Council on Undergraduate Research

April 19, 2005
Sheraton National Hotel
Arlington, Virginia
&
Rayburn House Office Building
Washington, D.C.

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The Posters Presented were supported by the generosity of many governmental and private funders, including:

- Army Research Laboratory
- Boston University Undergraduate Research Opportunities Program
- Centers for Disease Control
- Center for Integrative Natural Science and Mathematics
- Council on Undergraduate Research Summer Fellowship Program
- Department of Energy
- Department of Justice and Office of Juvinile Justice and Delinquency Prevention
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- National Science Foundation
  - Louis Stokes Alliance for Minority Participation
  - Research Experience for Undergraduates Program
- Nutrition 21
- Office of Naval Research
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- Rohatyn Center for International Affairs
- Society for the Advancement of Material and Process Engineering
- Welch Foundation

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Program

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8:00 am	Continental Breakfast, Sheraton National Hotel - Concourse Room
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	Ridg Mills Junior Legislative Aide - Office of Congressman Steny Hoyer
	Dee Ann Divis United Press International Senior Science and Technology Editor

Visits to Congressional Offices

11:00 am - 3:00 pm	Appointments with Representatives

Poster Session

3:00 – 4:30 pm	Poster set-up, Rayburn House Office Building - B-338, B-339, B-340
5:00 – 7:00 pm	Poster session and reception
7:00 – 7:30 pm	Break down posters

Student Poster Abstracts

Alabama

POSTER TITLE: Design of a Simulator for Ionizing a Radiation Detector
STUDENT: **Hanan Dahche**
FACULTY: John Watts
INSTITUTION: National Space Science and Technology Center
FUNDING: National Aeronautics and Space Administration
DISPLAY AREA: 1A

Abstract:
Space radiation has always been a concern due to its side effects on astronauts. Therefore, NASA has developed a radiation shielding program to test the possibilities of building materials that best protect astronauts. Deep Space Test Bed (DSTB) is one of many experiments designed for that purpose. This experimental setup involves deploying a set of radiation detectors on a large balloon in Antarctica. Our project dealt with the implementation of a software simulator to help NASA physicists design the physical DSTB detector package.

Our DSTB detector software simulator is written in C++ using object oriented programming techniques. Moreover, our simulator uses the radiation transport tool kit GEANT4 for describing the three-dimensional geometry of the detector set and the response to high-energy protons (100 MeV to 10 GeV) and their secondary particles as they move through the DSTB detectors. The simulations were run on a Linux system. The purpose of the simulations is to aid the detector designer develop the DSTB detector package. This requires technical interchange with the designers and testing of different design configurations. Often, a change in the design configuration of the data package requires a change in the simulation package. Our simulator also uses the AIDA package which is the histogram/graphics display package integrated with the GEANT4 package, and the JAS3 package written in JAVA which helps with the displaying and printing of plots.

Our task was to develop a geometrical representation of the physical DSTB detector based on the description and analysis of NASA physicists. The detector consists of seven boxes each of which is sensitive to particles being bombarded on it. These boxes have precise dimensions and are arranged in an explicit sequence with specific distances from one another. In our simulator, we represent the boxes by separate C++ classes. In each class, the material, geometry, surfaces, rotation, and visualization are defined. In addition, each class is derived from a specific GEANT4 class that handles the sensitivity of the boxes. The dimensions, distance, and structure of the boxes are variables that can be changed.

The simulation of our detector is controlled by several C++ classes derived from GEANT4 classes. These classes are: Tracking, Detector Response, Hit, Stepping, Stacking, Run, Event and Track management, Visualization and User Interface. For our purposes, we have added many methods to Run and Event classes in order to calculate the energy deposit, time, and other statistical information of the primary and secondary particles. AIDA codes were also added to those classes to histogram the required data.

Arizona

POSTER TITLE: Vitamin E Analogue as a Novel Treatment for Cancer
STUDENT: **Mikhal Gold**
FACULTY: Emmanuel Akporiaye
INSTITUTION: University of Arizona
DISPLAY AREA: 1B

Abstract:
An improved treatment for cancer that bypasses the harsh side effects of most chemotherapies is one of the most sought after goals in the research and medical community. One of the ways to achieve this goal is to find drugs that can specifically target cancer cells while leaving healthy cells unharmed. Recent research has shown that Vitamin E succinate (alpha-tocopheryl succinate; á-TOS,) a semi-synthetic analogue of Vitamin E, has significant anti-cancer properties, and may be used in conjunction with antigen presenting cells such as Dendritic cells (DCs) to treat existing cancer and prevent disease. This is because DCs can take up tumor antigens and present them to the body's own immune system. One of the drawbacks of this new treatment however, is that á-TOS must be dissolved in harmful solvents (such as ethanol or DMSO) in order to be administered. A liposomal form of the drug, vesiculated alpha-tocopheryl succinate (V-TOS), is an improvement on á-TOS because it can be dissolved in aqueous solutions. Two other analogue forms of á-TOS, vesiculated alpha-tocopheryl acetate (V-TEA) and LS244 have been developed as potential greater improvements over á-TOS and V-TOS. Unlike either á-TOS and V-TOS, V-TEA and LS244 are more stable due to resistance against enzymatic cleavage by host esterases. This study aims to compare V-TOS, V-TEA and LS244's anti-tumor activity on murine colon cancer (MC-38) in-vitro. A dose toxicity study showed that á-TOS and V-TOS have an IC-50 value of 22ìg/ml and 16ig/ml. A comparison between V-TEA, LS244, and V-TOS showed that V-TEA and V-TOS as well as LS244 inhibit proliferation and induce apoptosis more than the control. In addition, we compared the clonogenic potential of MC-38 cells after treatment with V-TEA, LS244 and V-TOS. These results point at a potential new cancer treatment option with tumor specific toxicity and limited risk to normal cells. Continuation of the study will include an in-vivo assessment of anti-tumor activity of the drugs. This research will hopefully have high translational potential for new chemo-immunotherapeutic treatments of cancer in humans.

California

POSTER TITLE: Pilot Study of Chromium Picolinate and Biotin to Diminish Glycation in Adults with Type 2 Diabetes
STUDENT: **Jennifer Shue**
FACULTY: Paul Harmatz
INSTITUTION: Children's Hospital & Research Center at Oakland
FUNDING: Nutrition 21
DISPLAY AREA: 1C
Abstract:
It has been postulated that nutritional intervention with chromium picolinate (CrPic) or biotin may enhance glucose tolerance in subjects with diabetes. This study evaluated the safety and efficacy of CrPic and biotin nutritional combination therapy in adult humans with type 2 diabetes. The design for this study was a randomized, double-blind, placebo-controlled trial. Subjects were randomized to one of two groups of either CrPic/Biotin (600 µg and 2 mg) or placebo for three months. Nineteen subjects, 9 men and 10 women between the ages of 22-64, completed the clinical trial. At the conclusion of the treatment phase, comparisons for differences in hemoglobin A1c (HbA1c), fasting plasma glucose (FPG), and serum lipids were made. No study drug-related serious adverse events (SAEs) or laboratory abnormalities were observed. The CrPic/Biotin group experienced a significant reduction in triglyceride (TG) levels relative to the placebo group. Differences in HbA1c levels were noted in the expected directions with a trend toward a decrease with CrPic/Biotin supplementation, however, results were not statistically significant. There were no differences observed in FPG, total cholesterol, high-density lipoprotein (HDL) cholesterol, or low-density lipoprotein (LDL) cholesterol between groups. These observations suggest that CrPic and biotin in combination may be a safe and effective lipid-reducing agent for diabetic subjects. Additional randomized, double-blind, studies with larger subject populations need to be conducted to confirm these results and investigate the benefits of combination versus single nutrient supplementation in subjects with type 2 diabetes.

POSTER TITLE: Determination of Biologically Relevant and Industrially Useful Liquid Crystals
STUDENT: **Whitney Duim**
FACULTY: Gerald Van Hecke
INSTITUTION: Harvey Mudd College
FUNDING: Arnold and Mabel Beckman Foundation: Beckman Scholars Program
DISPLAY AREA: 1D
Abstract:
Derivatives of the common sugar glucose, preparable from renewable resources, are environmentally-safe, biodegradable, and non-toxic surfactants of great practical interest for their potential applications in drug delivery, oil recovery, and cosmetic preparations. When the derivative octyl-glucoside is mixed with water, a number of self-assembled, liquid crystalline nanostructures are formed that depend on the water/glucoside ratio and temperature. For practical use of these liquid crystals as novel materials, a detailed understanding of the conditions under which they exist is required. Variants of two widely used techniques are employed to elucidate these nanostructures. Fluorescence is a well-established technique, but the use of the dye molecule prodan to probe the structures formed in these mixtures is a novel approach. Calorimetry is a classic technique to measure the energetics of chemical processes such as melting. A variant, modulated calorimetry (TMDSC), allows the measurement of very small energy changes such as those associated with the formation of the liquid crystal structures. The signal that the dye prodan provides via fluorescence depends on its environment, that is, the structure in which the dye finds itself. Visual inspection of the total signal can qualitatively determine the structures present. Temperature-induced structural changes are detected by changes in the prodan signals. This new technique is very sensitive, allowing the regions of temperature and composition at which individual structures and multiple structures exist to be mapped carefully for the first time. TMDSC shows promise in determining the very small energies required to change from one structure to another.

POSTER TITLE: The Role of Colloids and Iron-Containing Minerals in the Transport of Pu, Np and Sm
STUDENT: **Justin Walensky**
FACULTY: Annie Kersting
INSTITUTION: Lawrence Livermore National Laboratory
FUNDING: National Nuclear Security Administration: Hydrologic Resources Management Program
DISPLAY AREA: 1E

Abstract:
At the Nevada Test Site (NTS), over 800 underground nuclear tests were detonated as part of the U.S. nuclear testing program, leaving residual radioactivity of actinides and fission products. In order to assess the health risks of the residual radioactivity, it is important to understand how the residual radionuclides might be transported through the rock found at the NTS. A radionuclide cocktail was pumped through fractured induced carbonate and volcanic tuff rock cores collected from the NTS. One experiment involved injecting zeolite colloids (< 1 micron particulates) into the radionuclide solution prior to pumping the solution through the tuff core. Fifty to 84% of neptunium (Np) was eluted from both tuff and carbonate cores. In contrast, plutonium (Pu) strongly sorbed to tuff, except in the presence of zeolite colloids where 33% was eluted. In the carbonate experiments 16 - 55% of the Pu was transported through the cores. Samarium (Sm) sorbed strongly to both tuff and carbonate cores, except in the presence of zeolite colloids where 59% of the Sm was transported. The microanalytical techniques of alpha-radiography, secondary ion mass spectrometry (SIMS), and scanning electron microscopy were used in concert to determine the Sm, Np, and Pu interaction with the core mineralogy. We demonstrate the ability of zeolite colloids to enhance transport of Pu and Sm in volcanic tuff and suggest that even in the absence of colloids, Pu may migrate in carbonate. In addition, we show that mineralogy of the tuff controls sorption of Sm, Np, and Pu.

POSTER TITLE: Effects of preweanling methylphenidate exposure on the acquisition, extinction, and reinstatement of morphine-induced CPP
STUDENT: **Chad Andicochea**
FACULTY: Cynthia Crawford
INSTITUTION: California State University San Bernardino
DISPLAY AREA: 1F

Abstract:
Methylphenidate is used to treat attention deficit/hyperactivity disorder (ADHD) in children. This treatment is most often used in school-aged children although use of methylphenidate in preschool-aged children is gaining in popularity. While the efficacy of methylphenidate is not in question, there is increasing evidence that early methylphenidate treatment has effects on later drug responsiveness. The goal of the present study was to determine whether preweanling exposure to methylphenidate would alter morphine-induced conditioned place preference (CPP) in young adult rats. Rats (n=108) were treated with methylphendidate (0,2, and 5 mg/kg) daily for 10 consecutive days starting on postnatal (PD 11). Morphine-induced CPP was assessed on PD 60. A 10-day CPP procedure was used to assess the acquisition of morphine-induced CPP, which included one preconditioning day, eight conditioning days (consisting of alternating daily injections of saline or morphine), and one test day. After conditioning, rats were given extinction training where they received daily injections of saline before alternating 30-mind placements in the black and white compartments. Extinction conditioning lasted eight days and was followed by a test day. Following this test day, rats were given a priming dose of morphine (1 mg/kg, sc) 30 min before being tested for reinstatement of morphine-induced CPP. All rats conditioned with morphine showed CPP. Exposure to the5 mg/kg methylphenidate increased the magnitude of the morphine-induced CPP in reinstatement and increased time spent in the morphine-paired compartment in extinction. This data suggest that early methylphenidate may increase the rewarding value of abused drugs in adulthood.

