Apr 3rd, 2013

9th Annual Undergraduate Research Conference Abstract Book

Missouri University of Science and Technology

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

9th Annual Undergraduate Research Conference

A celebration of experiential learning at Missouri S&T

April 3, 2013

Missouri S&T Havener Center

MISSOURI S&T

Table of Contents

9th Annual
Undergraduate Research Conference

April 3, 2013
Missouri S&T - Havener Center

CONFERENCE AGENDA

<table>
<tr><td>8:00 am – 8:30 am</td><td colspan="4">Registration (Upper Atrium) / Poster Set-Up (Upper Atrium)</td></tr>
<tr><td>8:30 am – 9:00 am</td><td colspan="4">Opening Address
Provost Warren K Wray
Interim Vice Provost Larry Gragg
(St. Pat’s B)</td></tr>
<tr><td>9:00 am – 11:45 am</td><td rowspan="10">Poster Exhibits Open</td><td colspan="3">Concurrent Oral Sessions</td></tr>
<tr><td colspan="2">Engineering (Carver)</td><td>Sciences (Turner)</td></tr>
<tr><td rowspan="2">9:00 am – 11:45 am</td><td colspan="3">Concurrent Poster Sessions
(Upper Atrium)</td></tr>
<tr><td colspan="2">Sciences</td><td>Arts and Humanities</td></tr>
<tr><td>12:00 pm – 1:00 pm</td><td colspan="3">Luncheon & Keynote Address
Mr. John R Lovitt
Alumnus, Masters of Science in Computer Science 1970
Presents
“University Research and It's Application in Solving Real World Problems”
(St. Pat’s C)</td></tr>
<tr><td>1:00 pm – 3:30 pm</td><td colspan="3">Concurrent Oral Sessions</td></tr>
<tr><td>1:00 pm – 3:00 pm</td><td colspan="3">Arts and Humanities
(Carver)</td></tr>
<tr><td rowspan="2">1:00 pm – 3:00 pm</td><td colspan="3">Concurrent Poster Sessions
(Upper Atrium)</td></tr>
<tr><td>Research Proposal</td><td>Engineering</td><td>Social Sciences</td></tr>
<tr><td>3:00 pm – 4:00 pm</td><td colspan="3">Missouri S&T Reception
(St. Pat’s A & Miner Lounge)</td></tr>
<tr><td>4:00 pm – 5:00 pm</td><td colspan="3">Awards Ceremony
(St. Pat’s B)</td></tr>
</table>

- **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**
Michael Catanzaro	Computer Science	9:00 - 9:30 AM / Carver Room
Nathan Jarus	Electrical & Computer Engineering	9:30 - 10:00 AM / Carver Room
Erik O'Riley	Mechanical & Aerospace Engineering	10:00 - 10:30 AM /Carver Room
Sam Ruesing	Chemical & Biological Engineering	10:30 - 11:00 AM / Carver Room
Derek Schloemann	Chemical & Biological Engineering	11:00 - 11:30 AM / Carver Room
Samantha Wermager	Civil, Architectural & Environmental Engineering	11:30 AM - 12:00 PM / Carver Room
Trevor Wilson	Mechanical & Aerospace Engineering	10:00 - 10:30 AM /Carver Room

Sciences Oral Session		
Name	**Department**	**Time/Location**
Clayton Buback	Chemistry	9:00 - 9:30 AM / Turner Room
Alexander Korff	Civil, Architectural & Environmental Engineering	9:30 - 10:00 AM / Turner Room
Stephen Kraus	Physics	10:00 - 10:30 AM /Turner Room
Patrick McCarver	Chemistry	9:00 - 9:30 AM / Turner Room
Katie Payne	Biological Sciences	10:30- 11:00 AM / Turner Room
Ian Schroen	Chemistry	11:00 - 11:30 AM / Turner Room

Arts and Humanities Oral Session		
Name	**Department**	**Time/Location**
Matthew Eakins	English & Technical Communication	1:00 - 1:30 PM / Carver Room
Georginna Quiros	History & Political Science	1:30 - 2:00 PM / Carver Room
Nelson Shreve	Arts, Languages & Philosophy	2:00 - 2:30 PM / Carver Room

Poster Presentations

Sciences Poster Session			
Poster #	**Name**	**Department**	**Time/Location**
1	**Nathan Barron**	Computer Science	9:00 - 11:45 AM – Upper Atrium/Hallway
2	**Brandon Basler**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
3	**Andrew Bromet**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
4	**Casey Burton**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
5	**Aaron Carson**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
6	**Andrew Cudd**	Physics	9:00 - 11:45 AM – Upper Atrium/Hallway
7	**Kathryn Czeschin**	Chemical & Biological Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
8	**Hang Deng**	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
9	**Ariel Donovan**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
10	**Brandon Drennen**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
11	**Ethan Faber**	Geological Sciences & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
12	**Hannah Frye**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
13	**Michelle Gibson**	Civil, Architectural & Environmental Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
14	**Timofey Golubev**	Physics	9:00 - 11:45 AM – Upper Atrium/Hallway
17	**Tyler Herrell**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
14	**Brock Hinton**	Physics	9:00 - 11:45 AM – Upper Atrium/Hallway
15	**Avery Joseph**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
16	**Nathaniel Kamrath**	Computer Science	9:00 - 11:45 AM – Upper Atrium/Hallway
17	**Justin Lovelady**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
18	**Anna Luce**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
3	**Kate Menke**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
19	**Andrew Miller**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
18	**Candace Miller**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
20	**Mathew Pollard**	Physics	9:00 - 11:45 AM – Upper Atrium/Hallway
21	**Yunsheng Qiu**	Physics	9:00 - 11:45 AM – Upper Atrium/Hallway
22	**Carlos Rivera**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
23	**Colin Ryan**	Materials Science & Engineering	9:00 - 11:45 AM – Upper Atrium/Hallway
24	**Megan Schuller**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
25	**Lisa Simone**	Chemistry	9:00 - 11:45 AM – Upper Atrium/Hallway
26	**Charles Threadgill**	Biological Sciences	9:00 - 11:45 AM – Upper Atrium/Hallway
27	**John Volosin**	Information Science & Technology	9:00 - 11:45 AM – Upper Atrium/Hallway

Poster Presentations (Cont.)

Arts & Humanities Session			
Poster #	**Name**	**Department**	**Time/Location**
28	**Mary Frey**	History & Political Science	9:00 - 11:45 AM – Upper Atrium/Hallway
29	**Laura Welsh**	History & Political Science	9:00 - 11:45 AM – Upper Atrium/Hallway

Research Proposal Poster Session			
Poster #	**Name**	**Department**	**Time/Location**
30	**Dylan Courtney**	Biological Sciences	1:00 - 3:00 PM – Upper Atrium/Hallway
31	**Stephanie Deters**	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
32	**Tiffany Edwards**	Biological Sciences	1:00 - 3:00 PM – Upper Atrium/Hallway
33	**Anamaria Gaitan**	Biological Sciences	1:00 - 3:00 PM – Upper Atrium/Hallway
31	**Reid Herndon**	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
34	**Levi Malott**	Computer Science	1:00 - 3:00 PM – Upper Atrium/Hallway
34	**Pasha Palangpour**	Computer Science	1:00 - 3:00 PM – Upper Atrium/Hallway
35	**Sarah Rommelfanger**	Biological Sciences	1:00 - 3:00 PM – Upper Atrium/Hallway
36	**Larry Tolliver**	Biological Sciences	1:00 - 3:00 PM – Upper Atrium/Hallway

Poster Presentations (Cont.)

Engineering Poster Session			
Poster #	**Name**	**Department**	**Time/Location**
37	Yun Bai	Mechanical & Aerospace Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
38	Tyler Bick	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
39	Steve Brugere	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
40	Min kyung Cho	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
41	Matthew Glascock	Mechanical & Aerospace Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
42	Tommy Goodwin	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
43	John Heatherly	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
44	Ryan Jones	Materials Science & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
45	Julia Kuebrich	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
46	Matthew Laurent	Mechanical & Aerospace Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
47	Edward Norris	Mining & Nuclear Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
48	Yanda Qiao	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
49	Charlene Ruwwe	Chemical & Biological Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
50	Andrew Schranck	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
51	Chris Seto	Computer Science	1:00 - 3:00 PM – Upper Atrium/Hallway
52	Xindi Sun	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
53	Kaixiao Tian	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
54	Zhe Yuan	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
48	Na Zhang	Geological Sciences & Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway

Poster Presentations (Cont.)

Social Sciences Poster Session			
Poster #	**Name**	**Department**	**Time/Location**
55	Elizabeth Brem	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
56	Emily Gardner	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
57	Jacob Goldsmith	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
58	Samantha Kempker	Psychology	1:00 - 3:00 PM – Upper Atrium/Hallway
59	George Mausshardt	Computer Science	1:00 - 3:00 PM – Upper Atrium/Hallway
60	Michael Sestak	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway
61	Darrell Wallace	Civil, Architectural & Environmental Engineering	1:00 - 3:00 PM – Upper Atrium/Hallway

Keynote Speaker

John R Lovitt

Alumnus, Masters of Science in Computer Science 1970

Presents

"University Research and Its Application in Solving Real World Problems"

John received his master's degree in Computer Science from Missouri S&T's St Louis Center in 1970 while working at McDonnell Douglas in flight simulation and operational analysis. His career included 13 years at Hewlett Packard, and 18 years at Rational Software, and a final stint as CEO of Pattern Insight after a failed attempt at retirement. His proudest professional achievement is developing many of his employees into CEO and senior management roles.

He is retired from line management, but is deeply involved in early stage technology companies for both profit and social benefit as a board member, advisor and mentor.

John is a board member and former president of the Missouri S&T's Academy of Computer Science. He also serves on Wichita State University National and Engineering advisory councils. Other board roles include Appistry in St Louis, TransMed Systems in Cupertino, California, and Doctors Giving Back, a non-profit organization that provides health outreach programs in underdeveloped and impoverished African countries.

He is also a Mentor for the NSF I-Corp program, and for Santa Clara University's Global Social Benefit Incubator program. John received a Professional Degree from S&T's Computer Science Department in 2003. He is a member of S&T's Order of the Golden Shillellagh.

Conference Judges

The Office of Undergraduate Studies wishes to thank the following faculty & staff for their valuable contributions to the 8th Annual Missouri S&T Undergraduate Research Conference.

Ralph Alexander
Bonnie Bachman
Ron Bieniek
Michael Bruening
Kathryn Dolan
Stephen Gao
Katie Grantham
Amber Henslee
Dincer Konur
Merilee Krueger
Kelly Liu
Jana Neiss
Gayla Olbricht
Jennifer Pattershall
Prakash Reddy
Joshua Rovey
Chaman Sabharwal
Jeff Schramm
Katie Shannon
Bijaya Shrestha
Nancy Stone
David Westenberg
Henry Wiebe
Zhaozheng Yin
Y Rosa Zheng

Thank You!

Engineering
Oral Session

Abstracts

Michael Catanzaro

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

Funding Source: NSF EEC-0812121

FREEDM DGI Device Management

The Future Renewable Electric Energy Delivery and Management (FREEDM) Center has constructed a Distributed Grid Intelligence (DGI) to provide intelligent, decentralized energy management for its future smart grid. Groups of DGI nodes engage in power migrations in order to balance power usage at each node. Each DGI is responsible for the control of several local devices that consume and generate power. In order to be a useful household component, the DGI must support a dynamic set of devices that can be plugged in and unplugged while the DGI is in operation.

Michael is a senior in Computer Science at Missouri S&T. He works as a developer for the FREEDM DGI at S&T's Critical Infrastructure Protection Laboratory. His interests include artificial intelligence, cybersecurity, digital privacy, free software, and operating systems. When he's not programming, Michael enjoys reading (about programming) and casual Pokémon.

Nathan Jarus

Department: Computer Engineering
Major: Computer Science
Research Advisor: Dr. Sahra Sedigh
Advisor's Department: Computer Engineering

Funding Source: Samsung

Software Instrumentation for Failure Analysis of USB Host Controllers

Failures caused by electrostatic discharge (ESD) compromise the reliability of embedded systems. Peripherals, such as the universal serial bus (USB) are particularly vulnerable, as isolating them to avoid electromagnetic interference would defy their purpose - facilitating communication with and/or by the embedded system. Better understanding the propagation of failures that result from ESD would facilitate defensive development of hardware and software for embedded systems, but is hampered by the lack of non-invasive and lightweight instrumentation techniques. This paper proposes the use of software instrumentation for monitoring the reaction of the USB peripheral of an embedded system to ESD. It describes the efforts towards detection and root cause analysis of ESD-induced failures - correlating changes in the operation of the peripheral with the specific pin subjected to ESD. The work described is intended as proof-of-concept for the development and use of (in situ) software instrumentation for lightweight acquisition of data that can be used for runtime failure analysis and actuation of self-healing mechanisms, as well as postmortem statistical analysis of system reliability, availability, and survivability.

Nathan is a senior in Computer Science. He has been involved in undergraduate research for three semesters and enjoys the variety of work, from kernel driver hacking to theoretical CS problem analysis. When not studying computational intelligence and data analysis, he can often be found working on his cars or spending time with his wife. He plans to pursue a Ph.D. in Computer Science once he graduates this December.

Erik O'Riley

Joint project with Trevor Wilson

Department: Mechanical and Aerospace Engineering
Major: Mechanical Engineering
Research Advisor: Dr. Frank Liou
Advisor's Department: Mechanical and Aerospace Engineering

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

Computer Representation of a Seven Axis Kinematics Manipulator

A novel graphical user interface (GUI) is described which calculates forward and inverse kinematics of a seven-axis manipulator. We present this technology as a solution to manufacturing engineering needs because it greatly reduces the time of calculations and the simplicity of the GUI allows any novice to use the software as well as an expert on the subject. The GUI is also very adaptable to other robots. One needs only to input the Denavit-Hartenburg parameters and computer aided design (CAD) files. The GUI also places blue dots on the computer screen to indicate to the locations where the manipulator can reach and red dots where it cannot. This action ensures safety and efficiency even before deposition.

Erik is an undergraduate sophomore seeking his mechanical degree with a minor in programming. When he graduates he would like to work in either industry or academia working on robotics. He is very involved on campus. He is Vice President of the Industrial Designers Society of America (IDSA) chapter here at the Missouri University Science and Technology. He was also a member of the Formula Electric and Mars Rover design team. He plans on studying abroad in the fall for eleven months at Tohoku University in Sendai Japan.

