ASU IRA A. FULTON SCHOOLS OF engineering
ARIZONA STATE UNIVERSITY

FURI

Fulton Undergraduate Research Initiative

Fall 2016 Symposium

Snapshot Fall 2016

Mentors 26

FURI Students 118

29 women

89 men

4 sophomores

13 juniors

99 seniors

Majors

- Aerospace Engineering 14
- Biomedical Engineering 25
- Chemical Engineering 17
- Civil, Environmental and Sustainable Engineering 4
- Computer Science 8
- Electrical Engineering 6
- Engineering 2
- Engineering (Mechanical Engineering Systems) 2
- Engineering (Robotics) 5
- Environmental Resource Management 1
- Mechanical Engineering 23
- Software Engineering 3

engineering.asu.edu/furi

FURI Fulton Undergraduate Research Initiative

The Fulton Undergraduate Research Initiative (FURI) enhances and enriches a student's engineering and technical education by providing hands-on lab experience, independent and thesis-based research and travel to national conferences.

At this semiannual symposium, students present their research and share their findings with peers, Fulton Schools, the ASU community and the community at large.

The Fulton Difference: Discover. Create. Innovate.

November 18, 2016

We are excited to welcome you to the Fall 2016 FURI Symposium.

Students who participate in the Fulton Undergraduate Research Initiative — one of our signature experiential opportunities — work alongside our renowned faculty in some of the best engineering and research labs.

FURI provides students the chance to find their calling in research through hands-on lab experience, faculty mentoring and traveling to academic conferences to present their work.

The projects on display today work to further solutions to real-world challenges in education, energy, health, security and sustainability.

Programs like FURI attract some of the brightest students from across the country and around the world and challenges them to sharpen their skills.

In addition to gaining a proven ability to do research — often at the graduate level — FURI drives students to enhance their problem solving skills, independent work ethic, innovative thinking and increase their sense of discovery. This opportunity also opens doors for scholarships, internships and research at high-level institutions down the road.

We are proud of our students' accomplishments this semester and are grateful for everyone who helps make this program such a success. Congratulations to everyone and we look forward to your continued success.

Sincerely,

Kyle D. Squires, Ph.D.
Dean, Ira A. Fulton Schools of Engineering
Professor, Mechanical and Aerospace Engineering

FURI Symposium Participants

Students in the Fulton Schools' FURI research program develop a proposal under the mentorship of a faculty member, then apply for funding. Once accepted, they perform research, attend workshops and prepare research summaries. Participants receive stipends and research supply budgets.

The travel grant program helps students present their research at national conferences by providing financial assistance with travel expenses.

Grand Challenge Scholars Program students conduct research in a grand challenge theme and are invited to present their research at the FURI Symposium.

Jeremy Adams
Wade Adams
Samuel Aguiar***
Eyerusalem Assefa
Shelby Babcock
Daniel Baird
Christopher Balzer**
Eric Barrientos
Connor Beck**
Michael Bejarano**
Mark Blei
Lyle Bliss
Brandon Boepple**
Lexi Bounds
Samantha Brenna
Alexander Bridge**
Stephanie Brown
Daniel Bueno
Caleb Carlson
Ross Carlton
Lucas Casanova
Cesar Castro
Celine Chang
Thomas Chester
Jacob Clenney
Brenden Coleman
Brittany Convery
Andrew Cook
Michael Cottle
Brady Dennison**
Nicholas Dhuyvetter
Matthew Dickens**
Nicholas Downey
Douglas Elson**
Gamal Eltohamy
Jason Enriquez
Jarrett Eshima
Erin Federspiel
Nathaniel Ferre
Alicia Flores
Sebastian Fonseca
Emily Ford
Scott Freitas
Anikki Giessler**
Alessandra Gualtieri
Saumya Gupta**
Hannah Hansen
Harrison Hanzlick
Breanna Hassett
Gregory Hathorn**
Songze He
Taylor Hoffmann
Nathan Holt
Paul Horton
Ryian Hunter
James Hutchins
Adrian Ion
Cody Iwertz*
Hope Jehng
Alaina Jenish**
Kaleigh Johnson*
Joslin Jose
Mukund Khanwalker**
George Kharlakian
Aditya Khuller
Alexander Kim
Sebastian Klype
Alexander Kratz
Ivan Kruts
Cecilia La Place
Michael Lay
Robert Leader
Madeline Lent**
Richard Li
Kevin Liao
Nathan London
Miles Mabey
Akshara Malla*
Nicholas Martinez
Logan Mathesen**
Anthony McCourt
Tyler McDaniel
Kevin Mead
Frea Mehta**
Justin Mieth
Ubaldo Mijares Lopez
Jack Miller
Samuel Mokdad
Arianna Moreno**
Mohammad Mousa**
Keerthana Murali*
Akhila Murella
Hunter Murphy
Thomas Murphy
Helena Nabaty
Alyssa Nazareno*
Amanda Nguyen
Toan Nguyen
Mateo Oramas
Jacob Packer
Bhavik Patel
David Phelps
Dominic Podzemny
Maria Jose Quezada Valladares**
James Quigley
David Reynolds
Frederick Rivers
Nick Scheenstra
Jake Schichtel
Matthew Schneider
Joseph Schreiber
Frederick Sebastian
Simol Shah
Ryan Shillingburg
Neal Shulman
Adam Siegel
Danielle Simonet
Philip Sitterle
Caroline Smith
Gavin Steeber
Hannah Switzer
Carly Thalman
John Tobey
Zachary Tronstad**
Shreya Udupa**
Cody Van Cleve
Sean Wolfgang Wachtel
Nicholas Walker
Ji Wang
Shawn White
Megan Wieser
Avery Witting
John Woodward
Jiaqi Wu**
Jimmy Xu**
Jason Yang**
Aliya Yano

* Grand Challenge Scholars Program
** Undergraduate Research Travel Grant Program
*** Guest Presenter

FURI Faculty Mentors

David Allee, professor

Panagiotis Artemiadis, assistant professor

Mariana Bertoni, assistant professor

Jennifer Blain-Christen, assistant professor

Stuart Bowden, associate research professor

David Brafman, assistant professor

Michael Caplan, associate professor

Candace Chan, assistant professor

Aditi Chattopadhyay, professor

Mikhail Chester, assistant professor

Peter Crozier, associate professor

Lenore Dai, school director and professor

Adam Doupé, assistant professor

Heather Emady, assistant professor

Tirupalavanam Ganesh, associate dean and associate research professor

David Grau, assistant professor

Matthew Green, assistant professor

Karmella Haynes, assistant professor

Zachary Holman, assistant professor

Julianne Holloway, assistant professor

Claire Honeycutt, assistant professor

Owen Hildreth, assistant professor

Kiril Hristovski, associate professor

Keng Hsu, assistant professor

Shawn Jordan, assistant professor

Matthia Karreman, postdoctoral fellow, European Molecular Biology Laborator

Vikram Kodibagkar, assistant professor

Jeffrey La Belle, assistant professor

Micah Lande, assistant professor

Hyunglae Lee, assistant professor

Mary Laura Lind, associate professor

Huan Liu, professor

Yongming Liu, associate professor

Abdel Mayyas, assistant professor

Hamid Marvi, assistant professor

Troy McDaniel, assistant research professor

Bin Mu, assistant professor

Brent Nannenga, assistant professor

Narayanan Neithalath, professor

David Nielsen, assistant professor

Mehdi Nikkhah, assistant professor

Jay Oswald, assistant professor

Pedro Peralta, professor

Vincent Pizziconi, associate professor

Panagiotis Polygerinos, assistant professor

Agami Reddy, professor

Kaushal Rege, professor

Alexandra Ros, associate professor, School of Molecular Sciences, ASU

Konrad Rykaczewski, associate professor

Paulo Shakarian, assistant professor

Barbara Smith, assistant professor

Kiran Solanki, associate professor

Timothy Takahashi, professor of practice

Meng Tao, professor

Hanghang Tong, assistant professor

Sefaattin Tongay, assistant professor

Brent Vernon, associate professor

Erin Walker, assistant professor

Liping Wang, assistant professor

Qing Hua Wang, assistant professor

Robert Wang, assistant professor

Daniel White, lecturer

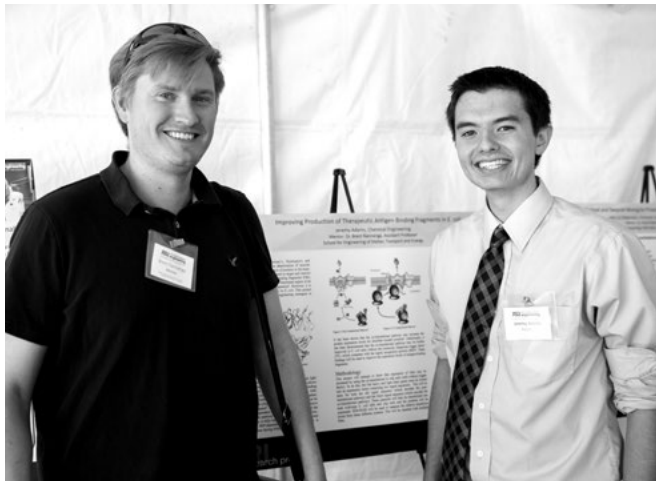
William L. Wilson, executive director, Center for Nanoscale Systems, Harvard University

Masoud Yekani Fard, assistant research professor

Hongbin Yu, associate professor

Frances Zenzen, adjunct faculty

Wenlong Zhang, assistant professor



Jeremy Adams, Chemical Engineering

Graduation: May 2017

Hometown: Mesa, Arizona

Optimizing the Production of Antigen-Binding Fragments in E. coli

Mentor: Brent Nannenga, assistant professor

Research Theme: Health

This project examines the effect of the secretory pathway and presence of trigger factor (TF) on the expression of antigen-binding fragments (Fab) in E. coli. Contrary to expectations, the co-translational pathway (encoded by the DsbA signal sequence) and using expression strains without TF (Δtig) significantly decrease cell growth during expression of the C6T Fab. Three hours after induction, expression systems using the traditional post-translational pathway and TF-containing (tig+) cells exhibited on average roughly twice the cell concentration as the DsbA-Δtig system. Future work will involve fractioning the cells post-expression, which may reveal possible explanations for this decrease in cell growth.

Wade Adams, Engineering (Robotics)

Graduation: May 2018

Hometown: Sedona, Arizona

Soft Robotic Wrist Relief Device

Mentor: Panagiotis Polygerinos, assistant professor

Research Theme: Health

The objective of this project is to find out if typing with a neutral plane in the wrist will alleviate symptoms of Carpal Tunnel Syndrome (CTS). It has been documented that CTS symptoms can be prevented or relieved while typing if the wrist is kept in a neutral plane. Creating a soft-actuated, wearable robotic relief device will help maintain a neutral plane in the wrist, thereby eliminating some of the symptoms of CTS. In the future, this device could be designed to be smaller and more efficient without the need of an external air pump.

Samuel Aguiar, Chemical Engineering

Graduation: May 2017

Hometown: Glendale, Arizona

Optical Force Contrast on CVD Grown Molybdenum Disulfide Atomic Layers

Mentor: William L. Wilson, executive director, Center for Nanoscale Systems, Harvard University

Research Theme: Energy

As nanomaterials become more prevalent in today's technology, there is a need to improve materials' characterization capabilities. Photoinduced Force Microscopy (PiFM) uses optically induced dipole-dipole forces to detect surface features and provides material contrast at the nanoscale. The purpose of this project is to determine the correlation between PiFM signal contrast and 2D material thickness where theory is lacking. PiFM was used to characterize surface features and thickness of atomically thin MoS2 while results were confirmed using Raman Spectroscopy. If developed further, PiFM characterization will determine surface characteristics and material identity at a higher resolution than is currently available.

Guest Presenter

Eyerusalem Assefa, Biomedical Engineering

Graduation: May 2017

Hometown: Addis Ababa, Ethiopia

Improving Pattern Fidelity in 3D In-Vitro Tissue Models Utilizing Dual Hydrogel Interface

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

The objective of this research was to create a 3D in-vitro model to mimic the native breast tumor microenvironment. Polydimethylsiloxane (PDMS) stamps and micromolding techniques were utilized to develop a collagen-based 3D tumor model. Geometrical design was optimized for the PDMS stamp to compartmentalize A 3D model's tumor and stromal region. The addition of tumor and stromal cells into the platform demonstrated the successful fabrication of the 3D model which will be used to investigate the role of stromal components on tumor growth and progression. Atomic force microscopy will be utilized to access stromal remodeling during active invasion.

Shelby Babcock, Chemical Engineering

Graduation: May 2018

Hometown: Chandler, Arizona

Multifunctional Thermoset Polymer Matrix with Self-Sensing Capabilities

Mentor: Lenore Dai, school director and professor

Research Theme: Security

The purpose of the research is to have early damage detection of epoxy by the incorporation of force responsive molecular units through grafting into an epoxy network. Hardener units that have been functionalized were successfully incorporated and produced a fluorescent response after 2 percent compression strain. Additionally, fluorescence shifted from the ultraviolet region to the visible blue light. The ability to detect early damage in materials could improve safety standards for replacement and management of heavily-used equipment. Future research would include investigation into trans-cis isomerization of activated mechanophore and further exploration of mechanophore grafting methods.

Daniel Baird, Computer Science

Graduation: May 2018

Hometown: Scottsdale, Arizona

Assessing Trending Data Sources in Social Media

Mentor: Huan Liu, professor

Research Theme: Security

Social media sites like Twitter and Facebook entice their users to post by displaying the top stories on their sites through their "Trends" interfaces. These interfaces provide a view of the top trending topics, which usually pertain to late-breaking news stories. The stories selected by Twitter for their trending news pages are evaluated to understand how they are a skewed representation of the news. After assessing the stories that are selected, a classifier to predict which stories will be selected for the trends page was built, which simultaneously helps to understand why certain trends are shown while others are not.

Christopher Balzer, Chemical Engineering

Graduation: May 2017

Hometown: Anthem, Arizona

Composite MOF Mixture as Volatile Organic Framework Sensor — A New Approach to LMOF Sensors

Mentor: Bin Mu, assistant professor

Research Theme: Energy

Metal-organic frameworks (MOFs) show high potential in sensing applications due to their high surface area and many exploitable luminescence mechanisms; however, self-quenching limits solid state emission signals. Five luminescent metal-organic frameworks were synthesized and exposed to a series of volatile organic compounds (VOCs) in the solid state. Three LMOFs were mixed and exposed to a series of VOCs to show the feasibility of solid mixtures in creating fingerprint-like spectroscopic regions for detection and identification of VOCs. The independent responses from each MOF create a predictable response pattern in each spectroscopic region. For many-MOF mixtures, this effectively dilutes self-quenching mechanism.

Undergraduate Research Travel Grant Program

Eric Barrientos, Biomedical Engineering

Graduation: May 2019

Hometown: Berwyn, Illinois

Undergraduate Researcher

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

This investigation seeks to characterize protein expression of SUM-159 breast cancer cells in a micro-engineered tumor model. This platform serves primarily to analyze cell migration and tumor-stroma interactions in 3D using fluorescent and bright field microscopy. The chemotherapeutic agent suberanilohydroxamic acid (SAHA) can be introduced to cells within the platform and cause a change in their morphology and migration. The effects of SAHA on protein expression of cancer cells can be analyzed using flow cytometry data. Confirming the ability of this device to support such techniques adds another layer of usefulness when studying cancer behavior, stromal interactions, or chemotherapeutic agents.

Connor Beck, Biomedical Engineering

Graduation: May 2019

Hometown: Burley, Idaho

Characterization of Glucagon via Electrochemical Impedance Spectroscopy in Complex Solution

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

In order to enhance diabetes mellitus (DM) glycemic control, a new biosensor capable of multi-marker detection, in addition to glucose, is needed. Currently no device in the market is capable of accurately monitoring the amount of glucagon or insulin in patients with DM. The goal of this research was to determine if Electrochemical Impedance Spectroscopy (EIS) is capable of measuring insulin and glucagon levels simultaneously on one sensor. If successful, a glucagon and insulin dual-marker disposable test strip can provide a more coherent picture of DM patients' health in addition to blood glucose test strips, allowing a better glycemic management.