Florida

POSTER TITLE: Incorporating NLO Surfactants into Polyelectrolyte Multilayers and Langmuir-Blodgett Assemblies for Potential Applications in Nonlinear Optics
STUDENT: **Niña Maria Rica Caculitan**
FACULTY: Malkiat Johal
INSTITUTION: New College of Florida
DISPLAY AREA: 1G
Abstract:
Molecules with potential for application in nonlinear optics were synthesized and characterized. They were surfactants of the type X-azo-C10-SO3-, where X = -NO2, -CN, and -OCH3. For characterization, they were incorporated into multilayer films using layer-by-layer (LBL) and Langmuir-Blodgett (LB) assembly. Various electron withdrawing groups allow for variation of the D-pi-A properties of the azo-benzene moiety responsible for their nonlinear optical activity. UV-visible spectroscopy, single-wavelength ellipsometry, dynamic force measurements, and second harmonic generation (SHG) were used to study the kinetics, multilayer formation, and nonlinear optical properties of the films. Two of the surfactants studied within the LBL film follow Langmuir adsorption behavior with equilibrium adsorption times under 200s. The observed blue shift from the bulk solution to the film in the order CN>NO2>OCH3 suggests H-type aggregation in the multilayer films. In the LB films, the same trend of decreasing group dipole moment leads to increasing packing density. The SHG results are consistent with the expected trends in the D-pi-A properties of the amphiphiles, although the measured nonlinear optical response declines with layer number in all systems studied.

Georgia

POSTER TITLE: Reverse Genetics Made Available to Undergraduates: TILLING the det2 Gene
STUDENT: **Emily Salman & Ryan Becker**
FACULTY: Linda Hensel
INSTITUTION: Mercer University
DISPLAY AREA: 1H
Abstract:
Reverse genetics is a newly emerging field that has developed in response to the influx of genomic date generated from high-throughput technology. A new technique, TILLING (Targeted Induced Local Lesions In Genomes), is a reverse genetic approach that correlates genetic structure to subsequent gene function. In TILLING, an allelic series is generated and the phenotypic responses for the different mutants are examined. An allelic series for the det2 gene of the model organism Arabidopsis thaliana is currently being developed. Det2 is one of the several light response genes in the photomorphogenic pathway of A. thaliana. The phenotypic evaluation of this allelic series will measure hypocotyl response under different light conditions. Part of my research involves modifying the CELI genotyping assay in order to examine the TILLED mutants in an undergraduate setting. TILLING is a useful tool for an undergraduate laboratory as a method for understanding reverse genetics as well as high-throughput technology.

Illinois

POSTER TITLE: The Effect of Morphine and WIN55212-2 on Thermoregulation in Rats.
STUDENT: **Christina Hansen**
FACULTY: Cynthia Handler
INSTITUTION: Millikin University
DISPLAY AREA: 2A
Abstract:
Homeothermic maintenance of a consistent body temperature depends on a balance between heat loss and heat production. Challenges to body temperature affect heat loss via vasodilation and heat production through alterations in metabolic rate. Previous research has demonstrated that both opioids and cannabinoids affect body temperature. Both selective and non-selective opioids alter heat production, which can be monitored by measuring oxygen consumption. This study examines the effect of WIN55212-2 on thermoregulatory mechanisms alone and in combination with morphine in male Sprague-Dawley rats. Morphine-induced (5mg/kg, IM) hyperthermia resulted from an increase in oxygen consumption, while the cannabinoid WIN55212-2-induced (4mg/kg, IM) hypothermia occurs via heat loss and a small but statistically significant reduction in oxygen consumption. In combination, heat loss is accompanied by a greater decrease in oxygen consumption, which produced a prolonged and increased hypothermia. The data indicate that heat production and heat loss may be synergistically modulated via opioid and cannabinoid receptors. This synergism contributes to changes in body temperature.

POSTER TITLE: Changes in ecosystem carbon following afforestation of native sand prairie
STUDENT: **Nathan Mellor**
FACULTY: Sherri Morris
INSTITUTION: Bradley University
FUNDING: Department of Energy
DISPLAY AREA: 2B
Abstract:
Determining the amount of carbon stored and length of storage as a function of land-management is important for predicting changes in the global carbon cycle. Elevated atmospheric carbon dioxide will damage native ecosystems. One strategy to mitigate elevated CO2 is to create stores or sinks. Soil is one possible sink for this carbon. Soil carbon is stored in pools that differ in residence times: the active pool stores carbon for several hundred days, the slow and resistant pools store carbon for hundreds to thousands of years. The Nebraska National Forest was sampled to evaluate changes in carbon following land-use change. Litter and soil samples were taken from native prairie, cedar and pine plantations. Soil cores were taken at three depths and long-term incubations were initiated. Cedars contained the largest amount of total soil carbon and pines contained the greatest litter carbon. Carbon evolution rates in the top 5cm were greatest in the cedar plantations and lowest in pine, indicating greater active fraction carbon in the cedar. Data from isotopes shows pine stands contain more soil carbon from the pines than remaining from the original prairie, suggesting long-term there was more rapid turnover in the pines than was found in cedars. While total carbon may not differ between cedar and pine stands, residence times and placement do. We must know the size, location and residence times of carbon in ecosystems if they are to be used as sinks.

Kansas

POSTER TITLE: Hierarchical Linear Modeling of Dynamically Recorded Emotional Responses to Music
STUDENT: **Rae Dain & Matthew Kaiser**
FACULTY: Dwight Krehbiel
INSTITUTION: Bethel College
DISPLAY AREA: 2C
Abstract:
Emotion is a dynamic process, elicited by changing environmental events but also dependent on characteristics of the person. One such elicitor is music, to which responses are now often measured continuously as the music is played (Schubert, 2001). While the effects of musical features, experimentally manipulated variables, and participant characteristics can be assessed with these measurements, the data have a complex multi-level, autocorrelational structure. Thus, the present study employed hierarchical linear modeling for analysis. Using a LabVIEW virtual instrument, participants listened and responded to three excerpts of classical music in a 2-by-2 factorial design. One factor was emotion versus music instructions (reporting emotion expressed by the music versus felt during listening). The other was response device (two-dimensional response space, axes of pleasantness and activation versus two sliders, one for each dimension). These factors and a variable coding for changes in the music were Level 1 variables in the models. Level 2 variables were years of private music lessons and years of participation in musical groups. All Level 1 variables were significant predictors of pleasantness or activation in some excerpts, but emotion vs. music instructions and musical features such as key changes had especially robust effects. Musical experience, especially years of participation, significantly modulated some of these effects. All effects were more prevalent for pleasantness than for activation, suggesting that subjective interpretation plays a greater role in the former. The findings also show how continuously measured emotional responses may be analyzed to reveal effects of both environmental events and participant characteristics.

Kentucky

POSTER TITLE: The Impact Of Organic Load On Geomicrobial Mineral Transformation In Cave Environments
STUDENT: **Nick Taylor & Michael Kreate**
FACULTY: Hazel Barton
INSTITUTION: Northern Kentucky University
FUNDING: CINSAM
DISPLAY AREA: 2D
Abstract:
Due to the straved nature of cave environments, microorganisms have adapted to life by utilizing a number of different methods to fix carbon, generate energy and obtain nutrients. One such mechanism of energy produced is through oxidation and reduction of elements found within the bedrock matrix of the cave. In order to investigate this process, samples from three locations within Carlsbad Cavern National Park were analyzed by liquid chromatography for organic content, X-ray diffraction and scanning electron microscope with energy dispersive spectroscopy for mineralogy, and molecular phylogenetic analysis of the 16S rDNA gene for microbial community structure.
Our results suggest that higher levels of organic input into the cave system has a dramatic influence on the community structure of the microorganisms found there, and limits the amount of microbial mineral transformation taking place. This is presumably due to the higher efficency of obtaining carbon and energy from organic versus inorganic processes. Our results suggest that the relative levels of organic input into subterranean environments may have a profound impact on the ensuing geomicrobial processes taking place.

Maryland

POSTER TITLE: Targeting MHC Class II Molecules to Lipid Rafts to Enhance Antigen Presentation
STUDENT: **Katherine Stammen**
FACULTY: Suzanne Ostrand - Rosenberg
INSTITUTION: University of Maryland, Baltimore County
FUNDING: National Institute of General Medical Science, Initiative for Minority Student Development
DISPLAY AREA: 2E
Abstract:
Tumor cells that are genetically modified to express the major histocompatability complex class II (MHC II) molecules prove to be effective cell based vaccines. These vaccines are effective because MHC II proteins present endogenously synthesized tumor peptides to CD4+ T helper cells, activating an immune response that would otherwise not be activated and therefore destroying the tumor. Lipid rafts are saturated regions in the phosholipid membrane that are insoluble in detergents and have been hypothesized to concentrate MHC II molecules to enhance antigen presentation. To assess this hypothesis, lipid raft localization amino acid sequences will be introduced into the MHC II molecule I-Ad. Multiple mouse tumor cell lines will be genetically modified to express these mutant forms of class II. Flow cytometry will be used to determine expression of I-Ad in M12.C3 cells Lipid rafts will be isolated from 4T1 cells via detergent extraction and flotation on a sucrose gradient to determine the I-Ad content in the rafts. During raft isolations altering the detergent concentration or cell number drastically affected the localization of marker molecules to lipid rafts. In addition, the two mutated forms of I-Ad, which were expected to cause enhanced lipid raft localization, did not preferentially localize to rafts. Future experiments will focus on developing consistent lipid raft isolation conditions, generating additional MHC II mutants that should preferentially localize to lipid rafts, evaluating these mutants as antigen presenting cells for tumor antigens, and ultimately, utilizing the cells for treatment of patients with metastatic mammary carcinoma.

POSTER TITLE: Robotic Cognitive Agents
STUDENT: **Brian Whitman**
FACULTY: Goran Trajkovski
INSTITUTION: Towson University
FUNDING: National Academics of the Sciences
DISPLAY AREA: 2F
Abstract:
Our goal is to reproduce POPSICLE, a cognitive learning study done with humans, except this time with robots acting as the cognitive agent. The original study had participants navigating discreet environments while the participant's learning and inter-communication was monitored. To reproduce this we need a platform that is small enough, but with enough functionality to perform the tasks required. It seems one platform is not enough; we've broken ours into two sections: high-level and low-level. The high-level functionality, specifically decision making, data logging, and wireless networking, we accomplish with the Palm OS. The low-level functionality, locomotion and localization, we perform with the Brainstem, a PIC based embedded system. Communication between the two systems is via RS232. Using this combine platform we hope to create robotic based cognitive agents able to reproduce the original experiment, including inter-communication.

