

SENIOR DESIGN DAY

April 28, 2023

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ROY. J CARVER
— department of —
**BIOMEDICAL
ENGINEERING**

Welcome!

The faculty and staff of the Roy J. Carver Department of Biomedical Engineering welcome you to Senior Design Day 2023, as we celebrate the achievements of our students. Please note that presentations will be conducted concurrently in Auditoriums 295 and 235 of the Boyd Law Building. Groups A and B will be presenting in the morning session and groups C and D will be presenting in the afternoon session.

The Senior Design Instructor Team
Prof. Colleen Bringman
Prof. Kristan Worthington

GROUP A - Opening Remarks by Prof. Colleen Bringman
Boyd Law Building, room 295; Prototypes displayed in Central lobby
Moderator: Ana Figueroa

8:30 am Team 5	A Method to Improve Intraoperative Measurement of Femoral Version Correction Dominic Rivas, Olivia Coder, Andrew Behrens; Mentors: Dr. Michael Willey and Dr. Jessica Goetz <i>Developing a method to improve the reliability and reproducibility of intraoperative measurement of femoral version correction.</i>
8:50 am Team 4	Endotracheal Tube Securement Device Scott Bell, Samantha Koch, Ashley Preston, Ryland Threlkeld-Wiegand; Mentors: Scott Alvarado, Dr. David Papworth <i>A better way to prevent endotracheal tube migration during surgery that prevents the loss of a breathing airway.</i>
9:10 am Team 6	Improving 2nd and 3rd TMT Joint Arthrodesis and Osteotomy Christian Bellantuono, Mario Guerrino, Ethan Manuell, Hunter Zieser; Mentors: Matt Coyne, Brad Boysen <i>A system that facilitates surgeons' ability to prepare and fixate the 2nd and 3rd TMT joint to increase bone fusion rates.</i>
9:30 am Team 9	Bladder Biopsy: A Streamlined Approach Madelynn Andersen, Cole Dingman, Kessa Jones, Bhavya Vats; Mentor: Dr. James Brown <i>Our device simplifies the bladder biopsy procedure by combining the tissue resection and cauterization tools, saving procedural time and</i>
9:50 am	SHORT BREAK
10:00 am Team 19	May the Force(ps) Be With You: Tracking Forceps Placement in an Operative Delivery Trainer Isabella Anania, Luis Caceres, Ben Hinz; Mentors: Marygrace Elson MD MME), Mikael Meyer (RN ICBCLC) <i>Improving forceps-assisted vaginal delivery outcomes by tracking forceps placement on a fetal head model via pressure sensors.</i>
10:20 am Team 16	Manual Wheelchair Redesign Aidan Atkins, Jami Ostrowski, Johanna Theeler, Katie Vaiciulis; Mentor: Dr. Rachel Vitali <i>This project is a cost-effective redesign of the manual wheelchair propulsion mechanism intended to optimize shoulder biomechanics and minimize shoulder pain and injuries.</i>
10:40 am Team 17	Temperature Regulation of Artificial Muscles Demir Tuken, Nathan Gates, Matt Chay, Kurt Bennet; Mentors: Dr. Caterina Lamuta, Dr. Deema Totah <i>Creating an insulation and cooling system for artificial muscles in orthosis' to protect the user and allow for efficient muscle contraction.</i>
11:00 am	Review of Design Prototypes in the Central Lobby
12:00 pm	Break for lunch

2023 SENIOR DESIGN CLASS

Isabella Anania Madelynn Andersen Arash Asadi Aiden Atkins Ivan Badovinac Sam Baule Andrew Behrens Scott Bell Christian Bellantuono Kurt Bennett Connor Bernitt Will Brewer Sam Buchholz Jordan Burtch Adrian Caceres Luis Caceres Matt Chay Olivia Coder Jacob Collogan Marshall Cordes Meaghan Cruise Matthew Cunningham Megan Dao Justin DeCoste Grace Deli Paxten Devilbiss Cole Dingman Luke Doyle Myles Evangelista Blaise Feller Kaylee Finnegan Kayla Garcia Rolando Garcia Wes Gari Nate Gates Agam Gill	Katya Gillig Mario Guerrino Matthew Heil Riley Higgins Ben Hinz Allison Hoeger Ashley Hytrek Molly Jaros Kessa Jones Owen Jones Hima Joseph Parker Kaminski Megan Kelly Alexander Kilburg Samantha Koch Aleah Kossan Jacob Krejchi Ryan Langstraat Bennet Lum Kaitlyn Lutsch Julie Macias Ethan Manuell Michelle Matejka Marissa McFadden Dalton Meyer Ethan Miera Rahul Modukuri Taylor Moore Roshni Nair Megan Nelson Njeri Ngendo-Gakinya Jami Ostrowski Sofia Peraza Munuzuri Gino Petrone Ashley Preston Dominic Rivas	Alejandro Rizo Jonathan Robshaw Younes Rouabhi Kyle Schneider Shadi Shariff Kirsten Sibbaluca Noah Sinclair Holly Smith Kylie Smith Mackenzie Steffen James Stenske Nicole Stubbe Elise Tauras Johanna Theeler Ry Threlkeld-Wiegand Demir Tuken Katie Vaiciulis Emilie Vaske Bhavya Vats James Westphal Maranda Wheelock Julia Wizeman Emily Wolf Kristan Worthington Maggie Yadlosky Ujiith Yogeswaran Hunter Zieser
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THE SENIOR CLASS WOULD LIKE TO THANK

