FURI

Fulton Undergraduate Research Initiative

Fall Symposium 2015

IRA A. FULTON SCHOOLS OF engineering

ARIZONA STATE UNIVERSITY

snapshot fall 2015

mentors 56

FURI students 104

35 women

69 men

1 freshman

25 juniors

78 seniors

majors

- Aerospace Engineering 10
- Biomedical Engineering 19
- Chemical Engineering 29
- Civil and Environmental Engineering 4
- Computer Science 6
- Electrical Engineering 9
- Engineering (Mechanical Engineering Systems) 2
- Engineering (Robotics) 2
- Engineering (Electrical Systems) 1
- Engineering Management 1
- Industrial and Organizational Psychology 2
- Industrial Engineering 1
- Materials Science and Engineering 1
- Mechanical Engineering 17

The Fulton Difference:
Discover. Create. Innovate.

November 20, 2015

It is our pleasure to welcome you to the Fall 2015 FURI Symposium.

The Fulton Undergraduate Research Initiative is designed to enhance the experiential learning opportunities of students by providing hands-on lab experience, independent and thesis-based research and the opportunity to travel to professional conferences early in their academic careers.

Some of the brightest students across the country bring their passion for research to the Fulton Schools. Through programs like FURI, their sense of discovery — an attitude that is fundamental to the research enterprise — is nurtured by faculty mentors. And our undergraduate researchers gain hands-on lab experience that requires a mix of strong academic preparation, creative approaches to problem-solving and the ability to work independently.

The exciting research projects you will see today work to further solutions to real-world challenges in health, energy, education, security and sustainability. We are proud of our impressive undergraduate students participating in and conducting graduate-level research.

We are grateful to everyone who helps make this program possible and extend congratulations to all the students presenting today. We look forward to your continued success.

Sincerely,

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

Amy Sever
Associate Director
Undergraduate Student Engagement

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.

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.

Nima Afzalian Naini
Sarah Alamdari-Perez
Lekha Anantuni
Barrett Anderies
Tyler Angell
Angel Armenta
Michael Armstrong
Galen Arnold
Zeynep Ayla
Christopher Balzer
Shona Becwar
Lyle Bliss*
Zachary Blomberg
Olivia Brancati
Alexander Bridge
Alexandra Brunelle
Kyle Burgard
Raissa Cardeal
Edgar Castillo
David Cayll
Brian Chang
Michael Christy
Avi Dasgupta
Jasmine Delgado
Andrew Dopilka
Brandon Dorr
Daniel D'Souza
Jonathan Edgington
Steven Elliott
Kiah Engebretson
Anthony Facchini
Linda Fou
Brett Gadberry
Benjamin Gilloon
Haley Gjertsen
Christopher Gregson
Saumya Gupta
Evan Hammac
Ji Sue Han*
Sofia Herrera**
Sean Holloway
Denton Holzer
Ian Horvath
Kody Ioia
Samantha Janko
Chenming Jiang
Adam Johnson
Kaleigh Johnson
Serena Kaplan
Nathan Kirkpatrick**
Katelyn Kline
Shota Kuwabara
James Kyeh
Alexandria Lam**
Jayse Langdon
Shane Larson
Madeline Lent
Rubin Linder
Alison Llave
Marisol Luna Aguero
Ryan Madler
Ryan Magnuson
Alexander Maltagliati
Allison Marley
John McCrea
Sanya Mehta
Jason Mende
Becca Mercer
Anna Moe
Aaron Molina
Matthew Mortensen
Rohan Murty
Karthik Nambiar
Fatima Naveed**
Thanh Nguyen
Spencer Offenberger
James Oplinger**
Joshua Oremland
Meilin Ossanna
Kai Ozawa
Tyrine Jamella Pangan*
Andrew Park
Bhavik Patel*
Amodini Pathak
Nitish Peela**
Andrew Perez
Joseph Pezzi
Chad Plymale
David Probst**
Maria Jose Quezada Valladares*
Elizabeth Quigley
Divya Raghani**
Abhishek Rajadas
Samarth (Sam) Rawal
Carlos Renteria
John James Robertson
Felicia Romero
Susan Sajadi
Christina Salas
Kari Sanford
Michael Saxon
Gizelle Setovich
Riha Shah**
Ema Shqalsi
Joana Sipe**
Bryan Smith
Cassandra Steeno
Ryan Sullivan
Vaasavi Sundar
Swetha Swaminathan*
Amanda Thart
John Tindell
Tanguy Toulouse
Frank Tsang
Adam Tse
Kevin Tyler
David Tze
Courtney Van Bussum*
Delaney Van Winkle
Sydney Vanda
Aimen Vanood
Edward Vinciguerra
Edward Votroubek
Nolan Walker**
Xinyu Wang
Alexander Wenderlich
Jason Wickham**
Shaun Wootten*

