Alabama Alliance for Students with Disabilities in STEM (AASD-STEM)
3rd Annual Conference

March 23, 2013 * Auburn University Hotel and Conference Center * Time: 8:00 a.m.-3:00 p.m.

Theme: Broadening the Participation of Students with Disabilities in Science, Technology, Engineering, and Mathematics: Challenges and Promising Practices

Time	Activity	Description		Location
8:00-8:30 AM	Registration	Registration and Continental Breakfast		Pre-Function Foyer
8:30 -8:45-AM	Overview of the AASD-STEM Program	**Opening Session** Opening Remarks Dr. Overtoun Jenda, Associate Provost for Diversity and Multicultural Affairs		Auditorium
8:45-9:45 AM	Research Presentation	***Assistive Technology for STEM*** Scott Renner (Tamara Massey)		Auditorium
9:45-9:55 AM	**BREAK**	**BREAK**		**BREAK**
9:55-10:25 AM	Mini Grant Presentation	***"SEE" Math in Action*** Dr. Monica Trifas and Todd McCutchen Jacksonville State University (Daniela Marghitu)		Auditorium
10:30-11:15 AM	Advocacy Presentation	***My personal story and the Fundamentals of Being an Effective Advocate*** Mr. Graham Sisson The Governor's Office on Disability (Caroline Dunn)		Auditorium
11:20-12:10 PM	Breakout Sessions: STEM Research Presentations	**Psychology and Life Sciences:** Dr. Steven G. LoBello, Auburn Montgomery (Glen Ray)	**Engineering and Physical Sciences:** Dr. Jeffrey Fergus, Auburn University (Jerrod Windham)	Ballroom B (Right) Seminar Room
12:15-1:15 PM	**LUNCH**	Hotel and Conference Center Ballroom ***Luncheon Speaker***: Daniel (Pulliam) Grisham (Auburn University '12) (Mohammed Qazi)		Ballroom A (right)
1:15-1:45 PM	Poster Session	Presented by Internship Recipients and Other Students		Governor's Room
1:45-2:45 PM	Student Presentations	**Student Presentations (10-12 minutes)** David Billingslea, Cassandra Stephens, Julaunica Tigner, Benjamin Spearman, and Daniel (Pulliam) Grisham (Ash Abebe)	**Student Presentations (10-12 minutes)** Kelly Correia, Halston Sleets, Jenna Platt, and Ian Kim (Gary Branch)	Auditorium Seminar Room
2:45-3:00 PM	Closing	Evaluation and Closing Remarks (Carl Pettis)		Auditorium

AASD-STEM

AASD-STEM CONFERENCE PRESENTERS

Mr. Scott Renner: Assistive Technology for STEM
Coordinator of Assistive Technology and Innovation: Auburn University Center for Disability Research and Service. Prior to his position at the Center for Disability Research and Service, he worked five years serving persons with disabilities as the Director of the Montgomery Center for Independent Living. Prior to that, Scott worked as the Information and Training Specialist for the State Tech Act Program STAR. His presentation will cover various types of Assistive Technology to be successful in STEM.

Dr. Monica Trifas and Todd McCutchen: "SEE" Math in Action
Department of Mathematical, Computing and Information Sciences, Jacksonville State University
This presentation will discuss the usability of the Tactile Image Enhancer tool to assist students in STEM with visual impairments.

Mr. Graham Sisson: My personal story and the Fundamentals of Being an Effective Advocate
The Governor's Office on Disability, Montgomery, AL
This presentation will discuss effective self-advocacy for persons with disabilities.

BREAKOUT SESSIONS

Dr. Jeffrey Fergus: Materials Science and Engineering: A Discipline for the Scientist / Engineer
Materials Research and Education Center, Auburn University

Dr. Steven LoBello: How I got to here and the better parts of my research life
Department of Psychology, Auburn Montgomery

LUNCHEON SPEAKER

Mr. Daniel Pulliam Grisham, (BS, Auburn University 2012), Graduate Student, Rutgers University, NJ