Undergraduate Research Travel Grant Program

Michael Bejarano, Biomedical Engineering

Graduation: May 2018

Hometown: Dallas, Texas

Electromagnetic Microrobots for Medical Applications

Mentor: Hamid Marvi, assistant professor

Research Theme: Health

Microrobots possess the potential to be directed through the human body for minimally invasive medical procedures such as targeted drug delivery and microsurgery. The objective of this research is to construct an electromagnetic coil system to actuate microrobots for use in minimally invasive medical procedures. Current progress includes completion of the assembly of the electromagnetic coil system and achieving system functionality. Through testing of various tissue samples, data will be collected to determine the optimal system for medical applications.

Undergraduate Research Travel Grant Program

Mark Blei, Materials Science and Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Synthesis and Characterization of Low-Dimensional Limits of Metal Phosphorus Trichalcogenides

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy, Sustainability

Two-dimensional (2D) materials, such as graphene and Transition Metal Chalcogenides have gained increased popularity due to their interesting optical and electrical properties. A new class of material is gaining interest among the materials science field. Metal Phosphorous Trichalcogenides (MPX3) are layered, wide range band-gap materials that makes them of great interest to industry and researchers, with foreseeable optoelectronic application. Manganese Phosphorous Trisulfide and triselenide have been successfully synthesized and are currently being characterized and studied to fully understand the materials' potential. Theory suggests that n-doped MnPSe3 will have a magnetic transition at the two-dimensional limit.

Lyle Bliss, Chemical Engineering

Graduation: May 2017

Hometown: Albuquerque, New Mexico

Adhesion of Copper to Nickel Sputtering on a Silicon Substrate

Mentor: Stuart Bowden, associate research professor

Research Theme: Energy

Solar energy is an integral part of solving the world's energy crisis, but many problems still hinder the solar industry, such as the declining availability and volatile price of silver. Research is ongoing to replace silver with cheaper, more abundant metals such as copper and nickel. The different properties of the metals make this difficult, in particular the adhesion of copper/nickel to a silicon substrate, and the diffusion of copper into silicon. Measuring the electrical properties of sputtered nickel and plated copper will help determine if they can practically be implemented in the solar industry.

Brandon Boepple, Chemical Engineering

Graduation: May 2018

Hometown: Scottsdale, Arizona

Heat Transfer via Conduction, Convection, and Radiation in a Rotary Drum

Mentor: Heather Emady, assistant professor

Research Theme: Energy, Sustainability

Rotary drums have many industrial applications with granules, including milling, heating, and mixing. Granules, however, don't behave like conventional solids, liquids or gases, which makes them difficult to model. This research focuses on understanding the heat transfer mechanism in the granular bed, inside a rotary drum, via conduction, convection and radiation. Experiments will be performed to investigate the effect of rotation rate, fill level and inlet air flow rate on heat transfer between the drum wall and granular bed. The goal is to quantify all three modes of heat transfer and to study which modes dominate under varying operating conditions.

Undergraduate Research Travel Grant Program

Lexi Bounds, Biomedical Engineering

Graduation: May 2018

Hometown: Chandler, Arizona

Comparison of Protein and Gene Expression in Human Embryonic Stem Cells (hESCs) and Neural Progenitor Cells (NPCs) Using Three-Dimensional Cell Culture Methods

Mentor: David Brafman, assistant professor

Research Theme: Health

As of 2015, 5.3 million Americans were diagnosed with Alzheimer's disease (AD). However, the cause of AD remains unknown, thus increasing the difficulty in developing therapies and treatments. The use of three-dimensional cortical spheroids (EBs) presents an opportunity to study the disease in vitro. The protein and gene expression of three cell lines were compared using Real-time Polymerase Chain Reaction (qPCR), immunohistochemistry (IHC), and immunofluorescence (IF). EBs generated from embryonic stem cells and neural progenitor cells displayed mature neuronal networking and accurate protein and gene expression. Future work includes analyzing cell lines with genetic mutations in genes linked to AD.

Samantha Brenna, Biomedical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Identification of Volatile Hormone Signatures for Monitoring Infertility in Real Time

Mentor: Barbara Smith, assistant professor

Research Theme: Health

Infertility, ranked as the fifth highest global disability, affects an estimated 34 million women worldwide. Increasing annually, infertility requires a new method of detection in order to provide more accurate diagnostics. In order to accomplish this goal, volatile organic compounds (VOCs) are being investigated to determine signatures of specific hormones such as progesterone. These signatures can then be tracked in biological samples to determine normal and irregular trends of hormone levels. The use of detection by VOCs creates an opportunity for more personalized treatment plans as well as a real time monitoring tool.

Alexander Bridge, Chemical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Solution Rheology: Scaling Theory and Membrane Applications

Mentor: Matthew Green, assistant professor

Research Theme: Sustainability

Polymer engineering is a rapidly expanding field that stands to solve many of society's grand challenges. Rheology, the study of materials' flow characteristics, is a staple discipline to advancements in polymer research. This project aims to prove fundamental rheological concepts and to develop extensive knowledge in the context of standard polymer and polyelectrolyte solutions. In addition, applications of polymer engineering to the optimization of medical devices will be explored through the production of a hollow fiber spinneret. This device will be utilized in future research in efforts to determine the material-based optimizations that are for critical components in medical devices.

Undergraduate Research Travel Grant Program

Stephanie Brown, Chemical Engineering

Graduation: May 2017

Hometown: Fall Creek, Oregon

Membrane Modification for Sensing Urine Ammonium Levels

Mentor: Mary Laura Lind, associate professor

Research Theme: Health

This research is being done to develop a membrane for use in separating ammonia gas from urine so that ammonium levels can be monitored. A membrane was treated with a base to change the pH level of an applied sample, turning aqueous ammonium into gaseous ammonia which was detected by a color-changing indicator paper. This method has been effective with single runs using an ammonium chloride solution.

Daniel Bueno, Chemical Engineering

Graduation: May 2017

Hometown: Hartford, Connecticut

Enhancing the Profile of Engineers as Relevant to Society amongst Middle School Students

Mentor: Tirupalavanam Ganesh, associate dean and associate research professor

Research Theme: Education

The objective is to determine effective methods to convey engineering concepts to middle school students. The effectiveness of a poster campaign highlighting undergraduate engineering students with a statement that personifies their research or engineering ideal into a message will be tested. The posters will be tested at a middle school with a pre-post survey of students' awareness of and interest in engineering. The poster content will be utilized for a website to inspire K-12 students to learn about engineering. In the next phase, along with posters, engineering activities will be conducted. Results will be compared with the poster campaign results.

Caleb Carlson, Engineering (Robotics)

Graduation: May 2017

Hometown: Flagstaff, Arizona

Design and Control of a Biomimetic Aquatic Soft Robot

Mentor: Panagiotis Polygerinos, assistant professor

Research Theme: Education, Security, Sustainability

The objective of this research project is to develop a biomimetic sub-aquatic robot that emulates the movement method of the deep sea nautilus. This consists of using soft materials to mimic the siphon pump propulsion method employed by the nautilus and other mollusks. The success of this project could provide a stable base for search and rescue or environmental monitoring. The next steps are to finalize the actuator design and to implement an integrated method of self-control as well as establish a basic method of implementing sensors both vital to navigation and useful for data collection.

Ross Carlton, Biomedical Engineering

Graduation: May 2017

Hometown: Lake Havasu City, Arizona

Ferricyanide-Ferrocyanide Electrochemical Force Transducer for Prosthetic Limb Feedback

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

Electrical responses to applied force can be measured from the Electrochemical Force Transducer. Previously, no explanation for the phenomena had been established. This research endeavor has characterized a current verse applied force response and discovered the secrets of why this relationship exists. A creative solution in the combination of sensor housing and testing apparatus allowed for precise mathematical modeling to compare with measured electrical responses from the transducer. This served to identify a change in double layer capacitance thickness as one contributing factor. The transducer can be used for prosthetic limb feedback, and further characterization will reveal new applications.

Lucas Casanova, Mechanical Engineering Systems

Graduation: May 2018

Hometown: Gilbert, Arizona

Fine Wire Ultrasonic Additive Manufacturing

Mentor: Keng Hsu, assistant professor

Research Theme: Energy

Using a process for 3D printing metal that utilizes concentrated acoustic energy, a set of process parameters will be studied to quantify properties of a fully built artifact. Methods for increasing the amplitude of 80 kHz and 120 kHz transducers and power density at the tool head have so far been examined. The displacement to deform a 100 µm wire must be at least 35 µm, by using higher frequencies, smaller vibration amplitudes can be used to bond the wires. Bonds will be examined using a Scanning Electron Microscope (SEM) to show further affects of ultrasonic energy on each layer in the build direction.

Cesar Castro, Civil Engineering

Graduation: May 2017

Hometown: Yuma, Arizona

Developing Insights into the Thermal Performance and Mechanical Fatigue of Cementitious Composites Containing PCM

Mentor: Narayanan Neithalath, professor

Research Theme: Sustainability

The research's purpose is to continue developing novel ways of implementing phase change materials (PCMs) within cementitious systems for improving thermal and mechanical performance. Lightweight aggregates (LWAs) were effective carriers in terms of performance and integration by utilizing the large pores to store bulk PCM. This method of bulk PCM within LWA reduced the thermal conductivity of cement mortars while increasing the thermal storage heat capacity compared to a plain mortar. Further research into PCM systems will establish a fundamental understanding of how PCMs could enhance the thermal performance of concrete structures, making them more sustainable.

Celine Chang, Mechanical Engineering

Graduation: May 2018

Hometown: Chandler, Arizona

Long-Life, Low-Cost Solar Module Using Copper Plating

Mentor: Stuart Bowden, associate research professor

Research Theme: Energy, Sustainability

This research is meant to develop and test a new and cost-efficient solar cell using copper instead of silver without compromising efficiency. Solar cells are currently manufactured using silver with an efficiency range of 11–15 percent. If successful, the method of copper-plating with a nickel seed, to prevent the copper from diffusing with the cell, will result in a 17 percent efficiency module. Developing a high efficiency copper-plated cell can reduce costs by nearly 100 times just by using copper instead of silver. Any future developments will be to reach higher efficiencies.

Thomas Chester, Mechanical Engineering

Graduation: May 2018

Hometown: Redlands, California

Fin Flutter Study: Effects of Fin Geometry and Motor Design on a Sounding Rocket's Performance

Mentor: Daniel White, lecturer

Research Theme: Security, Sustainability

The objective of this research project is to develop a motor and identify the ideal fin geometry for reducing flutter on a sounding rocket. The first semester of the project is focused on the motor, which will lead to reliable and safe launches of the rocket. Strand burning and propellant formulation is underway, with propellant mixing and testing coming soon. No significant findings have emerged yet, as this semester is being used to develop equipment and procedures for the actual experimentation occurring next semester. Future work includes building the sounding rocket and wiring data acquisition electronics to complete the project.

Jacob Clenney, Electrical Engineering

Graduation: May 2017
Hometown: Sierra Vista, Arizona

Dislocation Density Reduction in Multicrystalline Structures

Mentor: Mariana Bertoni, assistant professor
Research Theme: Sustainability

The purpose of this project is to engineer a device that uses an induction furnace and vibrations to move dislocations from silicon. The use of an induction furnace allows for rapid heating of the test sample such that the dislocation in the crystalline structure becomes more mobile so that the vibrations may facilitate their removal. This process has the potential to reduce the dislocations in multicrystalline silicon allowing for the fabrication of devices with higher efficiency and lower cost.

Brenden Coleman, Aerospace Engineering

Graduation: December 2017
Hometown: Gilbert, Arizona

ADCS Test Platform

Mentor: Daniel White, lecturer
Research Theme: Education

This project's goal is to create a reliable apparatus to be utilized for testing attitude control methods and to serve as an available teaching aid for introducing concepts of orbital dynamics and the conservation of angular momentum. Research progress has included the creation of a simplified design and layout for the test platform and creation of the software to run the platform from a laptop. The next step is creating the programs to run the platform. Results from this project can further research to advance attitude control which is used for satellites and other spacecraft.

Brittany Convery, Chemical Engineering

Graduation: December 2017
Hometown: Lexington, Illinois

Consistent Procedure for Contact Angle Measurement Utilizing Washburn Method

Mentor: Heather Emady, assistant professor
Research Theme: Education

This research's purpose is to investigate the most reproducible, reliable procedure for utilizing the Washburn equation for measuring contact angle between liquids of varying viscosities and powders of varying particle sizes. The Washburn method relates capillary liquid rise through a filter in packed tubes to the contact angle of the system. This method is currently challenging to perform with consistent results due to irregular particle distribution in tubes and difficulty with highly viscous liquids permeating filters. Differing packed densities and efforts to alter filter setup are being explored. Further studies could examine contact angle variances in relation to powder mixtures.

Andrew Cook, Mechanical Engineering

Graduation: May 2017
Hometown: Phoenix, Arizona

Development of a Lower Extremity Robotic Device for Ankle Studies

Mentor: Hyunglae Lee, assistant professor
Research Theme: Health

The objective of this research is to design and build a wearable robotic device to facilitate gait studies related to the ankle. The device will rapidly actuate a user's foot during the swing phase of walking while measuring the ankle's response. To minimize its interference with a user's natural gait, the lightweight robot will feature mechanisms that permit inversion-eversion and axial ankle rotation. By giving insight into the mechanics of the ankle, this device could aid in the development of rehabilitation methods for ambulatory disabilities, such as those brought on by strokes.

Michael Cottle, Mechanical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Look-Ahead Power Management Strategies for Hybrid Electric Vehicles Utilizing Traffic Elements

Mentor: Abdel Mayyas, assistant professor

Research Theme: Energy

As current Hybrid Electric Vehicles (HEVs) stand, there is ample room for improvement in the area of fuel efficiency. A solution to these shortcomings in fuel efficiency is the utilization of Power Management Strategies (PMSs). The primary focus of this research will be the implementation of road elevation changes and traffic elements, known as Look Ahead Information. The developed PMS will allow an HEV to effectively leverage regenerative braking, as well as the power split. Both of these optimizations will allow for more efficient performance from the HEV drivetrain. Future work will include the addition of Machine Vision.

Brady Dennison, Biomedical Engineering and Medical Microbiology

Graduation: May 2018

Hometown: Livonia, Michigan

International Genetically Engineered Machines Competition

Mentor: Karmella Haynes, assistant professor

Research Theme: Health

The research project involves studying quorum sensing (QS), a cell-to-cell signaling system in bacteria. Bacteria use QS to scan their surrounding environment and detect the concentration of small molecules (AHLs) specific to their own species. Currently, of the hundreds of QS systems discovered, there are only four QS systems commonly used in synthetic biology. To expand the amount of QS systems used, the project involved performing Liquid Chromatography-Mass Spectroscopy to characterize the production of the AHLs in E. coli. The observed structures of AHLs were effectively observed in E. coli. This means that E. coli can effectively produce AHLs, but further characterization will be required to determine the exact efficiency.

Undergraduate Research Travel Grant Program

Nicholas Dhuyvetter, Mechanical Engineering

Graduation: May 2018

Hometown: Poway, California

Developing an Electrically Insulating Thermally Conductive Interface Material

Mentor: Konrad Rykaczewski, associate professor

Research Theme: Energy

The objective of this research is to develop a TIM (thermal interface material) for future computing applications which has a high thermal conductivity. To test the properties of the prototype TIM, an apparatus was constructed which creates a heat gradient across the sample and measures temperature distributions. Once a TIM compound is created that has sufficiently high thermal conductivity, it can be incorporated into high-powered computing devices to dissipate heat from sensitive components. After development of this thermally conductive TIM, the next objective is to make it also electrically insulating so that it may be used directly on circuitry.

Matthew Dickens, Engineering (Robotics)

Graduation: December 2016

Hometown: Tempe, Arizona

Making in Museums

Mentor: Micah Lande, assistant professor

Research Theme: Education

This study explores how museums, and in particular children's museums, incorporate making for young makers and families and how educational learning objectives match up with the attributes of making and values expressed by maker families. This will be addressed by both qualitative analysis of ongoing interviews with Young Makers and the parents of Young Makers. Emergent thematic analysis is be used to highlight themes relevant to Maker families working together. Additionally, this work will explore the goals and practices of the informal science education museum community and establish a baseline and range of Making activities and makerspaces in children's museums.

Undergraduate Research Travel Grant Program

Nicholas Downey, Mechanical Engineering and Computer Science

Graduation: December 2017

Hometown: Gilbert, Arizona

Rocket Launch System Simulation

Mentor: Daniel White, lecturer

Research Theme: Education

The purpose of this research is to build a rapid prototyping software tool for demonstrating principles of rocket launch systems' design and flight. The current product models flight trajectories of single stage launch systems launching from a round earth in order to properly demonstrate gravity turn maneuvers. The results serve as a tool for studying theoretical single-stage-to-space systems and the limitations of current technologies toward achieving such systems. It also serves as an instructional tool for demonstrating the mechanisms driving gravity turns. Future researchers can expand the tool to include rocket staging, thrust vectoring, closed-loop controls, and improved physics models.