POSTER TITLE: DIFFERENTIAL CONDUCTANCE OF EXTREME TYPE-II SUPERCONDUCTORS IN HIGH MAGNETIC FIELDS
STUDENT: **Joel Tenenbaum**
FACULTY: Sasha Dukan
INSTITUTION: Goucher College
FUNDING: Research Corporation
DISPLAY AREA: 2G
Abstract:
Since many extreme type-II superconductors have critical temperatures well above that of readily available coolants, they are, by far, the best candidates for practical applications, many of which have already been implemented in recent years. More exotic applications, including levitating trains and frictionless bearings, have always excited the public's imagination as symbols of a more convenient, more efficient, and more economical and ecologically-friendly future. These additional applications await only a more thorough understanding of the behavior of these superconducting materials in high magnetic fields. In extreme type-II superconductors, at low temperatures and high magnetic fields, Landau level quantization of electronic energies results in the appearance of gapless excitations at highly symmetrical points on the Fermi surface. These gapless excitations govern the microscopic behavior of the superconductor in high magnetic fields and can be readily tested experimentally by Scanning Tunneling Microscope (STM) technique. As the bias voltage of an STM tip is varied, so does the tunneling current: the change in current for an infinitesimal change in voltage is known as differential conductance. We present a detailed theoretical and numerical study of the differential conductance for extreme type-II superconductors placed in high magnetic field at low temperatures, in which we discuss the predicted differential conductance and its relation to the quasiparticle energy spectrum of the superconductor.

POSTER TITLE: Differences in Disordered Eating as a Function of Criteria for Adulthood
STUDENT: **Janine Domingues**
FACULTY: Carolyn McNamara Barry
INSTITUTION: Loyola College in Maryland
DISPLAY AREA: 2H
Abstract:
According to Arnett (2000), individuals between 18-25 years engage in heightened self-exploration and are uncertain as to whether they are adults. Most of these emerging adults consider criteria such as independence to be highly important in determining adult status, whereas criteria involving appearance and body image are less important (Arnett, 1998). Although the importance of these criteria has been examined in numerous populations, research has yet to examine these criteria among those who engage in disordered eating, which is quite prevalent during this period (Vohs, Heatherton, & Herrin, 1999). As a result, this study examined the extent to which disordered eating differs as a function of the importance of the criteria for adulthood, while controlling for gender. Introductory Psychology students from a mid-Atlantic religiously-affiliated university (n=136, Mage=19.02 SD=1.08; 73% females, 87% European-American) completed the EAT-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982), and rated the importance of adulthood criteria (Arnett, 1998). A series of ANCOVA's were performed on disordered eating as a function of low v. high levels of importance of adulthood criteria with gender as a covariate. Results suggested that students with disordered eating considered criteria involving independence, biological transitions, and family capacities to be highly important. As a result, the transition to adulthood is more involved for emerging adults with disordered eating and thus has the potential to restrict their psychosocial development. Scholars need to examine the consequences of disordered eating further in order to assist legislators with creating sound policies that promote emerging adults' optimal development.

Massachusettes

POSTER TITLE: Exploring the Redox Capabilities of Archaeal and Bacterial Thioredoxin Systems
STUDENT: **Sarah E. Chobot**
FACULTY: Sean J. Elliott
INSTITUTION: Boston University
FUNDING: Boston University Undergraduate Research Opportunities Program
DISPLAY AREA: 3A
Abstract:
'This work investigates two proteins implicated in oxidative stress and disease, thioredoxin and thioredoxin reductase, using an electrochemical technique called protein film voltammetry to directly measure their bond redox chemistry. By understanding the redox properties of thioredoxins, we gain insight into their function at the molecular level. We find that the electron transfer reactions of thioredoxin and its reductase are reversible: the reduction potentials span a wide range, determined by the respective amino acid sequences for each thioredoxin active site. Variable pH studies indicate that both thioredoxin and thioredoxin reductase transfer two electrons and two protons. This is verified by temperature dependence, which demonstrates the cooperativity of redox chemistry is increased with temperature, approaching an ideal n=2 process. This data paves the way to future studies of the fundamental chemistry of thioredoxin that will enhance our understanding of the link between thioredoxin function and disease. In addition to transferring electrons to ribonucleotide reductase, thioredoxins can also transfer reducing equivalents to infectious tumors, aiding in their growth within the cell. Because of this function, thioredoxins are now being investigated as potential drug targets for many life-threatening diseases including cancer, HIV, rheumatoid arthritis, and malaria. Understanding the redox mechanism of thioredoxin will contribute to the development of drugs that could inhibit the growth of the tumors that would otherwise thrive in the presence of thioredoxin. The ability to study the electron transfer mechanism of the thioredoxin system will yield new assays for screening potential drug targets.

POSTER TITLE: Elusive Zeros Under Newton's Method
STUDENT: **Trevor O'Brien**
FACULTY: Gareth Roberts
INSTITUTION: College of the Holy Cross
FUNDING: Council on Undergraduate Research Summer Fellowship Program
DISPLAY AREA: 3B
Abstract:
When we consider how computer programs are able to solve complex problems, we must first consider the algorithms being implemented. One such algorithm that is widely known and used is Newton's method. Given its iterative nature, it is natural to study this algorithm as a discrete dynamical system. Of particular interest are the various open sets of initial seeds that fail to converge to a root under Newton's method. In studying such open sets, we attempt to analyze the effectiveness of Newton's method as a numerical algorithm, while disclosing some interesting mathematical behavior in the process.

In this project we chose to examine Newton's method applied to a particular family of fourth degree polynomials that rely on only one parameter value. These are polynomials of the form:
$(z2 - 1)(z – l)(z – l^*)$,
where l is a complex number, and l* is the complex conjugate of l. We have examined the parameter plane for this family of polynomials in cases where l is both real and purely imaginary. More specifically, we have developed and implemented computer programs to locate l values for which Newton's method fails on a relatively large set of initial conditions. In doing so, we have discovered some rather surprising dynamical figures in the l-parameter plane, including Mandelbrot-like sets, tricorns, and swallowtails. Through symmetry and the restriction to the imaginary axis, we have uncovered certain analytic and numerical evidence that aids in explaining the existence of such figures.

POSTER TITLE: Tunable Nonlocal Spin Control in a Coupled-Quantum Dot System
STUDENT: **Edward (Ted) Lester**
FACULTY: Susan Watson
INSTITUTION: Harvard University
FUNDING: National Science Foundation
DISPLAY AREA: 3C
Abstract:

The ability to manipulate and control electron spin--the intrinsic magnetic moment of the electron--is critical to the development of Spintronics, an emerging research field in which the quantum mechanical nature of the electron is exploited to create novel and powerful ways of processing information. To date, researchers have focused on manipulating individual spins and controlling nearest neighbor interactions between spins. In this project we explore the possibility of controlling the coupling between electrons beyond the nearest neighbor.
We developed an experimental representation of a two magnetic impurity system using two quantum dots coupled through a large open dot between them. Quantum dots, also known as artificial atoms, are discrete groups of electrons trapped in a potential well in a two-dimensional electron gas at millikelvin temperatures. Double quantum dots have potential as a source for spin entangled electrons for quantum information processing. Our simple system demonstrates the competing nature of the Kondo effect, where electrons screen the spin of a magnetic impurity, and the RKKY interaction, where there is a spin-spin interaction between magnetic impurities via conduction electrons. In doing this we demonstrate nonlocal spin control by suppressing and splitting Kondo resonances in one quantum dot by changing the electron number and coupling of the other dot. This leads to the possibility of solid-state quantum information processing using spin-entangled electrons beyond the nearest-neighbor exchange interaction.

Michigan

POSTER TITLE: IGF-I Mediates Neuroblastoma Bone Metastasis Through Modulation of RANKL and OPG
STUDENT: **David Zhen**
FACULTY: Eva Feldman
INSTITUTION: University of Michigan
DISPLAY AREA: 3D
Abstract:

Neuroblastoma (NBL) is the most occurring tumor in young children, of which 90% over the age of one die from the disease. The generation of effective treatments is often complicated by tumor metastasis, the spread of tumor cells from the original site of formation to other sites in the body. In NBL, bone is the primary metastatic site. Therefore, an understanding of this process is critical to the development of novel biomarkers and treatments. This research investigates the role of the insulin-like growth factor type 1 (IGF-I) in the modulation of the hormone NF-kâ ligand (RANKL), its receptor (RANK), and the decoy receptor osteoprotegerin hormone (OPG). We hypothesize that RANKL is necessary for the formation of osteoclasts in NBL bone metastasis and that IGF-I is an important regulator of RANKL and OPG in NBL. Studies indicate that the RANKL/RANK system activates several pathways, one of which initiates the differentiation of progenitor cells into active osteoclasts, the bone degrading cells of the body. This system is thought to be regulated through OPG, an inhibitor of RANKL, and possibly IGF-I. Our study shows the following: 1.) increased expression of RANKL and decreased expression of OPG in highly tumorgenic NBL cell lines (IMR32), 2.) increased cell to cell attachment by IMR32 to bone versus non-tumorgenic cells, and 3.) IMR32 induced osteolytic lesion formation in vivo. These data suggest that RANKL, OPG, and IGF-I play a crucial role in NBL bone metastasis, and thus, identify a possible therapeutic target for NBL patients.

POSTER TITLE: Synthesis and Characterization of Bimetallic Nanoparticles and Metal Oxide-Dendrimer Nanocomposites within Supercritical Carbon Dioxide
STUDENT: **Jonathan Brege**
FACULTY: Bradley Fahlman
INSTITUTION: Central Michigan University
FUNDING: Army Research Laboratory
DISPLAY AREA: 3E
Abstract:
Although supercritical fluids (SCFs) have long been exploited for homogeneous catalysis and extractions, the use of this medium for nanomaterial syntheses has only recently been investigated. Herein, we report the growth of bimetallic and metal oxide nanoparticles within supercritical carbon dioxide. For bimetallic particles, a micelle-free diffusion controlled synthetic route was used. By contrast, metal oxide nanoparticles were confined within a variety of dendritic polymers, resulting in particle diameters of < 5 nm. Characterization was performed using SEM/FESEM, TEM/EDS/EELS, dynamic light scattering, X-ray diffraction, and UV-Vis spectroscopy. Whereas the bimetallic nanoparticles will be useful for catalytic and microelectronic circuitry applications, the semiconducting metal oxide@dendrimer species will be subsequently deposited onto a variety of surfaces, including carbon fibers and fabrics, for the detection and deactivation of chemical warfare agents.

POSTER TITLE: Investigating Community Health
STUDENT: **Audra Jobin & Jenelle Dame**
FACULTY: Deb Sturtevant
INSTITUTION: Hope College
FUNDING: Holland Community Hospital Foundation
DISPLAY AREA: 3F
Abstract:
This research project, "Investigating Community Health," was conducted for the purpose of examining one community's perspective on health. Focus groups were held at twelve sites in order to hear from a diverse cross section of the community. The following six questions were asked during the focus groups: 1. What does it mean to be healthy? 2. What keeps you and your family healthy? 3. What gets in the way of you and your family staying healthy? 4. What does a healthy community look like? 5. What gets in the way of this community being healthy? 6. What could be done to make this community healthier?

Once the focus group sessions were completed, the responses to the questions were coded and analyzed. The responses were grouped and then compared/contrasted by demographic data. The results indicated the need for preventative measures to promote health, including good nutrition, exercise, social connections, spirituality, and appropriate medical care. The findings also identified barriers to good health including insufficient time and money. Concerns were raised about lack of insurance and access for minority populations. Also, lack of reliable transportation and lack of personal motivation were considered obstacles to good health.

The focus groups in this study allowed many voices to be heard in meaningful discourse. The groups identified several measures that would improve the health of their community. This research will lead to strengthened commitment, improved capacity building, and enhanced health of the community.

