence of these tissues does not produce significant errors in the measured results, supporting the theoretical prediction.

Texas

STUDENT: Emmanuel Y. Fordjour
INSTITUTION: University of Texas at Arlington
STUDENT HOME STATE: Texas
DIVISION: Biology
FACULTY ADVISOR: Julian G. Hurdle
POSTER TITLE: Analysis of Anti-*Clostridium difficile* Activity of Paired Antibiotic Combinations
DISPLAY AREA: 4F
SPONSORING AGENCY: Louis Stokes Alliance for Minority Participation, National Science Foundation and National Center for Complementary and Alternative Medicine National Institutes of Health
GRANT #: HRD-1202008 / 5R01AT006732
ABSTRACT: Clostridium difficile is an anaerobic intestinal bacterium that causes severe to fatal diarrhea, killing over 15,000 individuals annually in the US. The emergence of the epidemic BI/NAP1/027 *C. difficile* has increased the severity and recurrence of *C. difficile*-associated diarrhea (CDAD), prompting the search for alternative treatments. Antibiotic monotherapy for CDAD often fails or persist for long periods, prompting the idea that multi-drug therapy could be a better treatment approach. Furthermore, antibiotic combinations may reduce the risk of antibiotic resistance emerging during therapy. Such concepts have been applied to treat other persistent bacterial infections, but remain under-examined in treating CDAD. This project investigates whether paired combinations of different anti-difficile antibiotics could have synergistic or antagonistic effects against *C. difficile*. We have selected an array of membrane active agents, DNA, RNA, and protein synthesis inhibitors for in vitro combination studies. We assessed the minimum inhibitory concentrations (MICs) of these antimicrobials singly and in paired combinations against ten *C. difficile* clinical isolates. Based on these MICs, we determined fractional inhibitory concentrations (FICs) and consequently, the synergistic or antagonistic properties of these antimicrobial combinations. Novobiocin-ramoplanin and fusidic acid-rifaximin combinations were particularly effective, with additive to fully synergistic effects (FIC $\leq$ 0.75) observed in 70% and 55% of tests performed respectively. Of fundamental interest in this study are the biochemical interactions of anti-difficile combinations. Antagonistic combinations reduce the efficacy of multi-drug therapy. However, synergistic combinations enhance antimicrobial activity of either antibiotic and could reduce drug dosage and its concomitant toxicity to *C. difficile*-infected patients.

Utah

STUDENT: James E. Gardner
INSTITUTION: Utah State University
STUDENT HOME STATE: Utah
DIVISION: Health Sciences
FACULTY ADVISOR: Sydney Y. Schaefer
POSTER TITLE: Age-related changes in Attention during Motor Learning: Implications for the Provision of Physical Rehabilitative Services to Older Adults
DISPLAY AREA: 4G
SPONSORING AGENCY: National Swimming Pool Foundation
ABSTRACT: Motor learning theories predict that humans require high levels of attention to perform novel motor tasks, but little to no attention for learned tasks. Thus, practicing a task may decrease the amount of attention required to perform it. To test the theoretical relationship between attention and task practice, we used a physiological proxy for attention known as electrodermal activity (EDA). We hypothesized that EDA in healthy adults would decrease as they practiced a novel motor task. We also hypothesized that EDA would be higher overall in older adults than in younger adults when performing the same task. Because advancing age tends to limit one's ability to divide attention among multiple tasks, we expected an age-related increase in attentional requirement during motor performance. Two groups (young, n=5; age=22.4 ± 2.1 yrs and older, n=5; age=75.8 ± 5.2 yrs) practiced 150 trials of a novel upper extremity task over three days. We measured 1) EDA using wrist-worn sensors and 2) task performance, defined as movement time. Contrary to our first hypothesis, EDA increased with practice, suggesting that additional training may be necessary to reduce the task's attentional requirements. Results did, however, support our second hypothesis, with higher EDA in older adults compared to younger adults throughout practice. This suggests that older adults may use more attention than younger adults to perform a given task in order to compensate for other age-related declines in sensorimotor function. These findings have implications for the provision of physical rehabilitative services, given that ~50% of patients treated in the U.S. are over age 65. As such, our data support the need for more days of insurance-covered therapy and for alternative metrics of progression through therapy.

