Apr 7th, 2010

6th Annual Undergraduate Research Conference Abstract Book

Missouri University of Science and Technology

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6th Annual
Undergraduate Research Conference

April 7, 2010
Missouri S&T - Havener Center

CONFERENCE AGENDA

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(St. Pat’s B)</td></tr>
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<tr><td>12:00 pm – 1:00 pm</td><td colspan="4">Luncheon & Keynote Address

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Curators Professor of Chemistry, Missouri S&T
Presents
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(St. Pat’s A & Miner Lounge)</td></tr>
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(St. Pat’s B)</td></tr>
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- **OURE Faculty Fellows Proposal Review:** 9:00 am – 12:00 pm, (Meramec room)
- **Judges Conference Rooms -** (Mark Twain conference room and Walnut room)

Oral Presentations

Engineering Oral Session		
Name	**Department**	**Time/Location**
Andrew Adams	Civil, Architectural & Environmental Engineering	9:00-9:30 AM – Ozark Room
Justin Aholt	Mechanical & Aerospace Engineering	9:30-10:00 AM – Ozark Room
Jeffrey Ahrendts	Electrical & Computer Engineering	10:00-10:30 AM – Ozark Room
Matthew Bloom	Electrical & Computer Engineering	10:30- 11:00 AM – Ozark Room
Benjamin Brannon	Civil, Architectural & Environmental Engineering	9:00-9:30 AM – Ozark Room
Cory Brennan	Civil, Architectural & Environmental Engineering	9:00-9:30 AM – Ozark Room
Jesse Cross	Electrical & Computer Engineering	9:00-9:30 AM – Gasconade Room
Grace Harper	Geological Sciences & Engineering	9:30-10:00 AM – Gasconade Room
Andrew Heckman	Mechanical & Aerospace Engineering	10:00-10:30 AM – Gasconade Room
John Krumme	Electrical & Computer Engineering	10:30-11:00 AM – Gasconade Room
Thomas McKinnon	Electrical & Computer Engineering	10:30-11:00 AM – Gasconade Room

Sciences Oral Session		
Name	**Department**	**Time/Location**
Richard Campos	Biological Sciences	9:00-9:30 AM – Carver Room
Nathaniel Carter	Chemistry	9:30-10:00 AM – Carver Room
Stephen Jackson	Computer Science	10:00-10:30 AM – Carver Room
Dustin Kurath	Chemistry	9:00-9:30 AM – Turner Room
Megan Oldroyd	Chemistry	9:30-10:00 AM – Carver Room
George Rush	Computer Science	9:30-10:00 AM – Turner Room
Karen Schilli	Biological Sciences	10:00-10:30 AM – Turner Room

Social Sciences Oral Session		
Name	**Department**	**Time/Location**
Angela Hundt	Psychology	1:00 – 1:30 PM – Carver Room
Samantha Schussele	Economics & Finance	1:30 – 2:00 PM – Carver Room

Arts and Humanities Oral Session		
Name	**Department**	**Time/Location**
Amanda Amsden	English & Technical Communication	2:00 – 2:30 PM – Carver Room
Adam Smith	History & Political Science	2:30 – 3:00 PM – Carver Room

Poster Presentations

Sciences Poster Session		
Name	**Department**	**Time/Location**
Ryan Birmingham	Computer Science	9:00 - 11:45 AM – Upper Atrium/Hallway
Trevor Ellis	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Benjamin Hale	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Crystal Halloran	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Brittany Hood	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Allen Hooper	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Nichole Hurd	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Scott Melby	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Drew Menke	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Ashley Muehler	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Ryan Rader	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
Meghan Ray	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Daniel Roush	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
Patrick Stanley	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
Kelly Walsh	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
Faten Nasyrah Zulkifli	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway

Research Proposal Poster Session		
Name	**Department**	**Time/Location**
Ashley Banasnek	Information Science & Technology	9:00 - 11:45 AM – Upper Atrium/Hallway
Kathryn Boardman	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Caroline Fernandez	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Dominique Nocito	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
Matthew Nuckolls	Computer Science	9:00 - 11:45 AM – Upper Atrium/Hallway
Crystal Twenter	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
Michael Wisely	Computer Science	9:00 - 11:45 AM – Upper Atrium/Hallway

Poster Presentations (Cont.)

Engineering Poster Session		
Name	**Department**	**Time/Location**
Paulina Barranco	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Morgan Boresi	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Emily Briggs	Mechanical & Aerospace Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Kyle Buchheit	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Cailie Carlile	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Jingwen "Wendy" Chen	Electrical & Computer Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Pei Chuen Chia	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Omar Conte	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Corey Grace	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Travis Hemsath	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Kyle Holman	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
David Lecko	Electrical & Computer Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Samantha Markus	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Nis Mohmad	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Kelly O'Bryant	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Timothy Peters	Mechanical & Aerospace Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Cuong Pham	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Matthew Struemph	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Jordan Tripp	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
Ryan Wohldmann	Mining & Nuclear Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway

Social Sciences Poster Session		
Name	**Department**	**Time/Location**
Travis Gibson	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
Leslie Hagen	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
Ashley Nelson	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
Jodi Paul	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
Lauren Summerville	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway

Keynote Speaker

Nicholas Leventis

Curators' Professor, Chemistry
Missouri S&T

Presents

"A Career in Science"

Dr. Nicholas Leventis received his bachelor's degree in chemistry from the University of Athens (Greece) in 1980 and earned his Ph.D. in organic chemistry/photochemistry from Michigan State University in 1985. From 1985-88, Leventis was a postdoctoral fellow at Massachusetts Institute of Technology. In 1992, he completed the one-year graduate program in administration and management at Harvard University.

Leventis worked in the private sector for six years before joining the Chemistry Department at Missouri S&T in 1994. During leaves from the university, he was a summer faculty fellow at the U. S. Naval Research Laboratory in Washington D.C. and director of research on strong lightweight materials at the NASA Glenn Research Center in Cleveland, Ohio. In 2005, he received the NASA Exceptional Scientific Achievement Medal for his "groundbreaking research in the development of polymer crosslinked aerogels." In 2005 and 2007, the aerogel research earned Leventis the Nano50 Award, which annually recognizes the top 50 technologies, products and innovators in the field of nanotechnology.

Other research interests include physical organic chemistry, electrochemistry, polymers and inorganic materials. Leventis has published more than 115 scholarly articles and has been issued nine U.S. patents.

Conference Judges

The Office of Undergraduate Studies wishes to thank the following faculty & staff for their valuable contributions to the 6th Annual Missouri S&T Undergraduate Research Conference.

Diana L. Ahmad
Ralph Alexander
Bonnie Bachman
Stuart Baur
Joel Burken
Amitava Choudhury
Richard Dalton
Stephen Gao
Larry Gragg
Edna Grover-Bisker
Irina Ivliyeva
Jonathan Kimball
Merilee Krueger
Hyoung-Koo Lee
Kelly Liu
Scott Miller
Jana Neiss
Heath Pickerill
Joshua Rovey
Jeff Schramm
Bob Schwartz
Bijaya Shrestha
Andy Stewart
Daniel Tauritz
Klaus Woelk

Thank You!

Engineering
Oral Session

Abstracts

Andrew M. Adams

Joint Project with Benjamin Brannon and Cory Brennan

Department: Civil, Architectural and Environmental Engineering
Major: Civil Engineering
Research Advisor: Dr. Stuart Baur
Advisor's Department: Civil, Architectural and Environmental Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program
Missouri S&T Solar House Team

Concentrating Photovoltaic and Thermal Collector

Although thermal concentrators are readily available, the market for Concentrating Photovoltaic and Thermal Collectors is a fairly untouched application. This combination of thermal heat transfer and photovoltaic energy generation, working in harmony to produce a benefit in both arenas, is a bold step into the common application of renewable energy generation and use. The tests conducted within this research helped to prove the theory that the thermal energy could be taken from the concentrated cell thus producing an increase in the solar output of the cell itself. The concentration of the parabolic trough emphasized this effect by focusing the solar output onto the collector and creating a large temperature differential within the system. This experiment and its results furthered the understanding of combined energy generation systems.

Andrew M. Adams is a first year senior majoring in Civil Engineering at Missouri University of Science and Technology and a transfer student from Missouri State University and a graduate of Nixa High School. He took a Co-Op in Fall of '09 with the Missouri S&T Show-Me Solar House team to participate in the U.S. DOE 2009 Solar Decathlon. He is presently Lead Civil Engineer for the 2011 Show-Me Solar House Team, a member of Engineers without Borders, and an active member in various research projects at Missouri S&T.

Justin Aholt

Department: Mechanical and Aerospace Engineering
Major: Aerospace Engineering
Research Advisor: Dr. Fathi Finaish
Advisor's Department: Mechanical and Aerospace Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NASA-Missouri Space Grant Consortium

Control of Laminar Separation Bubbles via Plasma Actuators: a Preliminary Computational Study

A parametric Computational Fluid Dynamics (CFD) study was conducted to examine the plausibility of a plasma actuator as a means of controlling a Laminar Separation Bubble (LSB) over an airfoil at low Reynolds numbers. In this study, the effects of altering the strength and location of a plasma actuator, modeled as a localized body force, on the size and location of the LSB and on the aerodynamic performance of the airfoil were observed. It was found that the body force, when properly located and with sufficient magnitude, could effectively eliminate the LSB. Additionally, it was found that by eliminating the LSB, the aerodynamic efficiency of the airfoil could be improved by over 60%. Thus, it was determined that plasma actuators may indeed be an effective measure for reducing or eliminating the negative effects associated with LSBs at low Reynolds numbers, making the technology an excellent candidate for future experimental research.

Justin Aholt is currently a senior in the Department of Mechanical and Aerospace Engineering at Missouri S&T. He intends to graduate with a Bachelor's degree in Aerospace Engineering in May 2010, and a Master's degree in May 2011.

Jeffrey Ahrendts

Department: Electrical & Computer Engineering
Major: Computer Engineering
Research Advisor: Dr. Minsu Choi
Advisor's Department: Electrical & Computer Engineering

Funding Source: NSF ECCS - 0801362

Area & Latency Measurement and Optimization of Clock-Free Nanowire Reconfigurable Crossbar

This research project involves the study of Asynchronous Nanowire Reconfigurable Crossbar Architecture (ANRCA) to develop a more efficient and practical way of implementing this form of nanotechnology. This architectures design that is based on Null Convention Logic (NCL), a delayed insensitive logic that is not dependent on a global clocking distribution network. By using this logic, faults encountered with regular clocking networks can be avoided. By optimizing the newly crossbar system a newly hierarchical design was created to be build more complex logic blocks. From this proposed measurements and optimization methods can be used to estimate area and latency for different blocks. In this experiments, these logic blocks are configured to implement the structure of full adders to support the design effectiveness.

Jeffrey Ahrendts is a dual-degree engineering transfer student from Morehouse College who's hometown is Sunrise, FL. He is currently a senior here at Missouri S&T pursing a B.S. of Computer Engineering and B.S. of General Science with Mathematics and Japanese minor from Morehouse College.

Matthew Bloom

Department: Electrical and Computer Engineering
Major: Electrical Engineering
Research Advisor: Dr. Chengshan Xiao
Advisor's Department: Electrical and Computer Engineering

Funding Source: Office of Naval Research

Simulation of BPSK Communication: Using MMSE Linear Equalization for SISO and SIMO Models

The simplest form of a communication system is when one sending node and one receiving node are paired through a transmission channel (SISO). In this situation, data is easily compromised by noise and inter-symbol interference (ISI) from the channel's characteristics. By implementing a Minimum Mean-Square Error Linear Equalizer (MMSE LE), which uses the known channel characteristics, which are of finite length, as well as noise variance, the bit error rate (BER) can be minimized with respect to the ratio of signal power against noise power (SNR). A more complex communication system than SISO is the implementation of multiple nodes on the receiving end (SIMO). By using multiple receivers and implementing a MMSE LE, the BER can be dramatically reduced without having to increase bandwidth or transmission power.

Matthew Bloom is a senior in Electrical Engineering at the Missouri University of Science and Technology, and will be graduating with honors in May of 2010. Matthew worked on the university's solar car team during his first three years of college, and during his sophomore year, he was elected as Treasurer of the team. Matthew has participated in two research projects throughout his undergraduate career, the first being with Prof. Sudip Mazumder at the University of Illinois at Chicago. There, he worked on digital logic timing as well as basic power electronics. His current project is with Dr. Chengshan Xiao at Missouri S&T, focusing on BPSK communication and the errors that accompany transmission through imperfect channels. Matthew has worked on this project since September of 2009, and has finished the task asked of him, but plans to continue research with Dr. Xiao until his graduation.

