

## Alabama Alliance for Students with Disabilities in STEM (AASD-STEM) 5th Annual Conference

April 11, 2015 \* Auburn University Hotel and Conference Center \* Time: 8:00a.m.-1:30 p.m.

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

Time	Activity	Description	Location
8:15-8:45 AM	Registration	Registration and Continental Breakfast	Pre-Function Foyer
8:45 –9:00AM	Overview of the AASD-STEM Program	<b>Opening Session</b> Opening Remarks Dr. Overtoun Jenda, PI and Program Director AASD–STEM Program	Ballroom A (right)
9:00– 9:45AM	Student Presentation <b>(10-12 Minutes)</b>	<b>Student Research Presentations:</b> Myles Davis, Jacqueline Martin and Mitchell Moore (Jeremy Taunton)	Ballroom A (right)
9:45-10:05AM	Poster Session	Presented by Internship Recipients and Other Students	Governor’s Room
10:10-10:40AM	Research Presentation	<b>Minigrant Presentation</b> Dr. Arie Nakhmani (Daniela Marghitu)	Ballroom A (right)
10:40-11:30 AM	Alumni/Student Panel	Brittany Cook, Myles Davis, Leslie Dickson, Mitchell Moore and Shelby Nunnelee (Caroline Dunn, Tamara Massey)	Ballroom A (right)
11:30-12:30 PM	<b>LUNCH</b>	Hotel and Conference Center Ballroom <b>Luncheon Speaker: Ms. Lauren Lindsey</b> (Mohammed Qazi)  Evaluations (David Shannon) Closing Remarks (Carl Pettis)	Ballroom B (right)
12:30-1:30 PM	Breakout Sessions:	AASD-STEM Executive Meeting	Student Networking Meeting
			Ballroom B (left) Ballroom B (right)



## AASD-STEM CONFERENCE PRESENTERS

### PANEL SESSION

**Ms. Brittany Cook – Auburn University Montgomery**  
**Mr. Myles Davis – Tuskegee University**  
**Ms. Leslie Dickson – Auburn University**  
**Mr. Mitchell Moore – Graduate Student Auburn University**  
**Mr. Shelby Nunnelee – Auburn University Montgomery**

### LUNCHEON SPEAKER

**Ms. Lauren Lindsey, Laboratory Manager, Biological Sciences, Auburn University**  
**(BSc, Biology TU 2011; MSc Environmental Sc., TU 2014)**

### STUDENT PRESENTATIONS

**Myles Davis<sup>1</sup>, Joseph Mazur<sup>2</sup>, Sarah Wheeler<sup>2</sup>, Amanda Clark<sup>2</sup> and Alan Wells<sup>2</sup>: <sup>1</sup>Tuskegee University, Department of Biology, Tuskegee, AL; <sup>2</sup>Department of Pathology, University of Pittsburgh, Pittsburgh, PA**  
**Determining Dosing for Hepatocyte Damage and Prostate Cancer Chemotherapies**

Some therapeutics are known to cause hepatic toxicity. Our project assessed dosing of acetaminophen and troglitazone to achieve liver damage on fresh human hepatocytes in culture, and determined the optimal dosage of the chemotherapy drugs Cisplatin (Cis), Doxorubicin (Dox), and Camptothecin-11 (CPT) for the prostate cancer cell line PC3. Troglitazone, an anti-diabetic and anti-inflammatory drug, and acetaminophen, a pain reliever and a fever reducer, are associated with liver toxicity. We treated hepatocytes with 600 µg/ml, 1200 µg/ml, or 2400 µg/ml of acetaminophen or 100 µM, 200 µM, or 500 µM of troglitazone. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT), two enzymes released when liver damage occurs, were assayed in the UPMC clinical chemistry laboratories. A blood urea nitrogen test was also performed in the clinical laboratories to analyze nitrogen levels, a measure of hepatocyte function via protein catabolism. We found that troglitazone damaged the liver more than acetaminophen, and acetaminophen did not have a significant impact on hepatocyte protein catabolism. To determine the IC50 of Cis, Dox, and CPT for PC3 cells, we treated the cells in triplicate in a 96 well plate with drug concentrations ranging from 100µM to 100nM for 72 hours. We performed MTT assays to assess cell survival. The averages were analyzed and the IC50 values of CPT, Dox, and Cis were, 2.042 nM, 2.433 nM, and 3.644 nM respectively (n=2). These experiments suggest that PC3 cells are most sensitive to CPT since its treatment resulted in the lowest IC50 concentration. These data establish the ranges of a variety of chemotherapeutic drugs that can be used for prostate cancer therapy without damaging the hepatocytes. This work was supported by the Department of Defense grant #PC080566.