Sam Ruesing

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

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

Analysis of the Second Virial Coefficient of Glycosylated Proteins by Light Scattering

The second virial coefficient, A_2, has been used by others to characterize the stability of a protein in solution to screen for proper crystallization conditions. However, the effect of protein glycosylation on A_2 has not been investigated. Ribonuclease A and B are isoforms of the same protein that differ by a single glycosylation. Solutions of Ribonuclease A were analyzed by light scattering at two pH and temperature levels. A_2 was then determined for each condition by Zimm Plot analysis. Ribonuclease B was not tested yet. In future studies, A_2 for Ribonuclease B will be measured and compared to the determined values of Ribonuclease A to determine the effect of glycosylation patterns on A_2.

Sam is from Pontoon Beach, IL, is a senior in Chemical Engineering. He is the Vice-President of Missouri S&T's Academic Competition Organization and staffs high school Scholar Bowl tournaments throughout Missouri. He will graduate in May, 2013.

Derek Schloemann

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

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
NSF Grant 0933468

Attachment of Peptides to Amino-Polystyrene Microspheres

Peptides consisting of leucine with a lysine tail were attached to amino-polystyrene microspheres. The two applications of this project are the development of a sensor for Alzheimer's disease and the observation of peptide interactions in solution. Attachment was confirmed by FTIR. Light scattering measurements show that the latex aggregated during and after derivatization. The most likely cause for the aggregation was hydrophobic interactions between peptides attached to different beads. A possible solution to this problem is to use an alternate surface, such as a silicon wafer.

Derek is a senior in biochemical engineering from St. Louis, Missouri. He is a member of the Missouri S&T chapters of American Institute of Chemical Engineers, the International Society for Pharmaceutical Engineering, Omega Chi Epsilon Chemical Engineering Honors Society, and Tau Beta Pi Engineering Honors Society.

Samantha Wermager

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) Program

Energy Analysis of Student-Designed Solar House

This paper presents the findings from an undergraduate research project concerning the energy efficiency, consumption, and generation of a 1000 ft^2 solar house. The results were compared to a home of similar size and layout built using traditional construction methods. The solar house was modeled after the Chameleon House: Missouri University of Science and Technology's 2013 entry in the U.S. Department of Energy Solar Decathlon. The efficiency of the design was analyzed using Energy-10 Version 1.8 software. For this comparison, a fictional American couple was created and a breakdown of their energy-use habits was recorded to accurately depict the magnitude of energy consumption. A 71 percent energy savings was forecasted using the Energy-10 software by incorporating various energy conserving strategies in the home's design. In addition, if a 9.1 kW photovoltaic array is also installed on a home of this size, it is possible to fully offset the energy consumption of the home.

Samantha is a senior in Civil Engineering with a minor in Sustainability. She grew up on a farm near Hokah, Minnesota and is the daughter of Anthony and Connie Wermager. Currently, she is completing her final season as a member of the Missouri S&T Track and Field Team. Samantha has served as Treasurer, President, and Fundraising Chair of M-Club, a varsity athletic service organization. She is also a member of Tau Beta Pi (an engineering honor society) as well as Salsa Club. After working this summer and fall at Abeinsa BD in Chesterfield, MO; Samantha will return to Missouri S&T to finish up her bachelor's degree and continue her education through graduate studies in Civil Engineering.

Trevor Wilson

Joint project with Erik O'Riley

Department:	Computer Science
Major:	Computer Science
Research Advisor:	Dr. Frank Liou
Advisor's Department:	Mechanical and Aerospace Engineering

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

Computer Representation of a Seven Axis Kinematics Manipulator

A novel graphical user interface (GUI) is described which calculates forward and inverse kinematics of a seven-axis manipulator. We present this technology as a solution to manufacturing engineering needs because it greatly reduces the time of calculations and the simplicity of the GUI allows any novice to use the software as well as an expert on the subject. The GUI is also very adaptable to other robots. One needs only to input the Denavit-Hartenburg parameters and computer aided design (CAD) files. The GUI also plots blue indicators computer screen to show the locations where the manipulator can reach and red indicators where it cannot. This action ensures safety and efficiency even before deposition.

Trevor is a sophomore undergraduate seeking a degree in computer science. He has had experience with robotics systems in the FIRST robotics program. He has previously been a developer for the MegaMiner AI competitions as well as competed in said event. He has a variety of programming experience from C++ and Java, to LabVIEW and MATLAB. He is interested in robotics systems, internal frameworks, and game development and hopes to work in similar fields in the future.

Sciences
Oral Session

Abstracts

Clayton Buback

Joint Project with Patrick McCarver

Department: Chemical Engineering
Major: Chemical Engineering
Research Advisors: Dr. Chariklia Sotiriou-Leventis and Dr. Nicholas Leventis
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
United States Army Research Office (W911NF-10-1-0476)

Assembly of Polymeric Nanoparticles into Fibers versus Clusters: Experiment and Simulation

Aerogels are open pore, ultra-low density polymeric assemblies of nanoparticles that have practical use in many fields due to high surface areas, low thermal conductivities, high acoustic impedance, and low dielectric constants. However, the aggregation of nanoparticles to form aerogels is not well understood. Here, simultaneous "top-down" and "bottom-up" approaches are taken to provide insight into nanoparticle agglomeration into primary and secondary particles in a polyurea aerogel system. The top-down experimental approach seeks to characterize polyurea aerogels using SEM and Elemental Analysis. The bottom-up simulation approach attempts to generate predictions of aerogel properties by constructing molecular components and simulating reaction and aggregation. Eventual results could allow for fine-tuned engineering of aerogel properties based on predetermined requirements.

Clayton was born in St. Charles, Missouri. At age 16, he enrolled in the Missouri Academy of Science, Mathematics, and Computing, and graduated at the top of his class, earning an Associate of Science Degree and High School Diploma simultaneously. He now attends the Missouri University of Science and Technology, and is working on two Bachelor's Degrees: one in Biology, and one in Biochemical Engineering. After completing this, he will attend medical school, and hopes to make meaningful contributions to the field of oncology.

Alexander Korff

Department: Civil, Architectural, and Environmental Engineering
Major: Environmental Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: John and Susan Mathes Endowed Chair in Environmental Engineering

Analyzing Critical Drinking Water Parameters in Rural India

Over a two week period in India drinking water samples were collected from hand pumps and tanks in rural villages and analyzed for potential harmful pollutants, coliform bacteria, and general species that can adversely affect water quality. The water samples were collected from 15 separate sources in three villages near the city of Anwar, Gujarat India. The unfiltered drinking water samples were tested using the CEL 850 Basic Drinking Water Laboratory equipment and the Paddle Tester/Total Aerobic Bacteria/Total Coliform kit both from HACH. A majority of the samples collected in the areas tested were relatively potable, but some samples showed warning signs for possible serious health risks.

Alex is a senior in Environmental Engineering with plans to graduate in December 2013. After receiving his undergraduate degree he plans to pursue a Masters and eventually a Ph.D. in either Environmental Engineering or Science. Alex is very involved with his fraternity Kappa Sigma and has held officer positions in both Kappa Mu Epsilon and Phi Eta Sigma.

Stephen Kraus

Department: Physics
Major: Physics
Research Advisor: Dr. Yew San Hor
Advisor's Department: Physics

Funding Source: N/A

Introducing Magnetic Order in a Topological Insulator via Chemical Doping

Analysis of the topological insulator Bi2Se3 magnetically doped with various concentrations of Mn is performed. Magnetization measurements reveal paramagnetic behavior at low temperatures for a range of concentrations. Resistivity measurements and X-ray diffraction methods indicate that the bulk structure of the materials retain their desired properties and form after doping. Angle-resolved photoemission spectroscopy verifies the existence of topological surface states in the doped materials, but does not show the opened band gap associated with ferromagnetic ordering at the temperatures tested.

Stephen is a senior majoring in Physics and Applied Mathematics. He has been doing research in Dr. Hor's lab since the fall semester of 2012, and has been a LEAD Peer Learning Assistant on campus since fall of 2010. He intends to pursue a graduate degree in physics after graduation, perhaps in the areas of condensed matter or AMO physics.

Patrick McCarver

Joint Project with Clayton Buback

Department: Chemical Engineering
Major: Chemical Engineering
Research Advisors: Dr. Chariklia Sotiriou-Leventis and Dr. Nicholas Leventis
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
United States Army Research Office (W911NF-10-1-0476)

Assembly of Polymeric Nanoparticles into Fibers versus Clusters: Experiment and Simulation

Aerogels are open pore, ultra-low density polymeric assemblies of nanoparticles that have practical use in many fields due to high surface areas, low thermal conductivities, high acoustic impedance, and low dielectric constants. However, the aggregation of nanoparticles to form aerogels is not well understood. Here, simultaneous "top-down" and "bottom-up" approaches are taken to provide insight into nanoparticle agglomeration into primary and secondary particles in a polyurea aerogel system. The top-down experimental approach seeks to characterize polyurea aerogels using SEM and Elemental Analysis. The bottom-up simulation approach attempts to generate predictions of aerogel properties by constructing molecular components and simulating reaction and aggregation. Eventual results could allow for fine-tuned engineering of aerogel properties based on predetermined requirements.

Patrick is a senior in Chemical Engineering at Missouri University of Science and Technology. His previous work includes two years of undergraduate research on aerogel systems and a summer research internship at Pacific Northwest National Laboratory working with sea-salt/organic aerosols. In his spare time he enjoys reading and writing science fiction, playing board games, and browsing Wikipedia endlessly.

Katie Payne

Department: Biological Sciences
Major: Biological Sciences
Research Advisors: Dr. Robert Aronstam and Dr. William V Stoecker
Advisor's Department: Biological Sciences and Computer Engineering

Funding Source: N/A

"Insulin Neck": Is this the Earliest Sign of Insulin Resistance?

Acanthosis nigricans (AN) is so closely linked with insulin resistance (IR) that it has been called a "clinical surrogate" for laboratory-determined hyperinsulinemia.[1] AN presence can therefore indicate patients with IR, allowing implementation of interventions that may prevent progression to type 2 diabetes mellitus (DM).[2] We report 30 patients who presented with elevated body mass index (BMI) to correlate IR with different AN physical findings. Insulin neck (visibly increased texture on the posteriolateral neck) is the most sensitive physical finding for insulin resistance (IR). Insulin neck appears as visible lines, and/or furrows and ridges on the posterolateral neck. If neck texture is normal, IR is less likely to be present.

Katie is a Junior and full-time Research Coordinator of Stoecker and Associates. She plans to matriculate in a medical school of her choice after obtaining her B.S. in Biological Sciences at Missouri S&T. She is excited to share her latest clinical observation project and is proud to announce that it will be appearing in an upcoming issue of JAMA Dermatology.

Ian Schroen

Department: Freshmen Engineering
Major: Chemical Engineering
Research Advisor: Dr. Jay Switzer
Advisor's Department: Chemistry

Funding Source: U.S. Department of Energy grant DE-FG02-08ER46518
National Science Foundation grant DMR-1104801

Nonvolatile Resistance Switching in Electrodeposited Mn_3O_4

A novel synthesis method of Mn_3O_4 thin films is presented. Crystalline films of Mn_3O_4 are deposited by electrochemical oxidizing an acetate complex of Mn^{2+} in aqueous, weakly acidic solution at 80 ^oC. The morphology of resulting films is affected by the deposition parameters. The concentration of $Mn(II)(OAc)_2$ has the most pronounced effect on the resulting morphology. No influence of the deposition parameters on the deposit structure was observed. The resistive switching (RS) capabilities of Mn_3O_4 thin films are investigated. The films show filamentary, non-volatile RS behavior. The material can be switched hundreds of times between high (HRS) and low resistance (LRS) states. The switching parameters are stable in repetitive experiments. The states are persistent over time. This opens up the possibility to use the method to produce electrodeposited Mn_3O_4 solid-state memories as an inexpensive alternative to ultra-high vacuum (UHV) technologies.

Ian joined the military after high school and spent 5 years in the armed services after which he went back to school. He is attending Missouri University of Science and Technology in order to obtain a B.S. in Chemical Engineering. He will be graduating in May 2015 from Missouri University of Science and Technology.

Arts and Humanities
Oral Session

Abstracts

Matthew Eakins

Department: English and Technical Communication
Major: English and Philosophy
Research Advisor: Dr. Olivia Burgess
Advisor's Department: English and Technical Communication

Funding Source: N/A

The Role of Women in Literature: From King Arthur to Margaret Atwood

As a civilization, one goal we've strived for is total equality. However, within the realm of literature, women have continued to be objects of ridicule and subjugation for years. Looking at the depiction of women from Middle English texts, Chaucer's *The Canterbury Tales* and the *Chronicles of King Arthur*, it is clear how they were viewed in society then. By examining those texts next to the image of women from Margaret Atwood's *The Handmaid's Tale*, this paper shows how the gap between sexes still exists in literature, and that the role of women now is but a culmination of earlier traits.

Matthew is a senior majoring in both English and Philosophy, with a minor in German studies. He is from Evergreen Park, IL, on the outskirts of Chicago. He plans to graduate in May 2014, and continue his education in either linguistic studies or journalism.

Georginna Quiros

Department: History & Political Science
Major: History, Pre-Law Minor
Research Advisor: Dr. Petra Dewitt
Advisor's Department: History & Political Science

Funding Source: N/A

A Brief Historiography of Joseph McCarthy and McCarthyism

This paper examines the trends and changes in the historiography of Joseph McCarthy and McCarthyism. It places emphasis on the lack of evolution in interpretation and analyzes sources from the 1950s to current works. It also analyzes the lack of substantial evidence used in the sources and argues that historians should recognize the bias in the main sources used in previous interpretations of Joseph McCarthy and McCarthyism. The paper concludes that with the discovery of new evidence released through the Freedom of Information Act the subject should be reanalyzed and old evidence should be verified.

Georginna is an undergraduate student in the History & Political Science department at Missouri University of Science and Technology with a minor in Pre-Law. She expects to graduate in Summer 2013 and plans to enroll in law school for the 2014-2015 school year. Her academic interests include political history and constitutional law.