Douglas Elson, Mechanical Engineering

Graduation: May 2017

Hometown: Scottsdale, Arizona

Friction and Adhesion of Synthetic Gecko Feet

Mentor: Hamid Marvi, assistant professor

Research Theme: Energy

Is it possible to create a switchable adhesive that can operate under the conditions of outer space? Testing different switchable adhesives under different conditions will help the scientific community to characterize these materials. A laboratory setup for testing adhesive samples was prepared. Testing of the samples is to commence soon.

Undergraduate Research Travel Grant Program

Gamal Eltohamy, Electrical Engineering

Graduation: May 2018

Hometown: Phoenix, Arizona

Rechargeable, Flexible Magnesium-Ion Battery

Mentor: Hongbin Yu, associate professor

Research Theme: Energy

The goal of this project is to develop a rechargeable, flexible magnesium-ion battery to couple the growing demand of implantable devices. An entire battery cell has been fully developed and tested. Early tests show that the cell functions normally, as a battery would, but the capacitance values and time of discharge are not optimal. The battery will now go through a series of optimizations in order to enhance these values. Optimization will be done by trying out different materials for the cathode.

Jason Enriquez, Materials Science and Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Producing Electricity from Human Body Heat Using Graphene-Infused Thermoelectric Fabric

Mentor: Qing Hua Wang, assistant professor

Research Theme: Energy

Renewable energy is becoming increasingly important in the modern world due to the rapid decline of resources. Though there are attempts to generate renewable energy, none address human body heat. As a result, the goal of this FURI project is to generate electricity from human body heat through the use of a thermoelectric composite. This is done through the use Poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate) (PEDOT:PSS), a thermoelectric polymer, reduced graphene oxide to carry the electrical charge, and different cloths to create composites. In the future, the goal is to put together the components from this semester's project to create a temperature-monitoring bandage.

Jarrett Eshima, Biomedical Engineering

Graduation: May 2019
Hometown: Phoenix, Arizona

Analysis of Hormone Specific Volatile Organic Compounds and Mental Health

Mentor: Barbara Smith, assistant professor
Research Theme: Health

The objective of the research is to determine shifts in hormone concentrations through the detection of relevant volatile organic compounds. Using gas chromatography-mass spectrometry, the researchers aim to develop a method for detecting Cortisol in human biological samples. This method will be used to analyze and identify the limit of detection of Cortisol present in the air above biological samples. The end goal of the research is to find quantifiable shifts in the concentrations of a variety of hormones, including Cortisol, present within biological samples.

Erin Federspiel, Civil Engineering

Graduation: May 2017
Hometown: Larchmont, New York

Rheology of UHPC

Mentor: Narayanan Neithalath, professor
Research Theme: Sustainability

This research focuses on creating ultra-high-performance concretes (UHPC) by employing a systematic procedure that involves understanding the fundamental behavior of the composite binders with respect to workability, hydration and strength development. The first stage for creating UHPC is to understand the rheology of such binders at low water-cement ratios. A total of 26 binders containing supplementary cementitious materials, such as silica fume, fly ash, slag and metakaolin with cement replacements of 20–30 percent have been studied. The yield stress and plastic viscosities of these binders have been characterized using a rotational rheometer and have been reported.

Nathaniel Ferre, Aerospace Engineering

Graduation: May 2018
Hometown: Chandler, Arizona

AFM Based Near-Field Thermal Metrology for Nanometer-Scale Surface Temperature Mapping

Mentor: Liping Wang, assistant professor
Research Theme: Energy

The primary goal of this project is to experimentally measure local surface temperatures at nanometer scales with the effect of plasmonic local heating. In the past few decades, AFMs (atomic force microscopes) have become a basic tool in studying nanotechnology. Using an AFM, local surface temperatures can be accurately measured at the nanometer scale. The rapid development of information technology in microelectronics, such as CPU chips, requires temperature readings at nanometer scales. With this project's results, microelectronics will become smaller and thermal systems will more efficiently convert energy.

Alicia Flores, Aerospace Engineering

Graduation: May 2019
Hometown: Gilbert, Arizona

Characterization of Parylene Dielectric for Tension and Compression Testing

Mentor: Jay Oswald, assistant professor
Research Theme: Security

This project investigates the relationship between modifying Poly(2-chloro-p-xylylene) capacitors into sensors as a new approach that can be used to measure high strain rates in an RC circuit. By applying a high DC voltage and a low AC source, the distance changed between the parylene capacitor plates can be calculated. The mechanical strain calculated in the capacitor was minimal, making parylene an ideal choice for defense wear. The importance of improving new materials that provide lightweight protection against blast and impact loadings contributes to the protection of our police and armed forces.

Sebastian Fonseca, Biomedical Engineering

Graduation: May 2018

Hometown: Bogotá, Colombia

Generating Isogenic Cell Lines To Study APOEε4 Polymorphism in Alzheimer's Disease

Mentor: David Brafman, assistant professor

Research Theme: Health

Alzheimer's disease (AD) is one of the most prevalent illnesses in the United States with over 5.4 million Americans experiencing it as of 2016. This research aims to analyze the relationship between the APOEε4 allele and the development of AD. By using the CRISPR/Cas9 genome editing technique, isogenic cell lines were created in order to convert the APOEε4 polymorphism into the APOEε3 and APOEε2 variants. For future work, vectors containing sgRNA molecules that target the APOEε4 polymorphism will be transfected into the isogenic cell lines to evaluate the relationship between the APOEε alleles and the development of AD.

Emily Ford, Civil Engineering

Graduation: December 2017

Hometown: Chandler, Arizona

Craft Labor Productivity Analysis

Mentor: David Grau, assistant professor

Research Theme: Sustainability

Productivity in the construction industry is an essential measure of production efficiency and economic progress quantified by timing construction workers. Data was gathered through activity analysis at local construction sites where variables such as ambient temperature are measured to determine their influence on the time workers spent adding value to the project. Through this research, construction managers will understand the variables that influence productivity in order to implement changes to augment their efficiency. Future recommended work includes performing a crew balance analysis based on individual time spent actively or passively contributing to a task.

Scott Freitas, Computer Science

Graduation: May 2017

Hometown: Phoenix, Arizona

PathFinder: Rapid Analysis and Visualization of Network Connectivity

Mentor: Hanghang Tong, assistant professor

Research Theme: Education, Energy, Health, Security

The goal of this work is to create an online platform for users to analyze and visualize network connectivity using a set of user-specific query nodes. In order to create a viable online platform, the researchers addressed two key challenges: (1) how to quickly identify key network structures in relation to query nodes and (2) how to create an intuitive user interface that allows for both easy interaction and sufficient functionality. To this end, the researchers developed PATHFINDER, a program that assists users in visually mining key relationships and communities from large networks.

Anikki Giessler, Chemical Engineering

Graduation: May 2018

Hometown: Tempe, Arizona

Dielectrophoretic response of condensed DNA clusters in AC fields

Mentor: Alexandra Ros, associate professor, School of Molecular Sciences, ASU

Research Theme: Education, Energy, Sustainability

Strong electric fields have been used for dielectrophoretic DNA sorting, however, the significance of DNA clustering behavior for dielectrophoresis has yet to be investigated. DNA cluster size and migration characteristics using various electric field parameters were examined. Distinct amplitudes and frequencies of applied potential were used to determine correlation in DNA clustering. DNA clustering was observed with frequencies ranging from 10–100 Hz and electric field strengths above 800 V/cm for DNA molecules ranging in size from 10–50 kbp. Our work suggests that DNA clustering can be exploited using insulator-based dielectrophoresis for size-based separation and fractionation with extremely high efficiencies.

Undergraduate Research Travel Grant Program

Alessandra Gualtieri, Chemical Engineering

Graduation: May 2018
Hometown: Phoenix, Arizona

Design an Electrospinning Technique to Synthesize Structurally Graded Fibrous Scaffolds For the Improvement of Interfacial Tissue Regeneration

Mentor: Julianne Holloway, assistant professor
Research Theme: Health, Sustainability

The research aim is to design an electrospinning technique to synthesize structurally graded fibrous scaffolds for the improvement of interfacial tissue regeneration. The project goal is to create a collection mandrel that can rotate at different speeds, with increasing fiber alignment at higher mandrel speeds. An additional design parameter is the use of multiple syringe pumps to allow for different materials to be concurrently electrospun into one cohesive scaffold. The use of different materials allows for precise control over scaffold porosity and cell infiltration. These are extremely important parameters in determining ultimate scaffold performance for tissue regeneration.

Saumya Gupta, Chemical Engineering

Graduation: May 2017
Hometown: Phoenix, Arizona

Gold Templated Indicator for Ionizing Radiation

Mentor: Kaushal Rege, associate professor
Research Theme: Health

Formation of gold-nanoparticle dispersion can be used to determine the incident amount of radiation. A gold nanoparticle sensor has been developed in the lab using hexadecyltrimethylammonium bromide (C16TAB). When this solution comes into contact with ionizing radiation there is a visible color change when gold salts are reduced and templated, creating a nanoparticle dispersion.

Undergraduate Research Travel Grant Program

Hannah Hansen, Civil Engineering

Graduation: May 2017
Hometown: Mesa, Arizona

Design of a Cementitious Binder Suitable for 3D Printing Applications

Mentor: Narayanan Neithalath, professor
Research Theme: Sustainability

The ever-increasing capabilities of 3D printing have made the vision of 3D printing infrastructure a reality. The current research is dedicated to designing a cementitious binder suitable for such applications. The focus has been to understand the flow behavior of binders consisting of alternate cementitious materials such as metakaolin and silica fume in terms of rheological properties such as yield stress and plastic viscosity. Finding a suitable cement mixture will allow for rapid expansion of quick, safe and low-cost construction that will revolutionize building technology.

Harrison Hanzlick, Mechanical Engineering

Graduation: May 2018
Hometown: Tucson, Arizona

Stability of the Human Ankle in Relation to Environmental Mechanics

Mentor: Hyunglae Lee, assistant professor
Research Theme: Health

No information currently exists about the stability of the ankle as affected by stable and unstable mechanical environments defined by a constant stiffness. This study explores the range of stiffness-defined haptic environments over which a young healthy individual can maintain stability despite aggressive perturbation. The subjects were approximately four times as stable in the sagittal plane. Characterizing the ankle in multiple degrees of freedom (DOF) provides the information necessary to design precise controllers for wearable ankle robots and active lower-extremity prosthetics. Collecting data from more subjects will clarify how reflex responses contribute to ankle stability.

Breanna Hassett, Mechanical Engineering

Graduation: May 2018
Hometown: Phoenix, Arizona

Improving Force Measurement in Smart Shoes for Rehabilitation

Mentor: Wenlong Zhang, assistant professor
Research Theme: Health

Smart Shoes are a low-cost, mobile technology used in neuromuscular rehabilitation to measure ground contact forces (GCF) through pressure changes of insole air bladders. Accurately recording these forces allows the patient to monitor their progress and allows therapists to see issues not obvious to the naked eye. This research aims to characterize three different air bladder materials on their fatigue characteristics and repeatability under simulated walking conditions in an Instron load cell. The findings will be used to improve the Smart Shoes for applications in orthotic devices and exoskeletons.

Gregory Hathorn, Chemical Engineering

Graduation: May 2018
Hometown: Tucson, Arizona

Studies on Urease Mediated Nanoparticle Formation

Mentor: David Allee, professor
Research Theme: Health, Sustainability

In order to perform methods that were employed by Dr. Bhagwati Sharma, several different purities of urease were tested for their effects on the reduction of ionic metals by potassium carbonate. When the correct concentration of urease is used, incubation of each solution will change its color, according to the spectrum of the nanoparticle present: red for gold particles, yellow for silver nanoparticles and black/brown for platinum nanoparticles. There will be limited or no precipitate present in the solution, and the solution will be homogenous. Thus far, precipitate has been present, and the solutions have not changed color.

Undergraduate Research Travel Grant Program

Songze He, Mechanical Engineering

Graduation: May 2017
Hometown: Zhuhai, China

Optimization of UAVs Power Support Design

Mentor: Wenlong Zhang, assistant professor
Research Theme: Energy

Unmanned aerial vehicle (UAVs) technology is developing rapidly; however, the power supply duration of vehicles is still a critical problem. The average flight time of a quadcopter is 15 minutes and is limited in many applications on the vehicle. Accordingly, the researcher's objective is to use the solar system on the UAVs to provide additional power and to improve flight time. Flight time using solar power improved to only 33 percent due to aerodynamic difficulty. By taking aerodynamics into consideration, the future design of the solar system will help UAVs have a better flight time and a safer performance.

Taylor Hoffmann, Mechanical Engineering

Graduation: May 2017
Hometown: Scottsdale, Arizona

Active Knee Brace Using Soft Robotics for Assistive Rehabilitation

Mentor: Panagiotis Polygerinos, assistant professor
Research Theme: Health

This research employs an application of soft robotics intended to more appropriately assist in post-surgery knee rehabilitation. This is achieved through the development of a knee brace which adds assistive force to support injured areas throughout the gait cycle. The best option for this type of rehabilitative practice is to attach soft and lightweight air bladders to the brace which are actuated through a pneumatic pump at the appropriate intervals as the patient walks. This active knee brace aims to provide patients a practical method for walking and rehabilitating more rapidly after surgery.

Nathan Holt, Civil Engineering

Graduation: May 2017

Hometown: Buffalo, Wyoming

Effect of Climate Change on Arizona Transportation Infrastructure

Mentor: Mikhail Chester, assistant professor

Research Theme: Security, Sustainability

This study examines how the Phoenix transportation system will be affected by potentially increased precipitation due to climate change. Climate projection data was analyzed to provide a measure for how precipitation might change given different emission scenarios. These projections were input into model of a water basin in north Phoenix and comparisons of the results were made with current design standards and failure mechanisms. The results of the study reveal a potential vulnerability of Phoenix infrastructure to more frequent and more severe failures. Future work should examine how current infrastructure can be modified to meet future capacities.

Paul Horton, Software Engineering and Applied Physics

Graduation: May 2018

Hometown: Tucson, Arizona

Evaluating Team Cognition Theory in the Hackathon Setting

Mentor: Shawn Jordan, assistant professor

Research Theme: Education

The purpose of this study is to observe teams in a hackathon setting to determine how the environment enables successful software development in a small timeframe. This semester, the study is focusing on developing a data collection protocol through work with a similar research group as well as firsthand experience at hackathons. Through initial observations, it seems that hackathon teams perform well due to the programming competition's fast-paced structure and readily available technological resources, such as virtual reality devices and drones. This study aims to benefit engineering education by providing insight on how project-based learning can be improved.

Ryian Hunter, Aerospace Engineering

Graduation: May 2017

Hometown: Prescott, Arizona

Coupling of Aerial and Ground Based Robotic Systems

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Security

Ground based and aerial robotic platforms are both commonly utilized in a number of applications, however, the ways in which these varied platforms can usefully interact with one another are poorly understood. In order to better frame this area of study, the coupling of aerial and ground-based robotic systems was explored. Both off the shelf robotic hardware and custom 3D printed platforms were utilized. Control of the ground systems and coupling mechanism was implemented via Wi-Fi connectivity in the python programming language on the Raspberry Pi computing platform.

James Hutchins, Computer Science

Graduation: May 2017

Hometown: Chandler, Arizona

Dark Web Marketplace Analysis: TOR and I2P

Mentor: Paulo Shakarian, assistant professor

Research Theme: Security

This research focused on identification of threats to cybersecurity that are bought, sold and traded on the Invisible Internet Project (I2P) for comparison to the data already collected by CySIS on The Onion Router (TOR). I2P has slower page loads and fewer sites than TOR. The slower page loading likely contributed to user preference toward TOR sites. However, as law enforcement efforts focused on TOR sites increase, TOR users may migrate towards the I2P sites for anonymity. Future research can monitor the transition and new sites as they appear for useful information.

Adrian Ion, Mechanical Engineering

Graduation: December 2016

Hometown: Constanta, Romania

The Effect of Force Feedback on Inter-Leg Coordination

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Health

This research focuses on expanding the understanding of inter-leg coordination and its application as a rehabilitation tool. The comparison between two unilateral perturbations (stiffness and dropping) could help explain the effects of force feedback on the contralateral leg. Current findings suggest that dropping perturbations provide greater contralateral tibialis anterior muscle activation in the latter part of the gait cycle. The contralateral muscle activation has shown to be associated with the reduction of force feedback on the unilateral leg. Future work will utilize this understanding to develop a more accurate representation of the model of sensory inputs for human gait.