STUDENT PRESENTATIONS

Kelly Correia, Auburn University; Advisor: Dr. Nanette Chadwick, Auburn University
Effects of sediment load to host sea anemones on the behavior of anemonefishes
In this experiment, I examined the effects of sediment load to host anemones on the wedging, fanning, and no motion behaviors of anemonefishes. The number of dance bouts performed in a 30 minute period was recorded, as well as the number of wiggles in each bout by individuals of Amphiprion bicinctus (two-band anemonefish) interacting with the host anemones Entacmaea quadricolor (bubble-tip anemone) and Macrodactyla doreensis (long tentacle anemone). For each of 8 individuals of two-banded anemonefish, I recorded control and sediment treatment observations over 30 minutes for the duration of wedging, fanning, swimming and motionless behaviors, as well as the frequency of each. In the sediment treatments, I placed 4 grams of sediment (approximately 1 millimeter grain size) on each anemone. A final experiment was also performed, looking at the anemone's ability to remove the sand without the presence of the fish, and the time it took. For this experiment, the fish were removed from their host anemone using a plastic tank divider, and 4 grams of sand was placed on each anemone. The anemone was then observed to see how long it took the anemone to remove the sand without the assistance of the fish. Control observations, which were meant to form a baseline for normal fish behavior, were made on 8 fish and 5 anemones. Four types of behaviors were recorded: fanning, wedging, number of wiggles in each wedge, and no motion. Following the addition of sediment, the fish exhibited an overall increase in the number of wedges, fans, and number of wiggles in each wedge, as well as a general decrease in bouts of no motion. When looking at the percent time spent on each behavior, both males and females spent much more time engaged in fanning behaviors after sediment was added to their anemone. They also decreased their percent time spent motionless after the addition of sediment. The last five minutes of each 30-min observational time period were also quantified to see if the fish behaviors went back to normal following the removal of the sediment. After the sand was removed, the percent time spent fanning the anemone decreased in

both males and females. Also, the percent time spent on the no motion behavior increased or stayed relatively constant following the removal of the sediment. For the last experiment, results showed that the removal of sediment by the anemone alone took approximately 20 times longer than when the anemonefish were present.

Ian Kim, Auburn University; Advisor: Dr. W. R. Hood, Auburn University

Developmental Plasticity in Metabolism, Reproductive Physiology, and Lifetime Reproductive Performance

It is well established that a mother's diet during gestation and lactation can have lasting impacts on the physiological phenotype of her offspring. For example, low calorie and protein intake by mothers can prime the glucose and lipid metabolism of their young for life with limited dietary resources. As a result, the propensity of these physiological systems to store body fat throughout the life of the individual is increased when food is in abundance. Such changes in physiology are likely to also impact the fencundity and age at first reproduction, but this has received little attention. The goal of the research project that I participated in was to examine the effects of maternal diet on offspring physiological phenotype and subsequent reproductive performance. To test these interactions, the wild house mouse *Mus musculus* was used as a model because there are numerous established methods for characterizing the physiology of this species and because the house mice can be kept in natural enclosures where the effect of physiology on natural reproductive rates can be readily assessed. I participated in data collection on the reproductive performance of these mice. The parental generation was maintained on one of 2 diets, (1) low-protein, 10% diet; (2) high-protein, 20% diet. I collected data on the date of birth and litter size for mothers in each of these treatment groups. After weaning, the F1 offspring were either assigned a diet that matched the parental generation (high and low protein diet, respectively) or the F1 offspring were assigned a diet that did not match the parents (P generation: high protein/F1 offspring: low protein; P generation: low protein/F1 offspring: high protein). Some of these offspring were euthanized just before reproductive age to look at the effects of maternal diet on offspring physiology; the reproductive performance of the remaining animals is currently being quantified. As expected, animals born to mothers on a low protein diet that switched to a high protein diet after weaning displayed greater variation in abdominal body fat storage than individuals maintained on a diet that matched its mothers. Interestingly, individuals switched from an early high protein diet to low protein diet also displayed a similar trend. Individuals on diets that matched its parents had the lowest body fat. This pattern suggests that adipose deposition responds to general unpredictability of resources rather than occurring in response to the offspring being programmed for specific environmental conditions. The observed effect is predicted to decrease age at first reproduction in both mismatched groups. These findings will improve our understanding of how wild populations respond to variation in food availability and improve our understanding of variance in human fertility patterns.

