BIOMEDICAL ENGINEERING AWARDS AT E-DAYS

On April 19, 2019, members of the SBME Advisory Board—Julie Dunn, Gary Johnson, Stephanie Salazar, and Dennis Schlaht—served as judges and provided three biomedical engineering teams with cash awards at Engineering Days (E-Days). This annual event provides undergraduate engineering students an opportunity to showcase their completed senior design projects to faculty, family, industry representatives, and peers. The capstone senior design project teaches students how to succeed in a well-integrated, interdisciplinary engineering design environment and allows students to develop practical, hands-on skills.

This year, thirteen industry members representing various companies including AlloSource, Beckman-Coulter, BD, Medtronic, Osypka Medtec, UC Health, and Terumo BCT, also served as BME judges and critically evaluated student projects on technical content, presentation, creativity, and overall impression. The following BME student senior design projects were awarded:

**First Place: Smart Bandage** (faculty advisor: Christie Peebles)

**Group Members:** Ryan Boudreau (BME+CBE), Kelli Corrigan (BME+ME), Tyler Daniel (BME+CBE), Jacob Grady (BME+CBE), Neil Rettedal (Microbiology)

This team set out to create a living medicine bandage that contains genetically engineered cells which are able to sense and destroy infectious bacteria in wounds. This novel therapeutic kills tough strains of bacteria that are typically unaffected by many modern antibiotics on the market today. Because the engineered cells only release therapeutic agents when it is absolutely necessary, the chances of bacteria becoming resistant to our treatment is greatly reduced. As a proof of concept, this team chose to target MRSA, a strain of Staphylococcus aureus that has become resistant to a wide variety of antibiotics. The engineered cells contained within the bandage are suspended in a hydrogel which provides the nutrient necessary for the cells to remain active. The portion of the bandage that contacts the skin will allow proteins and small molecules to diffuse through, while keeping modified cells in place.

**Second Place: Sensor Technology for Enhanced Prosthesis Production** (faculty advisor: Steve Simske)

**Group members:** Jackie Foss (BME+ME), Luis Monterrosa Zavaleta (BME+ME), Tyler Parker (BME+ME), Dolly Ricapor (BME+ME), and Grant Wulf (BME+EE)

Sensor Technology for Enhanced Prosthesis Production (S.T.E.P.P.) is a two-part design project focused on quantifying the artisanal methods normally employed by a prosthetist. The first half of the project is focused on delivering a handheld probe for tissue stiffness. The probe data will then be translated onto a 3D scan of the limb generating the intensity map, recording the locations of soft versus harder tissue. This information is translated to a 3D-printed socket which can be shaped to match the intensity map generated by the probe. The second half of the design project involved generating data on the performance of the 3D-printed prosthetic sockets and investigating ways to enhance performance.

**Third Place: Cell Separations** (Sponsor: Terumo BCT)

**Group Members:** Ryan Rykhs (BME+ME), Ashley Marcolina (BME+ME), and Rachel Von Seggern (BME+CBE)

Current product lines use continuous flow centrifugation while maintaining functionally closed (sterile) systems. This team was interested in increasing fluid flow rates throughout centrifuges while maintaining the same or better cell recoveries. This project used an existing centrifuge design to develop single use disposable prototypes to increase throughput for more efficient cell separations. Increasing flow rates can be done by increasing G’s via higher RPM’s or larger radius; however, this team looked to achieve the same effect using more intelligent design methods. Higher G’s may negatively affect machine or disposable reliability. By predicting fluid flow characteristics using computation fluid dynamics software, it has been possible to predict fluid behavior within the centrifuge.