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

FURI faculty mentors

James Abbas, associate professor
Panagiotis Artemiadis, assistant professor
Chitta Baral, professor
Spring Berman, assistant professor
Stuart Bowden, associate professor
Christopher Buneo, associate professor
Michael Caplan, associate professor
Junseok Chae, associate professor
Aditi Chattopadhyay, professor
Scotty Craig, assistant professor
Peter Crozier, associate professor
Lenore Dai, professor
Heather Emady, assistant professor
Peter Fox, senior sustainability scientist
Tirupalavanam Ganesh,
assistant dean of engineering education,
associate research professor
Michael Goryll, associate professor
David Grau, assistant professor
Matthew Green, assistant professor
Bradley Greger, associate professor
Karmella Haynes, assistant professor
Owen Hildreth, assistant professor
Zachary Holman, assistant professor
Claire Honeycutt, assistant professor
Sharon Hsiao, assistant professor
Huei-ping Huang, associate professor
Hanqing Jiang, associate professor
Nathan Johnson, assistant professor
Subbarao Kambhampati, professor
Vikram Kodibagkar, assistant professor
Jeffrey La Belle, assistant professor
Amy Landis, associate professor
Jian Li, assistant professor
Mary Laura Lind, assistant professor
Yongming Liu, associate professor
Troy McDaniel, assistant research professor
Benjamin Mertz, lecturer
Bin Mu, assistant professor
Jitendran Muthuswamy, associate professor
David Nielsen, assistant professor
Mehdi Nikkhah, assistant professor
Pedro Peralta, professor
Kaushal Rege, associate professor
Bruce Rittmann, professor
Rod Roscoe, assistant professor
Konrad Rykaczewski, assistant professor
Rosalind Sadleir, assistant professor
Paulo Shakarian, assistant professor
Michael Sierks, professor
Angela Sodemann, assistant professor
Kiran Solanki, assistant professor
Sarah Stabenfeldt, assistant professor
Timothy Takahashi, professor of practice
Trevor Thornton, professor
Sefaattin Tongay, assistant professor
Cesar Torres, assistant professor
Shane Underwood, assistant professor
Michael VanAuker, associate professor
Xiao Wang, assistant professor
Hongbin Yu, assistant professor

Nima Afzalian Naini, Biomedical Engineering

Graduation: May 2017

Hometown: Scottsdale, Arizona

Detection and Quantification of Neonatal

Mentor: Rosalind Sadleir, assistant professor

Research Theme: Health

Neonatal intraventricular hemorrhage (IVH) is a common disease of premature birth. Bleeding in the newborn's brain could be evidence of underlying brain damage. This research project is focused on designing a device to detect and quantify IVH in the very first days of an infant's life. Now, a system that uses Electrical Impedance and EEG monitoring simultaneously has been developed. Tests have been done using a piglet model to check if small amounts of blood are visible. The results of these tests will be analyzed to improve functionality of this system and then the system will be used on human infants.