POSTER TITLE: Reading Between Sacred Lines: Status of Leadership in Regla de Ifá in Santiago de Cuba
STUDENT: **Shanti Zaid**
FACULTY: Jualynne Dodson
INSTITUTION: Michigan State University
FUNDING: McNair/SROP Scholars Program
DISPLAY AREA: 3G
Abstract:
This study seeks to explore leadership status within Regla de Ifá, as practiced in Santiago de Cuba, Cuba. Regla de Ifá is the premier divinatory system of the Yoruba-based Regla de Ocha religious tradition, more popularly known in the United States as "Santería." The researcher measured leadership status by focusing on three factors: growth, autonomy, and cross-tradition utilization of babalao, or Ifá leaders, in Santiago.
Though Regla de Ifá has been practiced in Cuba since at least the mid-nineteenth century, Cuban researchers suggest that performance of structured Ifá began in Santiago de Cuba only within the last thirty years, with knowledge and ritual instruments brought from western Cuba. Since then, the tradition experienced limited but visible expansion in the city, due largely to the commitment, selectivity, and materials involved in becoming a babalao. Western Cuba, especially Havana and Matanzas, currently holds a stronger concentration of Ifá leaders and babalao in Santiago are dependant on the occidental cleric community for religious training, initiations, and written materials. However, the researcher simultaneously discovered that some babalao in Santiago could autonomously initiate future babalao and perform ceremonies central to the practice. Further, insight gained through Regla de Ifá was respected as authoritative across other religious traditions practiced in the area, including Regla de Palo and Espiritismo. The researcher observed that babalao also had knowledge of and/or held leadership positions in these other traditions. This current investigation opened questions for future research, especially with regard to motives and expressions involved in utilizing Regla de Ifá across religious traditions.

Minnesota

POSTER TITLE: The Effects of Androgen Ablation on Vascular Integrity in Human Prostate Xenografts Measured by Fibrinogen Leakage
STUDENT: **Nhat-Anh Ngo**
FACULTY: Howard Reisner
INSTITUTION: University of North Carolina, Chapel Hill
DISPLAY AREA: 3H
Abstract:
Androgen deprivation therapy is used to treat symptomatic advanced prostate cancer, with the tumor vasculature as a secondary target. The objective of this project is to demonstrate that leakiness of prostate vessels increases from pre to post androgen ablation therapy, possibly reflecting endothelial cell death, retraction, or other physiological factors. We hypothesized that the number or percent of leaky vessels would increase following such therapy. Androgen deprivation was induced in human prostate xenografts in nu/nu mice by surgical castration and removal of pre-implanted supplemental testosterone pellets. Fibrinogen is a soluble protein found in blood plasma and is essential in the haemostatic pathway. Stained fibrinogen/fibrin in tissue spaces and/or deposited on vessel walls indicates damage of vessels possibly due to the withdrawal of testosterone. The number of blood vessels and fibrin deposition in the xenograft tissue were evaluated through immunohistochemical (IHC) analysis. Staining using antibodies specific for endothelial cells and for human fibrinogen was conducted on human xenograft tissue from mock castrated and castrated groups. Xenografts were harvested on days 0, 2, and 7 following surgery. Blood vessels positive for endothelial markers were counted, and compared to those positive for both perivascular fibrinogen and endothelial markers, an indication of leakiness. The analysis of these results will identify the time frame of when prostate vessels start leaking after androgen deprivation. This information will help in the development of new therapies that can target areas of vascular damage.

POSTER TITLE: Examining the Global Obesity Epidemic using Statistical and Epidemiological Methods
STUDENT: **Kezia Manlove, Janine Wetzel, Allan Trapp & Kathleen Kephart**
FACULTY: Julie Legler
INSTITUTION: St. Olaf College
FUNDING: National Science Foundation
DISPLAY AREA: 4A

Abstract:
Researchers have recognized for years the growing impact of obesity on global health; however, it is only recently that a concerted effort by the international community has been put forth to seek solutions to this problem. According to the World Health'Researchers have recognized for years the growing impact of obesity on global health; however, it is only recently that a concerted effort by the international community has been put forth to seek solutions to this problem. According to the World Health Organization (WHO), there are currently over 300 million obese people in the world. That this number is so high and that it continues to grow is of significant concern to global health because obesity has an impact on the following chronic diseases: type 2 diabetes, cardiovascular disease, hypertension, and some types of cancer. Since obesity is so hard to treat, most policy initiatives focus on methods to prevent it from occurring in the first place. Current literature points to changing diets and levels of physical activity as the main sources of this obesity epidemic. Our study focuses on: physical activity and the global spread of quick, nutrient-lacking food alternatives that are high in fats and carbohydrates. Including physical activity as a predictor is imperative because the interaction between energy intake and level of physical activity can have a significant impact on weight gain. WHO cites that societal influences such as "modernization, urbanization, and globalization of food markets" are major stimulants for the shifts of decreased physical activity and increased consumption of energy-dense foods. We examine the global spread of obesity employing statistical and epidemiological methods. Using WHO's regional divisions of the world, we identify areas of increased obesity and potential environmental factors related to those shifts.

POSTER TITLE: Number Forms and Simple Arithmetic
STUDENT: **Bethany Jacobson, Kirsten Eilertson & Janette Herbers**
FACULTY: Bonnie Sherman
INSTITUTION: St. Olaf College
DISPLAY AREA: 4B

Abstract:
Number forms are unchanging spatial arrangements of numbers visualized in the mind's eye of the individual, and are automatically activated by the presence of a number. According to Sir Francis Galton, about 1 in 15 women and 1 in 30 men have a number form, which originates in infancy or early childhood (Galton, 1883). Research following Galton has sought to investigate the effects of number forms on cognition, particularly calculation. In our study we compare the reaction times for simple arithmetic and comparison operations for three groups: people without number forms, people who visualize numbers using a number line or similar concept, and people with idiosyncratic number forms. We also investigate whether possessing a number form is related to high visualization aptitude, as measured by a self-report test of imaginal ability. Statistical analyses for this interdisciplinary collaboration between cognitive psychology and statistics will include linear regression to correct for learning effects over time in each trial, gender effects on mathematical ability and other forms of class membership, investigation of the interactions between accuracy, response time, and form, and other forms of statistical analysis of the data set. Information concerning the effects of number forms on mathematical ability could be used to create new teaching styles that encourage or discourage the use of visualization while performing mathematical operations, as well as to address the mathematical performance of students who have already developed number forms.

Missouri

POSTER TITLE: Microchip-based Biofuel Cell
STUDENT: **Anna Kinsella**
FACULTY: Shelley Minteer
INSTITUTION: Saint Louis University
FUNDING: Office of Naval Research
DISPLAY AREA: 4C
Abstract:
This research is focused on the development of a stackable, microchip-based biofuel cell. Biofuel cells must be micro-sized and stackable to be competitive with traditional batteries as alternative power sources. In this research, the enzyme pyrroloquinoline (PQQ)-dependent alcohol deyhdrogenase (ADH) is used as the biocatalyst in the biofuel cell to convert chemical energy to electrical energy. The cell is powered by the addition of ethanol through a flow channel to a bioanode. The bioanode contains a micromolded carbon ink anode that has been modified with one layer. This layer is a membrane containing the immobilized enzyme PQQ-dependant ADH. Unlike the previously used NAD+-dependent ADH, PQQ-dependant ADH does not require the use of a second electrocatalyst layer. The single immobilized enzyme membrane layer was characterized electrochemically. It was found that the layer is kinetically limited rather than transport limited. When used relative to an external platinum cathode, open circuit potentials and maximum current densities were obtained for the biofuel cell.

POSTER TITLE: Individual Differences in Alcohol and Tobacco Users: Self-Classification and Problem Recognition
STUDENT: **Andrew Littlefield**
FACULTY: Kristina Jackson
INSTITUTION: University of Missouri
FUNDING: National Institute on Alcohol Abuse and Alcoholism
DISPLAY AREA: 4D
Abstract:
Little information exists on the influence of individual differences on drug problem recognition. Understanding how individual differences influence accuracy of drinking and smoking assessment allows researchers and clinicians to predict which students are at-risk to incorrectly assess their drug usage.
This study examines relationships between individual differences (personality, peer influences, family history of substance use, and religiosity) and problem recognition among college-age smokers and drinkers; and seeks to answer three primary questions: How accurate are self-classifications of drug use? What individual differences influence accuracy of drug use self-classification? To what extent is accuracy of self-classification different for consumption versus consequences?
Problem recognition is measured as two separate concepts: consumption and consequences of drug use. Questionnaires will be administered to 300 college students. Various standard self-report measures will be used to objectively measure drinking and smoking consumption and consequences, as well as the individual differences of the participants. Self-classification will be subjectively measured by "to what extent are you a heavy drinker/smoker" for consumption and "to what extent are you a problem drinker/smoker" for consequences. Regressions will predict the difference (residual) between objective and subjective use from individual difference variables.
Based on previous research (Cook, Young, Taylor, & Bedford, 1998; McLennan et al., 1998; Sieving, Perry, & Williams, 2000), it is hypothesized that participants that possess high extraversion, low religiosity, peers with similar drug use, and parents without a drinking problem will be less likely to accurately assess both consumption and consequences for their substance use.

Nebraska

POSTER TITLE: New Toys for Tots: Uncovering Gender Stereotypes
STUDENT: **Hilary Harper & Jordan Winter**
FACULTY: Isabelle Cherney
INSTITUTION: Creighton University
DISPLAY AREA: 4E
Abstract:
Children's everyday activities constitute important developmental opportunities in that they serve as a forum for the socialization of cultural knowledge and practices. Interaction with toys can be seen as the gateway to many aspects of children's socialization and cognitive development in early childhood, including developing gender roles and gender stereotypes. Previous studies have shown gendered play preferences, but they have not specifically addressed what makes a toy more attractive for one sex and less attractive to the other sex. We examined age and gender differences in gender-typing of 27 new toys and 10 colors. A total of 38 two- to five-year-old children were shown gendered and ambiguous toy pictures and asked to identify "boy" and "girl" toys and to comment why they had made these choices. The video taped interviews were coded for verbalizations and sorting behaviors. The preschoolers showed differential stereotyping by age groups and gender. Younger children based their decisions on the number of boys or girls that were depicted with the toy picture and the color of toy. Older children used experience with the toy, or the order of presentation of the toys as cues, assigning gender to the people or animals presented with the toy picture, or parts of the toy to identify the toys. In general, older children held stronger gender stereotypes and boys showed stronger stereotype preferences than girls. These findings provide important information regarding the development of gender stereotypes and cognitive processes.

New Hampshire

POSTER TITLE: The Role of Protists in Bioremediation of an Organically Contaminated Aquifer
STUDENT: **Maureen Lewis**
FACULTY: Nancy Kinner
INSTITUTION: University of New Hamsphire
FUNDING: University of New Hampshire - UROP Office
DISPLAY AREA: 4F
Abstract:
Many people throughout the United States (U.S.) use groundwater from bedrock aquifers as their drinking water. Trichloroethylene (TCE), a cleaning solvent and carcinogen, is a common contaminant of bedrock aquifers. It is very difficult to remediate bedrock aquifers once they are contaminated because the groundwater is located in a fracture network that is complex. One cost effective method to cleanup TCE contaminated bedrock is bioremediation. Research in the past five years has shown that bedrock fractures contain naturally-occurring bacteria that can use TCE as an electron acceptor, if readily biodegradable organic carbon that can act as an electron donor (e.g., molasses, vegetable oil) is present.
My undergraduate honor's research is being conducted to determine if the presence of recently discovered, naturally-occurring protozoa in fractured bedrock aquifers increases in situ bacterial bioremediation of TCE. In other environments, protozoan predation enhances bacterial biodegradation of organic compounds by reducing the number of bacteria present so that those remaining are more efficient. My research was conducted using a glass reactor filled with rock surfaces, groundwater, bacteria and protozoa from a TCE contaminated bedrock aquifer. The reactor was maintained in a fill/draw mode at ambient bedrock conditions (no oxygen, 10oC, 5 mL/day groundwater flow). Bacterial and protozoan abundances and TCE, oxygen and organic carbon concentrations were monitored to determine TCE biodegradation rates as a function of bacterial and protozoan population dynamics. If protozoa do enhance bacterial biodegradation of TCE, then their abundance at TCE contaminated sites should be monitored to optimize in situ bioremediation.