Benjamin T. Brannon

Joint Project with Andrew Adams and Cory Brennan

Department:	Civil, Architectural and Environmental Engineering
Major:	Electrical Engineering
Research Advisor:	Dr. Stuart Baur
Advisor's Department:	Civil, Architectural and Environmental Engineering

Funding Source:	Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program Missouri S&T Solar House Team

Concentrating Photovoltaic and Thermal Collector

Although thermal concentrators are readily available, the market for Concentrating Photovoltaic and Thermal Collectors is a fairly untouched application. This combination of thermal heat transfer and photovoltaic energy generation, working in harmony to produce a benefit in both arenas, is a bold step into the common application of renewable energy generation and use. The tests conducted within this research helped to prove the theory that the thermal energy could be taken from the concentrated cell thus producing an increase in the solar output of the cell itself. The concentration of the parabolic trough emphasized this effect by focusing the solar output onto the collector and creating a large temperature differential within the system. This experiment and its results furthered the understanding of combined energy generation systems.

Ben Brannon is junior in Electrical Engineering from Nashville, Tennessee. He is heavily involved on campus in the Solar House student design team and several research projects stemming from it including studies on SmartGrid application, the Chameleon home automation system, advanced lighting control, Solar Building Benchmark and concentrating solar thermal systems. During the 2009 summer he worked as an intern at the National Renewable Energy Laboratory in Golden, Colorado researching the effects of renewable power generation on current grid infrastructure, and plans to return in 2010 to research the possibilities of occupancy detection from a camera-based microprocessor system. After graduation he plans to work in the renewable energy field in either green building system design or renewable power generation.

Cory J. Brennan

Joint Project with Andrew Adams and Benjamin Brannon

Department: Civil, Architectural and Environmental Engineering
Major: Civil and Architectural Engineering
Research Advisor: Dr. Stuart Baur
Advisor's Department: Civil, Architectural and Environmental Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program
Missouri S&T Solar House Team

Concentrating Photovoltaic and Thermal Collector

Although thermal concentrators are readily available, the market for Concentrating Photovoltaic and Thermal Collectors is a fairly untouched application. This combination of thermal heat transfer and photovoltaic energy generation, working in harmony to produce a benefit in both arenas, is a bold step into the common application of renewable energy generation and use. The tests conducted within this research helped to prove the theory that the thermal energy could be taken from the concentrated cell thus producing an increase in the solar output of the cell itself. The concentration of the parabolic trough emphasized this effect by focusing the solar output onto the collector and creating a large temperature differential within the system. This experiment and its results furthered the understanding of combined energy generation systems.

Cory Brennan is a fifth year senior pursuing his bachelor's degrees in Civil Engineering and Architectural Engineering from Belleville, Illinois. His work with the Missouri S&T Solar House, spurned an interest in renewable technologies, and integrated building systems. His course load within his department and research experiences with building integrated automation systems showcases this unique interest. After taking a semester co-op to lead Missouri S&T Solar House to its competition in Washington D.C. as its project manager, he hopes to begin his career within this emerging field.

Jesse Cross

Department: Electrical and Computer Engineering
Major: Electrical Engineering
Research Advisor: Dr. Y. Rosa Zheng
Advisor's Department: Electrical and Computer Engineering

Funding Source: National Science Foundation Grant ECCS-0846486
Office of Naval Research Grant N00014-07-1-0219

Channel Estimation and Modeling for Wireless Underwater Acoustic Communications

Many channel estimation methods are based upon stochastic models. It has been well established that the envelope of the radio channel impulse response (CIR) probability distribution function is a Rayleigh distribution. This results from the Gaussian distributed real and imaginary components. However, the underwater acoustic CIR has not been well established. Since the underwater acoustic channel is more severe than radio frequency channels, a t location-scale based, rather than Gaussian based, model for the underwater acoustic CIR complex components is proposed. An acoustic channel impulse response is estimated from existing experimental data. Then, a t location-scale distribution is fitted to the Probability Distribution Function of the estimated channel impulse response. Lastly, the fitted t location-scale distribution is compared to a fitted Gaussian distribution. It will be shown the t location-scale distribution is a better choice than the Gaussian distribution by using the two sample Kolmogorov-Smirnov test.

Jesse Cross is a senior in the Electrical and Computer Engineering department. He is expecting to graduate in May of 2010.

Grace Harper

Department: Geological Sciences and Engineering
Major: Geological Engineering
Research Advisors: Dr. Joel Burken and Dr. Curt Elmore
Advisor's Department: Environmental and Geological Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NIH

Evaluating the Effects of Waterjet Delivered Amendment on Benthic Organism

The remediation of contaminated sediments is regularly performed through the addition of remediation amendments. The delivery of these amendments is typically executed through mechanical mixing methods, which can be devastating to the benthic communities living in these areas. This research tests the effects of a less invasive amendment delivery system on benthic organisms. A custom waterjet nozzle combined with a pressurized amendment vessel and a standard pressure washer are currently being investigated as a means to deliver remediation amendments into contaminated sediments. The waterjet delivery system was tested on a benthic organism surrogate as a means to evaluate the newly developed delivery systems impacts on these creatures, and Styrofoam coupons were used as the surrogate. The coupons were placed in different environments and the exiting stream from the waterjet delivery system was passed over each. The variables examined in this analysis included water pressure, distance from the jet to the surrogate, depth of surrogate burial in sand and/or water, and different nozzle degree angles. For animals capable of burrowing at least an inch, like mollusks, would be safe from harm unless the waterjet was being operated within two inches of the sediment.

Grace Harper is a sophomore in Geological Engineering from Wentzville, MO. She is actively involved with Engineers without Borders as the organization's fundraising chair and Honduras team secretary. Her research interests are in remediation and she hopes to work in environmental clean up in the future.

Andrew Heckman

Department: Mechanical and Aerospace Engineering
Major: Mechanical Engineering
Research Advisors: Dr. Joshua Rovey and Dr. Kakkattukuzhy Isaac
Advisor's Department: Mechanical and Aerospace Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program

Modeling of Plasma Actuator Body Force

Within this report the process for modeling the fluid flow effects of a plasma actuator are detailed. This involved the development and use of an electrostatic solver, as well as a lumped circuit model of the plasma actuator for use in conjunction with the electrostatic solver. Also developed was a program for the Fluent software package to take body force data generated by the previous portions and import it into Fluent to be used in fluid flow simulation. Upon the start of flow simulations, it was found that the results did not match the experimental results, and a process of validation of the various programs was begun. This process has been mostly finished, and further fluid flow simulations will be continued in the near future.

Andrew attended Armstrong Elementary School and from there attended Hazelwood West High school. From there, enrolled and was accepted to UMR, which shortly thereafter changed it's name to MS&T. Pursued a degree in Mechanical Engineering, as well as minors in mathematics, computer science, and materials science. To date has worked with Dr. Rovey since the summer after sophomore year. Has worked on a numerical simulation of Hall Thruster erosion and has been working on the computer modeling of plasma actuators. Will shortly graduate with a bachelors, and intends to pursue graduate studies, and has applied to and been accepted as a graduate student at Missouri S&T. Will be pursuing graduate studies in Mechanical Engineering as well as finishing the minors in computer science and materials science.

John Krumme

Joint project with Thomas McKinnon

Department: Biological Sciences
Major: Chemical Engineering
Research Advisor: Dr. William Stoecker
Advisor's Department: Electrical and Computer Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program
DERMVIS Research Group

Drugs Associated with Fatal Cutaneous Reactions: Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis

Two severe drug reactions, Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) were analyzed using the FDA's Adverse Events Reporting System's (AERS) drug reports from 2004 to 2008. Drugs were identified as being at risk by analyzing the number of reported cases of SJS and TEN with serious and fatal outcomes for drugs with a significant proportional relative risk (PRR > 2.0). The study resulted in the discovery of primary suspect drugs in the top ten list of fatal outcome SJS-TEN cases. These drugs were not previously suspected to have significant SJS-TEN risk. The drugs include furosemide (PRR=6.6), ciprofloxacin (PRR=5.6), and ibuprofen (PRR=5.8). The data gathered from this study could be duplicated for other serious drug reaction leading to serious outcomes and death and made available to physicians through an online database.

John Krumme is a senior at Missouri S&T majoring in Chemical Engineering with a minor in Biological Science. Along with working with the DERMVIS, Krumme is active on campus as a student-athlete on the Miner's Men's Football Team, served as the president of Tau Beta Pi, participated as an active member of the school's pre-medical society (SCRUBS), and is an active member of Sigma Phi Epsilon. Krumme is also a member of the Mentoring Makes a Difference outreach program put on by Prevention Consultants for Missouri. Krumme will graduate in May, 2010, and will attend medical school in August at the University of Missouri.

Thomas McKinnon

Joint project with John Krumme

Department: Electrical and Computer Engineering
Major: Electrical Engineering
Research Advisor: Dr. Joe Stanley
Advisor's Department: Electrical and Computer Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Fellows Program
DERMVIS Research Group

Adverse Drug Reactions Database

Drug reactions account for at least 7% of all hospital admissions worldwide[1]. With insufficient records being submitted by physicians, especially in the US, reactions are not well known. For those records that are submitted to the FDA, the current drug reactions database Adverse Events Reporting System (AERS), MedWatch, is very hard to access by physicians. Writing a PERL code to convert AERS data text files into an Access Database will allow for records to be trended at a much greater rate, along with the printing of html outputs for selected drugs and criteria. For four selected drugs, 47.78% of the records were missing at least one piece of information, leading to an inability to trend the data due to lack of information. This is a common theme that goes along with the lack of access for US physicians to understand drug reactions.

Thomas McKinnon is a senior at Missouri S&T majoring in Electrical Engineering with a minor in Psychology. This is McKinnon's second year working the DERMVIS group, as he participated in OURE Research during the 2008-2009 school year working on the Automatic Detection of Blue Gray Ovoids In Skin Lesion Images. Along with working with the DERMVIS, McKinnon is active on campus as a student-assistant for the Miner's Men's Basketball Team, founding president of the American Indian Science and Engineering Society, and the INROADS Ambassador on Campus. McKinnon will graduate in May, 2010, and has accepted a job with Sprint/Nextel, whom he has completed four internships with, in Maitland, FL as a Network Engineer.

Sciences
Oral Session

Abstracts

Richard Campos

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Dave Westenberg
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Project title: Isolation and Identification of Potential PCB Degrading Microorganisms

Biodegradation is an attractive option for the remediation of polychlorinated biphenyls (PCBs) because it can lead to the complete destruction of a PCB. The samples of microorganisms we have worked with have possessed the potential to be PCB degraders based on the results of the growth on biphenyl. Once we are able to obtain permission to work with PCB and we can grow the samples directly on the PCB to conclusively determine if the samples in question contain the necessary gene to degrade PCBs. After using PCBs for so long it has been clear that the compound poses a threat to both the environment and to humans.

Richard Campos is a senior in the Biological Sciences Department. He wishes to eventually go to dental school, but is first going to receive his masters in Cellular and Molecular Biology at UMCK. He has been involved his department having been the president Phi Sigma the Biological Sciences honor's society during which time he started a scholarship for a deserving freshman in the department. He has also been involved on campus having held several positions on student council and is currently the City Council Representative for Missouri S&T's student council.

Nathaniel J. Carter

Joint project with Megan Oldroyd

Department: Chemical & Biological Engineering
Major: Chemical Engineering
Research Advisor: Klaus Woelk
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Missouri S&T Energy Research and Development Center

A Systematic Investigation into the Hydrothermal Degradation of Biomass as an Alternative Hydrocarbon Fuel Source

Biomass is viewed as a renewable and carbon-efficient energy source, and multiple procedures have been designed to harness the energy stored in these molecules. In this study, the mechanism of hydrothermal biomass degradation to form valuable synthetic-fuel precursor molecules was investigated. Using D-glucose as the model substrate, hydrothermal degradation experiments were conducted in a glass pressure vessel with samples taken periodically at a reaction temperature of 150°C. The primary reaction products are 5-hydroxymethylfurfural (5-HMF), formic acid (FA), 4-oxopentoic acid (levulenic acid or LA), and methane, as identified quantitatively by ^{1}H-NMR spectroscopy. As a continuation of a previous project, this study determined the effect of various catalysts on the formation of the degradation products in an attempt to identify methods of maximizing the formation of 5-HMF, the more valuable precursor chemical for synthetic fuel production, while minimizing FA and LA. The unprecedented formation of methane is also being investigated to determine its mechanism of production during the hydrothermal degradation reaction. Furthermore, it is the goal of this project to investigate the reduction of 5-HMF via electrolysis in order to demonstrate complete production of synthetic fuel.