Sarah Alamdari-Perez, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Alloying Two Dimensional Materials

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy

The goal of this work is to alloy 2D materials in an attempt to engineer their native band gap values. This will expand their use in applications that rely on broad range optical band gap values. To do this vapor chalcogen atoms are carried in the presence of MoO in a chemical vapor deposition chamber (CVD) allowing alteration of growth parameters. Using this process a bandgap of selenium alloys ranging from 1.54 eV to 1.85 eV has been achieved. Moving forward this process will be used to tune the bandgap of Tellurium alloys.

Lekha Anantuni, Biomedical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

Analyzing Gait Patterns Using Sensors on the Abdomen to Slow the Onset of Freezing of Gait Episodes

Mentor: Troy McDaniel, assistant professor

Research Theme: Health

Parkinson's disease is a neurodegenerative disorder in the central nervous system that affects a host of daily activities and may result in an abnormal gait pattern known as freezing of gait (FoG). These abnormalities can be detected using sensors in a shirt and feedback mechanisms can be implemented to warn the patient of an upcoming episode. Shimmer accelerometers will be incorporated at various locations in the shirt design in order to monitor variables of stoop, trunk angular rotation as well as triaxial acceleration. This wearable device will allow users to prevent freezing of gait episodes from affecting their daily living.

Barrett Anderies, Biomedical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Waveform train decomposition and quantitative analysis of ECoG data for rapid screening and identification of electrographic features in epileptic patients

Mentor: Bradley Greger, associate professor

Research Theme: Health

Epilepsy is a debilitating condition that affects children, adolescents and adults. Clinical treatment is informed by the type of epilepsy, which is determined by clinical analysis of electrocorticography (ECoG) data acquired from patients. The researchers aim to create an automatic epilepsy characterization tool to aid physicians during diagnosis. The researchers apply a novel, data-driven feature extraction algorithm to decompose ECoG channels into recurring waveforms for further analysis. Initial results show that the algorithm sorts recurring waveforms effectively, but is sensitive to parameter choice and noisy channels. Further modification of the error minimization method is expected to significantly improve waveform accuracy.

Tyler Angell, Electrical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Synthesizing Ultralight Carbon Aerogels for Pressure Sensors

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

The objective is to synthesize ultralight carbon aerogels for pressure sensing applications. The samples have been prepared and are ready for freeze-drying. The freeze drying process has been attempted, however complications have prevented the samples assembling properly. It is believed that the problem is that the freeze-dryer chamber is not maintaining a low enough temperature to allow for sublimation to occur. The proposed and intended solution is to cool and thermally insulate the chamber. The next steps, in one to two weeks, are then to test the ultralight structures using electrochemistry to determine their functionality as pressure sensors.

Angel Armenta, Chemical Engineering

Graduation: May 2017

Hometown: Mesa, Arizona

Desalination as a Solution to the Grand Challenge of Providing Access to Clean Water

Mentor: Tirupalavanam Ganesh, assistant dean of engineering education, associate research professor

Research Theme: Sustainability

The development of a solution that can use concentrated solar power as the primary function in desalinating seawater is the goal of this project. The concentrated solar power system was designed to be completely renewable, to require low frequency and complexity of maintenance and to provide a sustainable supply of drinking water. This device uses the process of distillation to remove salt from water and make it drinkable for people in underdeveloped regions. The next goal of this project is to collect quantitative data to prove its effectiveness in desalinating water and to improve the design.

Michael Armstrong, Mechanical Engineering

Graduation: May 2018

Hometown: Payson, Arizona

Labor Efficiency in Construction Utilizing Prefabrication Techniques

Mentor: David Grau, assistant professor

Research Theme: Sustainability

Pre-fabrication methods have been shown to increase the efficiency of labor in industrial production, particularly in the shipbuilding industry. This research attempts to quantify the efficiency of a construction site that is utilizing pre-fabrication methods for the construction of drywall units by using Activity Analysis and the Five-Minutes Rating. These methods have been used before to quantify the efficiency of construction projects that used traditional stick-built methods. The hope is that by quantifying the efficiency of pre-fabrication and comparing it to traditional methods we will be able to determine which method is most efficient.