POSTER TITLE: Perception of Genetically Modified Organisms in Germany
STUDENT: **Tiffany Petre**
FACULTY: Samuel Smith
INSTITUTION: University of New Hampshire
FUNDING: IROP program
DISPLAY AREA: 4G
Abstract:
Genetically Modified Organisms (GMOs) are one of the most researched novel food items on the market today and have FDA approval. Despite the research and approval, at least 57% of the German population chooses to avoid GMOs. Large food companies are reluctant to produce food products containing GMOs for the European market, because they know that German consumers won't buy them. Europe's and specifically Germany's reluctance to accept GMOs have had large international economical, political and cultural effects which are important to understand in our ever-expanding world.
Why are Germans so reluctant to accept Genetically Modified Organisms into their food system?
My research was based out of Freising, Germany at the Technical University of Munich. Surveys, interviews, and examination of current literature composed my research. The subjects surveyed were members of Freshman/Sophomore level classes at the Technical University of Munich. A social scientist, a European Commission representative, a major food corporation food representative, a GMO risk assessor, an organic farmer, and various professors were interview subjects.
Results/conclusions: -German tradition dictates that life and food should be close to nature
-Mad Cow and Hoof and Mouth disease have caused Germans to be more skeptical of their food system
-Scientists have conflicting views and many aren't viewed as credible
-Media coverage has created a high level of awareness of GMOs issues
-People are insistent about their right to choose
-Research on the long-term effects of GMOs does not exist
-Germans in general don't see the benefits of GMOs as outweighing the risks

New Jersey

POSTER TITLE: Epidemics in Multi-strain Disease Dynamics
STUDENT: **Marie McCrary**
FACULTY: Lora Billings
INSTITUTION: Montclair State University
FUNDING: National Science Foundation
DISPLAY AREA: 4H
Abstract:
As we become more sophisticated in our resources to fight diseases, pathogens become more resilient in their means to survive. A new feature in multi-strain viruses is that they can exhibit antibody-dependent enhancement (ADE). ADE is the increase in susceptibility to a more virulent second strain after contracting the first strain. This is especially dangerous in Thailand's dengue epidemic, where the lethal dengue hemorrhagic fever predominantly occurs in the second infection. It is believed that this trend toward multiple strains, in combination with ADE, will strengthen viruses in new ways against known treatments. We present a general form for a multi-strain model that includes the effect of ADE. In this model, we observe the change to periodic outbreaks with respect to the strength of ADE. Our model shows these outbreaks occurring earlier for more strains. Therefore, more strains need less ADE to produce an epidemic. This model can also be used as a tool to explore how quickly the disease spreads and to test various vaccination strategies to best eradicate the disease. We hope that our model serves as a means for a reduction in the intensity and duration of disease epidemics.

New York

POSTER TITLE: Detailed three-dimensional mapping of variations in mineral content and texture in metamorphosed gabbro, Hooper garnet mine, southeastern Adirondacks, New York.
STUDENT: **Stanley Skotnicki**
FACULTY: Gary Solar
INSTITUTION: SUNY College at Buffalo
FUNDING: Undergraduate Summer Research Fellowship Program
DISPLAY AREA: 5A
Abstract:
This project focuses upon rocks found in and around the abandoned Hooper garnet mine in the Adirondacks of New York State (Grenville province). Geologically, the rocks now exposed in the quarry were formed deep inside the Grenville mountain chain which existed along the ancient eastern edge of the North American continent, and which had formed as a result of continent-continent collision that took place about one billion years ago. The quarry exposure is nearly one hundred percent and rock outcrops exist on the floor, walls and at the tops of the walls, permitting three-dimensional examination and unraveling of the history these rocks have recorded.
While working in the field for this project, I have documented the extent of variation of fabric intensity, foliation dip, strike, and lineation of mineral textures throughout the quarry in order to correlate them in three dimensions across the mine. I have collected a large set of compositional, geometrical and orientation mineral data, and I have collected specimens for laboratory analyses. At the largest scale, I focused on the production of a geologic map of the entire mine that would present the fabric intensities and compositional variation. At the meter scale, I mapped several areas in fine detail, down to mineral grain-by-grain analyses. This work was augmented further in the laboratory using the collected specimens, examining them in cut hand specimens and corresponding microscopy of mineral textures.
The intent of this research has been to provide clues to the deformational history of this part of the southern Adirondacks, and this part of ancient North America as it appeared about one billion years ago. In order to do this, I have compared my results with those of other work in the region (the Piseco tectonite zone and the Snowy Mtn. Dome; Chiarenzelli et al., 2001; Valentino and Chiarenzelli, 2001; Freyer et al., 2003; Price et al., 2003; Solar et al., 2003), and on other structures of the Adirondacks. It is my intent that this data will be part of a growing data set that will allow for a better understanding in the kinematics of deformation recorded in this part of the Grenville orogen.

POSTER TITLE: Refining a Fusion Energy Output Detection System Through Optimizing the Carbon Target Thickness.
STUDENT: **Lauren McNamara**
FACULTY: Sharon Stephenson
INSTITUTION: SUNY Geneseo
FUNDING: Research Foundation for SUNY Geneseo
DISPLAY AREA: 5B
Abstract:
Currently, our nuclear power is generated through fission. However, if we use fusion instead, there would be no radioactive waste and no hazardous fuel. This project is part of a nation-wide, ongoing effort to make fusion a viable power source. Fusion can be produced in the laboratory, but it has yet to yield more power than it took to create it. Our contribution to this valuable study is to refine the system of determining the energy output.
A carbon disc detection system measures tertiary neutron yield to determine the energy output of a fusion reaction at the University of Rochester's Laboratory for Laser Energetics. After exposure to high-energy neutrons from a fusion reaction, carbon discs are placed in a detection system that measures back-to-back 511 keV gamma rays, a signature for tertiary neutrons. If the carbon disc is too thin, the statistics will be poor. However, the thicker the disc the more gamma rays escape or interact before they are detected. To determine the optimal disc thickness to balance these effects, Monte-Carlo modeling was done by randomly choosing source points for coincidence gamma ray emissions, randomly assigning transmissions paths, and applying appropriate attenuation effects.

POSTER TITLE: Assessing Risk for Rural Elder Abuse: Analyzing Cases Reported to a Local Office for the Aging
STUDENT: **Deanna Kowal**
FACULTY: Karen Porter
INSTITUTION: Alfred University
FUNDING: Department of Justice and OJJDP
DISPLAY AREA: 5C
Abstract:
Estimates indicate that elder abuse is a problem in our society affecting as many as half a million Americans each year. Research documenting the risk factors for physical, emotional, and/or financial abuse among older Americans is limited. Attempts to help victims are frustrated by their resistance to discuss personal or family situations. Rural communities, in particular, may be plagued with higher incidences of all forms of elder abuse due to such factors as limited access to social and medical services and lack of transportation. Our research utilizes cases reported to a local office for the aging in a rural western New York county to investigate the nature of reported elder abuse. Between January 2000 and June 2004, 119 cases of abuse were reported to the agency on individuals ranging in age from 61 to 99. Data were gathered from client case files on the nature of the complaint and the characteristics of the client. Our findings suggest that these elderly clients suffered different forms of abuse. The most frequent form reported was financial abuse (38%), followed by emotional abuse (19%), and physical abuse (11%). Over one-third of the clients were found to experience more than one form. While factors like poverty and isolation are important predictors for abuse and neglect, not all abuse victims were poor and/or living alone. Our findings suggest a varied profile. The greatest risk factor, however, may be lack of information and awareness on the part of family members, service providers, and the elderly themselves.

North Carolina

POSTER TITLE: Synthesis of N-[(2-(1H-Indazol-1'-yl)methyl)phenyl]chloroacetamide A precursor to Novel Fused, Medium- Sized Ring Heterocycles
STUDENT: **Sandra Ramsey**
FACULTY: Henry Russell
INSTITUTION: Johnson C. Smith University
FUNDING: NIGMS
DISPLAY AREA: 5D
Abstract:
The purpose of this research was to determine if the title compound could be synthesized in the same sequence as that previously used for indole. This compound will be used in future investigations of its photolytic potential to yield 7-, 8-, and 9- membered ring heterocycles analogous to those based on preliminary work using indole as the starting material. Such compounds are of particular interest because of the need for new medicinal agents that can serve as antibacterials that will be able to conquer resistant strains, antifungals to treat systemic infections, and antidepressants which will not be habit forming. Research on compounds containing the indole ring has shown biological activity.
The chloroacetamide was prepared by a three step sequence. N-alkylation of the sodium salt of indazole with 2-nitrobenzylbromide yielded the N-(2-nitrobenzyl) indazole. The nitro group was reduced to the amine by catalytic hydrogenation and N-chloroacetylated with chloroacetyl chloride. These compounds are novel and discussion will be presented detailing their characterized by 1H NMR and elemental analysis.

Ohio

POSTER TITLE: A domain in histone H3 of Saccharomyces cerevisiae plays dual roles in gene silencing and repair of UV-damaged DNA via the Rad6-Rad18 repair pathway
STUDENT: **Lindsey Bostelman**
FACULTY: Jeffrey Thompson
INSTITUTION: Denison University
DISPLAY AREA: 5E
Abstract:
Chromatin consists of DNA wrapped around octamers of histone proteins. Condensation of chromatin enables the inactivation of gene expression. This process is known as transcriptional silencing and is regulated by post-translational modifications of the histones. Several silencing modifications are initiated by Rad6, a protein known to be involved in repair of UV-damaged DNA. To study the implied relationship between histones and UV repair, we examined UV sensitivity in a set of yeast strains harboring mutations in histone H3 that disrupt transcriptional silencing. We found that H3 mutations that strongly disrupt silencing cause a 5-10 fold increased sensitivity to UV, however restoration of silencing in these mutant strains by second-site suppressors does not restore normal levels of UV sensitivity. By examining UV sensitivity in H3 mutant strains harboring deletions of various UV repair genes, we found that H3 operates as part of the Rad6-Rad18 UV repair pathway. These results suggest that histone H3 possesses a novel repair function independent of its role in silencing. We propose that the Rad6-Rad18 repair machinery may initiate specific modifications of histone H3 to create a repair-competent chromatin structure. This investigation provides evidence of the overlapping roles of histone H3 in gene silencing and DNA repair, a connection that is particularly intriguing given that many new cancer drugs are being developed that alter histone modifications in order to slow cancer cell growth. Our results suggest that great care will need to be taken in order to prevent these drugs from unintentionally causing additional DNA damage.

POSTER TITLE: Scientists to the Rescue: A Solution to a Water Conservation Problem
STUDENT: **Daniel Bole, Ginger Cartright, Nicole Danish**
FACULTY: Jeffrey Dick
INSTITUTION: Youngstown State University
DISPLAY AREA: 5F
Abstract:
As a means of conserving water on the Youngstown State University campus, the suitability of a shallow aquifer as an alternative water source for the University lawn sprinkler system was evaluated. The evaluation focused on hydraulic conductivity, transmissivity, storativity, and specific yield physical properties and the aquifer aerial extent. The physical properties were determined using soil auger samples and an aquifer pumping and recovery test. The aerial extent of the aquifer was determined using topographic expression, soil auger boreholes, and pre-existing borehole logs.

The aquifer is part of a Pleistocene kame terrace along the Mahoning River. It is a fine grained and well graded sandy material (CL-ML). The aquifer is present over an area of approximately 30 acres. Laboratory determinations of permeability on soil auger samples yielded an average hydraulic conductivity of 0.022 cm./sec. Aquifer transmissivity, storativity, and specific yield were determined from the pump test results using the Neuman solution and the AQTESOLV computer program. The average transmissivity was 11.52 square meters/day, the average storativity was 0.01, and the average specific yield was 0.17.

Results indicate the aquifer is capable of yielding 11,600 cubic meters/day, an amount that exceeds the University lawn sprinkler system needs. The actual sustainable will be substantially reduced as the aquifer volume and continuity is affected by building foundations and the aquifer may be bounded by non-contributing materials such as clay and other low permeable materials. In addition, maximized aquifer yield requires the installation of multiple production wells.