Virginia

STUDENT: Alexandra Zeller
INSTITUTION: George Mason University
STUDENT HOME STATE: Virginia
DIVISION: Mathematics/Computer Science
FACULTY ADVISOR: Padmanabhan Seshaiyer
POSTER TITLE: Mathematical Modeling of a Dynamic Social Process
DISPLAY AREA: 4H
SPONSORING AGENCY: Computational Science Training for Undergraduates in the Mathematical Sciences and Research Experiences for Undergraduates, National Science Foundation
GRANT #: DMS-0639300 / DMS-1062633
ABSTRACT: Social processes are actions that affect each and every human being every day. These processes range from something as simple as talking to a stranger on the street about the weather to global peace talks. Both actions involve not only the individuals engaging in conversation, but also those that are affected by the things discussed. Not only are these processes key in developing relationships, they are often the foundations of how a person 's personality is defined. Human beings have behaviors that are often unpredictable, so trying to develop a formula or model to represent these actions proves difficult. In this research, a behavioral model is proposed. This mathematical system of differential equation models the social interactions of human immigration and emigration within regions. The researcher then proposes distinctive scenarios which impact the population movements between locations. Potential applications are discussed and include disease outbreaks, regulatory influences, and language differences. Mathematical modeling is then combined with quantitative sociology in a system of differential equations to accurately project a dynamic social process.

STUDENT: Robert K. Ulrey
INSTITUTION: George Mason University
STUDENT HOME STATE: Virginia
DIVISION: Biology
FACULTY ADVISOR: Monique Van Hoek
POSTER TITLE: Cranberry proanthocyanidins have anti-biofilm properties against Pseudomonas aeruginosa
DISPLAY AREA: 4I
ABSTRACT: Biofilm is the colonization and aggregation of microbes to a surface. It is an important virulence factor in many bacteria. Bacteria within a biofilm are phenotypically resistant to antibiotics, desiccation, and the host immune system. Cranberry juice has long been used to prevent diseases of the urinary tract that are often related to biofilm formation. Recent studies have found that the A-type proanthocyanidins of cranberries have anti-biofilm properties against several bacteria. Using crystal violet biofilm staining, resazurin metabolism assays, and confocal imaging, we measured the ability of A-type proanthocyanidins to disrupt the biofilm formation of Pseudomonas aeruginosa. We determined that cranberry proanthocyanidins can disrupt the biofilm cycle of P. aeruginosa, possibly by inhibiting ATP production. Results suggest that A-type proanthocyanidins may be a useful therapeutic against the diseases caused by this organism.

Washington

STUDENT: Mollie Holmberg
INSTITUTION: University of Washington
STUDENT HOME STATE: Washington
DIVISION: Social Sciences
FACULTY ADVISOR: Luke Bergmann
POSTER TITLE: Understanding Patterns of Human Dependence on Agriculture and Forestry in the Anthropocene
DISPLAY AREA: 4J
SPONSORING AGENCY: Graduate Research Fellowship Program, National Science Foundation
ABSTRACT: Diverse lines of evidence indicate that humans have come to dominate many environmental and climate systems across the globe, prompting some researchers to declare the present part of a new geologic age known as the "Anthropocene." Since plants form the base of many biological ecosystems (including those to which people belong) and agriculture alone covers approximately forty percent of land surface, studying how humans appropriate Earth's plant production allows us to explore one of the most significant ways people have come to dominate Earth systems. Previous work has mapped the global distribution of plant growth supporting humans but failed to fully link this production to specific populations. To understand these connections, we begin by tracing global agricultural and forest production through a simplified representation of the global economy (containing about sixty million economic flows). To do this, we use global economic data collected by the Global Trade Analysis Project, enabling us to connect fields and forests with the often distant human populations whose lives they eventually support. Our model accounts for indirect plant consumption (for example, factory products require plant consumption by laborers) as well as plant materials people consume directly. Mapping these results and transforming them through Geographic Information Systems (software which can visually and computationally manipulate the results in diverse ways) allows us to describe major intersecting processes of globalization linking distant peoples and lands. For us to respond effectively to the increased human domination of Earth systems, improving our understanding of these socioecological relationships will be critical.