Galen Arnold, Mechanical Engineering

Graduation: May 2016

Hometown: Mesa, Arizona

Non-Contact Micropipette Tip Locator for an Electrohydrodynamic Printer

Mentor: Owen Hildreth, assistant professor

Research Theme: Energy

Nano-inkjet printing is an exacting process that requires precise and accurate position control across all aspects of the system. One key component, the inkjet nozzle, must be maintained within 3 to 5 µm of the substrate during the entire printing process. This requires knowing the position of the nozzle to within 0.5 µm. Current methods of establishing the position of the nozzle relative to the substrate risk damaging the nozzle and are time-consuming. This project sought to develop a non-contact tip locating method that is faster than current methods and minimizes the risk.

Zeynep Ayla, Chemical Engineering

Graduation: May 2017

Hometown: Istanbul, Turkey

Exploring Amino Acid Cross Feeding Strategies in Support of Stable Co-culture Growth

Mentor: David Nielsen, assistant professor

Research Theme: Sustainability

The purpose of this project is to analyze amino acid cross-feeding strategies that promote stable co-culture growth of different bacterial pairings. Several E. coli knockout pairings have been considered for co-culture growth. Two of the knockout strains (phenylalanine and methionine) have been proven to grow together and will be tested with other strains to compare growth patterns. The next step is measuring the growth ratio of a co-culture with blue and white selection and improving and guaranteeing this ratio by adjusting initial growth conditions.

Christopher Balzer, Chemical Engineering

Graduation: May 2017

Hometown: Anthem, Arizona

Solid State Sensing of Volatile Organic Compounds Using Luminscent Metal-Organic Frameworks

Mentor: Bin Mu, assistant professor

Research Theme: Health

Metal-organic frameworks (MOFs) are a class of nanoporous materials with a variety of applications. Metal-organic frameworks have been synthesized to study their fluorescence responses to an array of volatile organic compounds (VOCs). VOCs are of high interest as they are common chemicals and byproducts that can have carcinogenic effects and adverse effects on respiratory and neurologic systems. The synthesized MOFs show ranges of selectivity and sensitivity to the selected VOCs, and can be used as a sensor/filter to sequester and detect VOCs based on analyte binding and fluorescence enhancement or quenching. Future work includes implementing fluorescent MOFs into nanocomposite materials.

Shona Becwar, Chemical Engineering

Graduation: May 2016

Hometown: Cave Creek, Arizona

Fabricating Material to Promote Anaerobic Butanol Production

Mentor: David Nielsen, assistant professor

Research Theme: Energy, Sustainability

Butanol has been historically produced from fossil fuels, and is prevalent in everyday production. It can be used as a fuel replacement or diesel fuel additive. The need for sustainably produced butanol has been ubiquitously established. Butanol can be produced through manipulation of microbiological organism metabolisms. This process requires anaerobic, or oxygen free, fermentation. In upscaling the anaerobic process, the weakness is found in the ability of the media bottles to prevent the seep of oxygen. This research focuses on fabricating a new material that will prevent the gradual contamination by oxygen. This will allow upscale of the fermentation process.

Zachary Blomberg, Aerospace Engineering

Graduation: May 2017

Hometown: Chandler, Arizona

High Temperature Mechanical Properties of Metallic Material

Mentor: Pedro Peralta, professor

Research Theme: Energy

With concentrating solar power (CSP) emerging as a reliable alternative to more typical power generation strategies, companies like AORA have developed a revolutionary way to maintain a steady energy output by coupling CSP with additional heat sources. Often times, temperatures within these power generation systems can reach upwards of 1000°C, placing considerable burden on metallic components within. There is a need to quantify the mechanical behavior of these metallic materials under such temperatures, which are often surpassing the upper limits listed by manufacturers. We have seen thus far that these temperatures have affected sample metallurgy, namely hardness.