Nathan Carter is a senior in Chemical Engineering at Missouri S&T from St. Louis, MO. Upon his graduation in May 2010, Nathan will have earned minors in Spanish, Chemistry, and Physics, and will have participated in the equivalent of more than 10 semesters of undergraduate research in the areas of renewable alternative fuels and polymers for biomedical devices. Nathan's work experience includes a summer 2009 internship at Williams Energy Services in Tulsa, OK, and one year as the Head Peer Learning Assistant for the Missouri S&T Learning Enhancement Across Disciplines (LEAD) program. In addition, Nathan will spend the summer of 2010 as a Research Engineer Intern at Argonne National Laboratory before beginning graduate school in the fall to pursue a PhD in Chemical Engineering. Nathan has held numerous leadership positions during his undergraduate tenure and is a member of the Missouri S&T inline hockey team.

Stephen C. Jackson

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Bruce McMillin
Advisor's Department: Computer Science

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
National Science Foundation under CSR award CCF-061463

Visualization of Deadlock Detection Via Dihomotopic Progress Shell Decomposition

This work examines the concepts behind, and involved with, visualizing how a method for reducing the search space of a model verification algorithm accomplishes its task. This work also lays out the concepts behind concurrent software and their models as well how the theory behind the implementation of a reduction method. Finally it shows how visualization tools were designed and used to more quickly understand and verify the concepts being presented as well as their correctness.

Stephen Jackson is a senior Computer Engineering and Computer Science major from Platte City, Missouri. He expects to complete his degrees in December 2010.

Dustin Kurath

Department: Chemistry
Major: Chemistry
Research Advisors: Joe Counsil and Dr. Michael R. Van De Mark
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Freeze Thaw Test Modification

The existing freeze thaw test standard for waterborne coatings ASTM D-2243-95 was analyzed to evaluate heat transfer criteria for the test. Temperature data was collected from various locations in cans of a coating, a resin, and water continuously throughout the course of multiple freeze thaw cycles. Variables included whether or not air was moving past the can, comparison between waterborne latex and urethane resins as well as antifreeze levels in the coating. The temperature data was ultimately processed into charts depicting temperature as a function of time. Calculations were made to determine the total amount of heat energy needed to equilibrate a can using a calorimetric approach. Viscosity measurements were also taken to determine pass/fail on freeze thaw tests.

Dustin Kurath is a senior originally from Gurnee, IL majoring in Chemistry with emphasis on polymers and coatings. He plans to attend graduate school at Missouri S&T and ultimately pursue a career in research and development of paint and related products.

Megan Oldroyd

Joint project with Nathan Carter

Department: Chemistry
Major: Chemistry & Applied Math
Research Advisor: Dr. Klaus Woelk
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Missouri S&T Energy Research and Development Center

A Systematic Investigation into the Hydrothermal Degradation of Biomass as an Alternative Hydrocarbon Fuel Source

Biomass is viewed as a renewable and carbon-efficient energy source, and multiple procedures have been designed to harness the energy stored in these molecules. In this study, the mechanism of hydrothermal biomass degradation to form valuable synthetic-fuel precursor molecules was investigated. Using D-glucose as the model substrate, hydrothermal degradation experiments were conducted in a glass pressure vessel with samples taken periodically at a reaction temperature of 150°C. The primary reaction products are 5-hydroxymethylfurfural (5-HMF), formic acid (FA), 4-oxopentoic acid (levulenic acid or LA), and methane, as identified quantitatively by ^{1}H-NMR spectroscopy. As a continuation of a previous project, this study determined the effect of various catalysts on the formation of the degradation products in an attempt to identify methods of maximizing the formation of 5-HMF, the more valuable precursor chemical for synthetic fuel production, while minimizing FA and LA. The unprecedented formation of methane is also being investigated to determine its mechanism of production during the hydrothermal degradation reaction. Furthermore, it is the goal of this project to investigate the reduction of 5-HMF via electrolysis in order to demonstrate complete production of synthetic fuel.

Megan Oldroyd is a senior double majoring in Chemistry and Applied Math, with a minor in Biology. This is her third year to be participating in the OURE program at Missouri S&T. After graduating in May, Megan plans to attend graduate school in the fall, working towards a PhD in Biophysics.

George Rush

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Daniel Tauritz
Advisor's Department: Computer Science

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Evolutionary Algorithm Software Factory (EA-SoFa)

Evolutionary Algorithms (EAs) have shown great promise in solving complex real-world problems. However, there is a great lack of a standardized, thoroughly documented, and continuously maintained open-source research community resource containing industry-quality implementations of the field's classic and state-of-the-art algorithms. This project takes the first steps in providing this resource by creating an Internet-based software factory for EAs which takes as input an algorithm specification and provides as output the associated source code in the specified programming language. This resource will also include the pseudocode for the implemented EAs as well as links to the seminal papers in which the algorithms were published. This project will benefit researchers, educators, and practitioners that use EAs by providing a single resource to obtain standardized EA implementations.

George Rush is an undergraduate in the Computer Science Department. His research focuses primarily on evolutionary computation, and his interests include autonomic computing, artificial intelligence, and data mining. He will be graduating with his BS in Computer Science and a minor in Applied Mathematics in May 2010. Afterwards he plans to work for AT&T as an Associate IT Analyst and eventually pursue a Master's degree in Artificial Intelligence.

Karen Schilli

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Ronald Frank
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Genomic Analysis of the BCA Sequence 3 Gene Family in Glycine Max

Genomic analysis was performed on the Breast Carcinoma Amplified Sequence 3 gene family in Glycine max (soybeans). This study determined the extents and characteristics of the Breast Carcinoma Amplified Sequence 3 gene family and determined relationships that could potentially result in the expansion of the gene family. BCA Sequence 3 was characterized by expression profiles, gene structure, protein structure, and possible functions. This classification and organization of information was made possible by online bioinformatics tools.

Karen is a junior at Missouri University of Science and Technology where she is majoring in Biological Sciences. On campus, Karen is president of Helix and a member of Phi Sigma, and Scrubs. She also has an OURE for her research in the Plant Molecular Genetics Lab. Karen serves as a Teaching Assistant in several biology labs in the Biological Sciences department and also for Project Lead the Way. After graduation, Karen is planning attending medical school, where she will pursue a medical degree.

Social Sciences
Oral Session

Abstracts

Angela K. Hundt

Department: Psychological Sciences
Major: Psychology
Research Advisor: Dr. Jim Martin
Advisor's Department: Psychological Sciences

The Dark Side of Leadership Psychology among Developing Military Officers

This report summarizes the findings of Angela K. Hundt's research project with the Department of Psychological Science begun in fall 2009, under the supervision of Dr. Jim Martin. The purpose of this study was to examine leaders in training to determine if dysfunctional leaders can be caught early in their training. AFROTC cadets were evaluated for leadership potential through four sources: supervisors, two peers, and the cadets themselves. Evaluation scores were then correlated with cadet scores on a self-report personality inventory that was designed to access DSM-IV Axis II disorders (e.g., Narcissistic Personality Disorder, Antisocial Personality Disorder). Consistent with most experience in multi-source ratings, self-appraisals of performance tended to be higher than ratings from supervisors and peers.

Angela K. Hundt is a senior Psychology major whose primary interests in psychology are personality traits of leaders as well as contributing factors to developing leadership. Angela is a fourth year cadet in Air Force ROTC and will commission as a Second Lieutenant upon graduation in May 2010. She will begin her career as a Public Affairs Officer at Dyess AFB, Texas. In addition to Air Force ROTC, Angela is a member of Zeta Tau Alpha fraternity and Psi Chi, the national psychology honor society.

Samantha Schussele

Department: Nuclear Engineering
Major: Nuclear Engineering
Research Advisor: Dr. Michael C. Davis
Advisor's Department: Economics and Finance

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Statistical Analysis of Baseball Attendance after a White Flag Trade

In this research, a linear regression analysis is performed to determine the effect of a White Flag trade on the attendance of two Major League Baseball teams, the Cleveland Indians and the Chicago White Sox. Contrary to hypothesized results, the analysis of the Indians demonstrates an initial increase of between 3400 and 3800 people following the trade, which could be due to publicity surrounding the team. The analysis of the White Sox, however, shows no significant effect from the trade. These results do not necessarily signify that the trade had no effect on attendance but may arise from errors in the study, such as failure to properly account for team success or for the effects of the baseball strike of 1994.

Samantha Schussele is a junior in Nuclear Engineering at Missouri S&T. Currently, she is Secretary/Treasurer of National Residence Hall Honorary (NRHH), a peer mentor for the On-Track program, a member of the varsity cross country and track teams as well as a member of both American Nuclear Society (ANS) and Women in Nuclear (WIN). Samantha is also part of the Honors Academy and will be starting her senior thesis next semester. This past summer, Samantha worked as a Reactor Engineering Intern for Exelon Corporation and plans on returning in June for another summer internship with them. Her interest in Economics research was sparked two years ago when Dr. Michael Davis presented his work to Honors Academy students.

Arts and Humanities
Oral Session

Abstracts

Amanda Amsden

Department: English and Technical Communication
Major: English
Research Advisor: Dr. Eric Bryan
Advisor's Department: English

Like, What's the Deal With Like?

This project investigates word *like* as it used in Modern English, focusing on *like* as a quotative, discourse filler and hedge. Data was gathered by recording conversations between players of the video game *World of Warcraft* and afterward analyzed. When players used the word *like* in conversation the usage was placed into the following categories: preposition used in comparisons, a conjunction, a verb, a noun, an adverb, a quotatative, a hedge or a discourse particle. This research demonstrates why *like* should be appreciated in Modern English for its versatility and use as a discourse particle.

Amanda Amsden is currently a senior majoring in English with secondary teaching certification at the University of Missouri Science and Technology. After graduating May, she plans to teach English at a secondary school in the area while working on a master's degree in educational literacy. Amanda's hobbies include reading, riding four-wheelers and spending time with her dog and two cats.

Adam Smith

Department: History Department
Major: History
Research Advisor: Dr. Shannon Fogg
Advisor's Department: History Department

The Rescue of the Danish Jews

The Holocaust was a catastrophic event in world history, which took place during the years of World War II. One light during this time, was the rescue of the Jews in Denmark. This study looks at the combination of factors which led to 99% of the Jewish population being rescued, the most of any Occupied European country. Factors contributing to this rescue included the attitude of the Danes towards the Jews, German blundering, and the political situation in Denmark.

Adam Smith is a senior History major and Economics minor from Buffalo, Minnesota. In addition to his research, he is involved with several campus organizations such as History Club, Phi Alpha Theta and the Show-Me Solar House Team. He will be graduating in May and going onto graduate school next year.

Sciences
Poster Session

Abstracts

Ryan Birmingham

Department: Computer Science
Major: Computer Science and Computer Engineering
Research Advisors: Dr. Sanjay Madria and Dylan McDonald
Advisor's Department: Computer Science

Outliers in Wireless Sensor Networks

Detecting outliers has been a well studied problem in many applicable fields of research. Yet, wireless sensor networks present challenges because of their limited resources and unique need for real-time detection. Wireless sensor networks are deployed for a variety of reasons, and whether they are being used by the military, as weather sensors, or for another use, accuracy is always a necessity. With our research we examine the existing methods for outlier detection in wireless networks and propose new directions for future research. We not only will present a method to more confidently predict what data is an outlier, but to also find this information with as little delay as possible.

Ryan Birmingham is a dual major in Computer Science and Computer Engineering at the Missouri University of Science and Technology. He is participating in undergraduate research with Dr. Sanjay Madria and Dylan McDonald. This summer he will be participating in a NSF REU research program.

Trevor Ellis

Joint project with Allen Hooper and Scott Melby

Department: Geological Sciences and Engineering
Major: Geology/Geophysics
Research Advisor: Dr. John Hogan
Advisor's Department: Geological Sciences and Engineering

Analog Modeling of Tectonic Rifting: Extensional Structures Based on Stress Margin Width

It is observable that in regions where normal faulting has occurred, such as in basin-and-range topography, grabens created by dropped blocks tend to be restricted in width, regardless of the distance between border faults. It is also notable that these rifts tend to be sub-parallel, and form a reticulated pattern over large areas. In our analog "sandbox experiment," we will be replicating rift zones of various widths, and analyzing the formation and orientation of horst and graben features. Previous experiments have shown remarkably analogous results by varying rheology and thickness of strata materials. By modifying the width-to-depth ratio of the extentional zone, we expect to see multiple basin sets, and will study orientational relationships between horst margins.

Trevor Ellis is a senior at Missouri S&T, and is originally from Silex, Missouri. He is majoring in Geology, and hopes to work in groundwater systems after graduation.

Benjamin Hale

Department: Biological Sciences
Major: Biology
Research Advisor: Dr. Katie Shannon
Advisor's Department: Biology

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Is Hof1 a Dbf2 Target?