The Faculty & Staff Project Mentors and Advisors

The Biomedical Engineering Advisory Council

Parents, Partners, Family of Biomedical Engineering Students, Faculty, & Staff

Engineering Electronics Shop

Engineering Machine Shop

Lichtenberger Engineering Library

THE BIOMEDICAL ENGINEERING ADVISORY COUNCIL

Advisory Council Chair: Dennis Smith, Helmer, Inc.
Advisory Council Vice-Chair: Martin Bohnenkamp, MD, Penn Medicine

Dave Berry, Strategy Accelerant, Inc.
Jennifer Blauvelt, CIVCO Medical Solutions, Inc.
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Ahmed Halaweish, Siemens Healthineers
Matt Henry, Point B
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Ashish Sahai, MD, FAAOS, Spine & Orthopedic Center
Cori Thompson, Accenture
Jim Van Hoeck, MicroPort Orthopedics, Inc.

Have an idea for a project? Submit a design problem or
idea for next year's design teams at https://bit.ly/iowa_BME

GROUP B - Opening Remarks by Prof. Kristan Worthington Boyd Law Building, room 235; Prototypes displayed in West lobby Moderator: Matt Remy

8:30 am Team 1	UCL Protector— A Way to Prevent Skier's Thumb Ivan Badovinac, Katya Gillig, Molly Jaros, Maggie Yadlosky; Mentor: Madisson Miller <i>A way to stabilize the metacarpophalangeal joint (MCPJ) in adults to prevent Ulnar Collateral Ligament (UCL) impact injuries.</i>
8:50 am Team 3	Cervical Collar Pressure Injury Prevention Marshall Cordes, Kayla Garcia, Alexander Kilburg; Mentor: Julia Langin <i>A cervical collar to reduce the occurrence and severity of pressure injuries obtained as a result of wearing the collar for extended periods.</i>
9:10 am Team 12	Standardization of Hip Abduction Measurements Emilie Vaske, Wes Gari, Blaisius Feller; Mentors: Michael Shaffer (PT, MSPT, OCS, ATC), Amanda C. Paulson (PT, DPT, OCS) <i>A device to standardize hip abduction force measurements in a clinical setting.</i>
9:30 am Team 13	Isolating External Shoulder Rotation for Rotator Cuff Recovery Justin DeCoste, Megan Nelson, Arash Asadi, Gino Petrone; Mentor: Dr. Michael Shaffer <i>A device that can isolate shoulder rotation and stabilize the elbow at multiple degrees of shoulder abduction in patients recovering from rotator cuff injuries to improve recovery time.</i>
9:50 am	SHORT BREAK
10:00 am Team 14	Atrophy Related to Above the Knee Prosthetics Paxten DeVilbiss, Luke Doyle, Alejandro Rizo, Emily Wolf; Mentor: Tim Miller <i>A dynamic above knee prostheses socket that adjusts to the necessities of the user and changes according to the limb.</i>
10:20 am Team 8	Late-Stage Posterior Glottic Stenosis Intervention Hima Joseph, Marissa MFadden, Ana Sofia Peraza Munuzuri, Noah Sinclair; Mentors: Dr. Matthew Hoffman, Dr. Edward Sander <i>Creating an implantable solution to bypass the current ablative solutions associated with late-stage posterior glottic stenosis.</i>
10:40 am Team 26	Negative Pressure: An External Treatment to Obstructive Sleep Apnea Meaghan Cruise, Parker Kaminski, Kyle Schneider, Grace Deli; Mentor: Brian Andrews (MD) <i>A negative pressure external device that wraps around the anterior portion of the neck and under the chin to reduce upper airway obstruction by pulling the target tissue and muscles distal of the body.</i>
11:00 am	Review of Design Prototypes in the West Lobby
12:00 pm	Break for lunch