Olivia Brancati, Civil Engineering

Graduation: May 2016

Hometown: Scottsdale, Arizona

Precipitation Events of Summer 2014 in the Phoenix Metropolitan Area

Mentor: Enrique Vivoni, associate professor

Research Theme: Sustainability

An analysis has been conducted of all the precipitation events that occurred during the summer of 2014 in the Phoenix Metropolitan Area. This data was then analyzed to determine the recurrence of each storm event, and to identify the events that exceeded the 100-year recurrence interval. The significance of this research is to determine the distribution of the recurrence intervals, and then relate that to the design standards used for the infrastructure to contain these storm events.

Alexander Bridge, Chemical Engineering

Graduation: May 2017

Hometown: Scottsdale, Arizona

Exploring Polymer Solution Behavior Through Rheological Analysis

Mentor: Matthew Green, assistant professor

Research Theme: Education, Health, Sustainability

Polymer science provides solutions to many of the problems and grand challenges relevant to modern society. Rheology, the study of flow characteristics of materials, is a discipline that is crucial to many aspects of polymer research. The project aims to build experience in Newtonian and Non-Newtonian material behavior, and to generate critical information for other researchers looking into applications for biomedical therapeutics and separations membranes. As of present, lessons learned, general knowledge gained about solution treatment, and practice with instrument operation not only provide invaluable experience with research, but also allow for continuous improvement of process quality and results.

Alexandra Brunelle, Biomedical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Electrical Impedence Tomography Imaging of Intraventricular Homorrhaging

Mentor: Rosalind Sadleir, assistant professor

Research Theme: Health

Intraventricular hemorrhaging is a significant consequence of premature birth. This condition is currently detected using ultrasound. However, ultrasound cannot be used to continuously monitor an infant's condition because it depends on the presence of an operator. It is necessary to develop a technique that allows for continuous observation of the infant's brain. Electrical impedance tomography uses changes in current and voltage to show changes in conductivity. It can therefore be used to show small changes in blood volume. Using an electrode array similar to the EEG (electroencephalogram) array, EIT can be used to image the brain and provide continuous feedback.

Kyle Burgard, Mechanical Engineering

Graduation: May 2018

Hometown: Phoenix, Arizona

Academic Efficacy of Studious Play with an HCD Educational Toy

Mentor: Benjamin Mertz, lecturer

Research Theme: Education

This project is designed to put Giorgio Agamben's educational theory of Studious Play into practice. A toy is being prototyped that will effectively facilitate curriculum designed around helping students discover and make personal connections to educational topics, rather than being asked to remember the information without having made meaningful or memorable connections to it. In upcoming semesters of research this device and pedagogy will be tested in a classroom setting, with anticipated improvements not only in comprehension of the subjects, but in retention of the information as well.

Raissa Cardeal, Civil Engineering

Graduation: May 2017

Hometown: Camacari, Brazil

Effectiveness of 3D Printing on Student Learning Outcomes in Civil Engineering

Mentor: Shane Underwood, assistant professor

Research Theme: Education

The popularization of 3D printing promises to revolutionize and reinvent many of the activities carried out by people and society. This study investigated this technology as a means to positively impact learning outcomes in a Civil Engineering Materials course. Models of the common atomic structures models were developed to provide a tactile and visual representation of the concept of material structure. Once printed, the models are to be incorporated into the course instruction and the student outcomes will be assessed. After analyzing the results, we expect a positive impact, revealing the best way to utilize 3D printing technology in class.