Jenna Platt, Auburn University; Advisor: Dr. DeAnn Presley, Kansas State University

Soil Quality Indicators in Dedicated Energy Crops: Perennials and Annuals

The 2007 Energy Independence and Security Act subsidizes the growth and production of advanced biofuels which refers to "renewable fuel, other than ethanol derived from corn starch, that has lifecycle greenhouse gas emissions … that are at least 50 percent less than baseline lifecycle greenhouse gas emissions". Switchgrass is currently being developed as a dedicated energy crop for production across the U.S. and on marginal lands in the Great Plains. Switchgrass in Kansas can produce up to seven tons for each acre if under favorable water conditions or irrigation, but without the help of irrigation, yields will be reduced to reflect two to four tons per acre. Due to the fragile soils and semi-arid climate of this region, it is important to select cropping practices that do not further degrade soils, but rather maintain or improve soil resources. Therefore, the objective of this project is to determine any possible changes or differences considering both abiotic and biotic soil quality indicators. This study was performed on soils at the Southwest Research-Extension Center located in Garden City, Kansas on a Ulysses silt loam. Two cultivars of switchgrass were selected from a study established in 2007, and three annual forages were selected from an adjacent experiment. Perennial grasses were among the treatments with the smallest values for wind erodible fraction (WEF) and the largest values for geometric mean diameter (GMD). Though there was not a significant difference between the switchgrass cultivars, the cultivar more adapted for survival without irrigation in western Kansas did have a slightly smaller WEF and higher GSD, indicating that a well-established switchgrass crop may lessen soil degradation by wind erosion. In general, the recently harvested spring forages had the largest and most active soil microbial populations, and the perennials and winter-harvested sorghum had the lower soil biology parameters. In summary, dense healthy vegetation is essential for maintaining soil quality. Sustainable bioenergy must protect the soil resource to maintain the concept of sustainability.

Daniel Pulliam, Auburn University; Advisor: Dr. Mark Bryne, Auburn University

Design of poly (ethylene glycol) based hydrogels to control the release of sirolimus from drug eluting stents

Drug eluting stents have been approved by the FDA since 2003 for use in minimizing the risk of restenosis. To create safer drug eluting stents, it is vital to design polymers that allow for a controlled release pattern of a drug that prevents restenosis and eliminates the risk of thrombosis. The goal of this work focuses on the design of a hydrogel capable of the controlled release of sirolimus. Both poly(AA-co-HEMA-co-PEG200DMA) and poly(AA-co-HEMA-co-PEG200DMA-co-PDMS) were tested through various studies to assess factors governing the controlled release of sirolimus. The concentration of cross-linker, PEG200DMA, was found to hold an inverse relationship with drug release. The dependence of release on cross-linker concentration was supported by mechanical property testing that found increased concentrations of PEG200DMA yields lower Mc and mesh size values. Additionally, an inverse relationship exists between Mc and mesh size values and Young's modulus. Typical values for the Young's Modulus for 30 mol%, 50 mol%, and 100 mol% PEG200DMA hydrogel formulations polymerized in air were 0.786 MPa, 0.850 MPa, and 1.45 MPa, respectively. Hydrogels polymerized in N2 held values of 1.57 MPa, 1.80 MPa, and 2.49 MPa for the 30 mol%, 50 mol%, and 100 mol% PEG200DMA formulations, respectively. Mc values estimated for 30 mol%, 50 mol%, and 100 mol% PEG200DMA hydrogel formulations polymerized in air and in N2 were 99 Da, 60 Da, 40 Da and 9 Da, 7 Da, and 34 Da, respectively. Polymerization in a N2 environment induced smaller Mc and mesh size values in polymer networks, inhibiting drug release in comparison to networks polymerized in air. Light intensity during polymerization held an inverse relationship with sirolimus release. Swelling data supported structural differences among the hydrogels led to their differences in release patterns. The swelling and drug release data for poly(AA-co-HEMA-co-PEG200DMA-co-PDMS) showed altering the chemistry of the network delayed sirolimus release compared to poly(AA-co-HEMA-co-PEG200DMA) possibly due to structural differences, chemical affinity, and/or both.

Benjamin Spearman, Auburn University; Advisor: Dr. Elizabeth Lipke, Auburn University

Development of Biomimetic Polycaprolactone Substrates for Cell Behavior Modification