Hope Jehng, Chemical Engineering

Graduation: May 2018

Hometown: Fort Mohave, Arizona

Theranostic Delivery to Canine Intracranial Gliomas via Convection-Enhanced Delivery

Mentor: Michael Caplan, associate professor

Research Theme: Health

The objective of this research was to analyze the effectiveness of convection-enhanced delivery in canine intracranial gliomas. Dogs with naturally occurring intracranial gliomas were injected with iron oxide nanoparticles. The delivery volumes were high, but the tumor volumes were even larger. The percent coverage of tumor with iron oxide nanoparticles was around 30 percent. Treatment of human tumors needs much higher volumes in order to test limits of distribution volume of convection-enhanced delivery. Recommended future work includes achieving 100 percent coverage which may involve more catheters and injections to reach the required volume.

Alaina Jenish, Biomedical Engineering

Graduation: May 2019

Hometown: Queen Creek, Arizona

A Glucose Dehydrogenase Based Electrochemical Biosensor For Detection Of Glucose In Human Saliva

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

The technology utilizes glucose dehydrogenase flavine-adenine dinucleotide (GDH-FAD) immobilized onto a disposable screen printed electrode to measure glucose in saliva collected directly from subjects mouth without any sample preparation. To our knowledge this is the first reported use of measuring saliva glucose with GDH-FAD without sample preparation. Presented is the data from a benchtop study showcasing a saliva glucose sensor capable of detecting 1.23 mg/dL to 247.07 mg/dL of glucose, and a preliminary human subject study (n=12) showing an average lag time of 15 minutes and a positive correlation between Saliva glucose and blood glucose.

Undergraduate Research Travel Grant Program

Joslin Jose, Materials Science and Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Testing Catalytic Properties of Controlled Ceria Morphologies

Mentor: Peter Crozier, associate professor

Research Theme: Energy

The goal of this research is to test and optimize catalytic properties of ceria by utilizing controlled morphologies including ceria cubes, rods and spheres. Each morphology exhibits distinct crystallographic faces, each of which is associated with higher or lower surface energy. Cubes, for example, exhibit (100) faces and have higher energy than the (111) faces exhibits by spheres. Therefore, different shapes will have different catalytic properties. Understanding the correlation between morphology and catalytic activity will lead to better design of future catalysts.

Mukund Khanwalker, Biomedical Engineering

Graduation: May 2019

Hometown: Chandler, Arizona

A Continuous Biosensor For The Rapid Detection Of Insulin To Better Manage Diabetes Mellitus

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

In order to improve glycemic control, enhance quality of life, and decrease diabetes-related complications for patients with type 1 diabetes and type 2 diabetes mellitus, new biosensor technology needs to address both sensitivity and specificity with continuous detection. Glucose homeostasis is far more complex than just accounting for glucose levels. Maintaining homeostasis is also dependent on a complex feedback interaction between insulin and glucose concentrations. The study has proved that EIS provides a rapid and label-free means to measure insulin, which will provide more accurate information for insulin administration, thus improving glycemic management for T1DM and T2DM.

Undergraduate Research Travel Grant Program

George Kharlakian, Environmental Resource Management

Graduation: May 2017

Hometown: Scottsdale, Arizona

Assessing How Zero-Point Surface Charge Affects Removal of Arsenic by Titanium Dioxide-Hybrid Media

Mentor: Kiril Hristovski, associate professor

Research Theme: Health, Sustainability

The research's goal is assessing how point-of-zero charge pH (ZPC) of TiO2-Granular Activated Carbon (Ti-GAC) hybridized media changes with TiO2 content and correlating these trends with the trends describing the media's arsenic adsorption. ZPC tests on media with different TiO2 contents have been conducted, as have isotherm tests on the media's capacity for arsenic adsorption, both with varying pH levels and changing the ionic strength of the solution KNO3. Data shows better media performance at lower pH. The data will be useful in finding cheaper water treatment methods. Future testing will include different ionic strengths/pH/media combinations.

Aditya Khuller, Aerospace Engineering

Graduation: May 2019

Hometown: Delhi, India

Development and Demonstration Firing of a Pulsed Plasma Thruster for Small Spacecraft Applications

Mentor: Daniel White, lecturer

Research Theme: Energy

Pulsed Plasma Thrusters (PPTs) are high-specific-impulse, low-power electric thrusters. PPTs are ideal for applications in small spacecraft for attitude control, precision spacecraft control, and low-thrust maneuvers. This project aims to increase the efficiency of conventional PPTs, by developing and designing innovative power processing systems in a cost-effective manner. An igniter-less unit will preclude the most common failure mechanism, a life-limiting component in most electric thrusters. Additionally, this project will operate at relatively high vacuum pressure to expand the operational envelope for very LEO (low Earth orbit) applications, and a future prototype design for a small spacecraft is currently under review.

Alexander Kim, Mechanical Engineering

Graduation: December 2016

Hometown: Honolulu, Hawaii

Electrohydrodynamic Nano Inkjet Printing with 2,3-Butanediol Silver Nitrate Ink

Mentor: Owen Hildreth, assistant professor

Research Theme: Energy, Health, Sustainability

Electrohydrodynamic inkjet printing (EHD) is an additive high resolution printing technology that prints at the nanoscale by using a current of electricity to control the flow of ink. The objective of this research is to develop a cost effective, highly conductive ink that can print the same 3D geometries as inks currently used in EHD printing. While early results from this research are promising, the research team has still been unable to print vertically or continuously at high resolutions. The next step in this research is to develop new parameters that would overcome the current limitations of this ink.

Sebastian Klype, Mechanical Engineering

Graduation: May 2017
Hometown: Ahwatukee, Arizona

Investigation of Vibrational Stimulus on Hemiplegic Walkers for Gait Rehabilitation

Mentor: Panagiotis Artemiadis, assistant professor
Research Theme: Health

In the United States, more than 795,000 people suffer from a stroke per year, which often results in lifelong complications including a condition known as drop foot. Prior research indicates vibrational stimulus to the contralateral leg can produce positive muscular and neural reaction in the hemiplegic leg. These results encourage conducting experiments involving vibrational stimulus to the nerves affecting dorsiflexion on the non-paralytic side to stimulate the paralytic side. Experimentation indicates the peroneal nerve on the healthy leg must be thoroughly vibrationally perturbed to stimulate a dorsiflexion reaction in the hemiplegic leg. Future work should include experimentation on hemiplegic stroke patients.

Alexander Kratz, Biomedical Engineering

Graduation: May 2018
Hometown: Tucson, Arizona

Microfluidic Analysis of SDF1α/CXCR4 Activity in Breast Cancer Cells

Mentor: Mehdi Nikkhah, assistant professor
Research Theme: Health

The objective is to measure the presence and activity of two proteins: SDF1α, and its receptor, CXCR4. These proteins form a signaling pathway that is implicated in cancer cell invasion. A microfluidic device was used to quantify cell invasion in response to SDF1α signaling between cancerous and noncancerous cells. Utilizing immunofluorescence, the activity of these proteins was measured, quantifying the invasive effect of SDF1α on breast cancer cells and presenting a potential treatment pathway for limiting the invasion inducing effects of SDF1α.

Ivan Kruts, Aerospace Engineering

Graduation: May 2017
Hometown: Sacramento, California

Propulsion

Mentor: Timothy Takahashi, professor of practice
Research Theme: Energy

The goal of this FURI project is to not only analyze ducted fans, but to also compare their performance against propellers in static conditions and during various flight speeds as thrust declines. Previous research shows that propellers are more effective at generating static thrust than ducted fans, but a certain nacelle design might allow a ducted fan to perform as well as a propeller at flight speeds. If ducted fans can produce as much thrust as propellers, it will allow for more compact and faster RC Airplanes. Future work will involve the optimization of ducted fan nacelles to increase thrust.

Cecilia La Place, Software Engineering

Graduation: May 2018
Hometown: Chandler, Arizona

A Study of Self-Regulated Learning in Hackathon Environments

Mentor: Shawn Jordan, assistant professor
Research Theme: Education

In order to bring more effective learning methods into education, outside learning styles are being observed in hackathons (invention marathons). As of right now, refinement of the original problem statement has been completed and IRB applications are in progress. Abstracts for the ASEE conference in June 2017 have been drafted. Observations will commence in the next semester, thus no findings or conclusions can be drawn at this point. However, the data that will be collected will be used to improve curriculums by providing more learning methodologies, which is helpful if current methods are found to be ineffective.

Michael Lay, Chemical Engineering

Graduation: May 2018
Hometown: Chandler, Arizona

Effect of Hopper Design on Granular Flow

Mentor: Heather Emady, assistant professor
Research Theme: Energy

Hoppers are the main instrument in industry used to regulate the flow of solid particles. Unlike fluids, the flow rate of solid materials depends on a myriad of factors, including the shape of the hopper, which is the primary focus of this project. Smooth silica beads of two different size distributions have been tested in hoppers with four different cone angles, with the 55° angle having the fastest mass flow discharge. Moving forward, surface roughness of the particles will be altered to further investigate the effects of hopper geometry on different granules of the same material.

Robert Leader, Aerospace Engineering

Graduation: May 2017
Hometown: North Las Vegas, Nevada

Automatic Generation and Area-Ruling of Aircraft Bodies

Mentor: Timothy Takahashi, professor of practice
Research Theme: Education

Conceptual design and modeling tools are key to aircraft design, especially for supersonic flight. The research tool being developed can build models in a CAD environment when given a set of input parameters to optimize an aircraft's lengthwise cross-sectional area distribution. This will be used to better match an optimized case, thus allowing for a minimization of wave drag. This tool will be implemented in ASU's capstone class for Aerospace Engineering students and, eventually, can be combined with other tools developed for Rhinoceros CAD to create a suite of design tools.

Madeline Lent, Chemical Engineering

Graduation: May 2017
Hometown: Chandler, Arizona

Electrospinning Stimuli-Responsive Fibers at the Nanoscale as Functional Drug Delivery Mats

Mentor: Matthew Green, assistant professor
Research Theme: Health

The objective of this research is creating electrospun fibers as functional drug delivery mats to enable disease-tailored therapies with targeted delivery to reduce side effects in patients. By using a large electric potential to draw fibers from a solution flowing at a specific rate, the solution reaches a grounded target several inches away. The fibers are used as drug delivery mats and the kinetics of the peptide's release-time are tuned to occur in the range of one hour to one week. Observing the solvent impact on fiber spinning and diameter results in improving overall comfort of patients.

Undergraduate Research Travel Grant Program

Richard Li, Biomedical Engineering

Graduation: May 2019
Hometown: Gilbert, Arizona

Siloxane-Based Nanoparticles to Model Hypoxia

Mentor: Vikram Kodibagkar, assistant professor
Research Theme: Health

The objective of the project is to synthesize siloxane-based nanoparticles that are loaded with Nile Red dye in order to model hypoxia in cancer spheroids. In experimentation, the nanoparticles were successfully synthesized and one uptake method was characterized. The nanoparticles were proven to successfully fluoresce under fluorescence microscopy and indicated a successful uptake of nanoparticles within the spheroid. For future experiments, a recommended path would be to compare nanoparticle uptake with a pimonidazole stain to observe hypoxia versus nanoparticle concentration.

Kevin Liao, Computer Science

Graduation: May 2017

Hometown: Chandler, Arizona

Next Generation Black-Box Web Application Vulnerability Analysis

Mentor: Adam Doupé, assistant professor

Research Theme: Security

Black-box web vulnerability scanners are fundamentally ad-hoc, in that they simply crawl and fuzz a web application, hoping to trigger a vulnerability. In this regard, the research leverages a novel technique called inductive reverse engineering (IRE) to first build a model of the web application's functionality. IRE approximates the source code of the web application by synthesizing an abstracted program that satisfies a set of HTTP request/response pairs. This will lead to a more principled approach to finding vulnerabilities by analyzing the synthesized program using static analysis techniques.

Nathan London, Materials Science and Engineering

Graduation: May 2017

Hometown: Bullhead City, Arizona

Electrospinning Synthesis of Electrolytes for Solid-State Lithium-Ion Batteries

Mentor: Candace Chan, assistant professor

Research Theme: Energy

Current lithium-ion batteries contain a liquid component that is prone to leakage and combustion, and there is a push to replace it with a solid material. One candidate is Li7La3Zr2O12 (LLZO). This project focuses on the synthesis of LLZO nanowires and the affects of processing on their structure and properties. Wires have been successfully synthesized using the electrospinning process, and samples were heated in a furnace for different lengths of time. The samples will undergo several materials characterization methods to determine the structure of the wires, and the density and conductivity of pressed pellets will be recorded.

Miles Mabey, Engineering (Robotics)

Graduation: May 2019

Hometown: Prescott, Arizona

Swarm Based Construction Using Found Resources

Mentor: Wenlong Zhang, assistant professor

Research Theme: Education

Enabling robots to scavenge for resources is a process that could benefit many areas of robotics; ePucks allow this process to be tested. The researcher has decided to use Haar-Cascades to allow the ePuck's cameras to detect Legos. It is possible that by using this algorithm we can compensate for the low resolution of the ePucks camera. Using these algorithms, robots could effectively collect resources whether it be on mars or earth. Future works should add the use of path planning algorithms and swarm coordination between the ePucks.

Nicholas Martinez, Computer Science

Graduation: May 2018

Hometown: Phoenix, Arizona

Producing Task-Related Feedback for Lego Mindstorms Programming Activities

Mentor: Erin Walker, assistant professor

Research Theme: Education

This research aims to improve Lego Mindstorms programming curricula by integrating task-related dialogue to increase student engagement and facilitate the student's ability to detect errors. The project team is designing a framework that directs a student through specific tasks and gives informed feedback based on the student's program. Student program information is determined by parsing an extensible markup language (XML) file. This framework utilizes a cognitive tutor approach to analyze the student's work on a step-by-step basis. The contribution of this research is a new method of providing contextually-aware feedback to students learning the fundamentals of Computer Science.

Logan Mathesen, Industrial Engineering

Graduation: May 2016

Hometown: Tucson, Arizona

Modelling Megacities: An Approach to Modelling Dense Urban Area

Mentor: Frances Zenzen, adjunct faculty

Research Theme: Education, Energy, Health, Security

The researchers propose a modeling approach for megacities and their interactively complex systems, through a Design of Experiments (DOE) application, to support humanitarian operations by the United States Army. A controllable, statistically viable, representative urban ecosystem was selected to execute a design experiment in order to understand megacity complexity. The researchers selected a subset of key factors pertaining to city systems and developed an interactive model. The DOE results determined optimal factor levels that maximize model performance for urban disaster management.

Undergraduate Research Travel Grant Program

Anthony McCourt, Aerospace Engineering

Graduation: May 2018

Hometown: St. Petersburg, Florida

Mechanical Stress Testing on Galvanically Corroded Aluminum and Titanium Joints

Mentor: Kiran Solanki, associate professor

Research Theme: Energy, Security, Sustainability

This work models the affects of salt water and fatigue on carrier-based aircraft structures, which are continuously in contact with a structurally hostile environment. A testing rig was designed and built to place a specimen of 7075 Aluminum under a constant load while galvanically coupled with Grade 5 Titanium. By monitoring the corrosion rate periodically, a better life-span model can be generated. Since many aircraft are composed of aluminum with titanium bolts, these models can be used to better track when aircraft parts should be replaced and in development of dissimilar lightweight metal joints with superior corrosion resistance properties.

Tyler McDaniel, Mechanical Engineering

Graduation: December 2017

Hometown: Trabuco Canyon, California

Optimization and Control of a Quadrotor Vehicle through Tele-Operation and First Person View in Oculus Rift

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Education, Security

The research goal is to design a cohesive melding of Oculus Rift and Quadrotor Unmanned Aerial Vehicle (UAV) using an onboard camera for First Person Viewing (FPV) and Heads-Up Display (HUD) to assist in vehicle control. A program is being developed to allow viewing of transmitted video in 3D virtual space. The headset will also allow for viewing flight-based data. 3D headset viewing will have an impact in security and education research. The application will allow for immersive and perspective-based viewing in spaces that were previously inaccessible. Future applications will address a greater field of view through stereoscopic cameras.