Edgar Castillo, Aerospace Engineering

Graduation: May 2016

Hometown: Bellingham, Washington

Aerodynamic Affects Of A Nacelle On Engine Performance

Mentor: Timothy Takahashi, professor of practice

Research Theme: Education

The main goal of this project is to understand the behavior of the flow around a Radio Controlled (RC) ducted fan, and how it is affected with different nacelles around the engine. To accomplish this goal, a Pitot traverse system is needed to measure the flow around the engine. Thus far, the project is nearing the end of the design process of the Pitot traverse system and will soon enter into the construction phase of the project. Once the Pitot traverse system is complete and approved for use, the data acquisition phase will begin, followed by the data analysis.

David Cayll, Mechanical Engineering

Graduation: May 2017

Hometown: Houston, Texas

2D Materials Origami Architectures

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy

Graphene has an extremely large modulus of elasticity allowing it to be folded and deformed elastically without fracture. By folding sheets of graphene, we hope to see different Raman responses depending on the way it is folded. Currently, uniform sheets of graphene that will be folded and measured have been grown using the CVD technique. The polymer that will be used to exert strain to fold the graphene has been shown to work with other materials, but a method to transfer the single layer of graphene to this polymer is still being investigated.

Brian Chang, Mechanical Engineering

Graduation: May 2017

Hometown: North Brunswick, New Jersey

Investigating The Formation of Nanostrucutres in Alloys Produced by High-Energy Ball Milling at Cryogenic Temperature

Mentor: Kiran Solanki, assistant professor

Research Theme: Energy, Security, Sustainability

The objective of this research is to investigate the formation of nanostructures in alloys produced through high-energy ball milling at cryogenic temperature. A standard Spex ball mill has been modified to have cryogenic capabilities. Copper-tantalum is then synthesized though the cryomill and the powder will be examined using a TEM before and after thermal stabilization tests. The results will be used to improve on the development of nanocrystalline metal alloys, material model development, and the development of a large-scale material processing technique for cryomilling metal powders.

Michael Christy, Engineering (Robotics)

Graduation: May 2016

Hometown: Las Vegas, Nevada

Machine Augmented Human Vision

Mentor: Andgela Sodemann, assistant professor

Research Theme: Health

Machine Augmented Human Vision is the process of supplementing the visual stimuli of your optical nerves with the stimuli of some other process. Whether that process is vibration or electrical or audio stimuli. This research consists of researching the vibration stimuli coupled with some other stimuli to create the fullest picture of vision possible.

Avi Dasgupta, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Self-Sensing Thermoset Network Polymer with Grafted Functional Cyclobutane Mechanophore Units

Mentor: Lenore Dai, professor

Research Theme: Security, Sustainability

Creating a material that can detect when a material is about fail before it actually fails can lead to saving countless lives and copious amounts of money. Knowing when a bridge is about to break before it breaks would be priceless for the tragedy that it would avert. By detecting the peak of a stress curve, such a material can be produced. So far a functionalized hardener and epoxy have been produced. The next step would be to make the epoxy fluorescent so that it can be seen.

Jasmine Delgado, Mechanical Engineering

Graduation: December 2015

Hometown: Grassvalley, California

Leg Exoskeleton to Omit Crutches for Knee Injuries

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Health

A lower limb exoskeleton will omit crutches for users recovering from knee injuries or surgeries. Current devices serve to enhance human performance, aid in overall support or serve as a walking alternative for those who cannot do so themselves. Unfortunately, there is no leg exoskeleton that is meant for strictly rehabilitation purposes. Given that there is a lack of rehabilitation technology, the researcher's solution is to design a piece to aid those recovering from knee or ankle injuries. This piece will also enable users to perform their own rehabilitation throughout their recovery, making it a multi-purpose device.