Hof1 is a member of the Pombe Cdc15 homology (PCH) family, a conserved family of genes involved in cytokinesis in yeast and mammalian cells. Cytokinesis is the physical separation of one cell into two, accomplished by contraction of a ring composed of F-actin and type II myosin. In budding yeast, Hof1 is required for normal contraction of the actomyosin ring and accompanying septum deposition. The phosphorylation of Hof1 during mitosis has been shown to be mitotic exit network (MEN) dependent. The goal of this study is to show if Hof1 is a target of the MEN kinase, Dbf2.

Benjamin Hale is at his fourth and final year at Missouri University of Science and Technology. He has done two prior OURE's in environmental microbiology, has been employed as a research assistant on campus, and participated in a summer research internship through Iowa State University Interdepartmental Genetics Program.

Crystal Halloran

Joint project with Ashley Muehler

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. David Westenberg
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NIH - NIEHS Superfund Research Program,
Project # 5R01ES016158

Use of Endophytic Bacteria for Growth Promotion and Toxicity Resistance in Leachate Treated Poplar Trees

The goal of this research is to determine if *Enterobacter 638*, *Mycobacterium vanbaalenii PYR-1*, or *Methylobacterium populi* can improve growth and toxicity resistance in poplar trees used for phytoremediation of landfill leachate. Phytoremediation of the leachate can help prevent contamination of surrounding soil and water. Cuttings of three different poplar tree hybrids were inoculated with the endophytes, planted and watered with various concentrations of leachate. The growth and water usage of the trees were recorded and trees were harvested at different time intervals. Root samples were obtained and placed in a freezer to save for analysis. The roots were surface sterilized and processed for plating and incubation. We hypothesized that, tolerance to the leachate would correlate with increased endosymbiont growth and predicted that recovery of the inoculants from the root samples should also increase.

Crystal Halloran is a junior at Missouri University of Science and Technology and is pursuing her Bachelors of Science degree in Biological Sciences. Crystal is an active member of the biological sciences honor society Phi Sigma. She is also actively involved in the military community. Crystal is working toward a career as a Physician's Assistant.

Brittany Hood

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Katie Shannon
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Regulation of Cytokinesis in Budding Yeast by Kinase Dbf2

This research focuses on cytokinesis in budding yeast, specifically how Dbf2 is recruited to the bud neck of a cell undergoing cytokinesis and if the kinase activity of Dbf2 is required for cytokinesis. Dbf2 is a kinase in the mitotic exit network (MEN) that moves from the spindle pole body to the bud neck in late mitosis in order to be in position to possibly regulate actomyosin ring contraction. The main question for this research was whether or not Dbf2 could localize with no actin ring present during cytokinesis. Dbf2 was tagged with the HA epitope in a yeast strain in which actin ring formation is prevented by addition of glucose. Immunofluorescence of cells under control conditions and when no actin ring is formed showed that Dbf2 does not require actin to localize to the bud neck. It was found that a *dbf2-2 dbf20Δ* with a kinase-dead mutant Dbf2 allele strain exhibited cytokinesis defects at the non-permissive temperature, demonstrating that Dbf2 kinase activity is required for cytokinesis.

Brittany Hood is a senior at Missouri University of Science and Technology majoring in Biological Sciences. Brittany is from St. Louis, MO. She plans on continuing her education after graduation to obtain a Bachelor's of Science in Nursing. She coaches and plays club volleyball, and is a member of a local youth group.

Allen Hooper

Joint project with Trevor Ellis and Scott Melby

Department: Geological Sciences and Engineering
Major: Geology/Geophysics
Research Advisor: Dr. John Hogan
Advisor's Department: Geological Sciences and Engineering

Analog Modeling of Tectonic Rifting: Extensional Structures Based on Stress Margin Width

It is observable that in regions where normal faulting has occurred, such as in basin-and-range topography, grabens created by dropped blocks tend to be restricted in width, regardless of the distance between border faults. It is also notable that these rifts tend to be sub-parallel, and form a reticulated pattern over large areas. In our analog "sandbox experiment," we will be replicating rift zones of various widths, and analyzing the formation and orientation of horst and graben features. Previous experiments have shown remarkably analogous results by varying rheology and thickness of strata materials. By modifying the width-to-depth ratio of the extentional zone, we expect to see multiple basin sets, and will study orientational relationships between horst margins.

Allen Cooper, a senior at Missouri S&T, is majoring in Geophysics and minoring in Mathematics. He is captain of the Miner Threat Ultimate Frisbee team, and hopes to work in the petroleum industry after graduation.

Nichole Hurd

Joint project with Meghan Ray and Daniel Roush

Department:	Chemical and Biological Engineering
Major:	Chemical Engineering
Research Advisor:	Dr. David Westenberg
Advisor's Department:	Biological Sciences

Funding Sources:	Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program Missouri S&T Department of Biological Sciences, Missouri S&T Department of Chemical and Biological Engineering, Energy Research and Development Center, Materials Research Center

Isolation and implementation of the electron shuttling pathway from *Geobacter* into *Escherichia coli*

The growing need for alternative fuel sources has sparked interest and research across many scientific and engineering disciplines. The fledgling field of microbial fuel cell development has previously relied on anaerobic metal reducing organisms such as *Geobacter sulfurreduccens*. This project sought to isolate the electron shuttling pathway in *Geobacter* and transform them into the more manageable aerobic *Escherichia coli*. The Missouri University of Science and Technology iGEM team isolated four outer membrane cytochrome (omc) genes from *Geobacter*, vital to the extracellular transportation of electrons. The four genes; B, E, S and T, were cloned into individual plasmids. The eventual goal is to combine all four genes into one plasmid to transform into *E. coli* to create an aerobic, electron transporting microbial system.

Nichole Hurd is a junior in Biochemical Engineering from Kearney, Missouri. She is a resident assistant for Residential College 1, and is involved in several organizations, including a leadership position in the International Genetically Engineered Machines Team (iGEM).

Scott Melby

Joint project with Trevor Ellis and Allen Hooper

Department:	Geological Sciences and Engineering
Major:	Geology/Geophysics
Research Advisor:	Dr. John Hogan
Advisor's Department:	Geological Sciences and Engineering

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Scott Melby is a junior at Missouri S&T, majoring in Geology. As a non-traditional student, Scott commutes from Steelville, Missouri, where he keeps a hobby farm with his wife and three children. He has been working in the Remote Sensing Lab, and hopes to use this experience in field geology after graduation.

Drew Menke

Department: Biological Sciences
Major: Biology
Research Advisor: Dr. Dev Niyogi
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Phosphorus Dynamics in an Ozark Stream and a Hyper-eutrophic Lake in East Central Missouri

I compared phosphorus dynamics in 2 different aquatic systems: Mill Creek, a mesotrophic stream in Missouri's, south-central Ozarks, and a small, six acre hyper-eutrophic lake in east central Missouri. It was hypothesized that the greatest factors influencing phosphorus levels in Mill Creek were rainfall events during the sampling year of 2009. I measured a significant increase in both total phosphorus (TP), and soluble reactive phosphorus (SRP) phosphorous levels during rain events. This correlation between rain flow and mobile phosphorous within Mill Creek can be seen across the year. In the lake, I hypothesized that the distribution of phosphorus is not uniform, and that the main contributor to the varying distribution is rainfall. The data supports this hypothesis in that it presents itself as two distinctly different distribution curves. Furthermore the major form of phosphorus within the lake system is organic matter with only 5% of TP as SRP.

Drew Menke is a senior in the Biological Sciences department and will be graduating this May with a BS in Biology and a minor in Chemistry. His education will continue this summer, as he attends the University of Missouri as a graduate student, in their biochemistry department.

Ashley Muehler

Joint project with Crystal Halloran

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. David Westenberg
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NIH - NIEHS Superfund Research Program, Project # 5R01ES016158

Use of Endophytic Bacteria for Growth Promotion and Toxicity Resistance in Leachate Treated Poplar Trees

The goal of this research is to determine if *Enterobacter 638*, *Mycobacterium vanbaalenii PYR-1*, or *Methylobacterium populi* can improve growth and toxicity resistance in poplar trees used for phytoremediation of landfill leachate. Phytoremediation of the leachate can help prevent contamination of surrounding soil and water. Cuttings of three different poplar tree hybrids were inoculated with the endophytes, planted and watered with various concentrations of leachate. The growth and water usage of the trees were recorded and trees were harvested at different time intervals. Root samples were obtained and placed in a freezer to save for analysis. The roots were surface sterilized and processed for plating and incubation. We hypothesized that, tolerance to the leachate would correlate with increased endosymbiont growth and predicted that recovery of the inoculants from the root samples should also increase.

Ashley Muehler is a junior at Missouri University of Science and Technology. She is pursuing her Bachelors of Science degree in Biological Sciences with a minor in Chemistry. Ashley is a member of the national honor society, Phi Kappa Phi. She is also a member of the biological sciences honor society of Phi Sigma and life sciences club Helix. Ashley is pursuing a career in the research industry.

Ryan Rader

Department: Chemistry
Major: Chemistry Pre-Medicine Emphasis
Research Advisor: Dr. Nuran Erçal
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Lead-Induced Oxidative Stress and its Effects on the Blood-Brain Barrier

Lead is a toxic metal affecting multiple organ systems, including the nervous, renal, and hematological systems. Effects of lead on the nervous system are detrimental because of the strong correlation in studies between the IQ levels and the blood lead levels in children. This *in vitro* study shows the existence of oxidative stress in blood-brain barrier cells due to lead exposure. Administration of lead acetate (PbA) to cultures of human brain microvascular endothelial cells (HBMVEC) had a concentration and time-dependent inhibitory effect on cell survival. To evaluate the nature of lead's effect, we measured glutathione (GSH), reactive oxygen species (ROS), and catalase activities in lead-exposed HBMVEC cells. Increases in GSH, ROS and activity of catalase were observed in cultures receiving PbA. In order to investigate whether these changes in oxidative stress parameters caused any functional abnormalities, dextrin permeability assay and TEER, a test used to measure trans-endothelial resistance, were performed.

Ryan Rader is a Chemistry Pre-Medicine/Biological Sciences junior at Missouri University of Science & Technology. He will graduate in May 2011 and hopes to matriculate into medical school, where he will study Internal Medicine.

Ryan would like to thank his family for their undying support and the members of Dr. Nuran Erçal's laboratory for guiding him with infinite patience and wisdom.

Meghan Ray

Joint Project with Nichole Hurd and Daniel Roush

Department:	Chemical and Biological Engineering
Major:	Chemical Engineering
Research Advisor:	Dr. David Westenberg
Advisor's Department:	Biological Sciences

Funding Source:	Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program Missouri S&T Department of Biological Sciences, Missouri S&T Department of Chemical and Biological Engineering, Energy Research and Development Center, Materials Research Center

Isolation and Implementation of the Electron Shuttling Pathway from *Geobacter* into *Escherichia Coli*

The growing need for alternative fuel sources has sparked interest and research across many scientific and engineering disciplines. The fledgling field of microbial fuel cell development has previously relied on anaerobic metal reducing organisms such as *Geobacter sulfurreduccens*. This project sought to isolate the electron shuttling pathway in *Geobacter* and transform them into the more manageable aerobic *Escherichia coli*. The Missouri University of Science and Technology iGEM team isolated four outer membrane cytochrome (omc) genes from *Geobacter*, vital to the extracellular transportation of electrons. The four genes; B, E, S and T, were cloned into individual plasmids. The eventual goal is to combine all four genes into one plasmid to transform into *E. coli* to create an aerobic, electron transporting microbial system.

Meghan Ray is a junior in Biochemical Engineering from Havana, Illinois. She is a student leader in many organizations including W. T. Schrenk Society, Alpha Chi Sigma, and iGEM. She is also an active member of Kappa Delta Sorority.

Daniel Roush

Joint Project with Nichole Hurd and Meghan Ray

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. David Westenberg
Advisor's Department: Biological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Missouri S&T Department of Biological Sciences, Missouri S&T Department of Chemical and Biological Engineering, Energy Research and Development Center, Materials Research Center

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Hailing from Jefferson City, Missouri, Daniel Roush is a junior majoring in Biological Sciences with the intent of pursuing a career in medicine. He is involved in Phi Sigma, the biological honors society, and works extensively with iGEM, holding various leadership positions.