Kevin Mead, Computer Science

Graduation: May 2019

Hometown: Scottsdale, Arizona

A Comparative Study of Augmented and Virtual Reality in Education of Students with ADHD

Mentor: Troy McDaniel, assistant research professor

Research Theme: Education

The objective of this project is to compare the effectiveness of augmented and virtual reality in education of students with attention deficit hyperactivity disorder (ADHD). The augmented reality technology is almost complete and will be begin user studies soon. The virtual reality will transfer the augmented reality and replace the menu with Vive controls. This work seeks to provide a model for assistive educational technology for students with ADHD. By merging physical activity with engaging augmented reality, this project seeks to provide a model for students that don't thrive in the traditional classrooms. Future work includes projects with other subjects.

Frea Mehta, Chemical Engineering and Molecular Bioscience/Biotechnology

Graduation: May 2017

Hometown: Phoenix, Arizona

Traineeship in Correlative Microscopy

Mentor: Matthia Karreman, post-doctoral fellow at European Molecular Biology Laboratory

Research Theme: Health

Correlative microscopy utilizes advantages of multiple modes of microscopy to rapidly localize regions of interest and image important cellular and subcellular events at high resolution. This method is ideal to capture and study the moment of tumor metastasis through the blood-brain barrier, an event that is clinically relevant but not well understood. Using a combination of light, electron, and x-ray imaging, the physical basis of metastasis can be characterized. Once understood, it can be potentially targeted to stop the spread of cancerous cells.

Undergraduate Research Travel Grant Program

Justin Mieth, Biomedical Engineering

Graduation: May 2018

Hometown: Buffalo, New York

Startle Evoked Movements in the Dominant and Nondominant Arm during a Reaching Task

Mentor: David Allee, professor

Research Theme: Health

It has been hypothesized that the dominant arm relies more on neural feedforward control while the nondominant arm relies more on feedback control. By using Startle Evoked Movements (SEM) in a simple reaching task the differences in voluntary and involuntary movements can be documented and used to evaluate a subject's movement plan. Current findings match that of accredited previous work. Further data collection in a wider range of subject candidacy will lead to better understanding of planned movements and how they differ between the two arms and their neural control systems.

Ubaldo Mijares Lopez, Aerospace Engineering

Graduation: May 2018

Hometown: Phoenix, Arizona

Attitude Determination and Control System Research Platform

Mentor: Daniel White, lecturer

Research Theme: Security

Satellites experience many external forces in orbit around the Earth, causing attitude jittering, and in some cases, tumbling. The purpose of this project is to develop a testing platform for an attitude determination and control system. With this testing platform, an efficient method of collecting orientation data can be developed. In addition, torque data will be obtained through the use of multiple actuators to be able to efficiently control stabilization issues experienced by CubeSats (small, cube-shaped, inexpensive satellites). Effective sensing and controlling of the orientation of CubeSats will allow for an increase in reliable orbital observation.

Jack Miller, Aerospace Engineering

Graduation: May 2018

Hometown: Pine Island, Minnesota

Flexible Composite Propellant Tank Prototype

Mentor: Daniel White, lecturer

Research Theme: Sustainability

The purpose of this project is to create a prototype flexible composite propellant tank for rockets and spacecraft. With commercialization of space increasing, more economical means of producing spacecraft must be explored. This research has identified suitable composite materials, adhesives and liners to use in the production of flexible propellant tanks. In addition, current manufacturing abilities will be explored to determine the validity of large scale manufacturing. The future production of a prototype tank will provide insight into more economical means of producing fuel tanks with the potential of improved mechanical properties over previous designs.

Samuel Mokdad, Mechanical Engineering

Graduation: May 2017
Hometown: Chandler, Arizona

Thermoelectric Power Generation via the Utilization of Exhaust Heat from Internal Combustion Engines

Mentor: Robert Wang, assistant professor
Research Theme: Education, Energy

The objective of this project is to use thermoelectric modules to capture waste exhaust heat from an internal combustion engine. Thermoelectric modules with multiple cooling options, including water and fins of different lengths, were mounted to the exhaust pipe and the resultant power was measured as a function of engine speed using an Ohm's Law circuit. The apparatus will then be implemented as a laboratory module option in MEE 434 that demonstrates thermoelectric power generation and the importance of cold-side thermoelectric cooling. Furthermore, this project will be used to create a more efficient waste heat recovery device in the future.

Arianna Moreno, Biomedical Engineering

Graduation: May 2017
Hometown: Glendale, Arizona

Does Hospital Participation in Telestroke Lead to Faster DTN for Stroke Patients?

Mentor: David Allee, professor
Research Theme: Health

There is variation between hospitals on performance of acute ischemic stroke (AIS) care delivery. Some hospitals do well on door-to-needle (DTN) time for tissue plasminogen activator (tPA) delivery and others have substantial room for improvement. Telestroke programs can connect hospitals with fewer resources to the support that they need to ideally care for AIS patients. The correlation between the duration of a hospital's participation in the Partners Telestroke Network and patients' DTN time for tPA delivery was explored to better understand the impact of the Telestroke program.

Undergraduate Research Travel Grant Program

Mohammad Mousa, Biomedical Engineering

Graduation: May 2017
Hometown: Gilbert, Arizona

Advanced Manufactured Pressure Sensor for Low Level Sensitivity Detection for Prosthetics

Mentor: Jeffrey La Belle, assistant professor
Research Theme: Health

The goal of this project is to develop an advanced manufactured flexible pressure sensor that has the possibility to be used for the application of synthetic skin on prosthetics. Current pressure sensors for prosthetics use strain gauges, electromagnetism and capacitance to detect changes in pressure but often result with high pressure ranges. The proposed sensor can detect extremely small changes in pressure while mimicking the human skin in size, shape, feel or degree of sensitivity.

Undergraduate Research Travel Grant Program

Akhila Murella, Computer Science

Graduation: May 2018
Hometown: Phoenix, Arizona

Determining Microcontroller Viability in Point of Care Diagnostics

Mentor: Jennifer Blain-Christen, assistant professor
Research Theme: Health

Infection diseases have always been prevalent, and having the ability to noninvasively detect multiple diseases and/or pathogens in a non-clinical setting prior to the onset of clinical symptoms is very useful. The goal of this research project is to miniaturize the functionality of medical diagnostic equipment into a low-cost, disposable method that can eventually become widespread like a thermometer. To have a low-cost sensor, microcontrollers, such as the Nordic and Arduino, are tested to see which is the most viable to support the requirements. Then, a Bluetooth phone application will connect with the controller to improve functionality.

Hunter Murphy, Mechanical Engineering

Graduation: May 2017
Hometown: San Rafael, California

Stability of the Human Ankle in Relation to Environmental Mechanics

Mentor: Hyunglae Lee, assistant professor
Research Theme: Health

The objective of this experiment is to analyze ankle stability corresponding to mechanical environments of different stability magnitudes. The specific stability plane analyzed for a healthy human ankle was the sagittal plane. This plane was analyzed to determine the extent at which a human could effectively stabilize the ankle. Overall, a young healthy human can effectively stabilize the ankle in a wide range of stability magnitudes. This study is beneficial to the design and control of robots that physically interact with human lower extremities, including lower limb exoskeletons and powered ankle orthoses.

Thomas Murphy, Electrical Engineering

Graduation: May 2018
Hometown: Gilbert, Arizona

Research Assistant

Mentor: Hongbin Yu, associate professor
Research Theme: Health

The objective of this research was to develop a stretchable conductive interconnect for use in a stretchable capacitor that can be applied to wearable technology in varying fields of application. The stretchable conductive interconnect was successfully synthesized through a precise combination of polymers, acids and silver resulting in low resistivity and high stretchability. With this interconnect an attempt was made to create a stretchable capacitor that has so far yielded promising capacitance values for use as a sensor. Future work will focus on testing different designs of stretchable capacitors and then implementing them into a wearable device.

Helena Nabaty, Electrical Engineering

Graduation: May 2018
Hometown: Chandler, Arizona

Self-Stirring Syringe

Mentor: Brent Vernon, associate professor
Research Theme: Health

The improved Self-Stirring Syringe's objective is to explore the behavior of magnetic fields while ensuring efficiency is achieved after adding slots to the stator. After creating SolidWorks files, the researcher modeled the magnetic field changes by using COMSOL, which revealed that adding slots will not affect the intensity of the Magnetic Field. By addressing this issue, this product will reduce patient discomfort and deliver the correct drug concentration over a given time while allowing Dr. Faigel to view the solution in mixing. Next, the researcher will 3D print the product and test if maximum efficiency is achieved after the adjustments.

Amanda Nguyen, Biomedical Engineering

Graduation: May 2018
Hometown: Ahwatukee, Arizona

3D Reconstruction of Personalized Polyethylene Vocal Ridges for Regenerative Implantation

Mentor: Vincent Pizziconi, associate professor
Research Theme: Health

Vocal folds allow one to produce sound; slight error in implant sizing will result in failure. This project aims to develop a process of creating personalized 3D vocal fold surgical implants. A proof of concept was 3D printed using Solidworks to design a mold of the vocal fold, and created by molding techniques to shape the biomaterial, Medpor (Stryker). For an anatomically accurate implant, the larynx area needs to be isolated. The process to develop this implant will allow surgeons less guesswork and decrease operating time in the surgical suite, leading to improvement in laryngeal surgeries.

Toan Nguyen, Biomedical Engineering

Graduation: May 2019
Hometown: Gilbert, Arizona

Paclitaxel's Effect on CAF's Ability to Enhance Breast Cancer Cell Proliferation

Mentor: Mehdi Nikkhah, assistant professor
Research Theme: Health

This project examined a microfluidic device as a drug study platform. Microfluidic devices can encapsulate cells in 3D using hydrogels to imitate native cellular microenvironments. The microfluidic device used features a tumor region (where breast cancer cells were loaded), stromal region (where collagen gel was loaded), and media channels (where cell nutrients were loaded). 10 nM Paclitaxel was loaded in the media channels surrounding breast cancer cells of the tumor region in the experimental condition and were absent in the media channels in the control condition. The inhibitory effects of Paclitaxel on CAF's ability to enhance cell proliferation will be discussed.

Mateo Oramas, Mechanical Engineering

Graduation: December 2018
Hometown: Sedona, Arizona

Enhancement of Fatigue Life for Buckypaper Based Strain Sensors

Mentor: Masoud Yekani Fard, assistant research professor
Research Theme: Health, Security, Sustainability

Can a novel buckypaper-based strain sensor designed for use within fiber reinforced composite laminates be integrated with smart memory alloy (SMA)? Can SMA provide an induced compressive pre-stress, thus effectively increasing high cycle fatigue life of a sensor? SMA induces a pre-stress using methods previously employed with concrete members, provided the SMA is securely anchored within the compressed resin/carbon-nanotube medium. Careful curing and manipulating SMA geometry provides additional fixity. Success provides for safer composite structures whose structural health can be monitored with increased accuracy. Future work could employ this sensor in smart composite materials for active repair of structural members.

Jacob Packer, Biomedical Engineering

Graduation: May 2018
Hometown: Gilbert, Arizona

Utilizing Progerin Protein and Human-Induced Pluripotent Stem Cells to Replicate Alzheimer's Disease In-Vitro

Mentor: David Brafman, assistant professor
Research Theme: Health, Security

It was hypothesized that induced pluripotent stem cells (iPSCs) can be used as an effective model of Alzheimer's disease (AD) if treated with progerin: a mutation of a cell scaffolding protein that is associated with premature aging of cells. Since AD is a late-onset disorder, progerin protein was introduced to the naturally "young" iPSC population to better mimic age markers found in "old" cells. Cell abnormalities consistent with excess progerin were found to be present and quantifiable in the cell population. The cells will be tested further to confirm the efficacy of progerin as a factor in AD modeling.

Bhavik Patel, Mechanical Engineering

Graduation: May 2018
Hometown: Phoenix, Arizona

Bayesian Network Inference and Information Fusion for Accurate Pipe Strength and Toughness Estimation

Mentor: Yongming Liu, associate professor
Research Theme: Energy

The research's objective is to estimate pipe material strengths that represents the reliability and risk assessment of the aging pipeline infrastructure systems in the United States. Gas pipe specimens are grinded and polished, then tested to obtain chemical composition, material properties and lattice structures. Next, researchers perform analysis using the Gaussian Process Modeling, among other statistical analyses, to test various parameters in order to estimate pipe fatigue and toughness. Using data, researchers can accurately determine a pipe's lifespan and replace them before failure. Future work will be to analyze and estimate several different specimens ranging in different chemical composition.

David Phelps, Mechanical Engineering

Graduation: December 2017

Hometown: Tempe, Arizona

Effect of Plastic Anisotropy on the Deformation Behavior of Bicrystalline Aluminum Films

Mentor: Pedro Peralta, professor

Research Theme: Education

The characterization and documentation of grain size and orientation and its effect on the material properties of ultrafine-grained (UFG) and nanocrystaline (NC) metals and alloys will allow us to understand and eventually produce stronger engineering materials. Texture has also been shown to impact the mechanical properties and yield stress and the ultimate strength of UFG and NC materials. This research strives to show how relative grain orientation affects overall sample strength.

Dominic Podzemny, Mechanical Engineering

Graduation: May 2017

Hometown: Edgewood, New Mexico

Modeling Concentrated Solar Tracking Performance and Accuracy

Mentor: Agami Reddy, professor

Research Theme: Energy, Sustainability

The researcher utilized research methods and a two axis concentrated photovoltaic tracking system to analyze aspects of solar-tracking like: tracking accuracy, irradiance and ambient temperature. These variables will be used to create a mathematical model to accurately predict system performance to apply to similar systems. The tracker has been installed in the lab, manufacturer specifications have been studied, and additional subject matter experts networked along with an ongoing literature review. A method for automatically tracking accuracy, while accounting for error is being prototyped. In the near future, the system will be instrumented with sensors and data loggers to begin to gather data.

Maria Jose Quezada Valladares, Biomedical Engineering

Graduation: May 2017

Hometown: Mexico City, Mexico

The Role of Task Expertise in Startle Evoked Movements

Mentor: David Allee, professor

Research Theme: Health

Startle-evoked-movement (SEM), the involuntary release of a planned movement via a startling stimulus, has gained significant attention recently for its ability to probe motor planning. It was recently shown that hand movements are susceptible to SEM. Interestingly, only coordinated movements of the hand (grasp), but not individuated movements of the finger (upward index finger abduction), were susceptible. The objective of this study was to evaluate a more familiar individuated finger movement, typing, to determine if this task was susceptible to SEM. It was shown expert typists had SEM responses in almost all fingers while regular typists showed fewer differences.

Undergraduate Research Travel Grant Program

James Quigley, Software Engineering

Graduation: May 2018

Hometown: Tucson, Arizona

Autonomous Package Delivery Using a Quadcopter Based on GPS Navigation and Computer Vision

Mentor: Wenlong Zhang, assistant professor

Research Theme: Security

The project's objective is to build autonomous quadcopters that can function without the assistance or supervision of a human counterpart. In particular, the research is working toward getting a camera onboard the drone so it can locate a landing spot, lower itself successfully and land without damaging itself. Based on the research, the camera will need to interface with the quadcopter's on-board computer, which controls its navigation, and work with an external microprocessor. Taking the next step with these cameras will help improve quadcopters and allow for more applications, which can make day-to-day life safer, simpler or more efficient.

David Reynolds, Chemical Engineering

Graduation: May 2017
Hometown: Gilbert, Arizona

Improved Exfoliation of Two-Dimensional Nanomaterials from Powder Sources

Mentor: Qing Hua Wang, assistant professor
Research Theme: Energy

An improved mechanical exfoliation method for the production of 2D nanomaterials, discovered by Huang, et. al (ACS Nano. 9, 10612-10620 (2015)) showed great results for bulk crystal source materials by applying a surface treatment on the target substrate and heating. In this project, the method was applied to powders in an effort to produce 2D materials from these cheaper, more readily available sources. A series of temperatures, adhesive tapes and surface treatments were systematically assessed, but monolayer flakes were not achieved. We believe that more extreme parameters, which will enhance Van der Waals forces, will be needed to achieve monolayers.

Frederick Rivers, Chemical Engineering

Graduation: May 2018
Hometown: Chandler, Arizona

Computational Modeling of Advanced Hybrid Pervaporation Membrane Processes for Inland Brackish Water Desalination

Mentor: Mary Laura Lind, associate professor
Research Theme: Sustainability

Computational methods were used to optimize a RO (reverse osmosis) pervaporation hybrid process for the treatment of inland brackish water desalination concentrate. Software such as COMSOL, ChemCad and Hydranautics were used to most accurately model the process design. Numerous conditions were tested to assess what process parameters would yield the best energy efficiency and water recovery. The results of this research have the potential to improve water quality at low energy costs on a global scale. Further lab-scale experimentation is still required to conclude whether this process can be implemented effectively in real world situations.