Nelson Shreve

Department: Arts, Languages & Philosophy
Major: Physics
Research Advisor: Dr. Audra Merfeld-Langston
Advisor's Department: Arts, Languages & Philosophy

Funding Source: N/A

Mark Twain and Faïza Guène: the Coalescence of Style with Cause

A cornerstone of American literature, Mark Twain utilized his abilities as a writer to strike at the racial injustice that faced America during his time. In France, there is a rising star stirring the established "traditional" French society. Using the colloquial language of their settings, coming-of-age tales and first-person narratives to demonstrate their respective social ills that affect their epochs, Faïza Guène and Mark Twain share a staggering literary similarity both in style and inspiration.

Nelson is a junior in Physics. He is a LEAD Peer Learning Assistant and tennis instructor. Following completion degree he plans to continue on to medical school.

Sciences
Poster Session

Abstracts

Nathan Barron

Poster #1

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Marouane Kessentini
Advisor's Department: Computer Science

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

Fixing Model Transformation Errors Using Heuristic Search

One of the efficient techniques used in model-driven engineering to ensure the quality of model-transformation mechanisms is testing. Two important steps should be addressed: the efficient generation/selection of test cases and the definition of oracle functions that assess the validity of the transformed models. This work is concerned with an additional step related to automatically fixing model transformation errors. In this work, we propose an evolutionary approach that uses good traceability links to fix detected transformation errors. This novel evolutionary approach is based on the dissimilarity between the new collected traceability links after fixing errors and the base of good traceability links. Thus, the best solution is the set of changes (on transformation rules or metamodels) that maximize the similarity between our base of good traceability links and the new ones collected after executing the changes to correct errors. The validation results on widely-used transformation mechanism confirm the effectiveness of our approach in terms of precision and recall on ten different scenarios.

Nathan is presently a junior at Missouri University of Science and Technology. Nathan is getting a BS currently in computer science and a minor in mathematics. Nathan interests include: graphical user interface, volunteer work, racquetball, soccer, and many more outdoor activities.

Brandon Basler

Poster #2

Department: Chemistry
Major: Chemistry and Chemical Engineering
Research Advisors: Dr. Klaus Woelk and Dr. Douglas Ludlow
Advisor's Department: Chemistry and Chemical Engineering

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

Using Carbonate Buffers to Maximize the Yield of Liquid Fuel Precursors from Hydrothermal Biomass Conversion

With increasing costs and environmental concerns of fossil fuel, renewable biofuels are becoming more popular and economically attractive. Ethanol from corn starch is a common form of biofuel, although it is costly to produce and transport. In addition, the ethanol fermentation process only preserves 40% of the biomass carbon-carbon bonds that contain most of the chemical energy. In contrast, 5-hydroxymethyl furfural (5-HMF) can be formed from carbohydrate biomass and is a precursor to 2,5-dimethyl furan (2,5-DMF). 2,5-DMF maintains all of the biomass carbon-carbon bonds and can be used directly as liquid transportation fuel performing similarly to standard gasoline. The formation of 5-HMF through hydrothermal reactions of carbohydrate biomass and its yield depends strongly on the pH inside the reactor vessel. Therefore, an efficient pH control during the reaction is essential. In this project, the use of the carbonate/bicarbonate/solvated carbon dioxide buffer system is explored to achieve such pH control.

Brandon is currently a senior perusing dual Bachelor's of Science degrees in Chemistry and Chemical Engineering. He is planning on graduating in May 2013 and will be going to work for Marathon Petroleum in Robinson, Illinois. He has been President of Sigma Phi Epsilon Fraternity and Alpha Chi Sigma, the Professional Chemical Fraternity. He is currently President of Omega Chi Epsilon Honor Society. He is also active in the American Institute of Chemical Engineers, American Chemical Society, the Rolla Newman Center, Campus Christian Fellowship and the Knights of Columbus. He enjoys the outdoors, antique farm equipment, and spending time on his grandparent's family farm.

Poster #3

Andrew Bromet

Joint project Kate Menke

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

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

Effects of Low Flow and Stream Drying on Macroinvertebrate Communities

One concern with climate change for Missouri streams in the future is the possible loss of reliable flow, or increased stream drying. The two OURE students have examined biological communities along Mill Creek in Phelps County, Missouri. Mill Creek is a unique stream with a complex hydrology. There are several springs that feed the stream, which itself can lose water in some reaches because of the karst geology. Downstream from Wilkins Spring, the main spring in the watershed, the stream has a reliable flow. Certain upstream reaches have become intermittent or ephemeral given the drought in 2012. The main project goal of the students is to collect data on the biological communities along this stream, and determine the species composition and diversity of the biota. The data sets will prove useful for comparison of stream biota across a gradient of flow permanence. We have focused on collection and analysis of invertebrate communities thus far. There are large differences in the communities among the sites. The downstream, perennial reach has a typical Ozark stream community with many mayflies, caddisflies, and a high diversity of animal life. The upper reaches, with less reliable flow, have less diverse communities, with very different taxa. These upper reaches have some beetles, damselflies, and other taxa that are common to ponds and reservoirs, as opposed to streams.

Andrew is a senior in biological science with a minor in chemistry. He is a member of Helix, the Missouri S&T chapter for the American Society of Microbiology, as well as the Alpha Omega chapter of Sigma Tau Gamma. His interests include sports, outdoor activities, biology, and video games.

Poster #4

Casey Burton

Department: Chemistry
Major: Chemistry
Research Advisor: Dr. Yinfa Ma
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Environmental Research Center, Department of Chemistry

Enhancement of Amylase Activity by Enzymatic Immobilization on Polymer Matrices

Enzyme immobilization has been achieved by a number of techniques, but none have been reported to improve durability or activity of the enzyme. Indeed, the majority of published techniques either denatures the enzyme or physically entraps it. This study serves as a proof-of-concept of a new, chemical-based attachment to a polymer netting, thereby leaving the enzyme intact and functional while being immobilized. Amylase and starch were chosen as a model enzyme-substrate pair for their well-established background as a classical enzymatic reaction. In addition to this, starch was mildly hydrolyzed by hydrochloric acid and heat to accommodate more triiodide molecules. A strong linear correlation (R^2 = 0.9998) was observed between starch concentrations and absorbance at 580 nm. This newly developed technique has a method detection limit (MDL) of 1 µg/L (ppb) with a linear range of 1 ppb - 100 mg/L (ppm) in water matrices. The method was further validated through determinations of alpha-amylase activities. Starch degradation revealed typical enzyme kinetics, and enzymatic activity was found to be highly precise (RSD = 1.3%). In conclusion, these simple modifications to the traditional starch-iodine assay can greatly improve UV-VIS sensitivity toward the complex. Results of the activity and/or durability enhancement are pending at this time.

Casey is from Lake of the Ozarks, MO where he attended School of the Osage high school. His research career began there where he was involved in a number of studies that resulted in publications and presentations. He continued his research path at Missouri University of Science and Technology as a Chemistry major under the guidance of Dr. Yinfa Ma where he specializes in bioanalytical chemistry in his search for noninvasive, early cancer detection techniques. In his spare time, he owns and operates a development company, Sapentia Development, LLC.

Poster #5

Aaron Carson

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

Symbiotic Relationship between Bacteria and Soybeans Have Potential for a Natural Fertilizer

Bradyrhizobium japonicum is a soil dwelling bacteria known to have a symbiotic relationship with soybean. It is hypothesized that B. *japonicum* communicates with other B. *japonicum* through quorum sensing. At the right density of quorum sensing molecules, B. *japonicum* will nodulate the soybean roots and conduct nitrogen fixation for the plant. The nodulation by B. *japonicum* is currently used to replenish nitrogen depleted soils by famers. Companies are selling pre-inoculated seedlings for famers with B. *japonicum* present. In the lab, these plants grow and inoculate correctly. However, in the field famers are having difficulty getting the inoculation process to occur correctly. We believe the pre-inoculated seedlings are inoculated with B. *japonicum* grown at to high concentrations mimicking the environment in the nodule. The high concentration will produce a high concentration of quorum sensing molecules which will hinder the bacterium from nodulating properly.

Aaron is from St. James, Missouri and has attended MS&T for 4 years. He is currently a senior and will be graduating in May. He started researching during the summer of 2011. He is the vice president of Scrubs. Aaron plans to attend medical school after graduation.

Poster #6

Andrew Cudd

Department: Physics
Major: Physics/Computer Engineering
Research Advisors: Dr. Dan Waddill and Dr. Greg Story
Advisor's Department: Physics

Funding Source: Physics

Low Energy Electron Diffraction of Thin Chromium Films on a Palladium Crystal

The surface-surface interactions between a sample of palladium and a thin film of chromium grown on the surface were studied using Low Energy Electron Diffraction (LEED) and X-Ray Photoelectron Spectroscopy (XPS). The combination of the thin film and the properties of LEED allowed for close study of interaction of the chromium atoms on the surface of the palladium without penetrating into the palladium bulk. The geometric arrangement of the atoms and lattice that the chromium created as it bonded to the palladium was of great interest. The exact arrangement of the atoms as they attempt to fit together can be used to predict the properties of the interactions, along with the differences between thin and thick films of material, leading to new uses of the material.

Andrew is a junior that is dual majoring in Physics and Computer Engineering.

Katie Czeschin

Poster #7

Department: Chemistry
Major: Biochemistry
Research Advisor: Dr. Daniel Forciniti
Advisor's Department: Chemical Engineering

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

Kinetics of GSK3 Phosphorylation of Tau Protein

Tau microtubule associated protein is one of many factors responsible for neuronal structure. When the failure of tau compromises this structural integrity, the conditions are referred to as "tauopathies," resulting in neurodegeneration. This is caused by the hyperphosphorylation and subsequent aggregation of tau, which collapses the scaffold required for microtubule assembly. This research will investigate the causes of one of the most widely recognized tauopathies: Alzheimer's disease. Afflicted individuals have an abundance of GSK3, a phosphorylating kinase, in cerebrospinal fluid. It was therefore devised to test the kinetics of phosphorylation with respect to oxidative stress, acetylation, incubation, and time. For this particular OURE, the first stages of what is intended to be a continuing project will be undertaken. Tau will first be extracted from homogenized bovine brain, then separated out via ammonium sulfate fractionation. TEM and SDS-PAGE will be performed to verify the presence of microtubules and tau, respectively.

Katie is currently a junior in the Chemistry/Biochemistry emphasis program at Missouri University of Science and Technology. She splits her time between the research lab, Cycling Club, Climbing Club, General Delegation of Independents, and her position as Assistant Music Director and DJ at KMNR. After harboring this idea for Alzheimer's research since her freshmen year, she is grateful for the continuing opportunities provided by Missouri S&T and Dr. Daniel Forciniti.

Poster #8

Hang Deng

Department: Geological Sciences and Engineering
Major: Geology and Geophysics
Research Advisor: Dr. David Wronkiewicz
Advisor's Department: Geological Sciences and Engineering

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

Black Coating on Dolomite in Missouri: Organics or Inorganics Containing Manganese Oxide?

Dolomite $CaMg(CO_3)_2$ and calcite($CaCO_3$) are minerals in the carbonate rocks that outcrop throughout most of Missouri. Many of the outcrops of carbonate rocks in Missouri display a dark weathered surface that may contain relatively insoluble components present in the host rock (manganese) and/or microbial organisms (cyanobacteria). Dolomite samples in Missouri were analyzed through ICP-OES, SEM and optical microscopy to identify the composition of the black coatings. The ICP-OES analysis results show that manganese concentration of the black coating dissolved in HNO_3 solution is nearly identical to dolomite without black coating (0.097ppm > 0.093ppm). The ratios between Ca and Mg in two HNO_3 dissolutions and those in two H_2O_2 dissolutions have little difference while ratios in H_2O_2 dissolutions are slightly higher than those in HNO_3 dissolutions (1.83>1.65). The results indicate that the black coatings on dolomite would be more biogenic in origin than inorganic precipitates of MnO_2.

Hang is a senior undergraduate student in the Department of Geological Sciences & Engineering. He studied Petroleum Geology three years in China University of Petroleum in Beijing and was transferred to Missouri S&T in fall, 2011. He now works as a lab research assistant in Geochemistry and Clay Mineralogy Laboratory in the department and is being trained to work on geosciences perspective in carbon sequestration.

Poster #9

Ariel Donovan

Department: Chemistry
Major: Chemistry
Research Advisor: Dr. Honglan Shi
Advisor's Department: Chemistry

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

Removal of Water Contaminants by Using Agricultural Byproducts

The purpose of this project is to investigate agricultural byproducts (ABPs) as viable water treatment materials for removing water contaminants including pesticides, water disinfection byproducts (DBP), heavy metals along with other toxic metal elements, and other emerging water contaminants. Soybean hull, which is a renewable and abundant resource in Missouri, has been tested. This ABP was modified using different treatments to increase its ability to adsorb contaminants. Our laboratory experiment results show that most toxic heavy metal elements, including lead (Pb), can be removed from water by the treated soybean hulls in a short treatment time with high removal efficiency.

Ariel is a Junior at Missouri S&T pursuing a Bachelors of Science in Chemistry. She is currently working on water treatment research with Dr. Honglan Shi. After completing her degree at Missouri S&T, she plans to continue her education through graduate school.

Poster #10

Brandon Drennen

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

Why the Deletion of the RGCT Domain of the IQG1 Protein in Budding Yeast Causes Cell Death and Cytokinesis Failure?

The final step in cell division is cytokinesis. Cytokinesis must be coordinated with mitosis in order to prevent aneuploidy. Budding yeast are a good model organism for studying cytokinesis due to genetic and molecular tools and inexpensive growth medium. IQG1 is a protein that has been shown to regulate cytokinesis in budding yeast cells. The IQG1 protein contains four domains: IQ motifs that are needed for localization of IQG1 to the contractile ring, a CHD domain required for actin recruitment, a GAP domain essential for contraction, and a RGCT domain that was predicted to interact with formins Bni1 and Bnr1. However, we found that a deletion of the RGCT domain of the protein is still able to interact with the formins. Analysis of haploid spores showed that the RGCt is required for cell viability. Our current goal is to determine why the yeast cells die after the RGCT deletion.

Brandon is a junior majoring in Biological Sciences at Missouri University of Science and Technology. He grew up in Freeburg, MO and attended Fatima High School in Westphalia. He comes from a family of five brothers with loving parents and is the first one in the family to go to a 4 year college. Brandon is incredibly bright and treats others with both respect and tolerance. Brandon's future career goals are that he would like to either go to pharmacy school or attend grad school in hopes of creating new drugs that can combat human diseases such as cancer, AIDS, and many more.