**Jacqueline Martin, Tuskegee University; Advisor: Rodney Stone USDA Liaison, Natural Resource Conservation Service (NRCS)**

#### **Developing Non-Braille Tactile Solutions for Flat Membrane Switch Control Panels**

The Natural Resources and conservation Service (NRCS) is a branch within the United States Department of Agriculture (USDA) that helps America's farmers, ranchers, and forest landowners conserve the nation's soil, water, air and other natural resources. This presentation captures a complete summer internship of learning experiences acquired through NRCS as a USDA Scholar at Tuskegee University. Collectively, it encapsulates 230 hours of hands-on field experience rendered across North Alabama in response to agricultural operations, resource conservation, and farming improvements. Further, the content provides realistic impressions of daily work and careers that are aligned with degrees in Environmental, Plant, and Soil Science. The presentation is heavily comprised of pictures to capture the essence of the daily work activities. The intent is to leave the reader with the accelerated professional development a student gains (in the office and field) as a USDA scholar in training.

**Mitchell Moore, Auburn University; Advisor: Jose Vasconcelos, Dept. of Civil Engineering, Auburn University**

Storm water runoff from constructed surfaces like parking lots, buildings, and roads needs to be regulated and controlled. Research has shown that urban areas produce storm water runoff that can be damaging to the ecosystem. This is typically due to two factors: overall runoff quantity, and water quality. Impermeable surfaces like roads deliver larger amounts of rainfall to streams and rivers than the ecosystem is used to; this can cause stream instability, which is dangerous for organisms and the ecosystem as a whole. Additionally, studies have shown that storm water runoff from urban areas have higher concentrations of nutrients (like nitrogen and phosphorous) and heavy metals that can be dangerous for aquatic organisms. The research in this presentation is focused on monitoring these factors in highway storm water runoff. Because highways are long, thin stretches of road surfaces, they vary significantly from urban areas. The Alabama Department of Transportation has begun work on a new interstate (BNB) in Birmingham, AL that will cross over 50 streams and rivers. Local environmental groups are concerned about the impacts of this new roadway to the many important bodies of water and their associated ecosystems. This research focuses on the impact of a currently existing interstate in the area on a stream that receives storm water runoff. Our research indicates that the interstate does not negatively impact the stream ecosystem in a measurable way considering nutrient loads or storm water runoff quantity. In fact, in some cases the features of the roadway (ditches, medians etc.) seem to provide a buffer for rainfall to slowly enter the stream. Further studies in this site will include heavy metals and biological assessments.

**MINI GRANT PRESENTATION****Dr. Arie Nakhmani, Dept. of Electrical and Computer Engineering/Comprehensive Cancer Center, University of Alabama at Birmingham****Magic World of Science and Engineering for Special Needs Students**

Our society is in permanent need of highly trained professionals in science, technology, engineering, and math (STEM) areas. Attention disorders and learning disabilities may prevent some students from considering a career in STEM, which a disappointing loss, especially when their abilities exceed that of their peers. The University of Alabama at Birmingham (UAB), Department of Electrical and Computer Engineering hosted a STEM hands-on camp (sponsored by AASD-STEM), where special needs school students worked together with faculty and undergraduate students. In this camp, we hosted 14 students with different types and levels of disability. All were minority students, underrepresented in STEM, from the Birmingham metro area. The camp provided an introduction to the electrical and computer engineering discipline through various hands-on experiments and demonstrations, including: controlling Scribbler 2 robots, acquiring visual information from the IR sensors mounted on the robot, learning the beauty of math through exploring Mobius strips, fractals, and other mathematical structures, and developing algorithms to produce exciting visual effects in real time by using a simple video camera and computer. The students learned about electrical circuits and built applications ranging from a DC motor circuit to an FM radio. As part of this program, the students successfully learned PowerPoint presentation skills, and presented their work at the end of the camp. The main goal of this pilot project was to develop curiosity for science and technology, to improve critical thinking, which is essential for a successful STEM career, and to evaluate the appropriateness and effectiveness of the proposed program elements. Significant changes in student's attitude to STEM cannot be expected after a three day camp, but most students expressed an interest in participating in our future programs. This social event helped students with special needs socialize and improve their scientific inquiry skills. Pre- and post-surveys showed an increase in the level of interest in computers and technology, as well as in building and fixing things. Surveys also revealed that multiple choice questions are problematic for students with a short attention span, or with reading disabilities. We intend to use this project as a starting point for developing a continuous program of STEM outreach activities.