Heart disease is the primary cause of mortality in the United States, accountable for approximately 25% of all deaths. Current therapies for heart disease are limited in their capacity to regenerate diseased myocardium, and transplantable hearts are in chronically short supply. Developments in the field of tissue engineering are leading to novel cell treatments utilizing pluripotent stem cells, which are unique in their ability to differentiate into nearly any cell-type, including cardiomyocytes. Currently, there are serious limitations which are preventing these therapies from progressing to clinical testing, namely that these stem cell-derived cardiomyocytes often have heterogeneous electrical properties and are immature in comparison to native cardiomyocytes. Biomimetic materials, substrates that incorporate mechanical and chemical stimuli to emulate the native tissue environment, can be implemented to direct stem cells to properly differentiate into more homogeneous, fully functioning cardiomyocytes in an in vitro culture system. In this study, polycaprolactone (PCL), a biocompatible polymer capable of functional augmentation, was investigated for its ability to support cell proliferation. A system was developed to mold, cut, and sterilize PCL in a consistent manner. Inoculation of PCL surfaces was performed by pipetting a concentrated suspension of HEK 293 cells onto the surface of the material. After 48 hours of incubation, samples were treated with LIVE/DEAD stain. Initial results indicate successful adhesion of viable cells on the surface of PCL samples. To test the effect of PCL hydrophobicity on cell adhesion, the PCL was pre-treated with a NaOH solution for times of 0, 1.5, 3, 24, or 48 hours; cell adhesion was evaluated for each case. Results from this study will provide a basis for the creation of biomimetic, conductive materials capable of eliciting electrical signals to stem cell-derived cardiomyocytes.

Cassandra Stephens, Auburn University; Advisor: Dr. Daniela Marghitu, Auburn University

Auburn University Robo Camp K12 Inclusive Outreach Program: A three-step model of Effective Introducing Middle School Students to Computer Programming and Robotics

Since 20005 Dr. Marghitu and her research team have developed a three-step adaptive model and related curriculum for introduction to computing developed. The aim of this model is to introduce students of all abilities to a simpler programming environment (Kodu), to eventually progress to a more challenging programming environment (Alice), and then to gradually introduce them to two robotics environment (Lego NXT-G and Tetrix). Computer Science Unplugged kinesthetic activities that gives the students games, puzzles and magic tricks are also used toward engaging students in real Computer Science problem solving. While moving forward and sometime

backwards, depending on their individual abilities and preferences, between the three steps of the model, students are encouraged by instructors to explore how concepts such as variables, conditionals, and looping are implemented toward building the foundation of their computational thinking. Some novel strategies for K12 teaching with Kodu, Alice, Lego NXT-G and Tetrix robots are outlined. The latest camp in which the Robo Camp three-step ladder model has been used as a foundation for developing a K12 outreach CS curriculum was Computer Science for All (CS4ALL) K12 inclusive outreach pilot study organized at AU in July 2012. The camp was offered to a total of 31 students ranging in age from 10 to 17 from Alabama and Georgia schools. Each group was instructed by at least one or two CS instructors and one instructional aide from the Auburn University Special Education and Rehabilitation Department. Out of the 31 students, 7 students reported having specific disabilities and needed specific accommodations. Additional accessibility assistance was provided by the Alabama Institute for Deaf and Blind. The institute expert helped assess the technological needs of the visual impaired participants. The CS4All camp was scheduled over 5 days. Each day students worked for 7 hours and participated in the CSU activities either after the lunch break or the end of class. Feedback obtained from students and parents as well as from some of the programs surveys indicated this program as a success.

David Billingslea, Tuskegee University; Advisor: Mr. Mamadou Wade
Intro into mobile based applications
The engineering research project that I selected to be a part of was of the Electrical Engineering/ Computer Science background. As for my research professor, Mr. Mamadou Wade allowed me to undergo a project under his supervision. The general concept of the project is to create mobile based applications that apply to the background of my own respective field. In other words, the purpose of my research is to develop phone based applications that relate to electrical engineering. The last few weeks of my research have been dedicated to understanding the computational languages of C++ and C.

Halston Sleets, Tuskegee University; Advisor: Dr. Deloris Alexander, Tuskegee University
The Presence of Trypanosoma cruzi in Squash bugs, Anasa tristis in Tuskegee, Alabama
American Trypanosomaisis, commonly known as Chagas disease is currently an endemic that is sweeping Central and South America. The agent that causes Chagas Disease is Trypanosoma cruzi as known as T. Cruzi. The vector that transmits this parasite is the Triatomine bug, commonly known as the “kissing” bug or reduviid bug. T. Cruzi is becoming present in the southern United States where much is still unknown about historically Hispanic descent disease. This study is being conducted to investigate Triatomine bugs that are carrying T.Cruzi. Four varieties of squash were planted in a greenhouse to serve as an invitation to the reduviid bug. Keywords: Triatomine, T. Cruzi, reduviid, Chagas Disease, Trypanosoma, Cruzi, Trypanosomaisis