West Virgina

STUDENT: Priyanka Jagannath
INSTITUTION: West Virginia University
STUDENT HOME STATE: West Virginia
DIVISION: Health Sciences
FACULTY ADVISOR: Visvanathan Ramamurthy
POSTER TITLE: Nonsense Suppressors: A Cure for Blindness?
DISPLAY AREA: 4K

ABSTRACT: Leber Congential Amaurosis (LCA) is an inherited retinal disease characterized by blindness in children. A common cause of LCA is a premature stop codon at amino acid position 278 (W278X) in the human Aipl1 (hAipl1) gene. This will prevent the synthesis of full-length AIPL1 protein in human patients leading to blinding disease. We propose a novel treatment that involves usage of translation read through drugs (TRIDs), in which the stop codon is bypassed leading to translation of full-length AIPL1 protein. As a proof of principle, we demonstrate that aminoglycoside G418, a known TRID is able to suppress stop codon at 278 in hAipl1 gene resulting in full-length AIPL1 protein. Unfortunately, G418 is toxic to cells and is not suitable for human therapy. In contrast, PTC14, a non-toxic TRID currently in clinical trial for muscular dystrophy, did not restore full-length AIPL1. We then synthesized RTC13, another TRID successful in restoring dystrophin. At present efforts are underway to test RTC13 in its ability to restore full-length hAIPL1. Our long-term goal is to test the ability of a non-toxic TRID such as RTC13 in combination with gene therapy to restore vision an animal model for LCA.

Wisconsin

STUDENT: Jacelyn Peabody
INSTITUTION: Carthage College
STUDENT HOME STATE: Colorado
DIVISION: Biology
FACULTY ADVISOR: Bryan Williams
POSTER TITLE: The Hunt for Agmatine Receptors on Macrophages
DISPLAY AREA: 4L
SPONSORING AGENCY: National Heart, Lung, Blood Institute, National Institutes of Health
GRANT #: 5R25HL088728 / 5K08HL1045466-03

ABSTRACT: Agmatine, a derivative of L-arginine, is known to act as a neurotransmitter, is associated with lung exacerbations in cystic fibrosis patients, and can augment biofilm formation in Pseudomonas aeruginosa. Most CF patients succumb to chronic airway infections from this opportunistic pathogen. Our lab is interested in the host-pathogen dynamic in the CF lung and has found that agmatine plays a pivotal role in this process. Known agmatine-binding receptors are being searched for on primary murine macrophages, a cell we have shown responds to agmatine. Candidates are 5HT-2C-serotonin receptors and α 2-adrenoreceptors, whose existence has been putatively shown through adrenoreceptor blockade in the presence of agmatine. Western-blots were used to identify the presence of α 2-adrenoreceptors and 5HT-2C-serotonin receptors and to quantify the level of expression following stimulus of macrophages with lipopolysaccharide or agmatine. Understanding the immunomodulatory effects of agmatine allows for future studies of host-pathogen interactions in CF patients.

STUDENT: Laurelyn Sandkamp
INSTITUTION: University of Wisconsin-Eau Claire
STUDENT HOME STATE: Wisconsin
DIVISION: Social Sciences
FACULTY ADVISOR: Ruth J. Cronje
POSTER TITLE: Nutritional Agency Constraints Among Food Insecure Residents of Eau Claire County
DISPLAY AREA: 4M
ABSTRACT: The USDA (2013) defines food insecurity as a household-level economic and social condition of limited or uncertain access to adequate food. According to the Wisconsin Food Security Project (2007-11), one in three Eau Claire County (ECC) residents is poor or low-income (income less than or equal to 185% of the poverty line) and one in ten ECC residents is defined as food insecure. In response to these realities, this research investigates and evaluates the key day-to-day economic constraints that limit the ability of low-income residents of Eau Claire County (Wisconsin) to procure and prepare a healthful diet. Through a community action partnership with The Community Table, a community meal site in Eau Claire, a one-on-one oral survey was administered confidentially to 120 food insecure individuals over a one-month period. This survey modified The Community Table's standard quarterly survey to align with the Current Population Survey Food Security Supplement. The confidential, qualitative nature of the data collection process yielded surprising statistics and powerful insights detailing the money, time, and resource insufficiencies that influence respondents' ability to procure and prepare a healthy diet. The role of current local initiatives working to fight food insecurity is also evaluated.