**POSTER PRESENTATIONS****Chris Gaddes, Auburn University; Advisor Dr. Nels Madsen, Dept. of Mechanical Engineering, Auburn University****Examining the Effects of Artificial Light on Sleep**

Audio alarm clocks wake the sleeper abruptly and often to an unpleasantly dark early morning room. A Raspberry Pi microprocessor was used to wirelessly control LED light bulbs in order to simulate the rising sun to wake a sleeper to a partially lit room without need for an audio alarm before the actual sunrise occurred. The Raspberry Pi was programmed to cause the LEDs to slowly increase in brightness over the course of half an hour each morning.

The wake time was chosen by the user by creating a Google Calendar event entitled “wake” which served to trigger the Raspberry PI which was polling the calendar database in a loop. Additionally, the multicolored lights were varied away from white to visually match the color of the sun in order to more accurately simulate real sunlight. Although terms such as “alert” and “drowsy” are highly subjective, the relative “alertness” or “drowsiness” of the sleeper when the sunrise alarm clock was used was documented and compared to a control which used an audio alarm clock in a dark room. Daylight is one of the main environmental clues the human body uses to sync its internal clock. Thus, simulating a sunrise in an otherwise dark room in the morning should leave the sleeper feeling more alert, less drowsy, and less disoriented. This claim was shown to be true by experimental data. Additionally, even if the promising results of the experiment are simply due to the placebo effect, it seems undeniable that waking to a lit room is more “pleasant” than waking to a pitch black room. Preliminary results suggests that simulating the sunrise as is worth considering as a refreshing alternative to typical audio alarm clocks. Future research ideas include analyzing the effects of using additional senses to wake the sleeper. For example, aromas such as coffee could be used to signal the brain to wake up or subtle vibrations could be applied to the sleeper’s bed to gently wake them from their sleep.

**Nicole Gerhard, Auburn University; Advisor: Ana M. Franco-Watkins, Dept. of Psychology, Auburn University**  
**The Effects of Multitasking on Decision Making**

Many people believe that they are capable of multitasking. Although most people would not consider multitasking as a stressor, research demonstrates that multitasking can negatively affect performance (Junco & Cotton, 2012). Multitasking takes up attentional resources because people must divide their attention among the different tasks. Given the emphasis in today's society, we examined how divided attention acts as a stressor when people are making decisions. In particular, a dynamic decision making task was chosen to use, a Water Purification Plant simulation. This task is a resource allocation and scheduling task and simulates a water distribution system. This task is called a dynamic decision making task because the environment the user has to decide on changes based on their previous actions. Because things are always changing in our environment, a dynamic decision making task replicates choice used in a more natural environment. Participants were asked to complete either only the dynamic decision making task or that task along with a secondary task simultaneously. The secondary task required them to generate out loud random numbers at a set interval. This seemingly simple random generation task is effective at dividing the participants’ attention, and makes it challenging to complete both tasks. Based on previous research, we expected that requiring the participants to complete two tasks simultaneously will lower their performance on the dynamic decision making task because adding stressors to an environment typically decreases performance in making decisions. We also expected the natural learning curve that is present when practicing a task to be disrupted when required to complete another task simultaneously. We compare the results of this study with previous research where people make decisions under pressure, specifically with divided attention. The potential significance of this project is that it will contribute to the theory of how decision making processes are affected by the presence of additional attentional demands, specifically in situations that include divided attention. Additionally, we extend these findings into many current areas of research such as texting and driving, worker performance, and the education system.