Poster #11

Ethan Faber

Department: Geological Sciences and Engineering
Major: Geological Engineering
Research Advisor: Dr. Mohamed Abdelsalam
Advisor's Department: Geological Sciences and Engineering

Funding Source: National Science Foundation: IRES

Morphotectonic Evolution of the Lake Plateau Region: A Remote Sensing Approach

The Lake Plateau Region in East-Central Africa provides a great area to study both tectonics and geomorphology acting together. As one of the two main sources to The Nile, understanding how the processes that developed the Lake Plateau Region is very important to all that share the Nile. This work examines morphotectonic evolution by focusing on different types of lakes using remote sensing data (SRTM and Landsat) and published papers on the rift systems. The study shows that three types of lakes evolved from tectonics, East African Rift System. The first types are rift lakes formed on the western branch of the East African Rift System. The second type is a dammed dendritic lake due to the reversal of flow from the Congo. The last type is a large, shallow, circular lake between the East and West branches of the East African Rift System.

Ethan is a Geological Engineering graduating in May 2013. During his time at Missouri S&T, Ethan has worked with Engineers Without Borders and is the current Trip Leader for the Santiago, Honduras Program. In the summer of 2012, Ethan went to Ethiopia as a research assistant to study the effects of rifting in the Mid Ethiopian Rift. This fall, he will be pursuing a Master's of Geological Engineering at Colorado School of Mines to study the effects of mass wasting and its effects on society.

Poster #12

Hannah Frye

Department: Biological Sciences
Major: Chemistry, Biochemistry emphasis
Research Advisor: Dr. Robert Aronstam
Advisor's Department: Biological Sciences

Funding Source: cDNA Resource Center, Department of Biological Sciences

Modifying Muscarinic Signaling through Mutation of the Neurotransmitter Receptor M2's G-Protein

Muscarinic receptors are a class of G-protein-coupled receptors which recognize Acetylcholine to activate three main signaling systems. The path that the signal follows is determined by the G-protein with which the receptor communicates. This study in particular investigates two major receptor subtypes: M2 and M3. Chinese Hamster Ovary (CHO) cells stably transfected with human M2 muscarinic receptor DNA signal through the G-protein $G_{\alpha i}$, which normally inhibits formation of cyclic adenosine monophosphate (cAMP) and does not elicit any measurable calcium response. However, CHO cells transfected with M3 signal through the G-protein $G_{\alpha q}$, which produces a strong influx of extracellular calcium. To easily study the M2 pathway, we have developed and tested a chimeric protein of these two G-proteins, named $G_{\alpha qi}$. This increases the affinity of the altered protein to the M2 receptor. When M2 CHO cells are transfected with this altered DNA, the receptor follows a typical M3-$G_{\alpha q}$ pathway, producing a measurable calcium response.

Hannah is a second year student at Missouri University of Science and Technology studying Chemistry with a Biochemistry emphasis. She has been working in Dr. Robert Aronstam's Neurobiology laboratory for one year as an undergraduate researcher. On campus, Hannah is a Resident Assistant in Thomas Jefferson Hall, Public Relations Officer of the Missouri S&T International Genetically Engineered Machines Team, Secretary of the S&T student branch of American Chemical Society, and a brother of the Beta Delta chapter of Alpha Chi Sigma. This upcoming summer of 2013, she will be working for Cargill Corn Milling North America as a Quality Management Chemist Intern. She would like to thank Dr. Robert Aronstam, Adam Martin, Vanessa Kaighin and Hsiu-Jen Wang for their invaluable support and assistance throughout her research.

Michelle Gibson

Poster #13

Department: Civil, Architectural, and Environmental Engineering
Major: Environmental Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Environmental Engineering

Funding Source: John A. and Susan Mathes Endowed Chair of Environmental Engineering

Got Microbes? Finding the Link between Diet and Obesity

Obesity rates in the US continue to rise, with more than 30% of adults and around 20% of children are obese. Obesity is an independent risk factor for metabolic syndrome, cardiovascular diseases and other chronic diseases making it a number one cause of mortality and morbidity in the US and worldwide. A growing body of research suggests the involvement of the gut microbiota, specifically microbial products in triggering a low-grade chronic inflammation apart from the traditional view of poor diet and lack of exercise. In the current study, we studied the effect of "Western" diet on the cecal microbiota in pigs to understand the relationship between diet, gut microbiota and obesity. DNA sequencing targeting the 16S rRNA gene was applied to study the composition of microbial community. Preliminary results of the study demonstrate positive, statistically significant association between the diet, gut microbiota composition and obese phenotype.

Michelle is sophomore majoring in Environmental Engineering and minoring in Spanish. She has been involved in many campus organizations including Christian Campus Fellowship and Engineers without Borders. She is currently an Resident Assistant in the Quad.

Poster #14

Timofey Golubev

Joint project with Brock Hinton

Department: Physics
Major: Physics
Research Advisor: Dr. Alexey Yamilov
Advisor's Department: Physics

Funding Source: National Science Foundation (NSF)

Co-existence of Extended and Localized States in Thue-Morse Array of Optical Cavities

Thue-Morse sequence is a prime example of deterministic aperiodic systems with singular-continuous structure spectra. We report on a study of optical properties of a two-dimensional Thue-Morse-based array of micro-cavities. Under realistic conditions, tight-binding description is employed to investigate optical spectra of the system and spatial extent of its eigenstates. We observe coexistence of localized and delocalized states in narrow spectral regions and provide an explanation for this phenomenon.

Timofey is a junior at Missouri S&T and majoring in physics. He has been a member of the METIS research group advised by Dr. Alexey Yamilov since summer of 2012. His role in the research has been concentrated in studying the optical properties of the systems described above using the commercial package COMSOL Multiphysics. After receiving his bachelor's degree, Timofey plans to attend graduate school and pursue a career in research physics.

Tyler Herrell

Poster #17

Joint Project with Justin Lovelady

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

Funding Source: N/A

Through The Grapevine

Japanese beetles (JB), or *Popilia japonica*, are sweeping away agricultural crops across the nation. With grapes having a high value in the food industry, such as jellies, wine, and the raw product themselves, it is vital to protect these crops from this invasive beetle. A store bought lure can deter a small population, but on a larger scale, such as a 100 acre vineyard, it is not cost efficient or effective. A natural pesticide, B. thuringiensis (Bt), found in fertile earth is known to be a predator of the Japanese beetle. Using genetic engineering, predictions have been made that the Bt toxin gene can be introduce the into the grapes, then expressing the gene through the leaves will lead to a biological pesticide, controlling the infestation. Successful completion of this project will prevent millions of dollars' worth of damage and a more permanent solution to protect vineyards country wide.

Tyler is a junior at Missouri University of Science and Technology. He is studying Biochemical Engineering. He is a member of Sigma Nu Fraternity as well as the Honorary Fraternity Order of Omega. He is working on a future at a respected Engineering company.

Poster #14

Brock Hinton

Joint project with Timofey Golubev

Department: Physics
Major: Physics and Applied Mathematics
Research Advisor: Dr. Alexey Yamilov
Advisor's Department: Physics

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

Coexistence of Extended and Localized States in Thue-Morse Array of Optical Cavities

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Brock is a Junior at Missouri S&T, and is majoring in both Physics and Applied Mathematics. He has been working with the METIS research group, which is advised by Dr. Alexey Yamilov, since the beginning of spring semester 2012. His role in the research group has been to simulate the optical systems described above using MatLab programming. After obtaining his bachelor's degree, Brock plans to pursue a higher education in some field of medicine.

Poster #15

Avery Joseph

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

Funding Source: Grants acquired by Dr. Katie Shannon

Preventing Phosphorylation of Hof1 PEST Motif Affects Myosin Contraction During Ccytokinesis

The final step involved in cell division is the separation of a cell into two daughter cells by the process of cytokinesis. In budding yeast (*Saccharomyces cerevisiae*), the protein Hof1 is needed for efficient contraction of the actomyosin ring. Hof1 is phosphorylated during mitosis. To determine the function of this modification, mutations in the PEST domain that prevent Hof1 from being phosphorylated were created. When the mutant Hof1 was expressed from a plasmid, small bud necks and slower contraction rates were observed. Because we noticed some differences when wild type Hof1 was expressed from a plasmid instead of from the chromosomal locus, we wanted to test the effects of the Hof1 PEST phosphorylation mutations after integration into the chromosomal locus. We measured bud neck sizes and compared them to the wild type control. We also did time lapse microscopy on live cells tagged with Myo1-GFP to determine contraction rates.

Avery is a senior in the Biology department. She is an active member of Order of Omega and Zeta Tau Alpha. She has been conducting research with Dr. Shannon for two years and this is her second time presenting at the Undergraduate Research Conference. Avery plans to pursue a degree in Medicine post-graduation.

Poster #16

Nathaniel Kamrath

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Zhaozheng Yin
Advisor's Department: Computer Science

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

Markerless Motion Capture Using Kinect Sensors

Motion tracking technology in industrial applications is a very useful tool. It can be used to analyze the movements of assembly line workers in order to optimize their tasks or to train new employees or to help design machines for assembly lines. This paper investigates the use of multiple Kinect sensors as a method of motion tracking by simultaneously collecting data from multiple Kinects which are tracking the movements of the same human from different positions. Both the hardware and software which are required to do this are discussed.

Nathaniel is a junior studying Computer Science at Missouri S&T.

Poster #17

Justin Lovelady

Joint Project with Tyler Herrell

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

Funding Source: N/A

Through The Grapevine

Japanese beetles (JB), or *Popilia japonica*, are sweeping away agricultural crops across the nation. With grapes having a high value in the food industry, such as jellies, wine, and the raw product themselves, it is vital to protect these crops from this invasive beetle. A store bought lure can deter a small population, but on a larger scale, such as a 100 acre vineyard, it is not cost efficient or effective. A natural pesticide, B. thuringiensis (Bt), found in fertile earth is known to be a predator of the Japanese beetle. Using genetic engineering, predictions have been made that the Bt toxin gene can be introduce the into the grapes, then expressing the gene through the leaves will lead to a biological pesticide, controlling the infestation. Successful completion of this project will prevent millions of dollars' worth of damage and a more permanent solution to protect vineyards country wide.

Justin is in his third year at Missouri University of Science and Technology. He is studying Biochemical Engineering and pursuing a minor in Biology. He is a member of Delta Tau Delta Fraternity, in Undergraduate Research, a member of the Missouri S&T Jazz Band, and a Photographer for Rollamo Yearbook. His plans for after graduation are hopefully starting his career working for Monsanto, Environ or Anheuser Busch.

Poster #18

Anna Luce

Joint project with Candace Miller

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Matthew Thimgan
Advisor's Department: Biological Sciences

Funding Source: N/A

Identifying Novel Genes of Waking in Drosophila

Sleeping is a cyclic process regulated by our circadian rhythms and our sleep need, thus "clock" genes are a critical player in this process. One cause of the sleep disorder, insomnia, is attributed to heightened arousal of waking pathways, resulting in overactive waking instead of deficit in sleep. Genes involved in the waking process in humans can be studied in the model organism, *Drosophila melanogaster* (fruit flies), which have similar mechanism for regulating sleep. To identify novel genes involved in sleep regulation and waking pathways, we have mutagenized the genome of *Drosophila* with a chemical mutagen, Ethylmethane Sulfonate (EMS). These mutants are then screened for differences in their ability to respond to arousing stimuli, such as light and food. These experiments identified mutants with deficits in waking in response to stimuli and will give insight to why people have trouble initiating, maintaining, or have an insufficient duration of sleep.

Anna is a junior in Missouri S&T's Biology department, and works in the Drosophila Sleep Behavior Lab as well as being involved in many campus based organizations. Her biological interests include pre-medicine, emphasizing ophthalmology.

Poster #3

Kate Menke

Joint project Andrew Bromet

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

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

Effects of Low Flow and Stream Drying on Macroinvertebrate Communities

One concern with climate change for Missouri streams in the future is the possible loss of reliable flow, or increased stream drying. The two OURE students have examined biological communities along Mill Creek in Phelps County, Missouri. Mill Creek is a unique stream with a complex hydrology. There are several springs that feed the stream, which itself can lose water in some reaches because of the karst geology. Downstream from Wilkins Spring, the main spring in the watershed, the stream has a reliable flow. Certain upstream reaches have become intermittent or ephemeral given the drought in 2012. The main project goal of the students is to collect data on the biological communities along this stream, and determine the species composition and diversity of the biota. The data sets will prove useful for comparison of stream biota across a gradient of flow permanence. We have focused on collection and analysis of invertebrate communities thus far. There are large differences in the communities among the sites. The downstream, perennial reach has a typical Ozark stream community with many mayflies, caddisflies, and a high diversity of animal life. The upper reaches, with less reliable flow, have less diverse communities, with very different taxa. These upper reaches have some beetles, damselflies, and other taxa that are common to ponds and reservoirs, as opposed to streams.

Kate is a sophomore in Biological Sciences. She is a member of the soccer team and is involved in M-club, a service organization for collegiate athletes. In her free time she enjoys riding horses, cooking, and spending time outdoors.

Poster #19

Andrew Miller

Department: Chemistry
Major: Chemistry
Research Advisor: Dr. Paul Nam
Advisor's Department: Chemistry

Funding Source: Department of Energy

Development of Soybean Oil Based Polyurethane Rigid Foams for Structural Applications

As a part of the investigation to create polyurethane products from renewable biomass resources, polyurethane foams were produced from commercially-available polyols derived from modified soybean oils. For use in structural applications such as construction and casting, the rigid polyurethane foam was formulated to have high strength with the low thermal conductivity and density. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) experiments were carried out to assess the thermo-physical properties and composition of the foams produced. Density was measured by cutting geometric shapes. The mechanical properties and thermal conductivity were also evaluated. It has been shown that soybean oil derived polyols can replace the conventional petroleum-based polyol resins and produce quality polyurethane rigid foams with excellent structural performance.

Andrew is a senior in Chemistry program here at the Missouri University of Science and Technology. He has been involved in undergraduate research since the beginning of the summer of his sophomore year. Andrew is interested in the research and development of bio-based products and energy. His future plans are to attend graduate school.