Julaunica Tigner, Tuskegee University; Advisor: Dr. Tamara Floyd-Smith, Tuskegee University
Feasibility Assessment of the Integration of Microfluidics and NEPCM for cooling Microelectronics Systems
The growing demand for microelectronic systems to be smaller and faster has increased the energy released by these devices in the form of heat. Microelectronic systems such as laptop computers and hand held devices are not exempted from these demands. The primary traditional technologies currently used to remove heat generated in these devices are fins and fans. In this study, traditional methods were compared to more novel methods like cooling using forced convection in microfluidic channels and stagnant nanoparticle enhanced phase change materials (NEPCM). For this study, the difference between the surface temperature of a simulated microelectronic system without any cooling and with a particular cooling method was compared for several cooling scenarios. Higher ΔT values indicate more effective cooling. The average ΔT values for fans, fins, NEPCM and microchannels with water were 2°C, 5°C, 3°C and 4°C respectively. These results suggest that, separately, microchannel cooling and NEPCM are promising methods for managing heat in microelectronic systems. Even more interesting than NEPCM or microchannel cooling alone is the potential cooling that can be achieved by combining the two methods to achieve multimode cooling first by the phase change of the NEPCM and then by circulating the nanofluid (melted NEPCM) through microchannels. A feasibility assessment, however, reveals that the combination of the two methods is not equal to the sum of the parts due to the viscosity and associated pumping power requirements for the melted phase change material. Nonetheless, the combination of the method still holds promise as a competitive alternative to existing thermal management solutions.

AASD-STEM

POSTER PRESENTATIONS

Carlos Hernandez, Auburn Montgomery; Advisor: Dr. Glen Ray, Auburn Montgomery

Relating parent-child security with children's friends and best friends

The present study investigated the associations between concurrent self-perceptions of parent-child security (Mother, Father), classroom friendship network size, and close peer relationship quality (classroom friend and classroom very best friend) among 53 second-third graders (Mean age = 8.1y) and 53 fifth-sixth graders (Mean age = 11.4y). Results demonstrated a positive relationship between perceptions of parental security (maternal and paternal) and children's close peer relationship (friends and best friends). Interestingly, perceptions of parental dependability were more extensively related to children's close peer relationships than were perceptions of parental availability. Further, for younger children, friendship network size was positively related to perceptions of maternal availability and paternal dependability. Findings are discussed in terms of the role(s) that maternal and paternal security plays with regard to different types of children's close peer relationships.

Shelby Nunnelee, Auburn Montgomery; Advisor: Dr Robert Villafane, Alabama State University

The stability of a domain of the prokaryotic phage tailspike protein

The stability of protein structures is of major importance in the study of protein structure and function, especially since it is known that the majority of proteins exists on the brink of instability. Like many other important studies, its analysis in a prokaryotic system, will allow for a facile genetic dissection of most research areas. Our studies are aimed at using the prokaryotic phage P22 tailspike protein (P22 TSP) as a model for protein-protein interaction. When the phage assembles inside the bacterial cell, the last step in its assembly is the attachment of the TSP to a viral structure that is missing only its tail (called a "head" structure). Protein-protein interactions are critical to life of a living cell. But since the P22 TSP is a homotrimer it is imperative to know how this protein maintains its trimeric structure before we study how it interacts with the rest of the viral structure. The poster represents the first research efforts to use the well-known P22 TSP system to study protein-protein interactions. Some new data are also presented.

Brittany Brannum, Auburn University; Advisor: Dr. Elizabeth Brestan-Knight, Auburn University

Parent Child Interaction Therapy

Parent Child Interaction Therapy (PCIT) is uses a combination of Child Directed Interaction (CDI) and Parent Directed Interaction (PDI) play therapies. It is used with children between the ages of two and seven who have emotional and behavioral disorders. I worked under Dr. Elizabeth Brestan-Knight, the head researcher in PCIT at Auburn University. My main project this summer was creating a nation-wide data base for all known PCIT trained therapist; it is an ongoing project. Secondary projects included creating and maintaining a color coded filing system for the PCIT sessions and data entry for several graduate students.

Kimberlynn Edge, Auburn University; Advisor: Dr. Mary Mendonca, Auburn University

Zebra Finch and Sex Ratio

The Zebra Finch, Taeniopygoa guttata, is the most common finch Estrildidar. Zebra Finches are a well-studied research model system for understanding the neuroendocrine basis of avian song and reproduction biology. In birds, the females are the heterogametic sex possessing a Z and W sex chromosome. Therefore, unlike humans, females are responsible for determining the sex of the offspring. Studies on a variety of bird species including Zebra Finches have shown that females sex ration respond to both environmental as well as physiological stress by skewing the sex ratio of their offspring in response to conditions towards male when favorable and female when unfavorable. Previous studies suggest that an acute elevation of Corticosterone, a mediator of stress, before ovulation skewed offspring sex ratio by impacting sex chromosome segregation during the first meiotic division, occurring at ovlation twenty four hours before oviposition. The presence of chronic Corticosterone levels during ovulation produced a higher ratio of female offspring. In this study, we will test whether chronic elevation of testosterone, another steroid that has been implicated in skewing sex ratio, will also cause a skew. We will impact females of twenty mating pairs with oral blanks or with slastic capsules of testosterone which cause chronic elevation of testosterone. We will sample the bird eggs after embryonic development begins to determine their sex.