Patrick Stanley

Department: Chemical Engineering, Chemistry
Major: Chemical Engineering, Chemistry
Research Advisor: Dr. Amitava Choudhury
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
University of Missouri Research Board

Exploratory Synthesis of Oxyanion-Based Cathode Materials for Li-ion Batteries

Lithium ion batteries are a popular choice in hybrid and plug-in electric vehicles. There is a growing demand to discover new cathode materials for Li-ion batteries, which are cheap, safe, and provide high power density. Lithium containing olivine-structure of iron phosphate, $LiFePO_4$, has already emerged as a safe and cheap cathode material. We are exploring the existence of new compositions and structures with oxyanions (PO_4^{3-} and BO_3^{3-}) and transition metals. A ternary phase diagram was explored using varying amounts of BO_3^{3-}, Li^+, and PO_4^{3-}, with fixed amounts of F^-, H_2O, and Fe^{2+} under hydrothermal conditions. This exploration has yielded several new structures among which three have been identified as potential cathode materials: $Fe_5(H_2O)_4(HPO_4)_2(PO_4)_2$, $Li_2Fe(PO_4)(HPO_4)$, and $LiFeF_{0.5}(OH)_{0.5}PO_4$. Currently these materials are being analyzed for Li-ion conduction and Li^+/H^+ exchange properties. Preliminary results of our investigation will be presented.

Patrick Stanley is a junior dual majoring in Chemistry and Chemical Engineering. He is currently the Treasurer for the Rolla Catholic Newman Center and a member of the W. T. Schrenk Society and the American Institute of Chemical Engineers. Apart from his studies and research, Patrick spends time working out and teaching taekwondo, and geocaching. Originally from Auxvasse, Missouri, Patrick has an acute interest in plants and all things agricultural, as evidenced by his involvement in the National FFA Organization and he desires to apply his knowledge to the field agriculture after graduation.

Kelly Walsh

Department: Chemistry
Major: Chemistry
Research Advisor: Dr. Harvest Collier
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

An Investigation of Heavy Metal Ion Binding by Selenoamino Acid Derivatives

Initially, the proposed research project sought to investigate the synthesis and characterization of selected selenoamino acid derivatives in order to better understand the multi-metal ion binding mechanisms. The investigation was to focus on the preparation of 3,3'-selenobis-l-alanine (I), its compositional characterization, and study of the metal ion binding ability of (I). Study outcomes to be pursued include the determination of the crystalline structure of (I), the electronic spectral characterization of solution metal ion binding by (I) and its metal binding equilibrium constants, and the determination of the solid state crystalline structure of isolated metal coordination compounds of (I). With these lofty goals in mind, I began at the beginning, learning how to assemble a reaction apparatus and perform a reflux reaction. With this in mind, I will discuss the few steps I have completed with my ultimate focus on what I have learned during this experience.

Kelly Walsh is a sophmore majoring in Chemistry. He is an active member of Sigma Tau Gamma. In his free time he enjoys playing the guitar, reading news, and relaxing with friends. In the future he plans to operate his own pharmacy.

Faten Nasyrah Zulkifli

Department: Geology and Geological Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Andreas Eckert
Advisor's Department: Petroleum Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Two Dimensional Finite Element Analysis of Anticline Stress and Prediction of Second Order Fractures

This study utilizes two dimensional plane strain finite element analysis to investigate the state of stress and the likelihood of second order fractures associated to a generic anticline structure under varying loading conditions. Depending on the resulting state of stress, the models enable prediction of second order fracture location, likelihood of occurrence, and orientation. The independent variables of the model are the material properties of the rocks, the bedding plane coefficient of friction, and the magnitudes of the horizontal and vertical stress mimicking or simulating extensional, strike-slip, and compressional stress regimes. The analysis shows that decoupling the various bedding planes, i.e. by implementing small inter-bedding plane coefficient of friction has significant influence on the distribution of tensional and compressional stresses in the hinge of the anticline. The crest of the anticline layers experiences tension, while the inner layer in the hinge zone experiences compression. Together with the difference in material properties the resulting state of stress will determine second order fracture distribution. Depending on the location within the structure, either tensile failure, shear failure, or both shear and tensile failures will occur in an anticline setting. Furthermore, the stress regime strongly affects the occurrences of fractures. Failures will most likely occur in a compressional stress regime due to increased strain imposed to the model. The results of this study will help to determine geomechanical risks such as fault seal breach, stable drilling directions, and forecast the failure that will occur in the field.

Faten is from Kuala Lumpur, Malaysia and currently pursuing her undergraduate studies (BSc) in Petroleum Engineering at Missouri University of Science and Technology. Faten is on a fully funded scholarship by PETRONAS, the Malaysian national oil company. Her interest in petroleum engineering is drilling and exploration. After her graduation in May 2010, she is planning to work as a drilling engineer for PETRONAS in Malaysia. She is currently the Vice President of the Society of Petroleum Engineers, the Secretary of International Students Club, and member of the Malaysian Students Club, the Society of Exploration Geophysics, the Phi Kappa Phi honor society, and the Muslim Students Association. She currently works as a student research assistant for Dr. Andreas Eckert and as a student clerical assistant for the Petroleum Engineering program.

Research Proposal
Poster Session

Abstracts

Ashley Banaszek

Department: Business and Information Technology
Major: Information Science and Technology; Business and Management Systems
Research Advisor: Dr. Richard Hall
Advisor's Department: Business and Information Technology

Funding Source: United States Department of Energy

The Effect of Media Richness and Gender on Learning Information on Electric Drive Vehicles

The purpose of this research is to assess the optimal media richness level for learning information on electric drive vehicles (EDV). An EDV lesson will be taught to students using one of three media richnesses levels, consistent with Daft and Lengel's Media Richness Theory (1986). Students will be tested over the material and administered a subjective questionnaire assessing other cognitive and affective dimensions. A series of analyses will be carried out to examine the impact of media richness, gender, and their interaction. This research is part of a comprehensive project on EDV training, education, and dissemination, supported by a two million dollar grant from the U.S. Department of Energy. The findings will have implications for development of educational, training, and marketing media for the project.

After earning her associates in science at the Missouri Academy of Science, Mathematics, and Computing, Ashley enrolled in the Information Science and Technology program at Missouri S&T. There she continued to excel at her studies, earning departmental awards for leadership and outstanding achievement. In her junior year, she began to uncover research opportunities in her field and earned an undergraduate research position at the Center for Technology Enhanced Learning. Since then, her passion for research has only continued to grow. She plans to pursue graduate education in human-computer interaction and hopes to one day become a professor at an established research university.

Kathryn Boardman

Joint project with Crystal Twenter

Department: Geological Sciences & Engineering
Major: Geology & Geophysics
Research Advisor: Dr. John Hogan
Advisor's Department: Geology

Funding Source: NSF-National Science Foundation

Fold Classification of the Kalabsha and Seyal Fault Region

The region surrounding the Kalabsha and Seyal faults near Aswan, Egypt is characterized by complex folding as a result of a long history of deformation. The faults cut through a dome structure that, along with its basin counterpart, has a frequent appearance in the desert landscape. The formation and relation to neighboring faults of these dome and basin structures is unknown. This was the main focus of the field work we conducted in Egypt for a NFS project. In the field we discovered a set of folds located near the center of the dome, and bounded by the Kalabsha and Seyal faults. The classification of the type of deformation (soft sediment and/or tectonic) of the folding would result in a better understanding of the regional deformation, and fault involvement in its formation. This will be achieved through stereographical analysis of the collected structural data (strike/dip/location), and interpretation of field observations.

Kathryn Boardman grew up and attended grade school and high school in Salem, MO. After high school, Kathryn began her college career in Park Hills, MO. at Mineral Area College, and received an A.A. degree with honors in the Spring of 2006. In the Fall of 2006, she continued her education at Missouri S&T, and plans to graduate with her B.S. in Geology & Geophysics in the summer of 2010. Kathryn has been involved in PTK, and numerous geological societies such as DAKE (AAPG) and SEG, but most of her activities have been restricted to work by necessity. She has worked as a pharmacy tech., CNA, waitress, cake decorator, and baker, all of which have given her valuable experience in teamwork, on the job training and management. Kathryn's main interests in her field are mineralogy (radioactive substitution), petrology (mafic layered complexes), deformation band formation and how it can compartmentalize or trap fluids, development of Remote Sensing and Computational Geophysics technologies, and polar flips/reversals (effects on magnetic field, and relation to extinction events and crustal displacement). Kathryn plans to get a job in one of her areas of interests after she graduates.

Caroline Fernandez

Department: Geological Sciences and Engineering
Major: Geology
Research Advisor: Dr. John Hogan
Advisor's Department: Geological Sciences and Engineering

The Role of Preexisting Basement Structures During Continental Collison: Insights from Analog "Sandbox" Modeling

During continental collision, reactivation of preexisting faults may influence the development of geologic structures that lead to the formation of mountain chains. For example, during crustal rifting normal faults develop in the basement as it is extended. During continental collision (i.e., compression), we predict these normal faults will reactivate as reverse faults and change the shape and evolution of the accretional wedge. To help us better understand the role of "inherited basement structures" in the formation of orogenic wedges, we designed three analog "sandbox" models to simulate continental collision, where layers of colored sand represent sedimentary rocks and rigid boards with cuts represent the basement with normal faults. Model 1 represents continental collision without preexisting faults. Model 2 represents continental collision where the basement contains several normal faults all dipping in the same direction. Model 3 simulates a continental collision where the basement contains "Horst" and "Graben" style normal faulting.

Caroline Fernandez is an undergraduate senior in Geology. Her hobbies include; pottery, glass blowing, camping, scrapbooking, rock collecting, and reading. She hopes to find an exciting career as a geologist in the field of mining.

Dominique Nocito

Department: Chemistry
Major: Chemistry (with an emphasis in Biochemistry)
Research Advisor: Dr. Harvest Collier
Advisor's Department: Chemistry

Funding Source: US Department of Transportation

Measurement of the Production of Beta-1,4-Endoglucanase by Genetically Engineered Bacteria

With increasing oil prices the demand for agriculture-based ethanol derived from corn starch has driven up the price of corn. There is great promise in the development of cellulosic ethanol production, which can use the non-edible parts of plants as a carbon source. Cellulose in biomass can be broken down into fermentable sugars by either acid or enzymatic hydrolysis. Beta-1,4-endoglucanase is one of the enzymes that can be used in the break down of cellulose to sugars. Currently, no large-scale cellulosic ethanol production facilities are in operation due to the relatively high cost of operation compared with corn ethanol facilities. Advances in enzyme production efficiency could make cellulosic ethanol production economically feasible in the future. The aim of this experiment is to genetically engineer a diverse selection of bacteria to produce Beta-1,4-endoglucanase, and measure which bacteria can produce the enzyme on an industrial level.

Dominique Nocito is currently a freshman majoring in Chemistry major with an emphasis in Biochemistry and a member of Delta Sigma Phi fraternity. Dominique is currently researching "the extraction effeciency of metal oxide nanoparticles on 17 alpha -Ethinyleastradiol (EE2)" under the supervision of Dr. Yinfa Ma. After graduating from Missouri S&T, Dominique hopes to continue his education and go on to gradschool to receive a PhD in Biochemistry.

Matthew Nuckolls

Department: Computer Science
Major: Computer Science
Research Advisors: Dr. Daniel Tauritz and Dr. Ray Luechtefeld
Advisor's Department: Computer Science and Engineering Management & Systems Engineering

Virtual Facilitation of Human Group Interaction employing a Learning Classifier System with Crowdsourced Feedback

Natural human group dynamics sometimes can lead a group down unproductive pathways. An expert group facilitator may need to intervene to return the group to a productive workflow. However, human expert group facilitators are scarce and prohibitively expensive. We can codify the circumstances that lead the group astray into a set of matching rules, with an appropriate intervention for each situation. This proposal is concerned with developing a Virtual Facilitator software system which employs a Learning Classifier System to evolve increasingly higher quality matching rules based on crowdsourced feedback. Such a Virtual Facilitator can replace human expert group facilitators at a fraction of the cost and be ubiquitously available.

Matthew Nuckolls is scheduled to graduate from Missouri S&T in May 2010 with a B.S. in Computer Science and a minor in Cognitive Neuropsychology. He is an undergraduate researcher in the Natural Computation Laboratory, studying uses of Learning Classifier Systems to solve real-world problems. In addition to his research work, Matthew tutors and grades for the course CmpSc 253 - Algorithms. Prior to his academic career, Matthew served in the US Air Force for 10 years as an Explosive Ordnance Disposal Technician.

Crystal Twenter

Joint project with Kathryn Boardman

Department: Geological Sciences & Engineering
Major: Geology
Research Advisor: Dr. John Hogan
Advisor's Department: Geology

Funding Source: NSF-National Science Foundation

Fold Classification of the Kalabsha and Seyal Fault Region

The region surrounding the Kalabsha and Seyal faults near Aswan, Egypt is characterized by complex folding as a result of a long history of deformation. The faults cut through a dome structure that, along with its basin counterpart, has a frequent appearance in the desert landscape. The formation and relation to neighboring faults of these dome and basin structures is unknown. This was the main focus of the field work we conducted in Egypt for a NFS project. In the field we discovered a set of folds located near the center of the dome, and bounded by the Kalabsha and Seyal faults. The classification of the type of deformation (soft sediment and/or tectonic) of the folding would result in a better understanding of the regional deformation, and fault involvement in its formation. This will be achieved through stereographical analysis of the collected structural data (strike/dip/location), and interpretation of field observations.