Nicholas Scheenstra, Electrical Engineering

Graduation: December 2016
Hometown: Pine Mountain Club, California

Solar Cell Thin-Film Analysis at High Temperatures

Mentor: Zachary Holman, assistant professor
Research Theme: Energy, Sustainability

Solar cells range far and wide in terms of the type of thin-films that they contain and the arrangement of their layering. This makes it crucial to understand the inherent properties of these films and how they will react during further deposition processes, such as exposure to extreme temperatures. By analyzing breaking bonds or ejected atoms from a sample, further thin-film characterization can occur, resulting in a more robust wafer. By taking into account the effects of how, not just one, but all the layers in a wafer affect one another, a more efficient solar cell can be achieved.

Jake Schichtel, Mechanical Engineering

Graduation: May 2018
Hometown: Grandville, Michigan

Electrochemical Recovery of Silver from Disqualified Silicon Solar Cells

Mentor: Meng Tao, professor
Research Theme: Energy, Sustainability

The objective of this research is to further develop the technology necessary to recycle disqualified solar cells by maximizing the efficiency of the dissolution and electroextraction of silver. Compared to past experiments, larger quantities of silver were used in the electrolysis, revealing new concerns: under current conditions, the formation of silver dendrite in solution causes short circuiting of the electrolytic system. Geometry and electrical variables will be further investigated. Concentrations were theoretically connected to pH values, which could be useful in large scale applications. These relationships need to be experimentally tested.

Matthew Schneider, Aerospace Engineering

Graduation: May 2017

Hometown: New Lenox, Illinois

High Velocity Testing and Characterization of Composite Materials

Mentor: Aditi Chattopadhyay, professor

Research Theme: Security

The objective of this research is to optimize the design of a high velocity gas gun and calibrate the equipment for investigating impact damage. The pressure — velocity relationship has been calibrated for the gas gun. Given an initial pressure up to 500 psi, the projectile velocity can be predicted. Additionally, a 3D design of an alternate test chamber lid is in development to gather high-frequency, high-resolution imaging of impact tests. This work will facilitate high velocity impact tests up to 750 m/s and accurate post-processing of data from laser measurements and imaging during impact tests on composites and meteorite specimens.

Joseph Schreiber, Biomedical Engineering

Graduation: May 2019

Hometown: Henderson, Nevada

The Use of Startle to Evaluate Spinal Cord Injuries

Mentor: Claire Honeycutt, assistant professor

Research Theme: Health

According to the World Health Organization, between 250,000 and 500,000 people receive a spinal cord injury every year, which can result in death, paralysis, chronic pain and several secondary ailments. This research aims to determine if startle evoked movement has any use in rehabilitation. Loud sound stimuli were used to cause involuntary movements of several muscle groups. This research also assesses if the reticulospinal tract can be used to bypass damage in the corticospinal tract. Future studies will directly examine the direct application of these findings in the realm of rehabilitation.

Frederick Sebastian, Biomedical Engineering

Graduation: May 2017

Hometown: George Town, Malaysia

The Development of a Comfortable Prosthetic Socket with Vacuum Suction — Fishbone

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

Patients using current prosthetic sockets on the market can experience high discomfort due to a poor fit or have health concerns due to an unsanitary environment within the socket stemming from the lack of air flow. The objective of this project is to develop a novel design that would potentially counter these problems by allowing more ventilation from perforations on the outer shell and liner, or by allowing the user to adjust the socket themselves multiple times during the day using an existent tightening or ballast system. The research is part a larger lightweight transradial prosthesis project: Fishbone.

Simol Shah, Chemical Engineering

Graduation: May 2018

Hometown: Mesa, Arizona

Fluorescent Molecular Biosensors Derived from Transcriptional Regulators

Mentor: Brent Nannenga, assistant professor

Research Theme: Health

Engineered protein biosensors are used in combination with live cell fluorescence microscopy to reveal spatial kinetics and locality of intracellular processes as they occur. However, in biosensory technology, engineering sensors for molecules without a natural binding protein prove to be difficult and time-consuming. The research has focused on engineering the arabinose operon protein to express its Green Fluorescence Protein gene via increased sensor response time due to receptor-ligand kinetics. Through the combined efforts of photon fluxes resulting from fluorophores of GFP and the infinitesimal rate constant of ligand binding, the research is a pioneer study for tailor-made medicine.

Ryan Shillingburg, Aerospace Engineering

Graduation: May 2018

Hometown: Scottsdale, Arizona

Conceptual Design of a High Power Density Electrically-Driven Centrifugal Oxidizer Pump for Small Combustion Chamber Applications

Mentor: Daniel White, lecturer

Research Theme: Energy

The objective of this research project is to conceptually design an electrically-driven centrifugal oxidizer pump for sounding rocket applications. Theoretical calculations have been made to determine the constraints of the design, and a three-dimensional computer-aided design (CAD) has been created. The geometry of the impeller blades was a challenge due to the desired volumetric flow, but simplifications have been made for the preliminary design. This pump will allow for more sustainable launches due to the reusable battery driving the motor. The next step will be to print the design and test it under the specified conditions.

Neal Shulman, Materials Science and Engineering

Graduation: May 2018

Hometown: St. Louis, Missouri

Research Assistant

Mentor: Michael Caplan, associate professor

Research Theme: Education

Is it possible to foster an entrepreneurial mindset in students through a deconstruction of its core elements? This research aims to answer this question through monitoring and observing students, the production of a novel rubric and subsequent professor- and self-analysis. Students will be able to better themselves through self-reflection and professors will be able to tailor their teaching style to developed methodologies.

Adam Siegel, Materials Science and Engineering

Graduation: May 2018

Hometown: San Diego, California

Heating/Biasing TEM Holder

Mentor: Peter Crozier, associate professor

Research Theme: Energy, Sustainability

This research's aim is to develop a transmission electron microscope (TEM) sample holder that will allow for the observation of materials in situ while under reactive gas conditions with an applied bias at elevated temperatures. The current goal is to use the functioning holder that was built last semester and mount the completed heating/biasing chips on it for use in the TEM. A focused ion beam (FIB) prepared sample was mounted onto the holder to be tested in the microscope. The capabilities of the heating/biasing chips will enable many new in situ experiments to better understand the functioning of materials.

Danielle Simonet, Mechanical Engineering

Graduation: May 2018

Hometown: Tempe, Arizona

Characterising and Decreasing Failures of Lightweight, Flexible Solar Modules

Mentor: Stuart Bowden, associate research professor

Research Theme: Sustainability

This project aims to increase the lifetime of solar panels by characterizing the limits of physical deformations on cost-effective, high efficiency, heterojunction, flexible modules and developing counter-measures against breakage. The primary focus is to assess how much they can bend or stretch without breaking and still retain their solar absorption abilities. Unfortunately, current efficiencies are much lower than standard rigid modules, and literature is limited. The end goal is to collect sufficient data to find relationships between a module's functionality and the applied deformations. A future application is to create a thin, multi-cell module to connect to a power system.

Philip Sitterle, Chemical Engineering

Graduation: December 2018
Hometown: San Antonio, Texas

Synthesis of Light-Responsive Hydrogels for Dynamic Tactile Displays Targeting the Visually-Impaired

Mentor: Lenore Dai, school director and professor
Research Theme: Education

The goal of this project is to synthesize a light-responsive, smart polymer in order to create a tactile display which will produce 3D renderings of projected images through local volume changes. The desired polymer is a double-networked hydrogel of Polyacrylic acid and Polyacrylamide, which converts heat into volume change through absorbing or releasing solvent, with chlorophyllin interspersed, which converts light into heat. This technology will be especially helpful for the blind and visually impaired population in pursuing STEM fields by providing a tangible means of conveying concepts and images.

Caroline Smith, Electrical Engineering

Graduation: December 2018
Hometown: Phoenix, Arizona

Passive Electric Field Imaging

Mentor: David Allee, professor
Research Theme: Energy, Security

The main focus of the research is electric field imaging and based upon the images obtained, capacitive projections and sparse reconstruction CT (computing tomography) techniques are used to re-build images of various objects that are imaged. Research advances have been made in creating code that is able to reconstruct projections to create a realistic picture of the objects imaged. Findings thus far reveal many potential applications, such as potential bomb detection systems as well as non-radiation producing medical imaging. Future research will further the reconstruction imaging and equipment to optimize imaging.

Gavin Steeber, Biomedical Engineering

Graduation: May 2019
Hometown: Tucson, Arizona

The Characterization of Patient Derived iPSCs for the Quantification of Alzheimer's Disease Pathology in 3D Neuronal Cultures

Mentor: David Brafman, assistant professor
Research Theme: Health

The objective of this project is to characterize patient derived induced pluripotent stem cells (iPSCs) and subsequently quantify Alzheimer's disease (AD) pathology in 3D neuronal cultures. The iPSCs were generated from peripheral blood mononuclear cells derived from demented and nondemented control patients homozygous for the Apolipoprotein E4 (APOE4) risk allele, which is known to be the greatest genetic risk factor for late-onset Alzheimer's disease. Induced pluripotent stem cell derived 3D cultures will be characterized using ELISA based assays to quantify the AD related phenotype in order to show that our disease model correctly recapitulates the indicators of the disease.

Hannah Switzer, Biomedical Engineering

Graduation: May 2017
Hometown: Lewiston, Idaho

Detection of Epinephrine Levels in the Body Using Gas Chromatography-Mass Spectrometry

Mentor: Barbara Smith, assistant professor
Research Theme: Health

Epinephrine, or adrenaline, is a hormone crucial to maintaining cardiovascular homeostasis, and is involved in the body's "fight or flight" response. This research is focused on detecting epinephrine using gas chromatography — mass spectrometry (GC-MS) and solid-phase microextraction (SPME) with on-fiber silylation. A limit of detection (LOD) for epinephrine will be established in human biological samples to determine at what levels epinephrine can be detected using this technique. To do this, volatile organic compound (VOC) signatures and ion release times will be identified, and this information utilized to reach the long-term goal of epinephrine level detection in the body.

Carly Thalman, Engineering (Robotics)

Graduation: December 2016

Hometown: Mesa, Arizona

Design of Soft Robotic Grippers for Dexterous Manipulation in the Tasks of Daily Living

Mentor: Panagiotis Polygerinos, assistant professor

Research Theme: Education, Health

This study aims to create the ideal design for a soft robotic grasper, used in combination with a supernumerary limb design for impaired individuals to help accomplish daily life tasks. Observations of current grasper solutions for similar applications has led to a design that incorporates a soft, pneumatically controlled grasper which integrates with the existing limb. Computational models of the grasper design have been created, which demonstrate the grasping capabilities of this proposal. Initial prototypes of this grasper approach have been fabricated for testing and analysis purposes to build a foundation for future implementation.

John Tobey, Biomedical Engineering

Graduation: May 2017

Hometown: Minnetonka, Minnesota

Creating Vascular Networks for 3D Tumor Models

Mentor: Vikram Kodibagkar, assistant professor

Research Theme: Health

Creating a perfused vascular system for tumor spheroids has the potential to allow for more realistic tumor models. To create a micro-scale vascular structure capable of providing oxygen and nutrients to tumors, a couple of techniques are currently being explored. Polydimethylsiloxane (PDMS) molds and 3D printing show promise in creating these structures out of water-soluble carbohydrates. Currently, these structures have been created using a mold; however, 3D-printing offers more customizable and complex structures. Present and future focuses include the creation of these structures using 3D printing and the integration of these structures into tumor spheroids.

Zachary Tronstad, Chemical Engineering

Graduation: May 2019

Hometown: Tucson, Arizona

Tailoring the Hydrophilicity of Electrospun Membranes for Water Filtration

Mentor: Matthew Green, assistant professor

Research Theme: Sustainability

This project examines the effect of membrane hydrophilicity on the wettability of electrospun polymeric nanofibers. Changing the ratio of hydrophobic poly(vinyl chloride) to hydrophilic poly(vinyl alcohol) enables a tailored degree of hydrophilicity. Varying solution concentration and tip-to-collector distance has changed fiber formation, and currently 12 weight-weight percentage PVC/THF and 8 weight-weight percentage PVA/water solutions are being spun at a tip-to-collector distance of 15 cm and a voltage of 20 kV for ideal fiber deposition. Fiber distributions have averaged less than 6 μm in diameter, but increased voltage has correlated to decreased diameter. Modeling membrane properties will be the project's upcoming focus.

Undergraduate Research Travel Grant Program

Shreya Udupa, Aerospace Engineering and Economics

Graduation: May 2017

Hometown: Phoenix, Arizona

Multi-Sensor 3D Mapping Using Mobile Robots for Use with an Oculus Rift Headset

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Security

This project aims to develop a mobile robotic platform that is capable of generating 3D maps of its surroundings to be viewed on an Oculus Rift headset. As part of these efforts, a camera and depth sensor capable of scanning the surroundings have been mounted onto a mobile robot and interfaced with a RaspberryPi processing board. The board captures and stores the images and sensor readings for post processing. An image-stitching algorithm has been designed to combine the collected images and depth readings into a usable 3D map. This technology can potentially be used for exploration and rescue operations.

Undergraduate Research Travel Grant Program

Cody Van Cleve, Engineering (Robotics)

Graduation: May 2017

Hometown: Tucson, Arizona

Design and Development of Intelligent Safety Gear for a Modernizing Transportation Environment

Mentor: Micah Lande, assistant professor

Research Theme: Health, Security

The goal of this research is to form a base of quantitative motorcyclist safety metrics and evaluate the efficacy of existing motorcycle protective equipment in reducing or preventing injury to the rider. From this information base, criteria and constraints were developed for designing intelligent, active rider safety equipment that aims to reduce risk to the rider more effectively than standard, passive safety equipment. This intelligent equipment is specialized through hardware and software design, and tailored to mitigate risk in scenarios identified as most critical to rider safety.

Sean Wolfgang Wachtel, Engineering (Robotics)

Graduation: May 2017

Hometown: Rammstein, Germany

Gait State Classification Given Ground Contact Forces and Lower-Extremity Inertial Measurements

Mentor: Wenlong Zhang, assistant professor

Research Theme: Health

Real-time recognition of an individual's gait phase is accomplished by analyzing wearable sensor data with onboard microcontrollers, a task traditionally accomplished by analyzing motion capture data with a desktop computer. A support vector machine (SVM) algorithm is trained and supplied to the microcontrollers to classify collected data. Real-time, autonomous detection of a user's gait phase is most applicable in the controlling of other devices. An autonomous treadmill, for instance, could be created using gait phase data as input. In future work, the system will be adapted to control a lower-extremity exoskeleton.

Nicholas Walker, Biomedical Engineering

Graduation: May 2017

Hometown: Payson, Arizona

The Use of Startle to Evaluate Differences in Spinal Cord Injuries

Mentor: Claire Honeycutt, assistant professor

Research Theme: Health

Spinal cord injuries (SCI) produce profoundly debilitating effects, most significantly is loss of mobility. Startle evoked movement can be used to study changes in the brainstem and reticulospinal tract behavior non-invasively after trauma to the central nervous system. This phenomena was utilized to determine the extent of reprogramming that occurs in the brainstem after a SCI. In this study, reactions from a spectrum of injuries were observed and it was determined that this protocol may be useful in physical therapy applications. This pilot study set the course for future investigations in walking recovery following SCI.

Ji Wang, Engineering

Graduation: May 2017

Hometown: Huangshan, China

Collision Avoidance for Human Robot Interaction with 3D Optical Sensors

Mentor: Wenlong Zhang, assistant professor

Research Theme: Education, Health, Security, Sustainability

Nowadays, robots are working with human users closely in order to perform cooperative tasks. Safety in human-robot interactions has become a critical issue. The goal of this project is to reduce the risk of injury during the robot-human interactions. Currently, human position tracking has been conducted using a Kinect to monitor human movement. A predicted model (ARIMA) has been implemented to continuously estimate human movement. The next goal is generating an alternative trajectory of robots, based on human movement developed by the predicted model, in order to avoid potential collisions.