GROUP C**Boyd Law Building, room 295; Prototypes displayed in Central lobby****Moderator: Mallory Tollefson**

12:45 pm **Assisted Voxel Targeting for TMS Application**
Team 10 Jacob Collogan, Ashley Hytrek, Dalton Meyer, James Stenske; Mentor: Kanchna Ramchandran

A software that assists neuroscientists in targeting the location of treatment for transcranial magnetic stimulation (TMS).

1:05 pm **3D Cardiopedia**
Team 20 Matthew Cunningham, Agam Gill, Julie Macias; Mentor: Dr. Ravi Ashwath

Creating a mobile application to fill the need for an effective 3D visualization tool of congenital heart diseases in order to improve the patient-physician interaction.

1:25 pm **VR Applications for Firefighting PPE**
Team 15 Jacob Krejchi, Michelle Matejka, Ethan Miera, Kirsten Sibbaluca; Mentors: Zane Johnson, Done Demirgoz (PhD), Christopher Brown (PhD)

A way to inform firefighters of environmental and health factors to improve efficiency and safety.

1:45 pm **SHORT BREAK**

2:00 pm **Cell Therapy Material Thawer**
Team 21 Adrian Caceres, Allison Hoeger, Bennet Lum; Mentor: Dennis Smith

A device used to control the thaw rate of cell therapy products to maximize cell viability upon infusion.

2:20 pm **Safe & (Ultra)Sound**
Team 18 Jordan Burtch, Megan Kelly, Kaitlyn Lutsch, Holly Smith; Mentor: Geoff Wagner

A dispenser for CIVCO Medical Solutions' gel-free Envision pads which improves sonographer workflow during ultrasound procedures and provides a quicker application method.

2:40 pm **Lung Monitor for Home Use**
Team 25 Matthew Heil, Owen Jones, Jonathan Robshaw, Younes Rouabhi; Mentor: Dr. Melissa Bates

A device intended to monitor the lung health of a patient from their home.

3:00 pm **Review of Design Prototypes in the Central Lobby**

4:00 pm **End of afternoon session**

GROUP D**Boyd Law Building, room 235; Prototypes displayed in West lobby****Moderator: Rion Wendland**

12:45 pm **Novel Eyedrop Assist Device**
Team 2 Aleah Kossan, Myles Evangelista, Rahul Modukuri, Ujiith Yogeswaran; Mentor: Christopher S. Sales (MD, MPH)

An eyedrop delivery assist device that minimizes waste of medication by improving the user's ability to aim the bottle and dispense the right amount of solution using a button mechanism.

1:05 pm **Prioritizing Patient Privacy**
Team 7 Sam Buchholz, Mackenzie Steffen, Maranda Wheelock; Mentor: Holly Deeds

A privacy divider for the University of Iowa Health Care Emergency Department that aims to improve the privacy standard for overflow patients.

1:25 pm **SIMBA: A Simulated Environment for Neonatal Cardiac Tamponade**
Team 11 Samuel Baule, Nicole Stubbe, Julia Wizeman, Shadi Shariff; Mentor: Dr. Numra Aleem

A way to address insufficient training in the utilization of point-of-care-ultrasound for neonatal pericardiocentesis by physicians that improves physician comfort.

1:45 pm **SHORT BREAK**

2:00 pm **Axillary Artery Cannulation Simulator**
Team 22 Taylor Moore, Roshni Nair, James Westphal, Connor Bernitt; Mentor: Dr. John Keech

Surgical simulator for practicing axillary artery cannulation.

2:20 pm **Rib Pain Associated with VATS Procedure**
Team 23 William Brewer, Rolando Garcia, Elise Tauras, Kylie Smith; Mentor: Dr. John Keech

Creating a device that can avoid the pain caused by video-assisted thoracic surgeries.

2:40 pm **Chest Cavity Model**
Team 24 Megan Dao, Kaylee Finnegan, Ryan Langstraat, Njeri Ngendo-Gakinya; Mentor: Dr. John Keech

A model that accurately simulates the anatomical complexity of the thoracic cavity for cardiothoracic surgical residents to practice aortic cannulation.

3:00 pm **Review of Design Prototypes in the West Lobby**

4:00 pm **End of afternoon session**