**Andrew Jones, Auburn University; Advisor: Anwar Ahmed, Dept. of Aerospace Engineering, Auburn University**  
**Flow Visualization of a Joined Wing**

The primary objective of the research project was to investigate the effect of joined wing on the trailing vortices of an aircraft. The study aimed to mitigate the effect of trailing vortices on an aircraft. Trailing vortices cause downwash on the wing which is responsible for the induced drag. Induced drag depends on the lift during steady aircraft operation at high angle of attack i.e. high lift conditions. Furthermore, trailing vortices are the primary source of wake turbulence and are a safety hazard for the aircraft following the lead aircraft. By reducing or eliminating the trailing vortices, the induced drag on the wing can be reduced and improve the aerodynamic efficiency and safety of an aircraft. A reduction of the induced drag will also improve the range and endurance of the aircraft. The study was conducted by using the water tunnel to demonstrate the flow visualization over a scale model. This showed the effects of the joined wing on the flow and the vortices formed by the wing. This flow visualization was performed at three Reynolds numbers and several angles of attack. In conclusion, the joined wing reduced the vortices on the wing and moved them further aft to the tail of the aircraft. It also moved the vortices closer together. Future research needs to be done to see the exact effects to the lift and drag of this aircraft.

Following the testing the model in the wind tunnel, the numerical data on the lift and drag curve the resulting data will then be compared to the lift and drag curve for an equivalent finite wing.

**Mackenzie Matthews, Tuskegee University; Advisor: Jennifer Rice, Dept. of Civil and Costal Engineering, University of Florida**

**The Preliminary Study of Using the Transponder and DC Coupled Radar to Measure Displacement**

This research project seeks to apply a new sensor technology to improve structural monitoring, testing and assessment strategies for our aging infrastructure. The objective is to make a new type of wireless radar sensor system that detects low frequency displacement and static deflection of structures. A Moving Load Design was simulated to understand the characteristics of using the wireless sensor for measuring and improving the signal's quality for structural testing and assessment for bridges.

**Meghan Neace, Auburn University; Advisor: Brian Helms, Dept. of Biological Sciences, Auburn University**  
**Cross-disciplinary skills used to differentiate two morphologically similar species of freshwater crayfish (*Cambarus*)**

In this project we explore the issue of discerning morphologically similar species using illustration techniques. Two sister species of crayfish, *Camparus halli* and *Cambarus englishi*, were chosen to demonstrate the use of illustration in highlighting subtle differences between cryptic species. To accurately illustrate each species, a precise outline was created for each specimen using an iterative process of measurement, pencil drawing, photographing, and inking until an accurate representation was created. The next step in illustration was to add detail coloring to these outlines using Adobe Photoshop and a tablet as a painting medium. Color and detailing were important in highlighting the differences between the two organisms in ways, potentially superior to photographic documentation. For example, detail in the color of the antenna and the second pleuron shape, are particularly important diagnostic traits that are often lost in photographs. This method also has an advantage over photography because often specimens lose color and other identifiable features once they are preserved. An artist can account for this variation and create an image of the species true to how they are typically seen in the field. By using both digital and traditional drawing techniques this method allows collaboration between artist and researchers to highlight identifiable traits between morphologically similar species.

**Scout Wonsang, Alabama State University; Advisor: Tina Vazin, Dept. of Foundations and Psychology, Alabama State University**

**Impact of Dark vs. Light Background on Reading Comprehension for Individuals with Dyslexia**

The purpose of this study is to determine whether dyslexic individuals experience greater reading speed/comprehension on black on white text compared to white on black text. It is hypothesized that the reading speed/comprehension of a dyslexic individual will increase when an individual reads an article with white on black text opposed to black on white text. Twenty college students participated in this study in exchange for extra credit in their course. The results showed that seven of the 20 participants, four females and three males, had mild to moderate dyslexia with one of the seven testing positive for dysphonia dyslexia as well. None of the seven participants had been diagnosed with a reading disability or any other learning disability. Two of the seven participants had a family history of diagnosed learning disabilities including a brother and an aunt. One of the seven participants had a history of grade retention where one participant was retained during elementary school. There were no significant differences in high school grade point average or college grade point average between the participants who tested positive for dyslexia and who's did not. There was a significant difference in the percentile rank in reading comprehension/vocabulary as determined by the Adult Dyslexia Test between the participants who tested positive for dyslexia ( $M=16.1420$ ,  $SD=15.11543$ ) and those who did not ( $M=34.035$ ,  $SD=18.88172$ );  $t(18)=-2.155$ ,  $p=.045$ . Although the sample size was too small to obtain statistical significance, all of the participants who tested positive for dyslexia scored higher in reading comprehension on the passage printed with white text on black background compared to 1/3 of the other students. The importance of the preliminary findings of this study has implications for the presentation of educational materials, marketing, library media, and a host of other areas that may include individuals with dyslexia in their target program.