There are approximately 5.6 million bone fractures in the US each year (Canale, 2003). In large injuries patients may be missing segments of bone due to trauma, such as from a car crash, gunshot, tumors, or infection. These large bone defects can be a serious problem for physicians to treat because they can be difficult to heal. The goals for treatment are to maintain limb length and to restore function. Physicians often use biomaterials and/or implants to fill, stabilize, and repair the missing bone segment. In this design competition, teams will design and construct a prototype implant to fill and stabilize a partial bone defect.

Teams will need to purchase or borrow any materials, supplies, or tools needed for their design; however, the sawbone (plastic bone) with a defect will be provided on the day of the competition.

Canale ST. Campbell's Operative Orthopaedics. 10th ed. St Louis, Mo: Mosby-Year Book; 2003

**Competition Guidelines:**

1. Teams must consist of only high school students, with no more than 5 people per team. Multiple teams per school are allowed, but there is a maximum of 3 teams per school.

2. On the day of the conference, teams will be provided a sawbone radius (approximately 16mm diameter) with a partial defect (not cut all the way through the bone). The defect will be 20mm long, 8 mm wide, and 8mm in depth (Figure 1).
3. Teams will have 10 minutes to apply their implant materials/devices to fix and stabilize the damaged sawbone on site. Teams are NOT allowed to use power tools to apply implants to the sawbone. Hand tools are allowed.

4. The designed implant device and materials must fill the entire space of the bone defect and stabilize the defect.

5. The sawbone with design teams applied implant device/material will be tested using 4 point bending using 2 two pound weights (see diagram below). If the initial weight requirement is satisfied, then additional 2lb weights will be added on each side every 20 seconds until failure. (Figure 2)
6. The total cost of materials must not exceed $15 (excluding hand held tools).

7. Teams must present a poster (36 x 48 in display board) on their design that consists of:
   a. Team name, high school name, and names of team members
   b. Description of basic bone anatomy, physiology, &/or bone healing
   c. Identification and description of materials
   d. Design and materials rationale (e.g. why did you select these materials & what is the purpose in the implant design, or how is your design teams implant device/material supposed to work to stabilize and heal the bone)
   e. A budget breakdown of materials (excluding hand held tools)

The designs will be judged by local biomedical engineering professors and graduate students.

For questions please contact:
Brandon Martin
Society for Biomaterials University of Memphis Student Chapter President
sfb.umchapter@gmail.com