Crystal Twenter, the daughter of Larry Twenter, was born July 19, 1988. She grew up and attended grade school and high school in Sedalia, MO. After high school she decided to pursue a degree in geology from the Missouri University of Science and Technology, and plans to graduate in the spring of 2011. Crystal has been involved in numerous activities on campus since. Some of these activities include: President of C.L. DAKE society for two years, member for one year, AAPG, SEG, SGE, Theater, and CCF. She has had the opportunity to work in the mineral lab, research opportunity in the Bahamas, research opportunity on the Nile in Egypt, has had an internship with Barrick Gold of North America, and recently accepted an internship with Cliffs Hibbing Tactonite Mine in Minnesota. All of these activities have given her valuable experience to her career. Crystal's main interests are mineralogy, petrology, and structural geology. She intends to work in the geology or related field after she graduates.

Michael Wisely

Department: Computer Science
Major: Computer Engineering/Computer Science
Research Advisors: Dr. Daniel Tauritz and Dr. Matt Insall
Advisor's Department: Computer Science and Mathematics

The Automated Partial Credit Grader System

Education in the 21st century is quickly moving away from the traditional classroom lecture structure. A new generation of computer savvy students is accustomed to working at their own pace and receiving continuous feedback. Few, if any, institutions have the resources to offer around-the-clock human graders to provide the desired level of feedback. The current economic downturn is actually reducing the number of grader hours, overwhelming instructors and leading to less feedback. Educational companies have responded by increasingly offering automated training and test tools. However, these tools are very rudimentary, providing full credit for exact matches to model answers and no credit for any other answer. There is a clear and urgent need for a far more sophisticated system which can analyze what went wrong, assign partial credit, and provide detailed feedback to the student. The Automated Partial Credit Grader System is being proposed to meet this need.

Michael Wisely is a sophomore in Computer Science and Computer Engineering at the Missouri University of Science and Technology. He is actively involved in Missouri S&T's ACM-SIGGAME program and robotics design competition team while also participating in undergraduate research. Michael is a participant in the Missouri S&T Honors Academy.

Engineering
Poster Session

Abstracts

Paulina Barranco

Joint project with Morgan Boresi and Cuong Pham

Department: Chemical and Biological Engineering
Major: Chemical Engineering
Research Advisor: Dr. Daniel Forciniti
Advisor's Department: Chemical and Biological Engineering

Funding Source: National Science Foundation

Surface Properties that Catalyze Amyloid Fibril Formation

Amyloid fibrils are found in many diseases such as Alzheimer's Disease, Parkinson's Disease, Huntington's Disease, Type 2 Diabetes, Rheumatoid Arthritis, and many more. These fibrils are protein aggregates with a characteristic β-sheet formation, which binds Congo Red. It is possible that the formation of amyloid deposits is "catalyzed" by solid liquid interfaces. In this experiment the rate and extent of aggregation of bovine insulin was determined in the presence of several different surfaces. The experiments were design to deepen our knowledge about the formation of amyloid deposits without which limited progress may be achieve in finding cures for these devastating diseases. The chemistry of surfaces was chosen to mimic those surfaces found in cells. The rate of aggregation was followed by dynamic light scattering, which was used to monitor the aggregate size as a function of time. Congo Red assays were performed to confirm if the aggregates were amyloidic.

Paulina Barranco is a senior majoring in Chemical Engineering. Currently she is working as a Research Assistant under the supervision of Dr. Daniel Forciniti. During her time at Missouri S&T she has been an active member of the Society of Hispanic Professional Engineers (SHPE) and has participated in the International Students Club.

Morgan Boresi

Joint project with Paulina Barranco and Cuong Pham

Department: Chemical and Biological Engineering
Major: Chemical Engineering
Research Advisors Dr. Daniel Forciniti
Advisor's Department: Chemical and Biological Engineering

Funding Source: National Science Foundation

Surface Properties that Catalyze Amyloid Fibril Formation

Amyloid fibrils are found in many diseases such as Alzheimer's Disease, Parkinson's Disease, Huntington's Disease, Type 2 Diabetes, Rheumatoid Arthritis, and many more. These fibrils are protein aggregates with a characteristic β-sheet formation, which binds Congo Red. It is possible that the formation of amyloid deposits is "catalyzed" by solid liquid interfaces. In this experiment the rate and extent of aggregation of bovine insulin was determined in the presence of several different surfaces. The experiments were design to deepen our knowledge about the formation of amyloid deposits without which limited progress may be achieve in finding cures for these devastating diseases. The chemistry of surfaces was chosen to mimic those surfaces found in cells. The rate of aggregation was followed by dynamic light scattering, which was used to monitor the aggregate size as a function of time. Congo Red assays were performed to confirm if the aggregates were amyloidic.

Morgan Boresi is a senior graduating in May with a degree in Chemical Engineering with an emphasis in Biology and minors in Biology and Psychology Neuroscience. She works in Dr. Daniel Forciniti's laboratory as an undergraduate research assistant. Outside of research she participates in several student organizations including Kappa Delta Sorority, Panhellenic Council, and AIChE. After graduation she plans to attend graduate school at Arizona State University to earn a PhD. in Bioengineering.

Emily Briggs

Department: Mechanical and Aerospace Engineering
Major: Mechanical Engineering
Research Advisor: Dr. Douglas Bristow
Advisor's Department: Mechanical Engineering

Process Modeling for Dip Pen Nanolithography

Dip Pen Nanolithography (DPN) is 2-D nanoscale printing process. In DPN, an Atomic Force Microscope (AFM) probe is dipped into a specially formulated ink and then moved across a substrate to print the desired pattern. Although this process is commonly applied in research, the focus is on developing inks, not manufacturing. As such, the sophisticated transport models that have been developed do not translate easily to process planning and predicting product quality. This work develops a basic process modeling framework and process models for 16-Mercaptohexadecanoic acid (MHA). Samples of lines and dots are printed at varying speeds, pause times, and patterns. In addition to the process modeling, the printed patterns also reveal characteristics of the AFM such as hysteresis, that are as critical as the process model in obtaining desired patterns. The models developed in this work are the first steps toward process planning and control for high quality DPN.

Emily Briggs is currently a Mechanical Engineering junior who is an active member and officer of the Missouri S&T Robotics Competition Team for the past three years. Emily is also plays in the University and Community Symphony Orchestra.

Kyle Buchheit

Department: Chemical & Biological Engineering
Major: Chemical Engineering
Research Advisor: Dr. Parthasakha Neogi
Advisor's Department: Chemical & Biological Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Dynamic Contact Angles of Crude Oil

A Cahn dynamic contact angle device was used to measure the dynamic contact angles of crude oil. This is done by pulling a plate through a liquid-air interface at a constant velocity. The equipment measures the change in force as the plate leaves the interface, and this force is related to the dynamic contact angle. These angles, going up to entrainment where possible, will be measured against varying plate velocities. Alongside, viscosities, surface and interfacial tensions will be measured. The results will be checked against existing correlations. The data are expected to be of use in crude oil recovery. The Question being addressed is what is the limiting velocity for contact angles that could be used in determining the rate at which crude oil could be recovered from porous material.

Kyle Buchheit was born and raised in Old Appleton, Missouri. He attended the rural high school at Oak Ridge and was valedictorian of his graduating class. Kyle is currently a senior at the Missouri University of Science and Technology pursuing a B.S. in Chemical Engineering and a B.A. in Economics. After graduation, Kyle plans on remaining at Missouri S&T to work towards a Ph.D. in Chemical Engineering.

Cailie Carlile

Department: Civil, Architectural & Environmental Engineering
Major: Environmental Engineering
Research Advisors: Dr. Joel Burken and Dr. Dave Westenberg
Advisor's Department: Civil, Architectural & Environmental Engineering

Funding Source: Ontario Ministry of Environment

Endophytic Bacteria for Toxicity Resistance and Growth Promotion in Leachate Treatment

Recent research has shown that endophytic bacteria have growth benefits for some tree species. If the benefits help the trees to overcome contaminant stress, this could help the trees remediate groundwater and soil faster as well as to produce more biomass which can be beneficial, for example, as wood, pulp, or feedstock for biofuels. In this experiment, cuttings from three different popular tree hybrids were grown and watered with landfill leachate in varying concentrations in order to observe growth trends of the plants when inoculated with one of three different strains of potentially helpful bacteria. Two bacteria types, Methylobacterium populi (MP) and Enterobacter 638 (E6), were shown to improve overall growth weight the most. Mycobacterium vanballenii (MV) didn't improve growth weights compared to the control group. Data also showed higher concentrations of leachate may increase plants' susceptibility to spider mite damage while MV and E6 may help protect against it.

Cailie Carlile is a junior in Environmental Engineering at Missouri University of Science and Technology. She attended the Missouri Academy of Science, Mathematics and Computing at Northwest Missouri State University for her last two years of high school and University of MO-KC for one year before transferring to Missouri S&T in 2008. Cailie is a member of Chi Epsilon and Phi Kappa Phi honor societies as well as the United States Parachute Association. Her current research in phytoremediation is being done under Dr. Joel Burken and her goal is to better understand how contaminants and toxins could be biologically degraded efficiently and inexpensively. This summer, Cailie will be participating in an internship as Brookhaven National Laboratory. Her future plans after obtaining a bachelor's degree are to pursue a master's degree in Environmental Engineering at Missouri S&T and to continue research.

Jingwen “Wendy” Chen

Joint project with David Lecko

Department:	Electrical and Computer Engineering
Major:	Electrical Engineering, Computer Engineering
Research Advisor:	Dr. Sahra Sedigh
Advisor’s Department:	Electrical and Computer Engineering

Funding Source:	MODOT, Washington County Missouri, US Department of Transportation

The Smart Brick Wireless Sensor Node for High-Resolution Structural Health Monitoring

The objective of this project is to develop a wireless sensor node for the SmartBrick platform, which provides a low-cost and autonomous method for structural health monitoring. The SmartBrick sensor node leverages the Zigbee short-range communication capabilities of the base station to increase the monitoring range. The primary function of the node is to interface to humidity, temperature, tilt, strain, and vibration sensors and transmit their values to the base station via Zigbee. Long-range communication of data and alerts will be through the base station, which serves as the gateway to the outside world, and relays remote configuration and maintenance commands to the sensor nodes.

One of the primary motivations behind development of the sensor node is high-resolution monitoring of strain. Each wireless sensor node will be able to measure strain from 16 different locations on a structure, by multiplexing these gauges to the same signal conditioning circuit, which drastically reduces the number of nodes required for monitoring an area. Data collection can take place at regular intervals, or when triggered by events of interest. Each sensor node includes sufficient memory to store a day’s data, although the system default is to transmit the collected data to the base station once per hour.

Wendy Chen is currently a junior majoring in Computer Science with minors in Bioinformatics and Pre-Medicine at the Missouri University of Science & Technology. She plans to attain a M.D at a medical school on the East Coast after graduation. In her spare time she enjoys music, reading, and working with animals.

Pei Chuen Chia

Department: Geological Sciences and Engineering, Petroleum Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Baojun Bai
Advisor's Department: Geological Sciences and Engineering, Petroleum Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Modeling Preformed Particle Gel Swelling (PPG) and Deswelling Kinetics

Preformed Particle Gels(PPG) have been injected into mature oil reservoirs as a form of conformance control to decrease reservoir heterogeneity to improve sweep efficiencies during water injection for enhanced oil recovery. The ultimate purpose of this research is to provide a fundamental basis for gel selection. This work involves the study of swelling and deswelling kinetics of cross linked Acrylamide/ Potassium Acrylate Copolymer Preformed Particle Gels. The swelling and deswelling kinetic curves of the PPG were measured and their swelling and deswelling kinetic parameters were estimated. The activation energy for PPG's swelling and deswelling was found. The equilibrium swelling ratios of the PPG in brine solutions of different concentrations were determined from both the swelling and deswelling processes. Results showed that PPG swelling capacity increases with temperature but decreases with salinity. PPG deswelling capacity increases with temperature and also salinity.

Pei Chuen Chia is a senior majoring in Petroleum Engineering at Missouri S&T. She is from Kuala Lumpur, Malaysia. Pei Chuen has attended Missouri S&T since Fall 2006, and has been an Undergraduate Research Assistant for Dr.Baojun Bai since 2008. She is on course to graduate this May.