Shawn White, Mechanical Engineering

Graduation: May 2017
Hometown: Prescott, Arizona

Animal Locomotion on Wet Granular Media

Mentor: Hamid Marvi, assistant professor
Research Theme: Sustainability

The objective of this project is to enhance the locomotion of robots on granular media through the examination of reptiles that move effortlessly on multiple granular medias. Currently the research team is at the final steps of the manufacturing phase for the fluidized bed set-up. The next step is to conduct wet granular media experiments with three different species of lizards. This diversity will produce data in regards to the correlation between the physical characteristics of the individual reptiles to its locomotion efficiency. Future work consists of dry granular media experiments in the fluidized bed.

Megan Wieser, Biomedical Engineering

Graduation: May 2018
Hometown: Glendale, Arizona

3D Printing Methods in the Design of Implantable Spine Fixation Devices and Mechanical Load Testing

Mentor: Jeffrey La Belle, assistant professor
Research Theme: Health

Degenerative Disc Disease (DDD) is a spinal condition in which intervertebral discs (IVDs) herniate and lose disc height, thereby inducing lower back pain (LBP). To address limitations in current replacement disc technologies, this research is geared toward designing a flexible spine fixation device for the lumbar (lower) spine, which will provide a natural range of motion and stability for affected spinal regions. 3D printing and CAD design will be utilized to design a prototype of the fixation device. 3D printing has been shown to produce complex, yet cheap and biocompatible implantable medical devices to enhance the world of surgical technology.

Avery Witting, Biomedical Engineering

Graduation: May 2017
Hometown: Scottsdale, Arizona

Self-Stirring Syringe Pump Project

Mentor: Brent Vernon, associate professor
Research Theme: Health

Efficacy testing of a self-stirring syringe is being conducted by quantitative analysis through fluorescent spectroscopy and micro-bead concentrations for given infusion volumes. It has been found that the self-stirring syringe is able to agitate fluid using magnetic fields and a specialized stirring device in a manner that particles are homogeneously suspended throughout an infusion. Creating a more efficient, cheaper, and sustainable device while maintaining efficacy are some future research ideas to be explored.

John Woodward, Mechanical Engineering

Graduation: December 2017
Hometown: Phoenix, Arizona

Durability Characterization of Interlaminar Fracture Properties of Multiscale Buckypaper Based Nanocomposites

Mentor: Masoud Yekani Fard, assistant research professor
Research Theme: Security

The interlaminar fracture toughness of buckypaper-based nanocomposites was determined for mode I, II, and I-II, including durability effects. Analysis of mode I energy release rates showed high agreement with Modified Beam Theory, Compliance Calibration and Modified Compliance Calibration methods. End-Notched Flexure and 4-point End-Notched Flexure tests resulted in stable mode II fracture initiation and propagation. Results show that critical mode I energy release rate for delamination decreases monotonically with increasing mode II loading. Early accelerated aging (0–12 months, 60 °C and 90 percent RH) has the dominant diminishing effect on energy release rate for initiation and propagation.

Jiaqi Wu, Computer Science

Graduation: May 2018

Hometown: Peoria, Arizona

Ringtones: Diverse Homoserine Lactone Systems for Cellular Communication

Mentor: Karmella Haynes, assistant professor

Research Theme: Health

Quorum sensing (QS) is a system that many bacteria use to control genes in neighboring bacteria. Bioengineers have used QS networks to build genetic circuits, where AHL-signaling molecules connect logical operations. Complex genetic circuits are vulnerable to "crosstalk," where one network responds to AHLs produced by another, making it challenging to engineer parallel pathways. This project uses a system that decouples "Senders" from "Receivers" to test synthetic combinations for crosstalk. More than five Sender systems from different bacterial strains have been genetically isolated and tested. Results with the novel Senders show a diverse range of crosstalk, providing new insights into engineered QS systems.

Undergraduate Research Travel Grant Program

Jimmy Xu, Chemical Engineering and Molecular Bioscience/Biotechnology

Graduation: May 2018

Hometown: Gilbert, Arizona

Ringtones: Diverse Homoserine Lactone Systems for Cellular Communication

Mentor: Karmella Haynes, assistant professor

Research Theme: Health

N-acyl homoserine lactone (AHL) quorum sensing is a form of bacterial communication with many uncharacterized variants. This project aims to construct synthetic systems by splitting them into a Sender and a Receiver. The parts were designed, cloned and inserted into a standard vector. The successful design of these parts was tested through an optical density test, measuring cellular growth and RFP production. Of the 10 studied AHL systems, eight showed positive RFP growth curves. This proof-of-concept demonstrates that the Senders are likely producing their respective AHLs. Future work includes induction tests for orthogonality between systems using the LuxR variant, F2620.

Undergraduate Research Travel Grant Program

Jason Yang, Biomedical Engineering

Graduation: May 2017

Hometown: Litchfield Park, Arizona

Developing Conformal Process for Contouring Biomedical Material Implant Shape for Personalized Precision Regenerative Medicine: Phase 2

Mentor: Vincent Pizziconi, associate professor

Research Theme: Health

The goal of this FURI project is to establish an early proof of concept that 3D patient specific, conformal implants can be net shaped from 2D porous polyethylene biomaterials (Medpor®) currently used in reconstructive surgery at the Mayo Clinic using 3D visualization tools and additive manufacturing processes. This novel conformation process was demonstrated on two ENT patient surgical applications i.e. ear and vocal fold reconstruction. The preliminary results indicate that a multi-step thermomechanical conformation process can significantly simplify and increase the accuracy of patient-specific reparative surgery. Future work involves reducing the current multi-step process into a more streamlined process.

Undergraduate Research Travel Grant Program

Aliya Yano, Materials Science and Engineering

Graduation: May 2018

Hometown: Ontario, Oregon

CVD Synthesis of Atomically Thin ReS2 Layers

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy, Health

The objective is to grow consistent and uniform atomically thin layers of rhenium daisulphide (ReS2) using chemical vapor deposition. ReS2 has interesting optical, and electrical properties as well a high flexibility. It has potential for use in medical imaging as well as for flexible electronics and photovoltaics. ReS2 can grow in different structures on the substrates such as in triangles, hexagons or full coverage based on the parameters used. Consistent growth has been achieved and the next goal is to be able to control the orientation of the crystal growth and therefore the properties that rely on crystal direction.

Grand Challenge Scholars

The Fulton Schools Grand Challenge Scholars Program (GCSP) combines innovative curriculum and cutting-edge research experiences into an intellectual fusion that spans academic disciplines and includes entrepreneurial, global and service learning opportunities. The program's goal is to prepare tomorrow's engineering leaders to solve the grand challenges facing society during the next century. Through completion of the five components of the program, students will have the opportunity to engage in research relating to their selected grand challenge, explore interdisciplinary coursework, gain an international perspective, engage in entrepreneurship and give back to the community through service learning. Fulton Schools students who complete the program will achieve the distinction of Grand Challenge Scholar, endorsed by ASU and the National Academy of Engineering (NAE), and will be uniquely prepared to collaborate and succeed in a transdisciplinary and global environment.

Grand Challenge Scholars Program students who receive the GCSP Research Stipend are invited to share their research with the community by participating in the FURI Symposium.

Connor Beck, Biomedical Engineering

Graduation: December 2019

Hometown: Burley, Idaho

Characterization of Glucagon via Electrochemical Impedance Spectroscopy in Purified Solution

Mentor: David Allee, professor

Research Theme: Energy

This research was to determine if Electrochemical Impedance Spectroscopy (EIS) is capable of measuring the concentration of glucagon in purified solutions. It was seen that as the glucagon concentration increased, the imaginary impedance decreased. It was determined that EIS is capable of measuring glucagon concentration. The ultimate goal is to create a device that is capable of measuring different aspects of diabetes continuously, since there is currently no device on the market. Future work will involve determining if glucagon can be measured accurately in blood samples and if insulin and glucagon can be measured simultaneously.

Undergraduate Research Travel Grant Program

Cody Iwertz, Computer Systems Engineering

Graduation: May 2019

Hometown: Sierra Vista, Arizona

Machine Learning Approach to Data Mine the Dark Web

Mentor: David Allee, professor

Research Theme: Security

This research aims to develop a machine learning approach that will automate the process of developing parsers and crawlers to data mine Dark Web sites. Multiple websites use similar software that distinguishes between Dark Web sites. Past websites with already developed parsers and crawlers are utilized on new websites with similar structures. Further research will need to be done on comparing website structures in order to further develop a strong test set.

Kaleigh Johnson, Chemical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Sustainable Production of p-Coumaric Acid from a Co-culture of E. coli and Yeast

Mentor: David Nielsen, assistant professor

Research Theme: Sustainability

p-Coumaric acid is used in the food, pharmaceutical and cosmetic industries due to its versatile properties. While prevalent in nature, harvesting the compound from natural sources is an inefficient process that is both difficult and costly. This research aims to produce p-Coumarate using a co-culture of Yeast and E. coli directly from glucose. Methods used in this study include: designing optimal media for bacterial growth, genetically-modifying strains to produce the compound with maximum yield and analyzing the presence of p-Coumarate using High Performance Liquid Chromatography. The project goal is to create a feasible method for producing p-Coumarate sustainably.

Akshara Malla, Biomedical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Development of an Electrochemical Pancreatic Cancer Biosensor

Mentor: David Allee, professor

Research Theme: Health

Pancreatic cancer is lethal due to the difficulty in detecting and treating the cancer in its early stages. The researchers aim to create a multiplexed electrochemical biosensor for use in early cancer detection by analyzing patient samples of peripheral blood and pancreatic cyst fluid. This portable device utilizes electrochemical impedance spectroscopy to detect the complex formed between the pancreatic cancer specific antigens and antibodies in patient samples. Using this technique, the optimal binding frequencies of the antigens and antibodies are detected on gold disk electrodes for device application. Further modification of binding conditions and biomarkers will improve frequency determination.

Keerthana Murali, Biomedical Engineering

Graduation: May 2017

Hometown: Katy, Texas

Development of an Electrochemical Sensor to Detect Tumor Markers

Mentor: David Allee, professor

Research Theme: Health

The main objective of this research project is to be able to develop an electrochemical sensor that would be able to detect pancreatic tumor markers. So far the frequency at which the tumor markers can be detected are being characterized. This helps determine the optimal binding frequency at which the tumor markers will be detected. From the values obtained until now, this frequency has been in the same range as the gold standard method (ELISA). Further experiments need to be conducted to ensure that the dynamic frequency range is correct and comparable to the one of ELISA.

Alyssa Nazareno, Mechanical Engineering

Graduation: May 2018

Hometown: Scottsdale, Arizona

Long-Lasting, Highly Efficient Solar Modules using Alternate Interconnection Techniques

Mentor: Stuart Bowden, associate research professor

Research Theme: Energy

Using front- and rear-junction silicon heterojunction (SHJ) solar cells, a solar module can be built with a back-to-back interconnection structure with an efficiency to compete with that of commercial solar panels. The SHJ cells are being fabricated and tested for desired efficiency levels. A solar module will then be built using the back-to-back interconnection technique and tested for efficiency of about 20 percent or higher. This module will be physically less prone to failure than most commercial modules whose cells are connected through tabbing. If successful, these modules can improve the availability of high efficiency solar panels to American homes.

Get Involved!

FURI applications for

Summer 2017 ▪ Fall 2017 ▪ Spring 2018

Due March 1, 2017

Watch Inner Circle for proposal workshops and deadlines

innercircle.engineering.asu.edu

The Entrepreneurial Mindset

In a dynamic and interconnected world, it is critical for the Fulton Schools to teach a technical skillset along with an entrepreneurial mindset that fosters curiosity, connections and the creation of value (the 3-Cs). To advance this goal, ASU recently became a partner in the Kern Entrepreneurial Engineering Network (KEEN), a collaboration of hundreds of engineering faculty nationwide educating engineers with an entrepreneurial mindset. By applying an entrepreneurial mindset to their work, students anticipate societal and economic trends and provide valuable solutions that drive new business opportunities, create jobs and benefit society.

ASU has long been a leader in entrepreneurially minded learning, with a range of programs, resources and classes to empower students. Programs such as FURI teach students how to apply entrepreneurial thinking to a given career or field, leading to innovative solutions that create extraordinary value. KEEN proudly supports FURI and the program's efforts to instill curiosity, connections and the creation of value into research projects.

Learn more about KEEN and the 3-Cs at engineeringunleashed.com.

Where are they now?

Teagan Adamson (Biomedical Engineering '12, FURI Fall '10–Spring '12) is a clinical studies engineer at BIOTRONIK, Inc.

Cody Anderson (Civil, Environmental and Sustainable Engineering '11, FURI Fall '10–Spring '11) is an engineering instructor at Scottsdale Community College.

Maria Regina Arreloa (Chemical Engineering '11, FURI Fall '09–Spring '10) recently completed an MBA from l'Ecole Nationale des Ponts et Chaussees in Paris and is currently working in London for a management consulting firm focusing on marketing and sales, particularly for pharma companies.

Rachel Austin (Biomedical Engineering '12, FURI Fall '11–Spring '12) is a senior Manufacturing engineer in the IC Test Systems group at Medtronic, where they manufacture the circuit boards for all of Medtronic's implantable medical devices.

Jaclyn Avallone (Material Sciences and Engineering '12, FURI Spring '12) is pursuing her doctorate in materials at the University of California, Santa Barbara.

Joel Ayala (Biomedical Engineering '13, FURI Fall '11–Spring '12) is currently pursuing a master's in engineering at Duke University in Biomedical Engineering.

Celia Barker (Biomedical Engineering '13, FURI Fall '10–Fall '11) is pursuing a master's in management at the W. P. Carey School of Business at Arizona State University.

Hanin Bearat (Biomedical Engineering '07, FURI Spring '06–Spring '07) completed her doctorate in biomedical engineering at ASU and postdoctoral research at Duke University, and is currently a senior quality engineer at Medtronic.

Lina Bearat (Civil Engineering '12, FURI Fall '10–Spring '11) is working as a traffic engineering consultant at Kimley-Horn and Associates. Lina specialized in the planning and design of intelligent transportation systems for different states and municipalities.

Zack Berkson (Chemical Engineering '13, FURI Summer '11–Fall '12) is a first-year doctoral student in chemical engineering at the University of California, Santa Barbara and beginning to get involved in research in molecular interactions in organic solar cells.

Daniel Bishop (Bioengineering '09, FURI Fall '06–Fall '08) is a co-founder of a Pittsburgh-based health IT startup with two fellow ASU alumni. The startup serves a national customer base of hospitals and health systems with quality improvement software that helps healthcare professionals improve their efforts to prevent adverse patient safety events such as falls, infections and pressure ulcers.

Amy Blatt (Biomedical Engineering '14, FURI Spring '13–Spring '14) is currently pursuing a doctorate in biomedical engineering at the University of Michigan Ann Arbor. Her project is titled "Matrix mechanics drive runt-related transcription factor 2 (Runx2)-mediated breast cancer aggression and metastasis."

William Bowman (Materials Science and Engineering '12, FURI Spring '11–Spring '12) is currently starting his postdoc at the Massachusetts Institute of Technology.

Robert Bui (Electrical Engineering '14, FURI Fall '12–Spring '13) completed a master's in engineering at the University of California, Berkeley in spring 2015 and is currently a software engineer at NXP Semiconductors.

Colton Bukowsky (Material Science and Engineering '11, FURI Fall '08–Fall '09) is a materials science graduate researcher at the California Institute of Technology studying nanoimprint lithography for advanced light trapping structures in thin-film photovoltaics.

Katherine Driggs Campbell (Electrical Engineering '12, FURI Summer '10–Spring '12) is currently an electrical engineering doctoral student at the University of California, Berkeley.

Dillon Card (Mechanical Engineering BSE '14 & MS '15, FURI Spring '12–Fall '13, Spring '14) is a Falcon 9/Falcon Heavy Build Reliability Engineer at SpaceX in Hawthorne, CA. Occupy Mars!

Brittney (Haselwood) Cardinell (Biomedical Engineering '12, FURI '10–Spring '12) is currently a research associate and doctoral candidate at Arizona State University and is continuing her FURI research working toward a handheld biosensor to diagnose and quantify traumatic brain injury.

Joe Carpenter (Chemical Engineering '14, FURI Summer '12–Spring '14) is a doctoral candidate in materials science and Engineering at ASU.

Amelia Celoza (Civil Engineering '13, FURI Summer '09, Fall '11–Spring '13) is a master's student in the Sustainable Design and Construction program at Stanford University.

Kevin Chen (Electrical Engineering '12, FURI Fall '10–Spring '12) is a doctoral student in electrical engineering at the University of California, Berkeley.

Javier Corral Clayton (M.S. Chemical Engineering '16, B.S.E. Chemical Engineering '15, FURI Spring '13–Spring '14) is currently working as a process improvement engineer at Bimbo Bakeries USA in Orange County, California.