Wyoming

STUDENT: Talysa R. Stockert
INSTITUTION: University of Wyoming
STUDENT HOME STATE: Wyoming
DIVISION: Engineering
FACULTY ADVISOR: Zackie S. Salmon
POSTER TITLE: Heat Transfer Study in a Laboratory-Scale Twin-Screw Extruder for On-Board Hydrogen Storage
DISPLAY AREA: 4N
SPONSORING AGENCY: US Department of Education
ABSTRACT: With the rising concerns of environmental impacts from fossil fuels, new alternative energy technologies, such as hydrogen fuel cell vehicles, are being developed. The improvement in the hydrogen storage material, ammonia borane (NH3BH3), has established the need for an on-board solid material transportation system. By using a laboratory-scale co-rotating twin-screw extruder, this research investigates the heat transfer and transportation of low-density polyethylene (LDPE, a surrogate of ammonia borane) between the fuel storage tanks. Savings on production, repairs, power requirements, and the weight of the system will result when the separation component is incorporated in the twin-screw extruder. This investigation takes the conventional system of a co-rotating twin-screw extruder and integrates it into the developing field of hydrogen storage. In this evaluation, the volumetric flow rates were compared to the requirements of the US Department of Energy minimum hydrogen mass flow rate adapted to the use of ammonia borane. The heat transfer coefficient was studied to verify that adequate temperatures were obtainable for thermolysis (hydrogen separation) for the twin-screw extruder system. This investigation also provides theoretical analysis of the governing equations for the flow within the twin-screw extruder. With the advancement of this technology, hydrogen fuel cell systems can become lighter and safer for a wide range of uses. In the US transportation sector, these advancements would improve the competition with fossil fuels for vehicular use.

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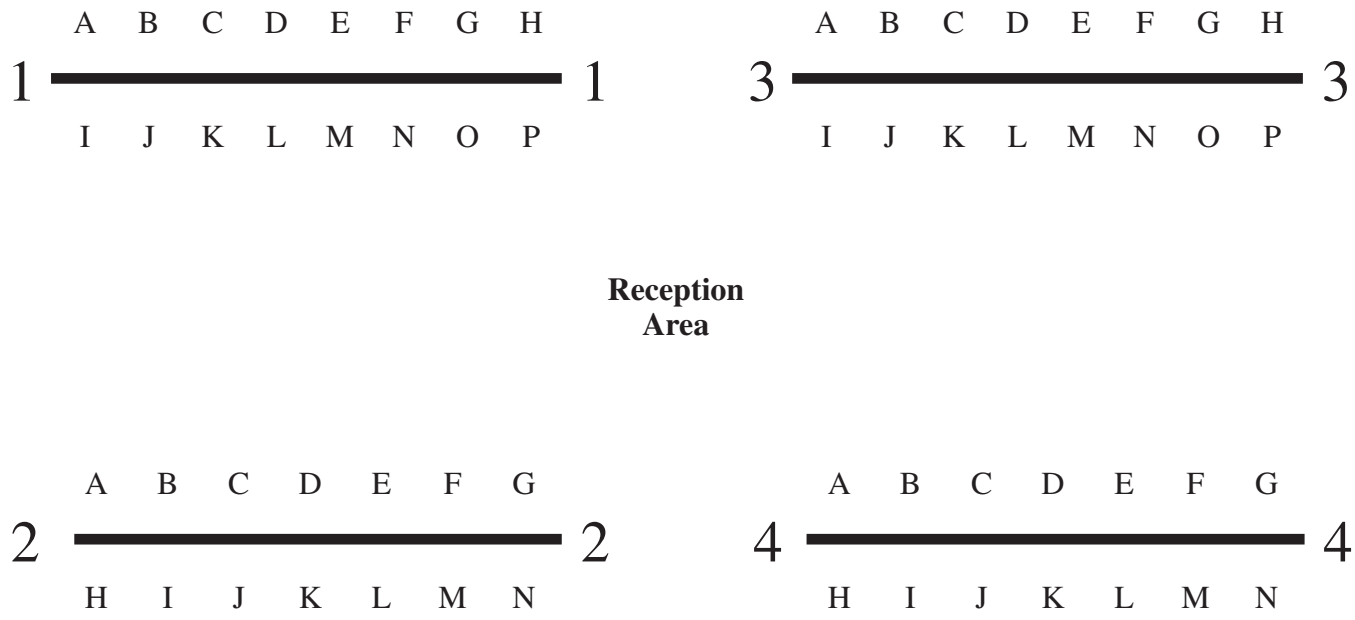

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