Mitchell Moore, Auburn University; Advisor: Dr. Willis Hames, Auburn University

Comparisons of Clastic Composition and 40Ar/39Ar Detrital Muscovite Ages for the Pottsville Formation from the Black Warrior Basin and Cahaba Synform

40Ar/39Ar detrital muscovite ages, sandstone modal analysis, and the clast composition in conglomerates provide a powerful basis for delineating the provenance of ancient sandstones, inferring paleodrainage patterns and revealing the dominant tectonic activity of source regions. The Greater Black Warrior Basin (GBWB) presents the greatest accumulation of orogenic sediment in the southeastern Appalachian foreland. Previous studies of sandstones along the eastern margin of the GBWB (Cahaba synform, Central Alabama) documented detrital muscovite 40Ar/39Ar age distributions with modes of ca. 455, 375, and 330 Ma. Sandstones of the Cahaba synform have a relatively immature composition, and detrital mineral phases including conspicuous garnet, biotite and rutile, that are interpreted to indicate derivation from amphibolite facies rocks (Peavy, 2008). Samples from the depocenter of the GBWB (the Hendrix core) are dominated by detrital muscovite ages of 320 Ma, with varying prominence of a 370 Ma mode. The composition of sediment from the GBWB depocenter (sampled over a ca. 4000' interval of section in North-Central AL) is relatively consistent and immature, similar to that of the Cahaba synform. Detrital hematite, apatite, zircon, biotite, tourmaline, and relatively rare garnet are evident in preliminary studies of heavy minerals from the depocenter. Conglomerates of the GBWB depocenter contain abundant clasts of chert, limestone (with bryzoans and echinoderms), shale, basalt (commonly submarine with quench textures), low-grade metamorphic clasts (phyllites), and quartzite. Initial studies of a ca. 2000' section on the northern margin of the depocenter (the Brooks core, NW-AL) document more quartzose composition and conglomerates with clasts that seem dominated by quartzite. Considering the depocenter, the relatively consistent composition of sandstones, detrital muscovite age, and conglomerate clast types are interpreted to reflect derivation from a volcanic arc terrane containing relatively low-grade Alleghanian metamorphic rocks. We consider the Suwannee terrane to be a likely candidate for much of the sediment that reached the GBWB depocenter, whereas portions of the Carboniferous basin to the northeast derived a majority of sediment from the southeastern Blue Ridge and Piedmont terranes.

John O'Neill, Auburn University; Advisor: Dr. Hareesh V. Tippur, Auburn Univerisity

Mechanical testing of Soda-lime Glass using the full-field digital gradient sensing method for evaluating stress gradients in transparent solids

The Full-field digital gradient sensing method for evaluating stress gradients in transparent solids, developed by Dr. Chandru Periasamy and Dr. Hareesh V. Tippur, was applied to soda lime glass to determine whether or not it could be utilized during mechanical testing of glass. The DGS method captures small angular deflections of light passing through a specimen, and was used to show through analysis that the small angular deflections linked to non-uniform changes in thickness and refractive index of a material can be further related to spatial gradients of the first invariant of stresses under plane stress conditions. The DGS method had been previously used to evaluate mechanically loaded PMMA specimens which had a Young's modulus around 2 GPa. Because the DGS method relies on the non-uniform changes in thickness and refractive index, the question of whether it could be applied to a transparent solid with a much higher Young's modulus arose. Since materials such as glass have a high Young's modulus compared to PMMA, the deformation of the specimen and the resulting angular deflections were expected to be much smaller than previously measured using the DGS method. Soda-lime Glass which has a Young's modulus around 74 GPa was chosen to be the specimen for this research, and the stress gradients measured simultaneously along and perpendicular to the loading direction, are in good agreement with the analytical predictions proving that the full-field DGS method can be utilized.