Oklahoma

POSTER TITLE: West Nile Virus: Prevalence Of An Emerging Infectious Disease In Oklahoma Mammals
STUDENT: **James Vaughn, Jennifer Bishop & Michael Nicholson**
FACULTY: Sherry Meeks
INSTITUTION: University of Central Oklahoma
DISPLAY AREA: 5G
Abstract:
West Nile Virus (WNV) is a Zoonotic disease infecting mosquitoes and birds. WNV was first diagnosed in Oklahoma in 2002 and is known to infect equines and humans as incidental hosts. Oklahoma is a diverse state with eleven seperate eco-regions. Each eco-region is inhabited by distinct varieties of wildlife. Our objective was to determine whether the WNV was crossing species and infecting mammals other than equines and humans through determination of the prevalence of the virus in wildlife species. We performed a pilot study of randomly trapped small mammals from selected eco-regions within the state of Oklahoma. Blood samples were collected in the field from the eye sinus utilizing capillary tubes following quidelines established by the American Society of Mammologists for the handling of animals prior to release. Blood was tested for the WNV antibody using serum-virus neutralization testing to detect IgG and IgM antibodies for the virus by the National Veterinary Diagnostic and Investigational Laboratory in Georgia. Antibody titers for specific infected species were determined and geographic prevalence mapped. To date, thirty-four (57.6%) blood specimens suitable for testing have returned positive results for WNV. Our study has identified seven species of mammals previously unidentified as being capable of infection by WNV. Using WNV as a model for an emerging infectious disease, these results suggest the potential for rapid spread past the normal host range and into new mammal species with unknown consequences for the species involved. The need for further research exists to evaluate any potential threat to wildlife.

Oregon

POSTER TITLE: Characterization of Anti-oxidants in C3 to CAM shifts in Mesembryathemum crystallinum
STUDENT: **Monica Smith**
FACULTY: Lonnie Guralnick
INSTITUTION: Western Oregon University
FUNDING: Faculty Support Fund
DISPLAY AREA: 5H
Abstract:
Mesembryathemum crystallinum is a facultative CAM plant that shifts from C3 to CAM metabolism during the imposition of water and salt stress. The shift is characterized by a net uptake of CO2 at night, stomatal closure during the light period, and an increase in titratable acidity (malate). During the subsequent light period, the malate that was stored at night is used as source of CO2 for photosynthesis. During the light the titratable acid is depleted as the internal source of CO2. This may lead to an increased concentration of oxygen radicals present in the leaf cells. This would decrease photosynthesis by damaging the photosynthetic membranes. Thus, the shift to CAM would increase the cell's need for antioxidant protection. Previous research with CAM plants has shown that anti-oxidants may increase in activity during the imposition of water stress but the plants were already using the CAM pathway. There are indications that the protective anti-oxidant enzymes, Glutathione Reductase (GR) and Superoxide dismutase (SOD) may be induced during the shift from C3 to CAM. We have preliminary results showing GR and possibly SOD activity is increased during imposition of salt stress. Our results indicate that GR may also be inhibited by malate, a metabolite of the CAM pathway. The understanding of GR is very important because it may lead to an understanding of the interactions of the photo protection pathway of the xanthophylls cycle with other antioxidants. This would be critical in crop plants which may undergo periodic water stress in semi-arid ranges.

Pennsylvania

POSTER TITLE: Oligobipyridine nanodevices that function as reversible molecular switches through the encapsulation of guest alkali ions.
STUDENT: **Johanna Scarino, Jeremy Umbenhauer & Brandon Ardnt**
FACULTY: Marc Harris
INSTITUTION: Lebanon Valley College
DISPLAY AREA: 6A
Abstract:
The field of nanotechnology is undergoing an exponential growth in the chemical and engineering sciences. This surge is being economically driven by the push to minimize the size of electronic devices. At the chemical forefront of this research is the synthesis and control of macromolecular complexes capable of mimicking mechanical motions. Two prominent scientific leaders, J.M. Lehn and F. Stoddart, have revolutionized the field of molecular-mechano by designing molecules that readily self assemble and display tunable mechanical properties. Their contributions to this field include molecular architectures such as helices, catenanes, rotaxanes, grids, and ladders, which mimic the mechanical motions of springs, gears, shuttles, and switches. It would be advantageous to construct similar molecular devices that perform these basic molecular operations while eliciting a characteristic visible response to indicate the position or state of the device.
The research presented here addresses this need through the design and synthesis of a series of oligobipyridines linked by pseudo-crown-ethers. When metallated these flexible complexes contain the ability to function as electro- or photo-activated mechanical switches in a variety of solvents through the encapsulation of small alkali ion guests. The ‘on’ or ‘off’ position of the molecular switch is visibly or electrochemically detected through the photo-emissive or electrochemical response of two facially interacting square planar transition metals. The reversible nature of this process serves as the basis for these systems to perform as molecular switching devices capable of functioning as analytical sensors, energy transfer and storage devices, and ion transport shuttles for semi-permeable membranes.

POSTER TITLE: Computer simulations of Ising-like model with applications in nanoscale devices
STUDENT: **Matthew Melucci & Benjamin Mitchell**
FACULTY: Jeff Rufinus
INSTITUTION: Widener University
DISPLAY AREA: 6B
Abstract:
Computer simulations have brought tremendous effects on science to the extent that realistic simulations of key processes in many areas of science can now be addressed using highly accurate simulations. For example, it is now possible to calculate to some degree of accuracy, the physical and chemical properties of materials ranging from simple to complex systems before they are fabricated. From the technological point of view, the pre-fabrication prediction is particularly advantageous because it would save a lot of time and money.
Monte Carlo simulation is one powerful method that has been known for decades by physicists, chemists, and biologists. Recently, this method has also been used by scientists and technologists to study a very wide range of problems in nanoscience and nanotechnology.
In this project we use Monte Carlo simulation to study the origin of ferromagnetism in diluted magnetic semiconductor materials, one kind of magnetic material that recently has gained much attention because of their high transition temperatures and potential applications in nanoscale devices. We have developed a large scale, high resolution computational framework to simulate the magnetic properties of this type of materials. Our model is three dimensional and uses periodic boundary conditions. It is based on the Ising ferromagnetic model with some modifications on the interactions between the lattice sites. This will enable us to predict the statistical quantities (e.g. critical temperature, magnetization) of the materials. We hope that in the long run this research could potentially impact the design of nanoscale devices.

South Carolina

POSTER TITLE: A Numerical Study of Atmospheric Gravity Waves to Help Improve Climate Models and Observations
STUDENT: **James Perkins**
FACULTY: Varavut Limpasuvan
INSTITUTION: Coastal Carolina University
DISPLAY AREA: 6C
Abstract:
Atmospheric gravity waves play a crucial role in determining the structure and composition of the atmosphere 20-100 km above ground. However, their small physical scales make them difficult to observe with conventional methods and to simulate with coarse-scale climate models. To generate reasonable climatology and assess climatic changes (imposed by anthropogenic influences), global climate models haphazardly account for gravity waves by "tuning" their effects using parameterization schemes. As such, climate models can generate contradicting results.
To better account for gravity waves, numerical simulations are performed using a fine-scale (~1 km) weather model, the Advanced Regional Prediction System (ARPS). With its upper boundary extended to 120 km, the model is initialized with idealized convective/topographical features and realistic weather conditions. While generated gravity wave disturbances are small compared to other near-surface atmospheric motions, their amplitudes become very large as they propagate above 50 km. Beyond this level, they begin to overturn and break in a manner similar to crashing ocean waves. In the process, they deposit their momentum and dramatically alter atmospheric circulation. Gravity wave sources and effects are diagnosed to potentially help constrain parameterization schemes used in climate models and validate new NASA satellite observations

POSTER TITLE: Probing Doped Single-Walled Nanotubes at the Atomic Level
STUDENT: **Russell Lake & Stephen Wagemann**
FACULTY: Chad Sosolik
INSTITUTION: Clemson University
FUNDING: National Science Foundation - REU Program
DISPLAY AREA: 6D
Abstract:
Single-walled carbon nanotubes (SWNTs) are foremost among the list of new materials that show promise as building blocks in the design of nano-electronic, optical and medical devices. Evidence of this fact is the rapid increase of research into processes to modify and manipulate SWNTs with the goal of constructing nanometer-sized devices with controllable properties. Progress in using new SWNT-based materials, however, is severely limited by our ability to isolate and probe these objects reliably at the single molecule level.
To address this issue, we have developed a method for the preparation and imaging of SWNT samples with a scanning tunneling microscope (STM). The STM is ideally suited to an investigation of SWNTs because of its ability to probe structure and spectroscopy with atomic resolution. Our work, initially conducted on a room temperature STM, shows that reliable single molecule studies of SWNTs can be performed under standard laboratory conditions with minimal setup time or cost.
In our studies, as-prepared SWNT samples were put in solution with concentrated dichloroethane and ultrasonicated to obtain dispersed nanotube solutions. These solutions were then deposited on flat substrates and imaged with the STM. By varying the solution concentration and deposition method, we obtained the optimal parameters for finding isolated SWNTs with the STM. Our method of preparation has led to ultra high vacuum and low temperature STM measurements that probe new, doped SWNT materials. Furthemore, our preparation steps are now being applied to STM studies of other nanoscale particles, such as buckeyballs and functionalized SWNTs.

South Dakota

POSTER TITLE: Characterization of Rgg, A Global Regulatory Protein Of Streptococcus Pyogenes
STUDENT: **Lindsey Rieck**
FACULTY: Michael Chaussee
INSTITUTION: University of South Dakota School of Medicine
FUNDING: National Institute of Allergy and Infectious Diseases
DISPLAY AREA: 6E
Abstract:
Streptococcus pyogenes is a human-host-specific bacterial pathogen, which produces several toxins associated with disease. Inactivation of a gene encoding a global transcriptional regulatory protein, designated rgg, dramatically alters toxin synthesis. However, it is unclear if the effect is directly due to rgg inactivation or is the result of secondary mutations. To address this question, I have complemented the S. pyogenes rgg- mutant strain. Specifically, an intact gene encoding Rgg was cloned into a bacterial plasmid. The recombinant plasmid was then introduced into the rgg- mutant strain by electrotransformation. Transcription of the episomal rgg gene was confirmed with Real-Time RT-PCR. Further analysis revealed that complementation restored toxin production to wild-type levels, as determined by biological assays and Real-Time RT-PCR. The results clearly demonstrated that Rgg is essential for toxin synthesis, thus making it a potential target for chemotherapeutic agents designed to minimize human disease by disrupting toxin production.

POSTER TITLE: Developing Parallel Algorithms for Seasonality Analysis
STUDENT: **Paul Marshall & Andrew Reinartz**
FACULTY: Daniel Swets
INSTITUTION: Augustana College
FUNDING: National Aeronautics Space Administration
DISPLAY AREA: 6F
Abstract:
NDVI, derived from data produced by NOAA and NASA satellites, provides scientists from NASA, NOAA, USGS and CDC temporal images for land cover/land use change analysis, drought monitoring, fire management, weather prediction, flood analysis, and the study of viral outbreaks, such as the Hantavirus in the Southwest. We calculate seasonal metrics and vegetation characteristics from these temporal images to enable the application of space-borne sensors to study various biological processes. Metrics such as the day when a growing season begins need to be calculated for each pixel in the image. And because the global application of these studies requires a vast number of pixels, we developed a highly efficient software system to provide these seasonality metrics.
Phase one of our project involved writing software to extract the metrics from each pixel. Due to the enormous size of the images, per-pixel processing was far too slow. Phase two implemented a threaded algorithm to enhance the speed and provide for overlapped file I/O. Phase three revolves around a clustering package to enable an unlimited number of networked computers to process different parts of the image. The suite of software packages required to accomplish this is encased in a user-friendly Java interface that helps control and monitor the processing of these images.
Threading, overlapped file IO, and clustering will help NOAA, NASA, and USGS scientists calculate metrics in near real time. This will enable them to utilize the satellite images more efficiently, enhancing their ability to perform regional and global biological studies.

