Name(s): Ellison, Brittney

Education Institution(s): The University of Alabama
Major(s)/Degree/Grad Year: Mechanical Engineering/BS/2012
NASA MSFC Mentor: Tina Malone
Org Code/Divison or Branch: EM10/ Hydrogen Test Facility

Research and Experience

- **Micromechanics Lab, working with Dr. Leila Ladani on NSF and NASA funded projects testing the mechanics of electronic and bio-materials, beginning fall 2011**

Membership and Activities

- **NASA Leadership Academy Summer Intern**
- **Speak-Up Tuscaloosa Volunteer/Mentor at Hillcrest Middle School**
- **Panhellenic Judicial Board for Sorority Recruitment**
- **Student Alumni Association**
- **Center for Teaching and Learning Math Tutor**
- **Shelton State Bridge Program Math Tutor**
- **Future Alumni for Tradition and Excellence**
- **Phi Mu Fraternity**
- **Phi Mu's Philanthropy Committee for Children's Miracle Network**
- **2008 Homecoming Dance Team**
- **Order of Omega Greek Honor Society**
- **Cardinal Key Honor Society**
- **Phi Eta Sigma Honor Society**
- **Gamma Beta Phi Honor Society**
- **Alpha Lambda Delta Honor Society**

Honors and Awards

- **American Society of Mechanical Engineers Emerging Leader Award**
- **Nominated for Most Outstanding Mechanical Engineering Sophomore**
- **Scholastic Achievement Award, Phi Mu Fraternity**
- **Dean's List**
- **President's List**
- **University of Alabama Scholar Award**
- **Engineering President Cabinet Scholarship**
- **Engineering Leadership Scholarship**
- **University of Alabama Alumni Scholar Award**
- **University of Alabama Alumni Heritage Scholarship**

Title of Poster: The Hydrogen Test Facility's Composite Disk Permeability Testing

Abstract:
NASA developed the Composite Cryotank Technologies Demonstration Project as a way to explore advanced composite materials that would reduce the cost and weight of liquid hydrogen (LH2) cryotanks. Reducing the mass of a launch vehicle without reducing the quality is a difficult challenge associated with leaving Earth. Currently, liquid hydrogen is contained in the space shuttle's external tank, which is made of an aluminum-lithium alloy. This fuel and oxidizer tank alone encompasses seventy percent of the dry mass of the launch vehicle. We want to replace this aluminum with a composite material so that the tank structures will weigh much less. At the Hydrogen Test Facility, we are testing the permeability, or leak rate, of several carbon-fiber composite disks in cryobiaxial environments to simulate space flight conditions. However, when these composite materials are subject to cryogenic environments, they have the propensity to develop micro-cracks. Excessive micro-cracking can lead to premature failure and inhibit the ability of the tank to retain the pressurants. During our study, we found that composites wherein plies of different orientations are dispersed, rather than grouped, show excellent performance even after cryogenic cycling. We will continue to test and study these materials until we have found cryotank technologies that are new, safe, and innovative that will enable human space exploration to destinations beyond low Earth orbit.