Poster #18

Candace Miller

Joint project with Anna Luce

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Matthew Thimgan
Advisor's Department: Biological Sciences

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

Identifying Novel Genes of Waking in Drosophila

Sleeping is a cyclic process regulated by our circadian rhythms and our sleep need, thus "clock" genes are a critical player in this process. One cause of the sleep disorder, insomnia, is attributed to heightened arousal of waking pathways, resulting in overactive waking instead of deficit in sleep. Genes involved in the waking process in humans can be studied in the model organism, *Drosophila melanogaster* (fruit flies), which have similar mechanism for regulating sleep. To identify novel genes involved in sleep regulation and waking pathways, we have mutagenized the genome of *Drosophila* with a chemical mutagen, Ethylmethane Sulfonate (EMS). These mutants are then screened for differences in their ability to respond to arousing stimuli, such as light and food. These experiments identified mutants with deficits in waking in response to stimuli and will give insight to why people have trouble initiating, maintaining, or have an insufficient duration of sleep.

Candace is a sophomore biological sciences student at Missouri University of Science and Technology. She has participated in undergraduate research for one year under Dr. Thimgan. After graduation she plans on attending medical school to pursue a career as a Reproductive Endocrinologist.

Poster #20

Mathew Pollard

Department: Physics
Major: Physics
Research Advisor: Dr. Julia Medvedeva
Advisor's Department: Physics

Funding Source: NSF-CEMRI Proposal

Amorphous In-Sn-Zn-O

Amorphous oxide semiconductors (AOSs) exhibit a rare combination of high optical transparency and high electron mobility surpassing that of amorphous silicon by orders of magnitude. Owing to the high electronegativity of oxygen anions and, hence, their strong interaction with metal cations, the network of metal-oxygen polyhedra is preserved on going from the crystalline to the amorphous state. Yet, variations in the oxygen coordination and distortions in the cation-anion chains alter the structure of valence and higher-energy conduction bands making it possible to tune the AOS properties. We employ first-principles density-functional calculations to investigate the structural and electronic properties of amorphous Zn-Sn-In-O and to determine how tensile strain affects the metal-oxygen bond lengths, bond angles, and coordination numbers in the oxide. Next, we identify the defect states responsible for the conductivity by calculating the atomic contributions to the valence and conduction band wave functions and characterize the defects structurally.

Mathew was born September 14, 1993 and raised in St. Louis County near Fenton. He graduated from Rockwood Summit high school. Received Eagle Scout in the Boy Scouts of America and was admitted to Missouri University of science and Technology in 2012. Mathew is majoring in physics and started research for Dr. Medvedeva.

Poster #21

Yunsheng Qiu

Department: Physics
Major: Physics
Research Advisor: Dr. Yew San Hor
Advisor's Department: Physics

Funding Source: N/A

Superconductivity Induced by Nb Doping in Bi2Se3 Topological Insulator

Topological insulators (TIs) are new emerging quantum materials with insulating bulks but conducting Dirac surface states. Doped TIs have depicted variety of bulk electronic properties. Here, we show that by Nb doping in Bi_2Se_3 TIs, we can induce superconductivity in the TIs with T_c ~ 3.2 K without destroying the topological surface states. Zero resistivity and Meissner effect of the Nb-doped Bi_2Se_3 TIs will be shown. Our heat capacity measurement on the Nb-doped Bi_2Se_3 suggests that this newly discovered superconductor could be a topological superconductor, which has bulk superconductivity but Majorana fermionic surface conductivity.

Yunsheng is a cooperative cultivation student with Harbin Industrial Institute of Technology. He came to MS&T last summer and spent time working with Dr. Hor on the doped topological insulator project.

Carlos Rivera

Poster #22

Department: Biological Sciences
Major: Biological Sciences
Research Advisor: Dr. Matthew Thimgan
Advisor's Department: Biological Sciences

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

Decreased Lipid Metabolism Provides Insight into Sleep Mechanisms

Regulation of sleep and wake cycles is critical to maintain consolidated and restorative sleep. We have identified a novel lipid metabolism pathway as a key player in sleep regulation, potentially through energy management. CPT 1 is the protein channel that allows a range of fatty acid chain lengths to enter the first membrane of the mitochondria, then ultimately to undergo Beta-Oxidation and then to oxidative phosphorylation. When levels of Cpt1are knocked down in the adipose tissue, flies robustly increase wakefulness when presented with starvation conditions, which is not seen in parental controls. We hypothesize that metabolic factors signal the brain to induce wakefulness. We can use this model system to test whether these factors change prior to or during increased wakefulness.

Carlos is a 22 year old graduating senior in Biological sciences. He has researched with Dr. Thimgan since the beginning of fall semester of 2011.

Colin Ryan

Poster #23

Department: Materials Science and Engineering
Major: Ceramic Engineering
Research Advisor: Dr. Richard Brow
Advisor's Department: Materials Science and Engineering

Funding Source: National Science Foundation Grants DMR-0305202 and DMR-1207520

Conversion of Rare-Earth Doped Borate Glass to Rare-Earth Phosphate Solid Solution Compounds

This study observed and characterized a new method of forming Rare-Earth phosphate ($REPO_4$) compounds using the dissolution of a doped borate glass in a potassium phosphate solution to precipitate X-ray amorphous $REPO_4 \cdot 2H_2O$ on what was the surface of the glass. This was then heat treated at 700°C to dehydrate and crystallize into $REPO_4$. X-ray diffraction and Raman spectroscopy showed the method's ability to form solid solutions in binary $REPO_4$ systems. Scanning Electron Microscopy showed the formation of hollow spheres of $REPO_4$ when using glass microspheres in the dissolution-precipitation process, indicating the ability to control final form through the form of the initial glass. Finally, the fluorescence properties of the $(Eu,La)PO_4$ system was measured, indicating an optimal Eu/(Eu+La) of 0.05.

Colin is a Senior in Ceramic Engineering and has been working with Dr. Brow's research group for 2 years. He is a member of Keramos, Alpha Sigma Mu, Tau Beta Pi, and Tau Beta Sigma. He is graduating in May and plans to pursue a PhD in Material Science, focusing on Glass Science.

Poster #24

Megan Schuller

Department: Chemistry
Major: Chemistry with Biochemical Emphasis
Research Advisor: Dr. Yinfa Ma
Advisor's Department: Chemistry

Funding Source: Missouri S&T Opportunities for Undergraduate Research Experiences (OURE) Program
Department of Chemistry
Environmental Research Center

Early Breast Cancer Detection by Quantitative Determination of Potential Biomarkers in Urine Samples Using Capillary Electrophoresis

Breast cancer is a disease that impacts the majority of the female population in the world. Unfortunately, the most reliable way of detecting this cancer is through tissue samples. This means of testing is very invasive and painful to the patient; therefore it is used as a last resort. Due to the fact that symptoms are often not noticeable until the later stages of progression, tissue samples are generally taken too late. The goal of this research project is to develop a capillary electrophoresis (CE) technique and apply the technique to detect the presence of breast cancer by using urinary biomarkers. After identifying potential biomarkers, we aim to validate this technique as a means of early detection. The experimental conditions, the current stage of the project, and future experimental designs will be presented at the conference.

Megan is a senior at Missouri University of Science and Technology. Her studies are in chemistry with a biochemistry emphasis and she is involved with organizations such as Phi Sigma Pi, a national honors fraternity, Alpha Chi Sigma, a professional chemistry fraternity, and Scrubs, the campus premed organization. Megan's goals are to attend Duke University School of Medicine and become a pediatric oncologist.

Poster #25

Lisa Simone

Department: Biological Sciences
Major: Biological Sciences
Research Advisors: Dr. Nuran Ercal and Dr. Shakila Tobwala
Advisor's Department: Chemistry]

Funding Source: N/A

Effects of the Novel Thiol Antioxidant N-acetylcysteine Amide (NACA) on Reversing Sodium Selenite-induced Cataracts in Rats

More than half of Americans will have had cataracts or cataract surgery by the age of 80. One of the hypotheses for this clouding of the eye lens is the oxidation and consequent aggregation of proteins in the lens. In this study, a novel thiol antioxidant, N-acetylcysteine amide (NACA), was used as treatment for sodium selenite-induced cataracts in rats. Half of the 68 rats were sacrificed at 3 weeks after sodium selenite or buffer intraperitoneal injection, and the remaining 34 were sacrificed at 7 weeks. Pictures of the cataracts were taken using a slit-lamp microscope, and the cataracts were assigned grades of severity according to Marthur's method. After dissection, the lenses were examined for antioxidant levels by glutathione (GSH/GSSG) assay, lipid peroxidation by malondialdehyde (MDA) assay, and proteins by western blot. From these parameters, the effects of NACA on reversing sodium selenite-induced cataracts in rats were evaluated.

Lisa will be receiving her B.S. in Biological Sciences with a minor in Chemistry in May 2013 from Missouri S&T. During her time at S&T, she has been a proud member of the Cheer Team and has enjoyed volunteering for various events on campus such as Expanding Your Horizons and Science Olympiad. Lisa is also grateful for the opportunity to have worked in Dr. Nuran Ercal's biochemistry research laboratory during her last three semesters. After graduation, she will be attending Washington University School of Medicine in St. Louis for their Doctor of Physical Therapy program, starting in August 2013.

Poster #26

Charles Threadgill

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

Funding Source: N/A

Generating a Drought Tolerant Strain of Bradyrhizobium Japonicum

The primary goal of the work will be to produce strains of *Bradyrhizobium japonicum* that has increased salt tolerance through acquiring the genes to produce betaine. The genes coding for betaine will be introduced to the organism through a plasmid. The mutant strains will have marked salt resistance and will be used in soybean plants to test for drought resistance. Along with the production of modified strains, the natural tolerance of each will be tested.

Charles is a junior in the Biological Sciences Department. He is member of phi sigma and is active in the department working as a teaching assistant for freshmen labs. He has been working on this project for a year and intends to continue his work throughout the summer.

Poster #27

John Volosin

Department: Business and Information Technology
Major: Information Science and Technology
Research Advisor: Dr. Bih-Ru Lea
Advisor's Department: Business and Information Technology

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

Measuring Impact of a Banking and Insurance Performance Dashboard

One of the many roles of a community bank is to understand the needs of the communities in which it serves. With these communities making available a tremendous amount of data, information management becomes critical to analyzing a constantly changing environment. Using the powerful drill-down capabilities of a performance dashboard, this research project will monitor the following three key performance indicators:

1) How the typical service area compares economically with other local Missouri counties, as well as the nation as a whole;

2) Insurance policies that customers purchase monthly to protect personal and business property;

3) Investment performance over time to demonstrate the diversity and longevity of a community bank.

Taking into cost into account, this research project will also develop a method for displaying the same bank and insurance agency statistics in a concise and cost-effective manner as an alternative to using a performance dashboard.

John is a part time student. John has maintained full-time employment in a banking environment for over five years. He will soon complete a Bachelor of Science degree in Information Science and Technology with an emphasis in Enterprise Resource Planning and a minor in business. John's goal is to pair his work experience and education with his understanding of technology and business in a way that is both personable and meaningful to the people with which he interacts.

Arts and Humanities
Poster Session

Abstracts

Mary Frey

Poster #28

Department: History and Political Science
Major: History
Research Advisor: Dr. Larry Gragg
Advisor's Department: History and Political

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

From Frontier Town to America's Playground: 50 Years of Promotion by the Las Vegas Nevada Chamber of Commerce

In less than fifty years from its founding, Las Vegas, Nevada transformed from a small stop on a major railway to a booming metropolis known as a fun getaway with beautiful sights, quick marriages, and legal gambling. This was all possible through the work of the Las Vegas Nevada Chamber of Commerce, particularly its leading members Walter Bracken and Maxwell Kelch and its hired advertising agency Steve Hannagan and Associates. These men worked first to build Las Vegas and make it known around the country, and then to brand it, make it readily recognizable, in order to draw thousands of tourists.

Mary is a senior in the Department of History and Political Science. She is also working on a minor in German. She will be attending University College Dublin in the fall to earn a Masters in Archaeology. She greatly enjoyed working on this project with Dr. Gragg and hopes to work with him again in the future.

Laura Welsh

Poster #29

Department: History & Political Science
Major: History
Research Advisor: Dr. Larry Gragg
Advisor's Department: History & Political Science

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

The Promotion of Las Vegas by Local Newspaper Editors (1905-1950)

Everyone knows the extravagant Las Vegas of today, but who knows the city's development from its humble beginnings as a desert railroad town? This research explores how local newspaper editors used their papers to advance Las Vegas. Based on *Las Vegas Age* and *Las Vegas Review-Journal* articles, prominent editors acted as boosters for the city's development during the first half of the twentieth century by emphasizing its attractions, supporting the Chamber of Commerce, and advocating for town improvements. By the 1950s, the residents of Las Vegas had attempted to promote several ventures such as agriculture, mining, and natural desert wonders. However, Las Vegas was widely unknown throughout the country until the construction of Hoover Dam in the early 1930s. The newspaper editors used their media to promote Las Vegas construction and organizations, encourage resident participation, and downplay unfavorable news of the city.

Laura is a junior studying for her bachelor's degree in history. She works in the university's History and Political Science Department and the Missouri S&T Archives. She is a member of Phi Alpha Theta History Honor Society. After graduation, she plans to attend graduate school to pursue a degree in public history or museum studies.

Research Proposal
Poster Session

Abstracts

Poster #30

Dylan Courtney

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

Funding Source: N/A

Early Detection of Colon Cancer Using a Synthetic Biological System in E. coli

Colon cancer is one of the leading causes of cancer related deaths; however, an early diagnosis can often lead to a complete recovery. Some early tests for colon cancer detect the presence of blood stool samples. The small amounts of blood in stool are often unnoticed by patients. Utilizing *E. coli* as a chassis it may be possible to create a genetic system to detect these trace amounts of blood in the intestine utilizing hemophore proteins originally found in *Serratia marcescens*. The signal generated from this detection of blood would then be amplified, spreading to other bacteria and causing a high level of expression of a chromoprotein. This protein when expressed in ample amounts would cause a change in the color of one's feces. The *E. coli* expressing this system could potentially be delivered in a yogurt to the intestines of people with high colon cancer risk.