Texas

POSTER TITLE: Antibacterial Efficacy of Indigenous MEdicianl Plants of Northern Mexico
STUDENT: **Donna Alcantara**
FACULTY: Suzzette Chopin
INSTITUTION: Texas A & M University - Corpus Christi
FUNDING: Louis Stokes Alliance for Minority Participation, National Science Foundation
DISPLAY AREA: 6G
Abstract:
Curanderismo is a Mexican healing technique that fuses Spanish doctrine with the medicinal use of indigenous plants. The goal of this research is to investigate the effectiveness of plants native to northern Mexico as herbal medicines; previous results demonstrated that 10 plants inhibited growth of the gram-positive organism, Streptococcus pneumoniae. This project hypothesized that additional plant species would be effective in inhibiting the growth of the gram-positive organism S. pneumoniae, and the gram-negative organisms Escherichia coli and Pseudomonas aeruginosa. Tinctures of 24 plant species were made using solvents of 95% ethanol or 45% ethanol or 0.98% saline, and their antimicrobial activates were examined by Kirby-Bauer disk diffusion testing, which was done in duplicate. Controls included ampicillin, penicillin, cefotaxime and solvents only; the alcohol solvents alone demonstrated no zones of inhibition. The most effective antibacterial activity occurred with tinctures from the plant ¡§Old Man's Beard¡¨ (Clematis drumondii); mean zones of inhibition were 2.3mm with E. coli, 2.9 mm with P. aeruginosa, and 8.5 mm with S. pneumoniae. The latter bacterial species also showed marked sensitivities to 9 other plant tinctures, exhibiting zones of inhibition from 1 mm to 7 mm (average zone of inhibition = 2.8 mm). Other plant tinctures showed no significant bactericidal activity to either E. coli or P. aerginosa. In conclusion, the reactive plant extracts appeared to have increased effectiveness on gram-positive bacterial strains.

POSTER TITLE: Quantification of phthalate ester leaching from clear and tinted poly(ethylene terephthalate) bottles as a function of ultraviolet light exposure
STUDENT: **Blithe Casterline & Sarah Sher**
FACULTY: Emily Niemeyer
INSTITUTION: Southwestern University
FUNDING: Welch Foundation
DISPLAY AREA: 6H
Abstract:
This study quantified phthalate ester migration from clear Aquafina® and tinted Dasani® poly (ethylene terephthalate) bottled water exposed to UV radiation. Plasticizers such as phthalate esters are commonly added to plastic packaging to give more desirable characteristics such as increased flexibility and shine. However, because plasticizers are not chemically bound to the plastic matrix, leaching from the polymer can occur. In this study, the phthalate ester compounds were extracted from the bottled water samples using solid phase extraction (SPE) and identified using gas chromatography and mass spectrometry (GC/MS). The primary phthalate of interest in this study was di-ethylhexyl phthalate (DEHP). DEHP was found in concentrations exceeding EPA drinking water standard levels in extractions of bottled water samples exposed to 0, 6, 12, 18 and 24 hours of UV radiation. Consumption of phthalate ester plasticizers, particularly di(2-ethylhexyl) phthalate (DEHP) is a cause of public health concern due to its suspected carcinogenicity. High concentrations of DEHP in bottled water are a direct health concern because DEHP has been previously found to disrupt normal estrogen and androgen activity as well as affect reproductive development in a number of cytotoxic studies.

POSTER TITLE: The Effects of Mutual Partner Violence on Women's Mental Health
STUDENT: **Eric Foster**
FACULTY: Susan Eve
INSTITUTION: University of North Texas
FUNDING: Centers for Disease Control
DISPLAY AREA: 7A
Abstract:
This study examined the effects of different patterns of violence between domestic partners on women's mental health. The five patterns of violence investigated included unilateral female dominated, unilateral male dominated, symmetrical, mutual female dominated, and mutual male dominated. The sample for this longitudinal interview survey consists of 835 low-income ethnically diverse women in heterosexual relationships, including 302 African Americans (36.2%), 273 Euro-Americans (32.7%), and 260 Mexican Americans (31.1%). Violence was measured with the Severity of Violence against Women Scales and the Severity of Violence against Men Scales. Mental health was measured by the global subscale of the Hopkin's Symptom Checklist. Of the violent relationships (n = 646, 77%), a majority were characterized by mutual violence (i.e., both partners participate in violent behavior; n = 445, 69%), with a majority of the violence primarily dominated by the male partner (n = 241, 54% of mutually violent relationships). One hundred and twenty-six women (15% of the sample) were in unilateral male dominated relationships, while 75 (9%) women were in unilateral female dominated relationships. Violence in mutually violent relationships was most predictive of women's mental health problems, $\hat{I}^2 = .36$, $p < .001$, accounting for 13% of the variance of these women's psychological distress, $F(1, 239) = 36.35$, $p < .001$. This research shows that intimate partner violence should not be examined as simply unidirectional male to female or female to male violence, as most violent relationships are characterized by mutual violence.

Utah

POSTER TITLE: Initial Genetic Characterization of Brine Flies from the Great Salt lake
STUDENT: **Eric Gabrielsen**
FACULTY: Jonathan Clark
INSTITUTION: Weber State University
FUNDING: National Science Foundation - Research Experience for Undergraduates
DISPLAY AREA: 7B
Abstract:
Among the most conspicuous inhabitants of the Great Salt Lake of northern Utah are brine flies of the family Ephydridae. Despite their ecological importance, little is known about the diversity of these flies. Two species have been identified, Ephydra cinerea and Ephydra hians. It is possible that other species of ephydrids exist as well, but there have been few systematic studies. The goals of this research were to identify a molecular marker that can be used to distinguish each species of brine flies. The internal transcribed spacer-1 (ITS-1) region was used because the size of the ITS-1 region often varies among species. E hians was found to have an ITS-1 region of approximately 770 base pairs (bp). However, for samples thought to be E. cinerea, two different sizes were observed, 670 bp and 520 bp. When the morphology of these flies was examined more closely, a consistent body size difference was apparent. There are two explanations for the pattern of ITS-1 variation presented here. (1) As previously thought, two species of brine flies, E. hians and E. cinerea, inhabit the Great Salt Lake. Within E. cinerea, there exist two populations that exhibit an intraspecific size variation in the ITS-1 region. (2) At least three different species of brine flies inhabit the Great Salt Lake, each characterized by a unique ITS-1 fragment size. While E. hians is easily identified morphologically, it is unsure which of the other two morphologically similar isolates corresponds to E. cinerea and which may be another species.

Vermont

POSTER TITLE: OsOPTs Show Differential Expression During Germination
STUDENT: **Kristyn Dumont**
FACULTY: Mark Lubkowitz
INSTITUTION: St. Michael's College
FUNDING: Vermont Genetics Network, through National Institutes of Health from BRIN Program of National Center
DISPLAY AREA: 7C
Abstract:
Seed formation and embryogenesis requires the transport and partitioning of specific nutrients, including amino acids which must be transported to areas of elevated protein synthesis during embryogenesis and endosperm formation. Amino acid transport is rapid and amino acids can be transported freely or as small peptides. Whereas many amino acid transporters have been characterized; few studies have investigated the role that peptide transporters play in seed development. Two peptide transport systems are known to exist in plants, the OPT gene family (Oligopeptide transport) and the PTR gene family (Peptide transport). The OPTs translocate peptides of 3-5 amino acids and no study has investigated the role that OPTs play in loading and unloading amino acids in monocot seeds despite the agricultural importance of seed proteins and the scientific interest in the mechanisms underlying resource acquisition and partitioning in seeds. We hypothesize that OPTs play a significant role in amino acid loading in the developing seed. Our hypothesis makes three predictions: 1) OPTs will transport peptides that are rich in the amino acids that comprise seed storage proteins, 2) OPTs will be expressed in a temporal and spatial manner consistent with the translocation of peptides to tissues of high protein synthesis, and 3) mutations in OPT genes will affect each phase of plant development. We are using genetic, molecular, and biochemical approaches to test this hypothesis in rice. We present here that OPT 2, 4, 5 and 7 are expressed 24, 48, and 72 hours post imbibition.

POSTER TITLE: Understanding Child Labor: Realities From Child Laborers in Mwanza, Tanzania
STUDENT: **Yohanne Kidolezi**
FACULTY: Jessica Holmes
INSTITUTION: Middlebury College
FUNDING: Rohatyn Center for International Affairs
DISPLAY AREA: 7D
Abstract:
With more than 200 million children in the labor force worldwide, child labor is one of the major global challenges today. Throughout the developing world, children as young as five years are subjected to health and psychological hazards due to their involvement in factory work, street vending, agriculture, and prostituition.
Ample child labor literature has appeared in the last decade. Using national household surveys, researchers have analyzed the determinants of children participation in the labor market. However, it has proved difficult to fully understand the problem due to the complex social and cultural dimensions of societies. Furthermore, universal household surveys may not capture useful results due to cultural and social differences of countries. Therefore, in order to fully understand the problem, there is need for research work that incorporates both social and cultural inputs of a society.
In this research project, we undertook fieldwork survey of child laborers in the streets of Mwanza in northern Tanzania. Child laborers of age five to seventeen were interviewed. The project involved collecting and analyzing information on their demographic, economic, and health characteristics of all children involved in all kinds of economic activities.
After analyzing the data, results were compared to a corresponding sample from the Tanzania Labor Force Survey. Preliminary results show marked differences in the characteristics of child laborers in our sample and the national survey sample. This is just one of the initial proofs that household-based surveys may provide a limited picture of child labor in all its dimensions.

Virginia

POSTER TITLE: Mathematical Model of Brucellosis
STUDENT: **Tanya Kazakova**
FACULTY: Elsa Schaefer
INSTITUTION: Marymount University
DISPLAY AREA: 7E
Abstract:
Brucellosis in an infectious bacterial disease of animals, such as cattle and elk, that is caused by Brucella and sometimes results in spontaneous abortions in newly infected animals. Humans are generally infected in one of three ways: eating or drinking something that is contaminated with Brucella, inhalation the organism, or having the bacteria enter the body through skin wounds. In humans, symptoms may include fever, sweating, headache, physical weakness, body and joint aches, chills, depression and weight loss. Control of brucellosis in agricultural animals is a prerequisite for the prevention of this disease in human beings.
In his article "The population dynamics of brucellosis in the Yellowstone National Park," Dr. Andrew Dobson proposed a SIR model, a system of ordinary nonlinear differential equations that describes aspects of the population dynamics of this disease. In that article he looks at both one-species and two-species models, taking into account different ways of disease transmission.
My poster proposes a revised version of Dobson's system and looks at vaccination strategies using the method of optimal control. The revision modifies the model's approach to population growth and disease-related death, adapting the model to reflect the impact of vaccination.

POSTER TITLE: Cross-Sectional Probability Study of 238U using the Silicon Telescope Array for Reaction Studies
STUDENT: **Benjamin Crider**
FACULTY: Mirela Fetea
INSTITUTION: University of Richmond
FUNDING: National Science Foundation, Department of Energy and Research Corporation
DISPLAY AREA: 7F
Abstract:
Estimating the neutron induced cross sections for reactions on nuclei with short lifetimes are important for understanding stellar evolution and isotopic and elemental abundances. However, such cross sections are often very difficult or impossible to measure directly. One of the best mechanisms currently available to study such reactions is through the surrogate method where the same compound system is produced via light-ion induced reactions on a stable target. By studying these surrogate reactions, we can learn about reactions that would be nearly impossible to create in the laboratory. An experiment was conducted using the Silicon Telescope Array for Reaction Studies at the Wright Nuclear Structure Laboratory at Yale University. A high-energy deuteron beam was fired at a 238U target, a 236U target, and a 92Zr target. Using the STARS detector and an array of high efficiency segmented clover germanium detectors in the YRAST Ball Array, Hydrogen, deuterons, tritons, and fragments could all be observed. Data was collected for each of the targets over a period of several weeks. The data is currently being analyzed using the Radware analysis package. Preliminary results will be presented.