Jenna Platt, Auburn University; Advisor: Dr. DeAnn Presley, Kansas State University

Soil Quality Indicators in Dedicated Energy Crops: Perennials and Annuals

The 2007 Energy Independence and Security Act subsidizes the growth and production of advanced biofuels which refers to "renewable fuel, other than ethanol derived from corn starch, that has lifecycle greenhouse gas emissions … that are at least 50 percent less than baseline lifecycle greenhouse gas emissions". Switchgrass is currently being developed as a dedicated energy crop for production across the U.S. and on marginal lands in the Great Plains. Switchgrass in Kansas can produce up to seven tons for each acre if under favorable water conditions or irrigation, but without the help of irrigation, yields will be reduced to reflect two to four tons per acre. Due to the fragile soils and semi-arid climate of this region, it is important to select cropping practices that do not further degrade soils, but rather maintain or improve soil resources. Therefore, the objective of this project is to determine any

possible changes or differences considering both abiotic and biotic soil quality indicators. This study was performed on soils at the Southwest Research-Extension Center located in Garden City, Kansas on a Ulysses silt loam. Two cultivars of switchgrass were selected from a study established in 2007, and three annual forages were selected from an adjacent experiment. Perennial grasses were among the treatments with the smallest values for wind erodible fraction (WEF) and the largest values for geometric mean diameter (GMD). Though there was not a significant difference between the switchgrass cultivars, the cultivar more adapted for survival without irrigation in western Kansas did have a slightly smaller WEF and higher GSD, indicating that a well-established switchgrass crop may lessen soil degradation by wind erosion. In general, the recently harvested spring forages had the largest and most active soil microbial populations, and the perennials and winter-harvested sorghum had the lower soil biology parameters. In summary, dense healthy vegetation is essential for maintaining soil quality. Sustainable bioenergy must protect the soil resource to maintain the concept of sustainability.

Daniel Pulliam, Auburn University; Advisor: Dr. Mark Bryne, Auburn University

Design of poly (ethylene glycol) based hydrogels to control the release of sirolimus from drug eluting stents

Drug eluting stents have been approved by the FDA since 2003 for use in minimizing the risk of restenosis. To create safer drug eluting stents, it is vital to design polymers that allow for a controlled release pattern of a drug that prevents restenosis and eliminates the risk of thrombosis. The goal of this work focuses on the design of a hydrogel capable of the controlled release of sirolimus. Both poly(AA-co-HEMA-co-PEG200DMA) and poly(AA-co-HEMA-co-PEG200DMA-co-PDMS) were tested through various studies to assess factors governing the controlled release of sirolimus. The concentration of cross-linker, PEG200DMA, was found to hold an inverse relationship with drug release. The dependence of release on cross-linker concentration was supported by mechanical property testing that found increased concentrations of PEG200DMA yields lower Mc and mesh size values. Additionally, an inverse relationship exists between Mc and mesh size values and Young's modulus. Typical values for the Young's Modulus for 30 mol%, 50 mol%, and 100 mol% PEG200DMA hydrogel formulations polymerized in air were 0.786 MPa, 0.850 MPa, and 1.45 MPa, respectively. Hydrogels polymerized in N2 held values of 1.57 MPa, 1.80 MPa, and 2.49 MPa for the 30 mol%, 50 mol%, and 100 mol% PEG200DMA formulations, respectively. Mc values estimated for 30 mol%, 50 mol%, and 100 mol% PEG200DMA hydrogel formulations polymerized in air and in N2 were 99 Da, 60 Da, 40 Da and 9 Da, 7 Da, and 34 Da, respectively. Polymerization in a N2 environment induced smaller Mc and mesh size values in polymer networks, inhibiting drug release in comparison to networks polymerized in air. Light intensity during polymerization held an inverse relationship with sirolimus release. Swelling data supported structural differences among the hydrogels led to their differences in release patterns. The swelling and drug release data for poly(AA-co-HEMA-co-PEG200DMA-co-PDMS) showed altering the chemistry of the network delayed sirolimus release compared to poly(AA-co-HEMA-co-PEG200DMA) possibly due to structural differences, chemical affinity, and/or both.