Dylan is a sophomore in Chemical Engineering intrigued by the microbiology based processes essential to biochemical engineering. He is an active member of the iGEM student design team, which focuses on utilizing synthetic biology principles to create biological machines. Dylan is interested in the possibility of research as a career path, and plans to utilize the experience he has gained as an undergraduate to pursue a degree in graduate school, hopefully being able to continue his interdisciplinary education combining principles of both microbiology and chemical engineering.

Poster #31

Stephanie Deters

Joint project with Reid Herndon

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

Funding Source: National Science Foundation

Desert Stars – Strikingly Curious Fe-Oxide Pseudomorphs of the White Desert, Farafra, Egypt

The purpose of this project is to determine the original and current mineralogy of the strikingly curious "Desert Stars" of Farafra, Egypt. The Desert Stars are Fe-oxide pseudomorphs. A pseudomorph is a crystal with the composition of one mineral with a crystal form that mimics a different mineral. The Desert Stars display spectacular crystal forms, including cubic, bladed, and stellate, thus the name *Desert Stars.* Once the mineralogy of these pseudomorphs has been established the conditions that led to the deposition of the original minerals followed by their replacement by another mineral need to be determined. Polygonal faulting, chalk lithology, and ionized fluids are considered depositional condition factors in Desert Star formation, which need to be investigated in this project.

Stephanie is a senior in Geology and Geophysics from St. Louis, Missouri. She is President of the C.L. Dake Geological Society and founder of French Club. Stephanie became in involved in this project in Fall 2012, when she was invited to join the Desert Eyes team, a multi-university geology research project in Egypt focusing on structural geology, sedimentology, tectonics, and mineralogy (funded by NSF). Stephanie's area of expertise is in mineralogy, and she will study the stellate crystals.

Poster #32

Tiffany Edwards

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

Funding Source: N/A

Early Detection of Pre-Malignant Cancer Cells using a VEGFR2-Wzb Angiogenic Receptor in E. Coli

The development of new blood vessels (angiogenesis) is a requirement for tumor growth and metastasis and the acquisition of this trait is an early indicator of cellular malignancies. A number of angiogenic factors have been discovered that tightly regulate angiogenesis. Vascular endothelial growth factor (VEGF) is one of the angiogenic factors. VEGF binds to a tyrosine kinase receptor which causes it to dimerize and be activated via transphosphorylation. This project proposes to design a synthetic system that will fuse the extracellular region of the VEGF receptor to the Wzb receptor of E. coli. Using VEGFR-Wzb receptor the system will be able to detect excessive amounts of VEGF that may be indicatory of tumor malignancy. This system will relay a signal to turn on a florescent protein that can easily be detected once VEGF has been bound to the receptor. This will allow for an early, non-invasive detection of pre-malignant cells.

Tiffany is a senior in the biological sciences department. She works for Dr. Mormile working on Antibiotic resistance studies from isolates in Soap Lake, Washington. She plans on attending the Missouri University of Science and Technology to continue her education as a Masters student. She is actively involved in several organizations on campus including Phi Sigma and AXE.

Poster #33

Anamaria Gaitan

Department: Biological Sciences
Major: Biological Sciences
Research Advisors: Dr. David Westenberg and Dr. Katie Shannon
Advisor's Department: Biological Sciences

Funding Source: N/A

E.coli Administration of GLP1 in the Presence of Glucose

Glucagon like peptide 1 (GLP1) has been used in recent studies as an experimental treatment for Type 2 diabetes. Type 2 diabetes is characterized by low insulin production of beta cells in the pancreas coupled with insulin resistance in muscle, liver, and fat cells. Patients with type 2 diabetes usually have to take medications that decrease sugar up take and/or increase insulin production. My project proposal uses synthetic biology to induce E.coli bacteria to create GLP1 in the presence of glucose. GLP1 is a naturally occurring chemical in the body. I predict, in the presence of glucose, E.coli will produce GLP1 and the resulting reactions when GLP1 binds to GLP1 receptors will stimulate the proliferation of beta cells and also induce existing beta cells to create insulin. E.coli was chosen because it already exists in human gut flora and is easy to manipulate using a lac operon repressor.

Anamaria is a senior majoring in Biological Sciences. In addition to this project proposal, she is also participating in undergraduate research with Dr. Ercal. The research she is involved in is looking into an experimental ultrasound delivery system of eye drug administration to rats. On and off campus Anamaria is involved with many organizations to include The Missouri Miner as the Photo and Entertainment editor, Military Aerospace Society, Blue Sabres, and Civil Air Patrol. As a student she also works part time at The Center as a lifeguard and as a Red Cross Lifeguard Instructor. Anamaria will be graduating this upcoming May with a Bachelor's of Science degree. Upon graduation she will join the United States Air Force as a 2nd Lieutenant and station in Colorado Springs at Schriever AFB as a Space Operations Officer.

Poster #31

Reid Herndon

Joint project with Stephanie Deters

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

Funding Source: National Science Foundation

Desert Stars – Strikingly Curious Fe-Oxide Pseudomorphs of the White Desert, Farafra, Egypt

The purpose of this project is to determine the original and current mineralogy of the strikingly curious "Desert Stars" of Farafra, Egypt. The Desert Stars are Fe-oxide pseudomorphs. A pseudomorph is a crystal with the composition of one mineral with a crystal form that mimics a different mineral. The Desert Stars display spectacular crystal forms, including cubic, bladed, and stellate, thus the name *Desert Stars.* Once the mineralogy of these pseudomorphs has been established the conditions that led to the deposition of the original minerals followed by their replacement by another mineral need to be determined. Polygonal faulting, chalk lithology, and ionized fluids are considered depositional condition factors in Desert Star formation, which need to be investigated in this project.

Reid is a sophomore in Geology from Paducah, KY. He is an active member of Marching, Jazz, Concert band and is a member of the Orchestra. Along with his activity in the band he is also active member of the KKΨ Band Service Fraternity. Reid was added onto the project in early Spring 2013 to assist and continue Stephanie Deters work on the Desert Eyes team, a multi-university geology research project in Egypt focusing on structural geology, sedimentology, tectonics, and mineralogy (funded by NSF) Reid was brought onto the team for his proficiency in Mineralogy.

Poster #34

Levi Malott

Joint project with Pasha Palangpour

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Sriram Chellappan
Advisor's Department: Computer Science

Funding Source: National Science Foundation

Investigating Internet Usage Behavior Modeling: A Multifractal Approach

Multifractal analysis has been implemented in many areas of research, such as network modeling, network intrusion detection, processing neural information, DNA sequence identification, turbulence modeling and many more. The success of this approach is because of its ability to identify persistent correlations on aperiodic, highly irregular time series. Our method is to collect real Internet usage data and then apply multifractal analysis techniques for each individual user. The results will be used as a feature vector for traditional machine learning techniques to identify a specific user given unlabeled Internet data. The proposed method could be applied to the aforementioned research areas plus applications of detecting legitimacy of network users, content delivery discrimination, theft alert, target tracking and other similar areas.

Levi is currently an undergraduate student enrolled in the Missouri University of Science and Technology Computer Science program. He is expecting to graduate in Fall of 2014 and continue his education in the Computer Science Doctoral program. He is currently a Research Assistant in the Social Computing Lab under the supervision of Dr. Sriram Chellappan.

Poster #34

Pasha Palangpour

Joint project with Levi Malott

Department: Computer Science
Major: Computer Science
Research Advisor: Dr. Sriram Chellappan
Advisor's Department: Computer Science

Funding Source: National Science Foundation

Investigating Internet Usage Behavior Modeling: A Multifractal Approach

Multifractal analysis has been implemented in many areas of research, such as network modeling, network intrusion detection, processing neural information, DNA sequence identification, turbulence modeling and many more. The success of this approach is because of its ability to identify persistent correlations on aperiodic, highly irregular time series. Our method is to collect real Internet usage data and then apply multifractal analysis techniques for each individual user. The results will be used as a feature vector for traditional machine learning techniques to identify a specific user given unlabeled Internet data. The proposed method could be applied to the aforementioned research areas plus applications of detecting legitimacy of network users, content delivery discrimination, theft alert, target tracking and other similar areas.

Pasha is currently an undergraduate student enrolled in the Missouri University of Science and Technology Computer Science program. He is expecting to graduate in Fall of 2013 is currently a Research Assistant in the Social Computing Lab under the supervision of Dr. Sriram Chellappan. His research interests include Computer Security, Machine Learning, and Computer Vision.

Sarah Rommelfanger

Poster #35

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

Funding Source: N/A

Using Microbes to Filter Air in the International Space Station

On human ventures into space like on the International Space Station, efficient recycling of air is critical to survival. Currently, the HEPA system filters air while electrolysis produces oxygen from water, both of which are energy-expensive processes. Phytofiltration uses plants and soil microbes to efficiently sequester harmful compounds and CO2 and produce oxygen in the same system with little energy input. While this system is efficient, space on the ISS is limited. My research goal is to devise a microbial community with the same functions as a phytofiltration system, including a) activated carbon b) the soil microbes present in a phytofiltration system and c) photosynthetic microbes that fulfill the multicellular plant's role in the system. This system would have all the advantages over the HEPA and electrolysis processes that phytofiltration does, but be more compact.

Sarah is a transfer student that arrived at Missouri S&T in January of 2012. She is currently a senior Biological Sciences major and President of the iGEM design team. She participates in on-campus research, and has also been award two summer research internships, one in 2011 at the University of California at Riverside one in 2013 at the National Renewable Energy Laboratory in Golden, CO. She aspires toward a career in research where she can utilize her experience in genetic engineering toward goals of environmental sustainability.

Larry Tolliver

Poster #36

Department: Biological Sciences
Major: Biological Sciences
Research Advisors: Dr. David Westenberg and Dr. Katie Shannon
Advisor's Department: Biological Sciences

Funding Source: N/A

Transgenic Modification of Sunflowers for More Efficient Phytoremediation of Radionuclide Contaminated Soils

Phytoremediation, the process of using plants to clean up a contaminated area, is already in practice for contaminants such as plastics or heavy metals. In particular, the sunflower (*Helianthus annuus*) has been explored as a bioremediator of radionuclide-contaminated soils, especially uranium contaminated sites. The phytoremediation of uranium by sunflowers can be made more efficient by adding a chelating agent such as EDTA to the contaminated soil. However, EDTA is suspected to be a potential environmental pollutant itself and a biodegradable chelating agent such as citric acid should be used instead. By creating a transgenic sunflower that produces its own citric acid, the need for an external source of citric acid could be eliminated, streamlining the phytoremediation process. Such a transgenic sunflower could have important applications in sites with heavy uranium contamination such as uranium mines, nuclear accident sites and warzones where depleted uranium rounds were used.

Larry is a senior in Biological Sciences and will be graduating in May. He plans on attending graduate school at Missouri S&T for a master's degree in Applied and Environmental Biology.

Engineering
Poster Session

Abstracts

Poster #37

Yun Bai

Department: Mechanical & Aerospace Engineering
Major: Mechanical Engineering
Research Advisor: Dr. Frank Liou
Advisor's Department: Mechanical & Aerospace Engineering

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

A Study of Metal Properties Repaired by Laser Deposition

Direct Laser Deposition Technology is an additive manufacturing process which directly manufactures a fully dense metal part from CAD model without intermediate steps. The metal powder is delivered into a molten pool created by the focused beam of a high-power laser beam melting the target material. The resulting deposits can be used to build metal parts in a variety of applications. The repair of damaged metal parts is potential application of Direct Laser Deposition Technology. In this research, the advantages of Direct Laser Deposition Technology over traditional welding repair will be studied with respect to the material properties such as tensile strength.

Yun is a senior student in Mechanical Engineering at Missouri University of Science and Technology. He started working on his undergraduate research by participating in OURE program. He also worked in Dr. Frank Liou's LAMPS lab as a research assistant. Yun's research interests are Additive Manufacturing, Rapid Prototyping and CAD/CAM. He will pursue a higher degree in the field of Additive Manufacturing after graduation.

Tyler Bick

Poster #38

Department: Civil, Architectural and Environmental Engineering
Major: Civil Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Environmental Engineering

Funding Source: John and Susan Mathes Endowed Chair in Environmental Engineering

Improving Microtask Platforms with the Intent of Alleviating Poverty

Crowdsourcing has a tremendous potential for bringing substantial economic improvement into both developed and developing regions of the world. Although the technology and ability to solve complex problems has existed in various forms, crowdsourcing has not reached its potential as a formidable business opportunity. Inefficiencies in current crowdsourcing technology are limiting the growth of potential businesses in both the developed and developing world. This study takes the simple crowdsourcing task of grading elementary spelling tests in order to take a deeper look at the problems and inefficiencies of typical crowdsourcing business. Current crowdsourcing platforms may not be utilized because of the difficult nature of programming the tasks. Another hurdle lies in defining a good method to solve a problem. If these problems can be addressed, crowdsourcing may prove to be a powerful tool in combatting poverty on a large scale.

Tyler is a senior in civil engineering. After taking a course from Dr. Oerther and learning about his research interests, he decided to get involved with Dr. Oerther and Mr. Schriner's Pulacloud.

Poster #39

Steve Brugere

Department: Geological Sciences and Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Runar Nygaard
Advisor's Department: Geological Sciences and Engineering

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

Bond Strengths in Well Design

In drilling operations fluid is used to create hydrostatic pressure to prevent the influx of formation fluids. If the weight of the fluid is too great it can produce a pressure exceeding formation fracture pressure. This will create fractures in the formation and allow fluid migration into the formation or lost circulation. This reduces the hydrostatic head and can lead to a kick or blow out. Cement can be pumped down hole to seal the fractures, but if the fluid's weight is increased this might fracture the seal. Knowing the bond strength between cement and formation can be used to prevent this from occurring. After setting casing and while drilling deeper the process of circulating fluid can create a temperature gradient between the cement and casing which causes a bond stress. If the bond is broken channeling can occur. Knowing the bond strength between cement and steel casing can be used to prevent de-bonding.

Steve is a senior at Missouri University of Science and Technology and will be graduating in May 2014. He majors in Petroleum Engineering and he is completing his research under the guidance of Dr. Runar Nygaard, instructor of well drilling and casing design and Ben Weideman, a graduate student whose research will incorporate the results from Steve's research. He is the treasurer for S&T's Society of Petroleum Engineers chapter and is an active member in the petroleum honors society, Pi Epsilon Tau, and the geological honors society, Sigma Gamma Epsilon. Steve has completed a 7 month co-op with Ameren Illinois working in their Gas Storage Department earning him experience with drilling operations, well workovers, and industry networking. Steve is looking forward to his internship this summer working with Kinder Morgan's drilling department in Houston, Texas.