POSTER TITLE: Activation of Adenosine A1 Receptos in the Dorsal Hippocampus Selectively Impairs Contextual Fear Conditioning in Rats.
STUDENT: **John Flowers**
FACULTY: Keith Corodimas
INSTITUTION: Lynchburg College
FUNDING: National Institute on Drug Abuse (NIDA)
DISPLAY AREA: 7G
Abstract:
The present study examined the effects of acute adenosine A1 receptor activation in the dorsomedial hippocampal formation on emotional (fear) learning. A classical (Pavlovian) fear conditioning paradigm was used to examine the effects of a selective adenosine A1 receptor agonist, N6-Cyclopentyladenosine (CPA), on fear conditioning to a tone that was paired with a very brief, mild footshock, and to contextual stimuli present in the conditioning chamber. Ten minutes prior to conditioning, male rats received bilateral microinfusions of CPA or vehicle (control) directly in the dorsal hippocampus. Twenty-four hours later, behavioral fear responses (i.e., freezing) were measured in a counterbalanced fashion. Freezing was operationally defined as the absence of all movement except respiratory-related. Activation of adenosine A1 receptors in the hippocampus significantly impaired the acquisition of fear to the conditioning context or environment (context conditioning), but had no effect on tone-elicited fear. Control experiments demonstrated that the disruption of context conditioning could not be attributed to state-dependent learning. These results suggest that endogenous adenosine located in the dorsal hippocampus modulates emotional learning and memory.

Washington

POSTER TITLE: Probing enzyme interactions leading to Alzheimer's Disease: Understanding the Nature of Presenilin1-Nicastrin Interactions
STUDENT: **Sandlin Preecs**
FACULTY: Lisa Gentile
INSTITUTION: Western Washington University
FUNDING: National Institutes of Health (National Institutes of Aging)
DISPLAY AREA: 7H
Abstract:
Alzheimer's disease (AD) is a degenerative neurological disorder that affects both higher brain function and, in late stages, fatally degrades a patient's basic reflexes. More than 4 million Americans suffer from the disease, which is characterized by dementia, a symptom of amyloid plaques and neurofibrillary tangles. These plaques are the product of cleavage of the amyloid precursor protein into a 42 amino acid peptide (Aβ), by a high molecular weight complex called γ-secretase. Previous studies have found γ-secretase function can be achieved with four transmembrane spanning proteins: presenilin-I(PS1), nicastrin (NCT), PEN-2, and APH-1. It has been shown that several point mutations in presenilin and nicastrin increase or decrease the activity of the γ-secretase complex, although the mechanism is not understood. It is the goal of our research to understand the γ-secretase activity that leads to the formation of amyloid plaques and understand how the physiologically relevant mutants decrease the production of the Aβ-peptide. Learning how to decrease the production of the plaque forming Aβ-peptide has important therapeutic implications for AD patients. It is our hypothesis that the PS1 and NCT mutants that decrease the formation of the Aβ-peptide do so by changeing the nature of their binding. To probe this we have cloned, over-expressed and purified the binding domains of both wtNCT and PS1 (wt and mutant). Biophysical studies will be presented which demonstrate the nature of the wild-type interaction and how that changes with mutation. Implications for the design of γ-secretase inhibitors will be discussed.

POSTER TITLE: Understanding Pathogenic Presenilin-1 Mutants in Alzheimer's Disease
STUDENT: **Brian Jeppesen**
FACULTY: Lisa Gentile
INSTITUTION: Western Washington University
FUNDING: National Institutes of Health (National Institutes of Aging)
DISPLAY AREA: 8A

Abstract:
Alzheimer's disease (AD) is characterized by the accumulation of amyloid plaques concentrated around the hippocampus, amygdale and cerebral regions of the brain. The amyloid plaques consist of 42 amino acid fragments, Aâ42 peptides, and result in neurodegeneration and loss of cognition of AD patients. It has been shown that Aâ42 peptide is the proteolytic product of the amyloid precursor protein (APP) by a heterotetrameric enzyme, ã-secretase, of which presenilin-I (PS-I) and presenilin-II (PS-II) are components. Pathogenic mutations in APP, PS-I and PS-II follow autosomal dominant patterns that increase ã-secretase activity and the development of Aâ42 peptides. Although, there are many mutations among these three genes, PS-I is the major contributor and estimated to be responsible for 70% of the cases of early onset familial Alzheimer's disease. Moreover, approximately 25% of the mutations in PS-I occur in the hydrophilic loop between membrane spanning regions 6 and 7 (TM6/7), making it an appealing site for study. The goal of our research lab is to determine the structural differences between selected missense mutants and the wild type PS-I in the TM6/7 region and correlate the findings to the pathology of AD. Using spectroscopic techniques, I have compared the folded structures of three pathogenic mutants to the wild type (wt) PS-1. My results show one mutant with significant structural deviation from the wt, indicating that a disruption of folding may trigger AD. Other mutants' structures remain relatively similar to the wt, suggesting a non-structural basis for pathogenicity.

POSTER TITLE: Novel Process for Manufacturing Expandable Carbon Fiber Honeycomb
STUDENT: **Jordan Kiesser**
FACULTY: Nicole Hoekstra
INSTITUTION: Western Washington University
FUNDING: WWU & SAMPE
DISPLAY AREA: 8B

Abstract:
The Vehicle Research Institute at Western Washington University is currently building a car designed for crash safety which is funded by the Federal Highway Administration. The Engineering Technology Department is investigating Carbon fiber honeycomb as a light weight high strength material to use for impact absorption applications in vehicle crumple zones. The existing process for manufacturing carbon fiber honeycomb at Western Washington University requires a long cycle time, intensive labor, and retooling to create honeycomb with different node lengths or cell geometries. The objective of this project was to develop a process that reduced cycle time and allowed for construction of honeycomb with different node lengths and cell geometries. The manufacturing process chosen for constructing carbon fiber honeycomb was based on using techniques and information from existing honeycomb manufacturing processes. The process of manufacturing expandable aluminum honeycomb (HOBE) is automated and results in low variation with fast cycle times. The process that was developed during this projects implementation involves making a HOBE block using uni-directional carbon fiber prepreg with an epoxy adhesive. Samples were tested for compression strength and density to determine the honeycombs mechanical properties. A designed experiment was run to determine the effect that the manufacturing method and the type of honeycomb node adhesive had on compressive yield strength and ride down. Based on the results of the experiment recommendations are presented for future research to increase the fiber matrix consolidation, optimize the benefits of changing cell geometries, produce profiled HOBE expansions, and to automate the process.

West Virginia

POSTER TITLE: Chronic and Acute Pain Affects Descriptions of Pain and Fear in Oral Surgery Patients and Nonclinical Controls
STUDENT: **Amber Davis, Jasen Perry, Kerry Fluharty & Emily Selby**
FACULTY: Daniel McNeil
INSTITUTION: West Virginia University
FUNDING: McNair
DISPLAY AREA: 8C
Abstract:
Knowledge about how language is used to describe physical conditions (e.g., pain), and emotional states (e.g., fear), is of critical importance in the diagnosis of medical and mental health disorders. Moreover, health care interventions often are guided by patients' words in describing whether treatment (e.g., medication) has abated pain or negative emotions, or had no effect, or even worsened the condition. An initial study conducted with 218 young adults investigated the relationships among 12 concepts, consisting of physical (e.g., pain, comfortable) and emotional words (e.g., anxiety, calm), which were rated in terms of their similarity to one another, on 7-point Likert-type scales. Multidimensional scaling, a statistical technique, showed that participants who had a history of chronic pain demonstrated greater distinction in their use of pain words (i.e., pain, hurt, and agony) relative to their healthier counterparts. A second study focuses on West Virginia University School of Dentistry Oral and Maxillofacial Surgery Clinic outpatients who are immediately anticipating a tooth extraction. Participants also rate the 12 concepts from the first study, as well as words related to tooth extraction, on the same seven-point scales. A two-week post-surgical follow-up assessment also is included. Implications from this work are that prior history of pain changes the way in which people describe their pain, providing greater discrimination among pain-related constructs. These findings are relevant to medical, dental, and psychological health care, in terms of understanding the various words patients may use while in painful and stressful assessment and treatment situations.

Wisconsin

POSTER TITLE: High Resolution Spectroscopic Studies in the Infrared and Far-Infrared Regions
STUDENT: **Brooke Chuzles**
FACULTY: Michael Jackson
INSTITUTION: University of Wisconsin-La Crosse
FUNDING: National Science Foundation
DISPLAY AREA: 8D
Abstract:
The most important scientific tool used to decipher the structure of matter has been molecular spectroscopy. So far, microwave spectroscopy has provided the most precise information available about molecular structures and electric dipole moments. To extend the available information obtained from microwave techniques to higher energies, studies are conducted in the infrared and far-infrared regions. In these regions, a variety of stable and unstable molecular species have been investigated using several spectroscopic systems.
This research began with the discovery of new optically pumped laser emissions from a variety of stable molecular species, including hydrazine and partially deuterated methanol isotopes. New laser emissions were discovered in the short-wavelength portion of the far-infrared region, typically defined as wavelengths below 150 micron. Once detected, the operating characteristics of these laser emissions (including their wavelength, operating pressure, power and polarization relative to the carbon dioxide pump laser) were measured. A three-laser heterodyne system was then used to measure the frequencies of these laser emissions to fractional uncertainties of a few parts in ten million. These laser lines can then be used as strong, coherent sources of far-infrared radiation for the investigation of unstable molecular species with the laser magnetic resonance (LMR) spectroscopic technique. Along with the far-infrared LMR spectrometer system recently constructed at the University of Wisconsin-La Crosse, the infrared LMR spectrometer system at the University of Oxford, England has been used to re-investigate the NCN radical, resulting in the assignment of numerous absorption signals in two vibrational bands.

Rayburn House office Building
Rooms 338-B, 339-B & 340-B

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
A E	**A E**	**A E**	**A E**	**A E**	**A E**	**A E**	**A**
B F	**B F**	**B F**	**B F**	**B F**	**B F**	**B F**	**B**
C G	**C G**	**C G**	**C G**	**C G**	**C G**	**C G**	**C**
D H	**D H**	**D H**	**D H**	**D H**	**D H**	**D H**	**D**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

Entrance

Entrance

Participants

Alabama
National Space Science and Technology Center
Arizona
University of Arizona
California
Children's Hospital & Research Center at Oakland
Harvey Mudd College
Lawrence Livermore National Laboratory
California State University San Bernardino
Florida
New College of Florida
Georgia
Mercer University
Illinois
Millikin University
Bradley University
Kansas
Bethel College
Kentucky
Northern Kentucky University
Maryland
University of Maryland, Baltimore County
Towson University
Goucher College
Loyola College in Maryland
Massachusettes
Boston University
College of the Holy Cross
Harvard University
Michigan
University of Michigan
Central Michigan University
Hope College
Michigan State University
Minnesota
University of North Carolina, Chapel Hill
St. Olaf College
Missouri
Saint Louis University
University of Missouri
Nebraska
Creighton University
New Hampshire
University of New Hamsphire New Jersey
Montclair State University
New Jersey
Montclair State University
New York
SUNY College at Bufflao
SUNY Geneseo
Alfred University
North Carolina
Johnson C. Smith University
Ohio
Denison University
Youngstown State University
Oklahoma
University of Central Oklahoma
Oregon
Western Oregon University
Pennsylvania
Lebanon Valley College
Widener University
South Carolina
Coastal Carolina University
Clemson University
South Dakota
University of South Dakota School of Medicine
Augustana College
Texas
Texas A & M University - Corpus Christi
Southwestern University
University of North Texas
Utah
Weber State University
Vermont
St. Michael's College
Middlebury College
Virginia
Marymount University
University of Richmond
Lynchburg College
Washington
Western Washington University
West Virginia
West Virginia University
Wisconsin
University of Wisconsin-La Crosse