Joshua Conter (Mechanical Engineering '15, FURI Fall '14–Spring '15) is currently an associate architecture engineer working in Global Transmissions and Electrification Advanced Engineering at General Motors.

Taylor Dolberg (Chemical Engineering '14, FURI Spring '12–Fall '13) is pursuing a doctorate in chemical and biological engineering at the Northwestern University. Her research is in synthetic biology working on cell-based therapeutics, specifically red blood cell based biosensors.

Nate Dunkin (Civil, Environmental and Sustainable Engineering '11, FURI Spring '09–Spring '11) is a doctoral candidate at the Johns Hopkins University's Bloomberg School of Public Health.

Laila El-Ashmawy (Civil, Environmental and Sustainable Engineering '11, FURI Spring '10–Spring '11) is finishing a dual degree program in energy economics from the Colorado School of Mines and IFP-School in Paris after spending four years working as an engineer on drilling rigs in the Gulf of Mexico and Qatar.

Adam Fairfield (Computer Science '13, FURI Spring '12–Fall '12) is now a software development engineer in test for DirectX at Microsoft.

Darcy Frear (Biomedical Engineering '13, FURI Spring '11–Spring '13) is currently pursuing a doctorate at Harvard University in the Speech and Hearing Bioscience and Technology program. Her projects are hearing devices to help those with conductive hearing loss and modeling the middle and inner ear with an impedance model.

Robert Fruchtman (Computer Science '12, FURI Fall '09–Spring '12) is a full stack software engineer at YourMechanic, a Y Combinator startup in Mountain View, California, that lets people get their car fixed at home or at work by mechanics.

Michael Garcia (B.S. Aerospace Engineering '09, M.S. Mechanical Engineering '10, FURI Fall '08–Fall '09) is a lead mechanical design Engineer at SpaceX.

Cameron Gardner (Biomedical Engineering '15, Finance '15, FURI Fall '13–Spring '15) is currently a doctoral student studying clinical medicine jointly between the National Institutes of Health and the University of Oxford.

Mark Garrison (Electrical Engineering '11, FURI Fall '09–Spring '10) is the chief technical officer and co-founder of Saleae LLC, a Bay Area startup building logic analyzers, tools for debugging and reverse engineering embedded electronics.

Nathan Gaw (Biomedical Engineering '13, FURI Fall '10–Spring '13) is currently pursuing a doctorate in industrial engineering at Arizona State University where he is developing new algorithms to analyze medical images.

Alison Gibson (Aerospace Engineering '15, FURI Spring '13–Fall '14) is currently a graduate student in the Aeronautics and Astronautics program at the Massachusetts Institute of Technology, where she works in the Man Vehicle Lab on wearable devices for astronauts.

Rachel Ginn (Biomedical Engineering '12, FURI Fall '11) is currently working toward a master of science in biomedical informatics at Arizona State University and Mayo Clinic Hospital.

Liliana Rincon Gonzalez (Biomedical Engineering '07, FURI Spring '06–Spring '07) is currently a research scientist at Florida International University. She is involved in a project to provide sensory feedback to upper limb amputees with a wireless peripheral nerve stimulation system. She completed a doctorate at ASU in biomedical engineering before moving to the Netherlands where she was a Postdoctoral Fellow at Radboud University.

Omar Habib (Electrical Engineering '10, FURI Spring '10) is a senior process design engineer at Qualcomm Inc. and pursuing a doctorate in electrical engineering at Arizona State University

Tina Hakimi (Biomedical Engineering '12, FURI Spring '10–Spring '12) is completing a Whitaker International Fellowship with the Brien Holden Vision Institute in Sydney, Australia, working to redefine the design of soft contact lenses using new information about the ocular surface shape.

Ibrahim Halloum (Chemical Engineering '15, FURI Spring '12–Fall '13) completed his master's in chemical engineering (4+1) at ASU and is currently an engineer at Genentech Inc.

Neekta Hamidi (Biomedical Engineering '13, FURI Summer '10–Spring '11) is currently at the Executive Office of the President in Washington, D.C.

Joseph Hanson (B.S. Mechanical Engineering, FURI Summer '13–Spring '15) is currently a thermal/mechanical systems engineer in the internet of things group at Intel and is pursuing a master's in mechanical engineering at ASU.

Shannon Hertfelder (Aerospace Engineering 2015, FURI Fall '11–Spring '12) is currently working as a design engineer at Daimler Trucks North America while pursuing a master's in mechanical engineering at Portland State University.

Carly Hom (Biomedical Engineering '13, FURI Spring '12–Spring '13) is currently employed as a senior post-market quality engineer for Stryker Sustainability Solutions in Tempe, Arizona and will be starting a dual degree MBA/master's in the Industrial Engineering program at ASU.

Albert Hsia (Biomedical Engineering '11, FURI Fall '09–Spring '11) completed his D.O. degree at Midwestern University Arizona College of Osteopathic Medicine in 2016. He is currently a first-year family medicine resident at Mountain Vista Medical Center in Mesa, Arizona.

Sebastian Husein (Materials Science and Engineering '13, FURI Fall '11–Fall '12) is currently a doctoral student at ASU studying wide bandgap semiconductors for solar cell applications, and working at the NSF-sponsored Quantum Energy & Sustainable Solar Technologies Engineering Research Center. He worked at the Ernst Ruska Centre for Microscopy in Juelich, Germany in summer 2015.

Zahra Hussaini (Physics/Mathematics '13, FURI Spring '12–Summer '12) is currently a research assistant at the National Institute of Standards and Technology.

Katherine (Cai) Irimata (Chemical Engineering and Statistics '13, FURI Spring '10–Fall '12) is a doctoral student in the Statistics program at Arizona State University.

Lisa Irimata (Biomedical Engineering '15, FURI '12–Spring '14) is pursuing a master's in mechanical engineering at the University of Notre Dame.

Joshua James (Chemical Engineering & Finance '12, FURI Summer '10–Fall '10) Process Engineer at Intel Corporation from June '12–August '13. Joshua is currently a second-year doctoral chemical engineering student at ASU focusing on light paraffin/olefin and hydrogen/carbon dioxide separations using inorganic membranes.

Amit Jha (Biomedical Engineering '13, FURI Fall '12–Spring '13) is currently an engineering consultant for Tata Consultancy Services.

Galen Toby Johnson (Masters Chemical Engineering '12, FURI Spring '09–Fall '11) is currently an agile product owner for GE's new industrial monitoring solution, Asset Performance Management (APM) in Atlanta, Georgia.

Paul Juneau (Biomedical Engineering '14, FURI Spring '13–Summer '13) is currently pursuing a doctorate.

Eric Kincaid (Materials Science and Engineering '13, FURI '11–'12) is pursuing an Erasmus Mundus Master's degree in the SERP-Chem program (www.serp-chem.eu) with a specialization in chemistry and materials science with each semester spent at a different university in Europe.

Julia King (B.S. Chemical Engineering '16, FURI Fall '14–Spring '15) is currently pursuing a doctorate in chemical engineering at the University of Washington, Seattle.

John Kondziolka (Civil, Environmental and Sustainable Engineering '12, FURI Fall '10–Spring '12) is an environmental engineer at Gradient in Cambridge, Massachusetts.

Dwight Lane (Biomedical Engineering '12, FURI Summer '11–Spring '12) is currently a second-year doctoral student in bioengineering at the University of Utah.

Kevin LaRosa (Electrical Engineering '12, FURI Spring '10–Spring '12) is an applications engineer working at Texas Instruments.

Xuan Liang (Chemical Engineering '13, FURI Spring '12) is starting a master's in chemical engineering at the University of Maryland this semester.

Brian Lines (Chemical Engineering '10, FURI Fall '08–Spring '09) is an assistant professor in the Civil, Environmental, and Architectural Engineering Department at the University of Kansas.

Michael Machas (Chemical Engineering '13, FURI Fall '11–Spring '13) received his master's degree in chemical engineering in the spring of 2014 and began pursuing his doctorate in chemical engineering at Arizona State University in fall 2014.

Alicia Magann (Chemical Engineering '16, FURI Spring '15 and Spring '16) is a chemical engineering doctoral student at Princeton University, pursuing theoretical research on quantum control.

Beth Magerman (Mechanical Engineering '13, FURI Fall '11–Spring '13) is pursuing a master's in mechanical engineering at Arizona State University as a research assistant studying remote measurement and modeling of wind development for wind turbine control.

Ryan Manis (Mechanical Engineering '10, FURI Spring '08–Spring '10) is currently working as a dry etch process development engineer at Intel in Oregon.

Joy Marsalla (Civil, Environmental and Sustainable Engineering '12, FURI Fall '08) is an environmental engineer and LEED green associate at Intel Corporation in Oregon where she supports technology development through air modeling and projections to ensure current and future compliance at wafer fabrication facilities.

Michael Mast (Aerospace Engineering '12, FURI Spring '11–Fall '11) is currently a systems engineer at Honeywell Aerospace. He is the lead focal for autothrottle and flight director for the Gulfstream program and is pursuing a master of science in aerospace engineering.

Alena Matusevich (M.S. Material Science and Engineering '14, FURI Spring '12) is a board quality and reliability engineer at Intel in Chandler, Arizona, working with contract manufactures and original design manufacturers to insure manufacturing quality and long-term reliability of pre-certified/certified boards and systems.

Kevin McMillin (Computer Science '11, FURI Fall '09) is working as a user experience designer at NASA Ames Research Center in Moffett Field, California.

Isha Mehta (Civil, Environmental and Sustainable Engineering '12, FURI Fall '11–Spring '12) is currently working as a structural designer at Caruso Turley Scott Inc., creating engineering art structures, high rises and more.

Megan Mincieli (Mechanical Engineering BSE'14 & MS '15, FURI Fall '12–Spring '14) is a composites build reliability engineer at SpaceX in Hawthorne, CA.

Kirk Morales (Computer Science '08, FURI Fall '07–Spring '08) is a Phoenix-area entrepreneur, currently co-founder and CTO of Hopscratch, helping entrepreneurs start and protect their business. Kirk also mentors and advises local technology startups.

Divya Geetha Nair (Materials Science and Engineering '12, FURI Fall '10–Spring '12) is working as a process engineer in Intel Micron Flash Technologies in Utah.

Alisha Nanda (Chemical Engineering and Biochemistry '13, FURI Summer '10–Spring '12) is currently pursuing a M.D. at the University of Arizona College of Medicine - Phoenix.

Meelad Nikpourian (Mechanical Engineering '12, FURI Fall '11–Spring '12) is a product manager at Danaher Corporation and is currently pursuing an MBA at W. P. Carey School of Business.

Elizabeth (Walker) Nofen (Chemical Engineering '12, FURI Summer '10–Spring '11), graduated with her doctorate in chemical engineering from ASU in May 2016 and is currently a senior materials engineer at Intel Corporation in Chandler, Arizona.

Gabe Oland (Biomedical Engineering '13, FURI Summer '11–Spring '13) is pursuing a M.D. at the Medical College of Wisconsin in Milwaukee, Wisconsin.

Brian Perea (Chemical Engineering '12, FURI Spring '09–Spring '11) is a doctoral candidate in chemical engineering at the University of California, Berkeley. He is currently developing a rapid, low-cost test to predict the risk that molecules pose to developing human embryos during pregnancy.

Guy Pickett (Mechanical Engineering '12, FURI Summer '11–Fall '11) is currently working as a process engineer at Alta Devices in Sunnyvale, California, a thin-film, high-efficiency solar cell manufacturing company.

Tiffany Pifher (Biomedical Engineering '15, FURI Spring '13) is currently working as a process engineer on the advanced manufacturing team at Stryker Sustainability Solutions where they reprocess single-use medical devices.

Emily (Sutton) Preston (Materials Science and Engineering '13, FURI Summer '11–Spring '12) is a yield engineer at Cascade Microtech in Oregon, where she works on improving assembly and testing processes for advanced wafer probes used in electrical measurement and testing of semiconductor integrated circuits and chips.

Spencer Prost (Computer Science '13, FURI Fall '11–Spring '13) is currently a staff scientist at Pacific Northwest National Laboratory developing custom instrument and lab automation software for novel ion mobility spectrometers with the intended goal of accelerating research which aligns with the Office of Science Biological and Environmental Research program of the U.S. Department of Energy.

Qasim Rahman (Biomedical Engineering '14, FURI Summer '12–Spring '13) is currently pursuing a M.D. at the University of Arizona College of Medicine - Phoenix.

Tim Reblitz (Electrical Engineering '12, FURI Summer '11–Spring '12) is an Application Engineer at Applied Materials in Santa Clara, California. Within the Applied Global Services division, Tim is part of the team that engineers manufacturing-automation software used by semiconductor device fabs and other microelectronics manufacturers.

Mariela Robledo (Chemical Engineering '13, FURI Summer '11–Spring '13) is a manufacturing team leader II for the Nature Valley Bars department at General Mills-Albuquerque. She is responsible for providing business leadership and technical development to a team of high-performance technicians. She is the vice president of the NM SHPE Professional Chapter, and chair of the SHPE National Conference Meals and Podium Events committee.

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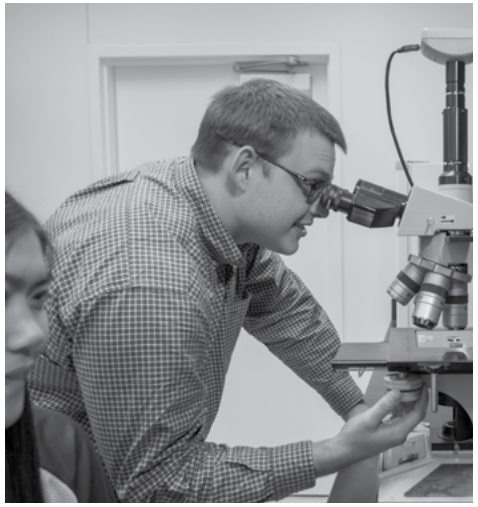

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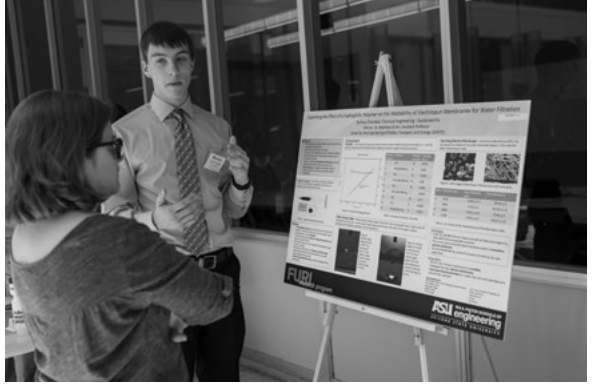
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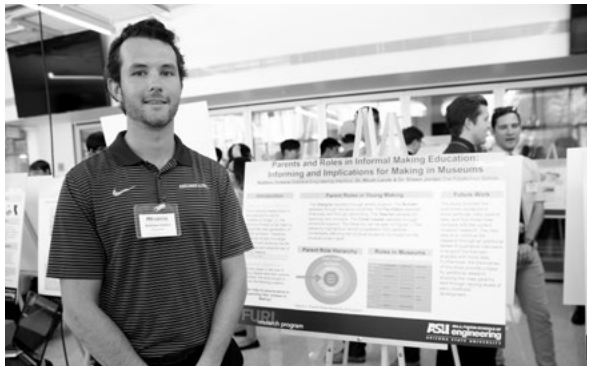
Parents and Roles in Informal Making Education:
Informing and Implications for Making in Museums


Gamal Elzohamy, Electrical Engineering
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School of Electrical Computing and Energy Engineering
Anode
Cathode
Electrolyte
Further Work

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Fueling Innovation
Building Engineers

At Arizona State University, we've been educating engineers for Arizona and the world for nearly 60 years. With more than 19,000 students, we are building the engineers of the future and pursuing the discoveries and solutions to challenges facing society.

In 2003, Ira A. Fulton, founder and CEO of Arizona-based Fulton Homes, established an endowment of $50 million in support of ASU's College of Engineering and Applied Sciences.

His investment served as a catalyst, enabling the development of a dynamic portfolio of strategic initiatives that benefit our students and faculty and the communities where they live and work.

Throughout the years, Ira A. Fulton has remained an active supporter of the school that bears his name. He is a familiar face to students and a regular presence at events such as this semiannual FURI Symposium.

"I strongly believe you cannot have a great city without a great school of engineering."
Ira A. Fulton