Min kyung Cho

Poster #40

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

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

Fibril Formation by Human and Bovine Insulin Fragments

Many diseases such as Alzheimer's and Parkinson's are linked to amyloid deposits, which are insoluble protein aggregates. It is known that their formation damages tissue, but the kinetics of their formation is not well understood. Factors affecting protein aggregation include concentration, agitation, and pH. Bovine and human insulin fragments known to form aggregates were synthesized. Solutions of the fragments were frozen and thaw to induce the formation of fibrils. In addition, experiments were designed to incubate solutions of the fragments in a water bath under constant aeration. Unfortunately, this set of experiments has not been completed yet. Congo and ThT staining were used to detect fibril formation but the results were inconclusive.

Min kyung is from South Korea, is a senior in Chemical Engineering at Missouri University of Science and Technology. She is the president of Korean Student Association for 2012-2013. She is graduating in May, 2013 and plans to study cosmetic engineering in graduate school.

Poster #41

Matthew Glascock

Department: Mechanical & Aerospace Engineering
Major: Aerospace Engineering
Research Advisor: Dr. Josh Rovey
Advisor's Department: Mechanical & Aerospace Engineering

Funding Source: NASA Missouri Space Grant Consortium

Monopropellant Exhaust Gas Manifold Study

In the study of a dual-mode plasma space propulsion concept combining the benefits of chemical and electrical propulsion in a single monopropellant system, the observation of plasma formation in monopropellant exhaust gas mixtures is necessary. This demands a manifold system capable of delivering varying mixtures of N2, CO2, and H2O into a vacuum chamber, and interfacing with the current laboratory experiment equipment. The approach to this requirement was to design a system that regulates the three gases separately and, using mass flow controllers, mix the three gases before injecting them into the chamber. This task proved trivial for the N2 and CO2 gases, yet more challenging for the mixing of gaseous H2O. A number of hardware solutions were investigated in the interest of designing the least expensive system possible. The result is a manifold system meeting the requirements and allowing for continued study.

Matt is a Junior student currently in pursuit of an Aerospace Engineering Bachelor's degree, with a minor in Physics. He has enjoyed a very successful academic career thus far. Outside of the curriculum, he is involved in the Missouri Satellite Project student research team on campus at Missouri S&T, developing a small satellite. He is also conducting undergraduate research in the space propulsion field in the Aerospace Plasma Laboratory on campus. Matt has plans to attend graduate school for a Masters degree in the Aerospace Engineering field following graduation in May 2014. His research interests lie mainly in the field of electric space propulsion, and its application to small satellites.

Poster #42

Tommy Goodwin

Department: Civil, Architectural, and Environmental Engineering
Major: Environmental Engineering and Biological Sciences
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: John A. and Susan Mathes Endowed Chair of Environmental Engineering

Determining the Effectiveness of Bio-sand Filtration to Remove Coliforms from Drinking Water along the Tapajos River in Para, Brazil

The Tapajos River resides on a flat plain where when the rainy season commences the water level rises several feet vertically causing the coasts to expand sfrom half a mile across to several miles across. This causes people living along the river to be unable to attain clean water easily. Bio-sand filters are used by people along the river to obtain consumable drinking water. The objective of this research is to determine whether the sand filters are effectively removing contaminants from the water. The method used to determine the amount of coliforms present in the drinking water is the m-ColiBlue24© assay. Using this method, filtered drinking water is passed through a filter paper which is applied to a petri dish with an ampule of m-ColiBlue24© broth and incubated. After 24 hours, colonies were counted in the dish; colonies that grew blue indicated E. coli colonies whereas red and blue colonies both indicated total coliforms.

Tommy is a senior in Environmental Engineering and Biological Sciences and is planning on pursuing a career in providing clean drinking water to impoverished peoples in order to raise their standard of living. Tommy is currently involved in Engineers without Borders where he is the chlorination team lead for a project that is providing water to roughly 2200 people in Nahualate, Guatemala. He has instructed the Fundamentals of Environmental Engineering lab for three semesters and plans to continue on with teaching sometime in the future. Previously Tommy did research with Dr. Oerther in microbial source tracking in attempts to determine the origination of E. coli spikes at Lake of the Ozarks, MO. Tommy has a strong background with water treatment and continues to push forward into new ventures in his specialized area.

Poster #43

John Heatherly

Department: Geological Sciences and Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Runar Nygaard
Advisor's Department: Petroleum Engineering

Funding Source: N/A

Geothermal Energy

In 2010, Missouri University of Science and Technology began an effort to update the methods used to supply energy on campus. The current system uses coal and wood fired boilers to produce steam that provides power through a turbine. These boilers are outdates, have a high operational cost, and offer limited ways to control pollution. A new geothermal systems that provides ground source heat is currently being constructed across campus. The project includes nine well fields, a geothermal loop, ground source heat pump chillers, three local geothermal plants, and an update to the current chilled-water system. Each of these plants and their associated well fields will be responsible for providing energy to select buildings on the Missouri S&T campus. When completed in 2014, the project is expected to cut energy and water use, reduce carbon dioxide emissions, and offer savings in energy and operational costs.

John Heatherly is currently a third year student at Missouri S&T studying petroleum engineering.

Poster #44

Ryan Jones

Department: Material Science Engineering
Major: Ceramic Engineering
Research Advisor: Dr. Richard Brow
Advisor's Department: Ceramic Engineering

Funding Source: Graduate Assistance in Areas of National Need (GAANN)

CaO in Optical Waveguides

Optical waveguides have been formed by using femtosecond laser pulses in ZnO-P_2O_5 glasses. This system is useful for optical applications such as waveguides, but is not chemically durable. It is believed that the addition of alkaline-earth oxides will add chemical durability to the system while maintaining the waveguide forming properties. In this project, CaO is considered as a potential additive to the ZnO-P_2O_5 glass system. To facilitate the selection of a glass composition for waveguides a glass forming ternary diagram consisting of CaO-ZnO-P_2O_5 was created. Glass compositions for the diagram were melted twice for a total of three hours. Properties such as glass transition temperature (T_g) and density were recorded for each composition. Glasses with partial crystallization or phase separation were recorded separately from pure glass. The bottom limit for glass forming capability is near the 30% P_2O_5 line. The density of a glass decreases with increasing CaO content.

Ryan is a senior in the Ceramic Engineering department and Missouri University of Science and Technology. He has been working under Dr. Brow for two years in glass research. Shortly after starting work, he worked only with Charmayne Smith on her projects. In the summer of 2012, he was given his own research project: to develop a glass forming diagram of the ternary system of ZnO-CaO-P_2O_5.

Poster #45

Julia Kuebrich

Department: Environmental Engineering
Major: Environmental Engineering
Research Advisor: Glenn Morrison
Advisor's Department: Environmental Engineering

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

Methamphetamine Contamination in Household Materials and the Effect of Skin Oil

The production of methamphetamine releases harmful chemicals into the air, which can then diffuse into and accumulate within the building structure, and later be 're-emitted' and cause absorption of methamphetamine into furnishings, clothing, and children's toys. People living in post-laboratory homes could be exposed to harmful levels of methamphetamine. In this research, we exposed clothing, skin oil contaminated clothing, furnishings, and children's toys to vapor phase methamphetamine in a laboratory chamber. We were able to determine the relationship between the concentration of methamphetamine in air (40ppb) and that which will accumulate in furnishings, clothing, skin oil, and children's toys. An implication of our findings is there is a risk of children ingesting more than 0.3µg/kg/day (California reference dose, actual values of child ingestion could be as great as 2.12 µg/kg/day for upholstery material) if they are mouthing exposed materials.

Julia Kuebrich is currently pursuing a Bachelor's of Science at Missouri S&T in Environmental Engineering with a minor in Geological Engineering. Originally from Alton, IL, she plans to graduate in May 2013.

Poster #46

Matthew Laurent

Department: Mechanical and Aerospace Engineering
Major: Mechanical Engineering
Research Advisor: Dr. Daniel Stutts
Advisor's Department: Mechanical and Aerospace Engineering

Funding Source: Mechanical and Aerospace Engineering

Parametric Pendulum

Although *parametric resonance* occurs in areas disparate as quantum mechanics, cosmology, and the mechanics of machinery, very few students in the physical sciences and engineering are ever exposed to the concept. The presence of time-varying coefficients in the differential equations describing a parametrically excited system leads to a rich set of dynamical behaviors, including counter-intuitive stability or instability. The study presented here describes a simple mechanical system consisting of a pendulum suspended on a pivot driven harmonically up and down by a slider-crank mechanism, and the mathematical model describing the angular position of the pendulum as a function of time. Floquet analysis is used to predict both the presence of stable and unstable parametric combinations of angular velocity and slider-crank length for the up and down pendulum equilibrium pendulum positions. These predictions are verified experimentally using a machine designed and built for this purpose.

Matthew transferred to Missouri S&T in Fall of 2010 and will be graduating in May 2013 with a B.S. in Mechanical Engineering. This is his second undergraduate research that he has done. He has also been a very involved member in Missouri S&T's Formula SAE design team, and held office as Team Leader from June 2011 to June 2012.

Poster #47

Edward Norris

Department: Nuclear Engineering
Major: Nuclear Engineering/Computer Science
Research Advisor: Dr. Xin Liu
Advisor's Department: Nuclear Engineering

Funding Source: Nuclear Regulatory Commission Faculty Development Grant

Scintillation Detector Integration with the Android Platform

A software application of gamma-ray spectra is developed for the Android based smart phone platform. This will allow people to connect a radiation detection device, such as a scintillation detector, to a smart phone via USB. Spectra data transferred to the smart phone will be presented to the end-user in a graphical format. This application is very useful for the detection of radioactivity in our daily life.

The software is developed using Android SDK and Emulator. The software consists of three major modules: (1) Graphical user interface (GUI); (2) File management; and (3) Data management. The GUI is designed with the goal of simplicity and ease of use. It consists primarily of menus and submenus. The file management module is responsible for file open and save operations. The data management module includes data acquisition, data processing, data display, auto peak identification, auto isotope identification, zooming, etc.

Edward is a senior undergraduate student at the Missouri University of Science and Technology currently working on a B.S. in Nuclear Engineering and Computer Science. In the fall of 2012 he presented to the American Nuclear Society on the early stages of this work.

Poster #48

Yanda Qiao

Joint project with Na Zhang

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

Funding Source: N/A

Relative Permeability Modifier (RPM) Effect of Polymer Injection in Shales Gas

In order to improve the sweep efficiency of water floods, many relative permeability modifiers (RPM) have been used to control water. RPM can modify the water/gas flows in the hydraulic fracture and reduce the water production. However, previous experiments were seldom focused on PRM effect of polymer for gas/water in shale gas reservoirs. During the experiment we use the ideal model, capillary tubes, to study the disproportionate permeability reduction mechanisms of polymer to gas and water in shales gas. From the research data, the disproportionate permeability reduction effect of polymer for gas/water flow are illustrated and confirmed by the results. Reduction of water permeability varies from 1.5 to 3.2 depending on different injection rates and is always larger than gas permeability reduction which remains close to 1.That shows the RPM may decrease the excess water production and increase the gas production in shales gas.

Yanda Qiao, Missouri University of Science and Technology, Petroleum Engineering, Senior.

Poster #49

Charlene Ruwwe

Department: Chemical and Biochemical Engineering
Major: Chemical Engineering; Biological Sciences
Research Advisor: Dr. Muthanna Al-Dahhan
Advisor's Department: Chemical and Biochemical Engineering

Funding Source: Chemical and Biochemical Engineering Research Funds

Optimization of *Scendesmus sp.* Growth in a Photobioreactor

In this project, a photobioreactor was constructed using the specifications and modeling equations found in the thesis "Mathematical Modeling for Photobioreactor Design" by Xiaoxi Wu. This reactor and theory were used to map and understand the growth rates and growth factors of the algae with respect to incident light. Some factors were altered in the processes in order to find optimum growth parameters and maintain proper fluid flow, support, and lighting. These factors include, but are not limited to, light to dark ratio, Carbon dioxide concentration, and lighting intensity. This project's testing was focused on and performed with the freshwater algae species, *Scenedesmus quadricauda*. Moreover, this process can also be applied to any single-celled or micro-algae species in such a way as to reduce the time and effort needed to efficiently grow each species in any type of desired photobioreactor that is more applicable to industrial situations.

Charlene is a non-traditional senior majoring in both the Chemical Engineering: Bio-emphasis and the Biological Sciences programs. She aspires to attain a PhD in Chemical Engineering with an emphasis in pharmaceutical delivery systems. Charlene would like to run a research and development lab for a large-scale pharmaceutical company. She hopes to find a solution for the treatment of viruses and to serve as an inspiration and a role model for her son.

Andrew Schranck

Poster #50

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

Funding Source: John A. and Susan Mathes Endowed Chair of Environmental Engineering

Utilization of Survey Questions and Responses to Evaluate Sanitation Concerns in Santarem, Para, Brazil

Santarem, Brazil is located in a developing region of the state of Para, situated along the convergence of the Tapajos and Amazon Rivers. The people of Santarem have nominal access to potable water, and many households in the villages have been given biosand filters. Missouri S&T students traveled to Brazil to evaluate current living practices related to water sanitation and personal hygiene. The team tested water and collected data from villagers who had biosand filters in their homes. The research team produced a survey utilized to collect important information from the local villagers of Santarem. Survey formatting and styles were researched in order to produce a survey that would reveal unbiased results and a wide range of data. The purpose of the surveys was to reveal indicators of water related health risks that can be evaluated and used to produce future solutions to water sanitation and public health problems in similar communities.

Andrew began his involvement with Dr. Oerther in the fall semester of 2012 while learning about decision support systems/tools (DSS/DST) that can be used for a plethora of purposes, including applications involving third world countries, water sanitation, and point of use (POU) drinking water treatment systems. Andrew began his quest for international service by joining the Engineers Without Borders chapter at Missouri S&T in the fall of 2010. He has traveled to Bolivia twice to assess and implement erosion and surface water flooding projects. Andrew is a fifth year student dual majoring in Civil/Architectural Engineering at Missouri S&T. After five years of varsity swimming, grueling coursework, and eye opening experiences, he plans to graduate this May and pursue a career which allows him to use his engineering background to improve the quality of life for people suffering from water related issues.