Omar Conte

Department: Civil, Architectural & Environmental Engineering
Major: Civil Engineering
Research Advisor: Dr. Ronaldo Luna
Advisor's Department: Civil Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Panama Canal's Volcanic Tuff - Remolded Strength

The Panama Canal was completed in 1914. Now for the proposed widening and excavation of the canal, one of the most important aspects is to assure that the slopes on each side are stable for the continued operation and navigation of this important passage. Additionally, the use of cut/dragged materials for use as fill in levees, embankments and other earth structures needs to be evaluated. This can be accomplished by determining the available soil shear strength to assure stability during and after construction. Along the Canal there is a weak volcanic tuff: Cucaracha formation. The engineering characterization of this formation in a remolded state is the topic for my research investigation. To this end several remolded samples were compacted. The specimens were tested to failure under loading using unconsolidated undrained (CU) triaxial test. The shear strength parameters of the remolded soil were determined by testing at different confining stresses following an axial compression stress path. Using the strength parameters determined for short- and long-term conditions the stability of levees was evaluated.

Omar Conte is a senior undergraduate student pursuing a Civil Engineering major with a minor in Business. Originally from Panama City, Republic of Panama transferred to Missouri S&T in Spring 2008, from Lindenwood University St. Charles, MO. Omar has been working in the Missouri S&T Geotech Lab for more than a year as a research assistant. He also has been involved in different projects such as: direct shear testing for a PhD student's research, MoDOT project in charge of soil classification tests (sieve analysis, hydrometer test and Atterbergs limits), consolidation tests and development of GIS maps displaying geographically the bridge foundation's types in Missouri. Omar is a member of Chi Epsilon, Tau Beta Pi and SHPE, he is looking forward to going to grad school after graduating this coming May.

Corey Grace

Department: Civil, Architectural, and Environmental Engineering
Major: Civil Engineering
Research Advisor: Dr. Lesley Sneed
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NEESR-NSF

Investigating the Seismic Behavior of Bridge Piers Subjected to Combined Loading with Distributed Hybrid Testing

The most important goal of civil and structural engineering is to protect against loss of life. Earthquakes are still not completely understood phenomena, and it is these events that pose great threats to human life. Research is necessary to better understand the effects of nature, and it is performed by essentially trying to replicate it. Better methods for simulating natural occurrences are continually being developed and utilized such as hybrid (or pseudodynamic) testing. The George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) is an organization that supports research attempts at understanding the effects of earthquakes. The coordination of the leading researchers in the field is essential for understanding such complex behavior. It is then critical that we apply what is learned from research to construction because it is as Susan Hough and Lucile Jones of the U.S. Geological Survey have said, "Earthquakes don't kill people, buildings do."

Corey Grace is a senior majoring in Civil Engineering at Missouri University of Science and Technology and will be graduating in May 2010. He is the son of Tim and Jo Ellen Grace of Columbia, MO. Corey serves as the Honduras trip project leader for Engineers Without Borders, the president for American Concrete Institute, and a student leader for Wesley Campus Ministry. Corey is also a member of Tau Beta Pi and Chi Epsilon engineering honor societies. Corey has worked as an undergraduate research assistant for two years and also works as a teacher's assistant; teaching weekly surveying labs to underclassmen. After graduation, Corey plans to pursue a master's of science degree in Structural Engineering before beginning his career as a structural engineer for Black & Veatch in Kansas City.

Travis Hemsath

Joint project with Matthew Struemph

Department: Civil, Architectural, and Environmental Engineering
Major: Architectural/Civil Engineering
Research Advisor: Dr. John Myers
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: Leonard Wood Institute (LWI)

IED Crater Repair for Enduring Route Remediation

Recent road repairs performed in Iraq and Afghanistan revealed several deficiencies in current repair techniques. Temporary solutions such as aggregate backfill were unacceptable due to the ease of emplacement of additional explosive devices. Additionally, asphalt repairs were easily penetrated with common hand tools to place improvised explosive devices (IEDs) where tampering was difficult to recognize. Concrete patches proved to be short-term solutions, as hasty concrete repairs deteriorated under traffic, providing access for additional IED placement. While traditional concrete placement exposed repair units to enemy attack due to extended material production and cure times. As a result this investigation is being conducted in conjunction with the U.S. Army Engineer Research and Development Center (ERDC) to determine the most promising rapid-setting material alternatives for capping IED crater repairs. This research makes use of the standard test methods and the required vehicle load rating to provide recommendations for selection of rapid-hardening materials and equipment for conducting repairs that will reopen routes to traffic within 30 minutes to 1 hour of repair.

Travis is a senior majoring in Architectural and Civil Engineering at the Missouri University of Science and Technology. He is the son of Bob and Beckie Hemsath of St. Charles, Mo. He is a member of Tau Beta Pi (engineering honor society), Chi Epsilon (civil engineering honor society), Phi Kappa Phi (honor society), Kappa Mu Epsilon (mathematics honor society), Institute of Transportation Engineers, and American Concrete Institute. After graduation Travis plans to work as a consultant in pursuit of his PE.

Kyle Holman

Joint project with Jordan Tripp

Department:	Civil, Architectural & Environmental Engineering
Major:	Architectural Engineering
Research Advisors:	Dr. John Myers and Dr. Lesley Sneed
Advisor's Department:	Architectural Engineering

Funding Source:	Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program Missouri S&T NSF

Learning Tools for Structural Analysis: Laboratory Modeling

The objective of this research project is to develop a set of laboratory exercises for the Structural Analysis (ArchE 217/ CE 217) course taught at Missouri S&T. Labs will be designed in order to further understanding in the areas of influence lines, superposition, and indeterminate structures. Influence lines help to determine the variation in shear, moment, or deflection at a point along a member due to moving concentrated loads. In order to convey this concept effectively, specifications for a scaled simply-supported structure will be designed along with a mechanical system to control the movement of the load. Data will be taken during testing using structural data collection software. A computer-based analysis program will be developed to accurately determine beam geometry and analyze the collected data. The principal of superposition allows complex loadings to be broken down to individual components to simplify calculations. Specifically, beam deflections will be analyzed. For this lab, beam specifications will be designed along with a computer based analysis program to show that the sum of the individual loadings has the same effect as the combined loading. An indeterminate structure is one that has more reaction forces than equilibrium equations available for analysis. To make the analysis of these beams easier, a lab using RISA-2D, a structural analysis program, will be designed. The beam and loadings for this lab will be designed in order to produce proper results. This research project will have an immediate and direct impact on campus. Over 100 students per semester take ArchE 217/CE 217, and an improved laboratory experience will further knowledge and understanding of the subject material.

Kyle Holman is a senior in the Architectural Department and will graduate in May of 2010. He is planning to pursue his master's degree in Structural Engineering. His past times include lifting weights, going to Bible studies, and hanging out with friends.

David Lecko

Joint project with Jingwen “Wendy” Chen

Department: Electrical and Computer Engineering
Major: Electrical Engineering, Computer Engineering
Research Advisor: Dr. Sahra Sedigh
Advisor’s Department: Electrical and Computer Engineering

Funding Source: MODOT, Washington County Missouri, US Department of Transportation

The Smart Brick Wireless Sensor Node for High-Resolution Structural Health Monitoring

The objective of this project is to develop a wireless sensor node for the SmartBrick platform, which provides a low-cost and autonomous method for structural health monitoring. The SmartBrick sensor node leverages the Zigbee short-range communication capabilities of the base station to increase the monitoring range. The primary function of the node is to interface to humidity, temperature, tilt, strain, and vibration sensors and transmit their values to the base station via Zigbee. Long-range communication of data and alerts will be through the base station, which serves as the gateway to the outside world, and relays remote configuration and maintenance commands to the sensor nodes.

One of the primary motivations behind development of the sensor node is high-resolution monitoring of strain. Each wireless sensor node will be able to measure strain from 16 different locations on a structure, by multiplexing these gauges to the same signal conditioning circuit, which drastically reduces the number of nodes required for monitoring an area. Data collection can take place at regular intervals, or when triggered by events of interest. Each sensor node includes sufficient memory to store a day’s data, although the system default is to transmit the collected data to the base station once per hour.

David Lecko is currently a second-year student studying Computer and Electrical Engineering at Missouri S&T. He currently serves as the Chief Business Officer of the Missouri S&T EcoCAR team, and is active in Missouri S&T Student Council. In addition to involvement in undergraduate research, David is also a member of IEEE, the Missouri S&T racquetball team, and Phi Eta Sigma National Honor Society. During the past summer he worked as an IT Student Manager. After graduation, he plans to pursue a Master's Degree in Business Administration. David is the son of Peter and Patricia Lecko of St. Louis, MO.

Samantha Markus

Department: Civil, Architectural, and Environmental Engineering
Major: Environmental Engineering
Research Advisor: Dr. Joel Burken
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Department of Civil, Architectural, and Environmental Engineering

Comparing Field Sampling Methods in Phytoforensics

Volatile organic compounds (VOCs) are chemicals that come from a variety of products including paints, solvents, wood preservatives, air fresheners, automotive products and dry cleaned clothing[1]. These compounds may cause a variety of health effects ranging from eye irritation and headaches, to cancer. As with all compounds it depends on the specific chemical, the duration of exposure, and the concentration experienced by the person. Finding groundwater contamination is not as easy as it would first seem. The ground does not change colors and put up a sign that says, "Help, I'm contaminated!" So how do we find it? The current methodology is to take a sample of the groundwater and send it to a laboratory for tests. This can be costly and invasive. A new process using trees has been created. Trees soak up groundwater in order to live. If the groundwater contains VOC contamination, then the tress will take up that as well. These new methods capitalize on the contamination present in the trees. They all begin by taking a core sample of the tree. Then, the air around the core or the air in the void left in the tree are sampled with various instruments. The purpose of this research was to compare these methods. These four methods are generally referred to as tree cores, SPSs, SPME-PDMS fibers, and SPME-carboxene fibers. They were compared for the time to use, knowledge required to measure, and the cost to operate. It was expected that the SPS would be the best choice overall. [1] http://www.epa.gov/iaq/voc.html

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Samantha Markus is a senior in Environmental Engineering. She has been involved in many organizations and activities throughout her college career including: the Newman Campus Ministry Center, Water Environment Federation (WEF), Solar House Team Safety Officer, World Youn Wha Ryu Association (Martial Arts Organization), and the theatrical production of Beauty and the Beast. She is excited to have participated in this research project and to share it with the Missouri S&T campus.

Nis Mohmad

Department: Geological Science and Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Baojun Bai
Advisor's Department: Geological Science and Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Interactions of Surfactant and Preformed Particle Gel (PPG) Used for Conformance Control

Improved oil production is critical today when some analysts are predicting world oil production is peaked. Conformance control using PPG and surfactants and is one of the effective ways to prolong reservoir's lifetime by increasing sweeping efficiency and mitigate issues like excess water production in heterogeneous reservoirs. But, there are huge uncertainties concerning the in-situ gelling properties in the industry. This paper will discuss how surfactant and PPG properties (types, concentration, size) affect the two important gelling parameters: swelling ratio and dynamic shear modulus, G'. The PPG behavior has been investigated extensively in the lab, showing that (1) surfactant can increase the swelling capacity of the PPG up to 7.5 % rise compared to its swelling capacity in 10.0 wt % brine however high surfactant concentration will decrease the swelling capacity; (2) All surfactants reduced the PPG G' significantly. Largest reduction occurs in anionic and cationic surfactant.

Nis Mohmad is a senior in Petroleum Engineering and she is from Malaysia. She has been involved in EOR and PPG research since 2008.

Kelly O'Bryant

Department: Chemical Engineering
Major: Nuclear Engineering
Research Advisors: Muthanna Al-Dahhan and Rahman Abdulmohsin
Advisor's Department: Chemical Engineering

Funding Source: Department of Energy

Gas Dynamics of a Pebble Bed Reactor

For a Pebble Bed Reactor, there is a complex interaction between the flowing gas and the heat generating pebbles. It is important to understand this interaction in order to accurately account for the gas dispersion and heat exchange in the Pebble Bed Reactor. In the experiment, helium gas will be used as a tracer in an air stream traveling through on a plastic column of pebbles. The air is injected at two locations above and below the column which is three feet in height and 30 cm in diameter. Relative to the pebbles, the gas travels very quickly, so the pebbles are stationary for the experiment. Three samples are taken and analyzed from each injection point. The entire system can be divided into different mixing zones. The data from the samples is analyzed to get an accurate description of the mixing dispersion in the system.

Kelly O'Bryant is a junior in Nuclear Engineering at the University of Missouri Science and Technology. He has been a Peer Learning Assistant with the LEAD program for three semesters, tutoring students in math and nuclear engineering. Kelly joined Dr. Al-Dahhan in his research with Pebble Bed Nuclear Reactors funded by the Department of Energy in October of 2010.