Brooke Widder, Auburn University; Advisor: Dr. Aimee Callender, Auburn University

Effects of Prompted Self-Explanation of Text on Comprehension and Memory

In previous research different training strategies such as Self-Explanation Reading Training (SERT; McNamara, 2004) have been shown to improve learners self-explanation by prompting them to engage in five critical tasks: paraphrasing (putting text into one's own words), bridging inferences (linking the current sentence to previous information in the text), prediction (anticipating subsequent information in the text or a reminder to look for specific information later in the text), elaboration (common sense, reasoning, and prior knowledge to explain the text and connect it with pre-existing knowledge base), and comprehension monitoring (identifying parts of the text that the reader does not understand). Paraphrasing has shown to be the most commonly used; however, it may be the least affective in furthering a learners understanding of the information. The current study investigated whether these skills need to have extensive training, or if students can implement them correctly through a simple training session and prompts throughout the text.

Lacey Wright, Auburn University; Advisor: Dr. Saad Biaz, Auburn University

Collision Avoidance of Multiple UAS Using a Collision Cone-Based Cost Function

Greater importance is being placed on unmanned aircraft systems (UAS) by both the military and civilian sectors. Currently, human interaction in the form of guidance and control is required for most applications involving UAS. Smart UAS exist to address this limitation; however, in order to be effective in real-life scenarios, several hurdles must be overcome. One such obstacle is the inability of UAS to avoid one another in a limited airspace. The collision avoidance algorithm extends the concept of the collision cone for use with multiple UAS. A cost function based on the collision cones between each UAS and its possible aggressor UAS is computed. Using simulated annealing, the bearings of these UAS are adjusted until the minimum number of near-misses is estimated to occur as determined by the minimization of the cost function. The algorithm is tested using a simulated environment.

Anthony Holliman, Tuskegee University; Advisor: Dr. Gerald D. Griffin, Tuskegee University

HSV-1 modulation of Activity Regulated Cytoskeletal protein in neuroblastoma cells

Approximately 60% of the US population is infected with Herpes Simplex Virus Type 1 (HSV-1). After the virus infects epithelial cells, it travels to neurons in the peripheral nervous system and forms a latent infection. Additionally, HSV-1 can cross into the central nervous system and can cause encephalitis. During latent infection, HSV-1 inhibits the Activity Regulated Cytoskeletal (ARC) gene, which regulates synaptic strength and is involved in neuroplasticity. The effect of HSV-1 on ARC expression during acute infection is unknown. Thus, we are testing the hypothesis that HSV-1 regulates ARC gene expression early during infection. To do this, we are infecting SY5Y neuroblastoma cells with the F strain of HSV-1 and using Western Blotting and immunocytochemistry to evaluate the amount and localization of ARC 3, 9, and 18 hours post infection.

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Tumor Targeting using Peptides In Vitro on Cancer Cell Lines

Background: The African American population is adversely affected by breast cancer, prostate cancer, and neuroblastoma. African American women are more likely to die of breast cancer; African American men in the US have the highest risk and are more likely to be diagnosed at an advanced stage of prostate cancer, and African American children are more likely to develop high-risk neuroblastoma and subsequently have worse event-free survival compared with white patients. Purpose: Our aim is to design and evaluate lytic peptides for their antitumor activity, determine if peptides and their peptoid versions will target and inhibit the cell proliferation in the cancer cell lines, and finally determine the molecular mechanism involved in peptide mediated proliferation. Experimental design: Cellular uptake of the peptide and effects on cell viability and cell profileration will be determined. To target neuroblastomas, the peptide was fused to a benzyl-guanidine at the N-terminus of the peptide. The effects of this procedure on cell proliferation will be determined and gross morphological changes among peptide treated cell cultures will be observed.

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High Performance Computing Metrics CTR System

There are many effective Open Source metric collection tools in use today. However, many of them are only focused towards solving a specific end point problem rather than focusing on the bigger picture to become or be integrated into an enterprise solution. During this project, many products will be evaluated for their ability to be retrofitted into an enterprise solution that combines “data collection”, a transport layer, and a central data collection location. Data Collection may come from many sources and could require different “collectors” depending on need a performance levels. Data Collectors may also tie into data evaluation or thresh-holding mechanisms at the local collection point in order to meet critical time dependent decisions. The desire is to design a framework for an Enterprise Solution from Open Source products that will allow for the collection of metrics (data), transport that data to a central location, and store that data in a way that is accessible by other products. Once stored the pre collector data may be analyzed at multiple levels. Those levels could be different “software domains” (i.e. a job executing across many nodes, file systems served by many nodes, all nodes in a cluster or a cluster of clusters, etc.), or “hardware domain” (i.e. nodes on an Infiniband switch or in a Infiniband fabric, IO servers in a SAN, etc.), or any other defined group of collection points. The analysis of the data will take many forms, real-time to allow actions using predefined rules, batch or time defined to generate reports, ad hock, or other as needed.