Poster #51

Chris Seto

Department: Computer Science
Major: Computer Engineering
Research Advisor: Dr. Zhaozheng Yin
Advisor's Department: Computer Science

Funding Source: Lockheed Martin

Multicopter Testbed for Computer Vision Applications

This research project demonstrated how a rotary wing "multicopter" aircraft could be used as a platform to carry sensors, computers and other data collection and analysis systems to complete a multitude of tasks that would be costly or dangerous for full sized, manned aircraft. These tasks are computer vision centric, and are related to the evaluation of ground based items such as buildings, railroad tracks or even crowds of people through the use of airborne cameras mounted on the aircraft. During this project, a multicopter was constructed, tested and confirmed to be suitable for such tasks.

Chris is a sophomore of CompE from Chesterfield, MO. He has 4 years of experience in the field of unmanned aircraft flight controls, and independently consults in the UAV field professionally. In addition, Chris works on other research projects at MST specializing in mechanical process control using embedded electronics.

Xindi Sun

Poster #52

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

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

Analysis of Correlations between Lab-Measured Porosity, Permeability and Well Logging-Determined Porosity, Permeability

Permeability and porosity are two important parameters to evaluate target layers in CO2 sequestration. Because of the high cost of taking core samples from reservoirs and technology difficulties, well logging, a visual method without touching cores is often used to analyze the porosity and permeability. In this research, permeability and porosity values determined from well logging ~~a~~re compared with lab-measured porosity and permeability values, to identify a correlation. Based on reasonable matrix density assumptions, well logging-determined porosities can match well with lab-measured data. Due to experimental limitation, lab-measured porosities for some cores are lower than well logging-determined data. Cementation factor, m, has a significant effect on irreducible water saturation, Swirr, which is used to estimate the permeability of target layers. Base on reasonable assumptions of m and Swirr, well logging-determined permeability can match well with lab-measured data.

Xindi is a senior student of Petroleum Engineering in MS&T. She will graduate in December 2013. She is a transfer student from Northeast Petroleum University China. She is a member of SPE.

Poster #53

Kaixiao Tian

Department: Geological Sciences & Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Andreas Eckert
Advisor's Department: Geological Sciences & Engineering

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

A Numerical Study of Perforation Stability

Sand production represents a serious problem during hydrocarbon production from sandstone reservoirs. Sand production lowers production rates, damages production equipment, and thus has a potential to deteriorate the value of a producing well. Since sand control is generally an expensive investment for an oil/gas operator, it is beneficial to conduct analyses capable of predicting the onset of sand production. In this study, a high-resolution 3D finite element model of the wellbore – perforation system is constructed and utilized for a staged finite element analysis to simulate the state of stress after drilling and perforating. Based on elasto-plastic material properties and considering different Andersonian stress regimes, plastic strain and principle stresses are computed and graphically presented to show the locations prone to failure and thus sand-production.

Kaixiao was a student from China University of Petroleum (Beijing). He transferred to Missouri S&T during 2011 Fall Semester. He works as an undergraduate research assistant and helps Mr. Amin Amirlatifi, a PhD candidate, with his CO_2 sequestration project by running several reservoir simulation models. Kaixiao is currently a student teaching assistant for PE 338, Finite Element Analysis Applied in Petroleum Engineering. He is also the PetroBowl Chair for Society of Petroleum Engineers Missouri S&T Chapter.

Zhe Yuan

Poster #54

Department: Geological Sciences and Engineering
Major: Petroleum Engineering
Research Advisor: Dr. Mingzhen Wei
Advisor's Department: Geological Sciences and Engineering

Funding Source: N/A

Parameter Study of Polymer-Flooding-Oil-Recovery Method With the Use of CMG

Injecting polymer into the reservoir is a commonly used method to enhance oil recovery in the oilfield. It is usually used when there is a large amount of residual oil in the reservoir after first or secondary oil recovery process. Different reservoir properties like permeability and reservoir heterogeneity can affect the polymer flooding process. This research is mainly focused on how parameters of reservoir will affect the polymer flooding efficiency. The CMG program is used to simulate reservoir and polymer flooding in the reservoir and then help to generate results. CMG is a commercial software package designed for reservoir simulation, and it applies the principles of finite difference method.

Zhe was a student from China University of Petroleum (Beijing). She transferred to Missouri S&T in 2011 Fall Semester. Currently she is working for Dr. Mingzhen Wei as a student teaching assistant for PE308/408, Applied Reservoir Simulation. Zhe is also the vice president for Society of Petroleum Engineers Missouri S&T Chapter.

Poster #48

Na Zhang

Joint project with Yanda Qiao

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

Funding Source: N/A

Relative Permeability Modifier (RPM) Effect of Polymer Injection in Shales Gas

In order to improve the sweep efficiency of water floods, many relative permeability modifiers (RPM) have been used to control water. RPM can modify the water/gas flows in the hydraulic fracture and reduce the water production. However, previous experiments were seldom focused on PRM effect of polymer for gas/water in shale gas reservoirs. During the experiment we use the ideal model, capillary tubes, to study the disproportionate permeability reduction mechanisms of polymer to gas and water in shales gas. From the research data, the disproportionate permeability reduction effect of polymer for gas/water flow are illustrated and confirmed by the results. Reduction of water permeability varies from 1.5 to 3.2 depending on different injection rates and is always larger than gas permeability reduction which remains close to 1.That shows the RPM may decrease the excess water production and increase the gas production in shales gas.

Na Zhang, Missouri University of Science and Technology, Petroleum Engineering, Senior.

Social Sciences
Poster Session

Abstracts

Elizabeth Brem

Poster #55

Department: Civil, Architectural, and Environmental Engineering
Major: Environmental Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: John and Susan Mathes Endowed Chair in Environmental Engineering

Eliminating Extreme Poverty Through Microwork

This research is focused on the elimination of extreme poverty utilizing microwork and human computation. The prominent question is: What are ways to promote continuous micro-work in order to eliminate extreme poverty? To answer this question, an understanding of what microwork and human computation means is a necessity and the ability to construct a human computation project is a must. The process of constructing a human computation problem is broken down into a series of smaller steps which can be completed quickly by one, or multiple people, with ease to complete a larger, unified project. The overall goal is to create a steady flow of microwork, that will in turn provide access to a sustainable income to those living in extreme poverty so that they can provide the basic necessities of life to their families and themselves, thus eliminating extreme poverty.

Elizabeth is an undergraduate student with emphasis in Environmental Engineering. She received her Associates Degree from Southwestern Illinois College in Engineering Sciences. She is currently attending Missouri University of Science and Technology and performing research under Dr. Daniel Oerther.

Poster #56

Emily Gardner

Department: Psychological Science
Major: Psychology
Research Advisor: Dr. Don Sharpsteen
Advisor's Department: Psychological Science

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

Family Interactions and Mood

Spanking as a form of discipline is prevalent in the United States, with over 90% of Americans spanking their children. Considering the prevalence of spanking, it has been a topic of study for years. While earlier studies focus primarily on the negative effects of spanking, more recent studies examine the causes of spanking. The frustration-aggression hypothesis proposes that frustration leads to aggressive behavior. Taking into account parental frustration, this experiment examined anger as a potential cause of the likelihood to engage in spanking in reaction to negative behaviors of a hypothetical 5-year-old child. Participants included 121 college students who experienced an induced mood state while answering questions with regard to likeliness to spank. The results of this study do not allow for a causal statement, but there is evidence of a positive relationship between anger and spanking. Limitations and future research are discussed.

Emily is a senior psychology major with a minor in business and an emphasis in human resources and personnel. She obtained her associate's degree in sociology from Three Rivers College and transferred to Missouri S&T in 2011. In the fall, she will be attending school to obtain a graduate degree in industrial/organizational psychology. Her research interests include work-life balance, workplace stress, employee attitudes, and motivation. She hopes to work as a consultant after graduate school. Currently, she is research assistant to Dr. Sharpsteen. Emily is also a member of Psi Chi and social chair for PsyCo, the campus psychology organization.

Poster #57

Jacob Goldsmith

Department: Psychological Science
Major: Psychological Science
Research Advisor: Dr. Amber Henslee
Advisor's Department: Psychological Science

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

The Effectiveness of an Online Plagiarism Intervention Module

More than half of all college undergraduates engage in academic dishonesty. Specifically, it is likely that plagiarism is more common than reported. The current study evaluated the effectiveness of an online academic integrity module (Group A) compared to a recorded online lecture (Group B). Thirty-six undergraduate psychology students were randomized to two groups. Participants in both groups completed an 11-item mastery-based quiz assessing their understanding of academic dishonesty. We hypothesized that students in Group A would exhibit fewer incidents of plagiarism and complete the quiz with fewer attempts as compared to Group B. Results revealed no statistically significant difference in incidents of plagiarism between the groups (χ^2 (1, N = 33) = .081, p = .78). A correlational analysis revealed a significant positive relation between the number of quiz attempts and the number of plagiarism incidents (r (31) = .388, p = .03).

Jacob is a Psychology major at the Missouri University of Science and Technology. As an undergraduate he has had the opportunity to be involved with various research projects. He has been a paid research assistant for Dr. Nancy Stone, a paid research assistant for the Army Research Lab in Maryland, a research assistant in Dr. Amber Henslee's lab on College Student Drinking, and is currently working on his OURE on a Plagiarism Intervention Program with Dr. Amber Henslee. Jacob plans to attend graduate school for his Ph.D. in Neuroscience, and later hopes to become a professor and researcher at the collegiate level.

Poster #58

Samantha Kempker

Department: Psychological Sciences
Major: Psychology
Research Advisor: Dr. Amber Henslee
Advisor's Department: Psychological Sciences

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

Evaluating the acceptability of GAMMA among Greek-affiliated students

The purpose of this study is to evaluate the acceptability and feasibility of the Greeks Advocating Mature Management of Alcohol (GAMMA) program at Missouri S&T. GAMMA is a Greek-affiliated student led organization that sponsors intervention strategies to increase Greek-affiliated students' responsible alcohol-related behavior. Student opinions of GAMMA and their alcohol-related behaviors will be investigated via a two-part survey. For students who attended GAMMA events, we hypothesize that students' acceptance of GAMMA will negatively correlate with drinks per day and alcohol-related problems and positively correlate with the use of protective behavioral strategies, as compared to students who do not attend GAMMA. We hypothesize that Greek-affiliated students will find GAMMA to be a more acceptable alcohol program as compared to non-GAMMA programs. The results of this study will help inform campus prevention strategies at S&T, in particular those specific to Greek-affiliated students.

Samantha was born in the small town of Taos, MO. She grew up loving anything involving the outdoors and continues to love hunting, camping, and driving her four-wheeler. In high school, Samantha's school counselor instilled in her a love for psychology and she is now a junior psychology major at the Missouri University of Science and Technology. After graduating, Samantha intends to obtain her PhD in clinical psychology.

Poster #59

George Mausshardt

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

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

APCG – User Interface

Education in the 21st century is quickly moving away from the traditional homework structure. A new generation of technologically adept students is accustomed to working at their own pace and receiving instantaneous feedback. Few institutions have the resources to offer around-the-clock human graders, and the recent economic downturn has actually reduced the number of grader hours and increased class sizes. There is a clear and urgent need for a sophisticated system which can analyze student error, assign partial credit, and provide detailed feedback to the student through the use of a web-based program that is not only easy to use, but also sophisticated and powerful in its user-facing methods and functions. The Automated Partial Credit Grader (APCG) specifically addresses these problems through the creation and use of a powerful graphical user interface that makes the system easier to use than other systems and not only rivals the usability of standard paper and pencil, but in some ways surpasses it. This poster details the conception and construction of the APCG system's graphical user interface.

George is majoring in Computer Science is currently conducting research in the Natural Computation Laboratory at the Missouri University of Science and Technology. This is his first year working in this research group and in OURE.

Michael Sestak

Poster #60

Department: Civil, Architectural, and Environmental Engineering
Major: Civil Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: John and Susan Mathes Endowed Chair in Environmental Engineering

Utilizing Decision Support Tools to Provide Clean Water

Decision Support Tools are applications that can be downloaded on to devices like smart phones or computers that aid the user through a series of questions to provide a clear and simple solution to their problem. These types of tools are available online through several different mediums. MST DrinKlean's goal is to create a user friendly source for finding the best solution to safe drinking water based on the circumstances of particular communities. An initial step to developing this tool has been the setting of parameters and analyzing various filtration devices. Clean Drinking water is vital not only for low income people and families in rural USA, but in developing countries where disease and sickness cause over 1.6 million deaths each year. There are over 800 million people around the world without access to clean water. MST DrinKlean can help find the best way to provide safe drinking water to those who need it.

Michael is an aspiring student in civil engineering from Jefferson City, Missouri, whose goal is to provide solutions to problems that people face every day. He enjoys outdoor activities and spending time with friends and family.

Poster #61

Darrell Wallace

Department: Civil, Architectural, and Environmental Department
Major: Civil Engineering
Research Advisor: Dr. Daniel Oerther
Advisor's Department: Civil, Architectural, and Environmental Engineering

Funding Source: John and Susan Mathes Endowed Chair in Environmental Engineering

Validating Smartphone Applications

Nearly sixty percent of Americans are fat. This is partially due to overeating, partially due to lack of exercise, and partially due to environmental determinants. Being informed and sharing accountability appear to be sufficient to improve wellness. Smart phone apps such as 'MyFitnessPal' provide a way to share accountability in a social network as well as to track exercise and food. Our study is testing the benefits of smart phone apps to improve wellness in school age children as well as the elderly in Missouri. We are comparing our results in Missouri with results we are observing in rural and urban India to better understand the role of geography and culture to combat overweight and under-exercise. As part of this study, we visit local schools and nursing homes in Rolla and have also visited schools and homes in Gujarat, India. We expect that our approach will confirm our hypothesis that smart phone apps provide a robust means to improve knowledge of wellness ultimately improving health.

Darrell is a junior at Missouri University of Science and Technology studying Civil Engineering. While on campus Darrell is involved with Delta Sigma Phi Fraternity, Student Activity Finance Board, Steel Bridge Design Team, Campus Christian Fellowship, and Blue Key Honor Society. In Darrell's spare time he enjoys rock climbing, playing golf, and spending time with his family.

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