Timothy Richard Peters

Department: Department of Mechanical and Aerospace Engineering
Major: Aerospace Engineering
Research Advisor: Dr. Walter Eversman
Advisor's Department: Department of Mechanical and Aerospace Engineering

Funding Source: Spirit Aerosystems

Effects of Mechanical Tolerances on Realized Attenuation

A Monte Carlo analysis, coupled with non-intrusive polynomial chaos methods, is used to examine the effect of mechanical tolerances on realized attenuation of two degree of freedom linings for duct acoustic propagation. A probability density function for impedance is developed by representing lining physical and geometric tolerances with randomized distributions. Eight total parameters, such as lining thickness and hole diameter, are allowed to vary. Non-intrusive polynomial chaos methods are used with a finite element duct propagation code to examine the effect on predicted attenuation. This analysis scheme is performed for sideline and approach cases of two sub-optimum acoustic linings for turbofan engines. It is found that variations in lining parameters cause a significant deviation from the nominal impedance and consequently affect attenuation. The results of this study can be used to determine which lining parameters should be closely monitored during the manufacturing process to achieve the desired attenuation.

Timothy Peters is a senior in Aerospace Engineering at Missouri University of Science and Technology. He has a special interest in aircraft engine structures. Timothy is also the chief engineer of the aircraft portion of Advanced Aero Vehicle Group at Missouri S&T. After graduating, Timothy will be working as a structural analyst for Spirit Aerosystems in Wichita, Kansas.

Cuong Pham

Joint project with Paulina Barranco and Morgan Boresi

Department: Chemical and Biological Engineering
Major: Chemical Engineering
Research Advisor: Dr. Daniel Forciniti
Advisor's Department: Chemical and Biological Engineering

Funding Source: National Science Foundation

Surface Properties that Catalyze Amyloid Fibril Formation

Amyloid fibrils are found in many diseases such as Alzheimer's Disease, Parkinson's Disease, Huntington's Disease, Type 2 Diabetes, Rheumatoid Arthritis, and many more. These fibrils are protein aggregates with a characteristic β-sheet formation, which binds Congo Red. It is possible that the formation of amyloid deposits is "catalyzed" by solid liquid interfaces. In this experiment the rate and extent of aggregation of bovine insulin was determined in the presence of several different surfaces. The experiments were design to deepen our knowledge about the formation of amyloid deposits without which limited progress may be achieve in finding cures for these devastating diseases. The chemistry of surfaces was chosen to mimic those surfaces found in cells. The rate of aggregation was followed by dynamic light scattering, which was used to monitor the aggregate size as a function of time. Congo Red assays were performed to confirm if the aggregates were amyloidic.

Cuong Pham is a senior majoring in Chemical Engineering with a minor in Chemistry. He has been an undergraduate research assistant for Dr. Forciniti since January 2009. Outside of research he is involved in several hockey teams where he plays goalie.

Matthew Struemph

Joint project with Travis Hemsath

Department: Civil, Architectural, and Environmental Engineering
Major: Architectural/Civil Engineering
Research Advisor: Dr. John Myers
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: Leonard Wood Institute (LWI)

IED Crater Repair for Enduring Route Remediation

Recent road repairs performed in Iraq and Afghanistan revealed several deficiencies in current repair techniques. Temporary solutions such as aggregate backfill were unacceptable due to the ease of emplacement of additional explosive devices. Additionally, asphalt repairs were easily penetrated with common hand tools to place improvised explosive devices (IEDs) where tampering was difficult to recognize. Concrete patches proved to be short-term solutions, as hasty concrete repairs deteriorated under traffic, providing access for additional IED placement. While traditional concrete placement exposed repair units to enemy attack due to extended material production and cure times. As a result this investigation is being conducted in conjunction with the U.S. Army Engineer Research and Development Center (ERDC) to determine the most promising rapid-setting material alternatives for capping IED crater repairs. This research makes use of the standard test methods and the required vehicle load rating to provide recommendations for selection of rapid-hardening materials and equipment for conducting repairs that will reopen routes to traffic within 30 minutes to 1 hour of repair.

Matthew Struemph is a senior in Civil Engineering at Missouri S&T. He will be graduating in December of 2010. Matthew is a member of several organizations on campus including the Concrete Canoe team, the Trap and Skeet Team, and Theta Xi fraternity. Upon graduation Matthew plans to work as an onsite engineer for infrastructure projects.

Jordan Tripp

Joint project with Kyle Holman

Department: Civil, Architectural & Environmental Engineering
Major: Architectural Engineering
Research Advisors: Dr. John Myers and Dr. Lesley Sneed
Advisor's Department: Architectural Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Missouri S&T NSF

Learning Tools for Structural Analysis: Laboratory Modeling

The objective of this research project is to develop a set of laboratory exercises for the Structural Analysis (ArchE 217/ CE 217) course taught at Missouri S&T. Labs will be designed in order to further understanding in the areas of influence lines, superposition, and indeterminate structures. Influence lines help to determine the variation in shear, moment, or deflection at a point along a member due to moving concentrated loads. In order to convey this concept effectively, specifications for a scaled simply-supported structure will be designed along with a mechanical system to control the movement of the load. Data will be taken during testing using structural data collection software. A computer-based analysis program will be developed to accurately determine beam geometry and analyze the collected data. The principal of superposition allows complex loadings to be broken down to individual components to simplify calculations. Specifically, beam deflections will be analyzed. For this lab, beam specifications will be designed along with a computer based analysis program to show that the sum of the individual loadings has the same effect as the combined loading. An indeterminate structure is one that has more reaction forces than equilibrium equations available for analysis. To make the analysis of these beams easier, a lab using RISA-2D, a structural analysis program, will be designed. The beam and loadings for this lab will be designed in order to produce proper results. This research project will have an immediate and direct impact on campus. Over 100 students per semester take ArchE 217/CE 217, and an improved laboratory experience will further knowledge and understanding of the subject material.

Jordan is currently a senior majoring in architectural engineering at the Missouri University of Science and Technology. In addition to the OURE program, Jordan is also actively involved in Christian Campus Fellowship, Chi Epsilon (the national civil engineering honor society), and the Intramural Managers Association. Following graduation, he plans to attend graduate school to pursue a master's degree in architecture.

Ryan Wohldmann

Department: Mining and Nuclear Engineering
Major: Nuclear Engineering
Research Advisor: Dr. Carlos Castano
Advisor's Department: Nuclear Engineering

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Creating Earth Stratospheric Conditions in a Vacuum Chamber

My project was the creation of a vacuum chamber which would replicate the conditions found in the earth's stratosphere. The earth's stratosphere is mostly ozone. This was done by creating a vacuum chamber that was ozone safe using Teflon. Semi-pure oxygen was then injected into the chamber. Then, a UV lamp was used to change the oxygen to ozone. Finally, an RGA(residual gas analyzer) was used to measure the amount of oxygen and ozone present. This project was the base step for a larger project involving the affects of hydrogen on the earth's atmosphere.

Ryan Wohldmann is a sophomore at Missouri S&T in the Nuclear Engineering Department. He was been working with vacuum technologies for four semesters.

Social Sciences
Poster Session

Abstracts

Travis Gibson

Joint project with Ashley Nelson

Department: Psychology
Major: Psychology
Research Advisor: Dr. Jacqueline Bichsel
Advisor's Department: Psychology

Development of a Survey Assessing Attitudes Toward Genetic Research

This study involved the development of a comprehensive questionnaire assessing attitudes toward genetic research. Face validity was obtained by having faculty members with expertise in genetic research rate and edit the questions. The questionnaire was administered to 289 participants (145 males, 144 females). The Attitudes Toward Genetic Research Questionnaire revealed seven primary factors: (a) support of genetic testing for oneself or one's child, (b) support of genetic testing for others, (c) perceived benefits of genetic research, (d) self-assessed knowledge of genetic research, (e) belief that genes outweigh the environment in determining behavior, (f) belief that genetic research is unethical, and (g) support of federal funding for genetic research. These factors mainly supported the pre-conceived areas of assessment in such attitudes, demonstrating construct validity. One interesting finding was that older individuals were less likely to believe that genetic research was unethical, but were less likely to support funding for genetic research.

Travis Gibson is majoring in Psychology with a minor in Mathematics. He is the president of Psi Chi and the Youn Wha Ryu Martial Arts Club; and is the Lab Coordinator of his research lab. Travis plans to graduate in spring 2011. He will be presenting research at the American Psychological Association Convention in August. In the future, Travis plans to work for the FBI.

Leslie Hagen

Department: Psychological Sciences
Major: Psychological Sciences
Research Advisor: Dr. James Martin
Advisor's Department: Psychological Sciences

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program

Predictive and Convergent Validity of Ability-Bas Emotional Intelligence Assessments

This study (*n* = 141) examined the convergent validity for two new measures of Emotional Intelligence (EI), the Situational Test of Emotional Understanding (STEU) and the Situational Test of Emotional Management (STEM), using correlational data from an established measure of EI, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT). Both the STEU and STEM correlated significantly and positively with the MSCEIT total score and their corresponding branch scores. The predictive validity of EI was also examined using happiness, student satisfaction, and group performance as criterion variables. Happiness was negatively related to EI, and no relation was found between EI and group performance or student satisfaction. Results suggest that group performance is better predicted by attitude and personality, and that the predictive value of EI is not within the realm of academic success.

Leslie is a senior in the department of Psychological Sciences.

Ashley Nelson

Joint project with Travis Gibson

Department: Department of Psychology
Major: Psychology
Research Advisor: Dr. Jacqueline Bichsel
Advisor's Department: Department of Psychology

Development of a Survey Assessing Attitudes Toward Genetic Research

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Ashley Nelson is presently a senior at Missouri University of Science and Technology. Ashley is graduating with a B.S. in Psychology in May 2010. She is currently a research assistant and will be presenting her research at the American Psychological Association Convention in August. Her future plans include attending graduate school and obtaining a Ph.D. in Clinical Psychology.

Jodi Paul

Joint project with Lauren Summerville

Department: Psychological Sciences
Major: Psychology
Research Advisor: Dr. Jacqueline Bichsel
Advisor's Department: Psychological Sciences

Cognitive and Personality Predictors of Attitudes Toward Genetic Research

Most research on attitudes toward genetic research has focused on individual differences that are explained by demographic or environmental factors. The present study utilized cognitive and personality factors in the prediction of attitudes toward genetic research to explore how reasonably stable traits account for the variance in attitudes. A sample of 289 participants (145 males, 144 females) ranging in age from 18-88 was administered the Woodcock-Johnson III Tests of Cognitive Abilities, the Big Five Inventory-44, and the Attitudes Toward Genetic Research Questionnaire (GRQ). Regression analyses determined the proportion of variance accounted for in each GRQ factor by both the cognitive and personality variables. The results of these analyses indicated a significant amount of the variance in each GRQ factor was accounted for by differing cognitive and personality variables. These variables added to the variance in GRQ accounted for by demographic factors.

Jodi Paul is presently a student of Psychological Science at Missouri University of Science and Technology. She is in the last semester of her undergraduate studies and anticipates receiving a B.S. in Psychology with an emphasis in Cognitive Neuroscience and a minor in Pre-Medicine in May of 2010. After graduation, she will enter the Behavioral Neuroscience Ph.D. program at the University of Alabama at Birmingham. While in this program she hopes to gain further research experience in Neuroscience, focusing on neuroimaging techniques and neurodegenerative disorders. Currently, Jodi Paul is working in the Cognitive Studies Lab aiding in research investigating personality and cognitive factors that underlie attitudes toward genetic research. She will be presenting her research at the American Psychological Association Convention in August.

Lauren Summerville

Joint project with Jodi Paul

Department: Psychological Science
Major: Psychology
Research Advisor: Dr. Jacqueline Bichsel
Advisor's Department: Psychological Science

Cognitive and Personality Predictors of Attitudes Towards Genetic Research

Most research on attitudes toward genetic research has focused on individual differences that are explained by demographic or environmental factors. The present study utilized cognitive and personality factors in the prediction of attitudes toward genetic research to explore how reasonably stable traits account for the variance in attitudes. A sample of 289 participants (145 males, 144 females) ranging in age from 18-88 was administered the Woodcock-Johnson III Tests of Cognitive Abilities, the Big Five Inventory-44, and the Attitudes Toward Genetic Research Questionnaire (GRQ). Regression analyses determined the proportion of variance accounted for in each GRQ factor by both the cognitive and personality variables. The results of these analyses indicated a significant amount of the variance in each GRQ factor was accounted for by differing cognitive and personality variables. These variables added to the variance in GRQ accounted for by demographic factors.

Lauren Summerville is currently a junior enrolled at Missouri S&T. She is working towards completion of a Bachelor of Science in Psychology with emphasis in Cognitive Neuroscience. She is also pursuing a minor in History. Lauren presently works in the Cognitive Studies Laboratory as a Research Assistant. This upcoming August, she is attending the American Psychological Association Convention to present the aforementioned research. Future plans for her include obtaining a Doctorate, continuing her interests in research, and potentially working as a professor at a university. She is set to graduate May of 2011.