Andrew Dopilka, Chemical Engineering

Graduation: May 2017

Hometown: Glendale, Arizona

Anchoring Zeolite Nanoparticles for More Efficient Osmosis Membranes

Mentor: Mary Laura Lind, assistant professor

Research Theme: Energy, Health, Sustainability

As fresh water becomes a more valuable resource, the need to find ways to purify water more efficiently is becoming essential. One of the main purification techniques is through osmosis, which relies on a semipermeable membrane that only lets water through. One idea to optimize the membrane is to use zeolites (alumina-silica crystals) that can act as molecular sieves. The main question is how to incorporate these crystals into the membrane in an effective way. So far the results have been promising so the goal is to find a process that can be easily applied and is effective.

Brandon Dorr, Biomedical Engineering

Graduation: May 2018

Hometown: Tucson, Arizona

Engineering RNA-Guided Regulators for Improved Growth Characteristics in E.coli

Mentor: Xiao Wang, assistant professor

Research Theme: Energy, Sustainability

E.coli is an auspicious organism for the creation of sustainable bioproducts. Engineering E.coli strains with improved growth rates would be advantageous for the improvement of sustainable biotechnologies. Progressing from previously identified gene knockouts, which have improved growth rate, regulatory CRISPR-dCas9 systems were designed to validate and quantify engineered growth rate improvement. Spectrophotometry and optical density readings determined that repression of umuC and ybaL lead to significant and near-significant improvements of growth rate of E.coli in minimal medium. These results inform the design of new bacterial strains, which may have improved characteristics for the manufacturing of sustainable bioproducts.

Daniel D'Souza, Computer Science

Graduation: May 2018

Hometown: Chandler, Arizona

Exploring Collaboration in Human-Robot Teams

Mentor: Subbarao Kambhampati, professor

Research Theme: Security

This project focuses on improving robot interactions with humans and their environment by combining interaction with planning algorithms. This research integrates a depth camera and pan-tilt camera for localization and recognition, microphone, speaker, and touch-display with a Mobile Robots PeopleBot. The platform recognizes individuals and engages in a visual and verbal interaction using a touch interface and voice prompts, extracts the desired state-of-the-world from speech, and plans and executes actions to realize that state using a classical AI planner. Simulations show human-robot teams to be effective, but future work involves real world testing, and improving environment sensing to enable complex goals.

Jonathan Edgington, Civil Engineering

Graduation: December 2016

Hometown: Clive, Iowa

Productivity Analysis in Civil Engineering and Construction Projects – A Sustainability Perspective

Mentor: David Grau, assistant professor

Research Theme: Sustainability

Evidence supports that the U.S. construction industries' shrinking base of skilled laborers is a growing concern as productivity in construction is declining along with qualified human capital. Productivity in construction industry has not shown improvements over the past few decades when compared to the tremendous productivity improvements in the manufacturing sector. The research team is collecting data on the quantification of cyclical job duties or tasks directly affecting construction production rates; i.e. activity analysis, crew balancing, foreman delay surveys, and site plan analysis. This first semester research is still in start-up phase.

Kiah Engebretson, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

ZIF-71/PDMS Mixed Matrix Membranes For The Separation Of Biofuels Through Pervaporation

Mentor: Mary Laura Lind, assistant professor

Research Theme: Energy

The goal of this research project is to separate biofuels by creating composite membranes, which have good alcohol separation from water performance. This separation is done through a process known as pervaporation. Zeolitic imidazolate frameworks (ZIF-71) are synthesized to create a membrane because they enhance polydimethylsiloxane (PDMS) polymer performance. If this research were successful, it would supplement energy sources that cannot be renewed such as fossil fuels and oil.

Anthony Facchini, Biomedical Engineering

Graduation: May 2016

Hometown: Napa, California

Characterization of Hypoxia in Multicellular Spheroids

Mentor: Vikram Kodibagkar, assistant professor

Research Theme: Health

The purpose of this project is to mathematically characterize oxygen concentration and pimonidazole diffusion as a function of radial distance within a spheroid. These derived mathematical equations will then be compared to experimental results for accuracy. To obtain experimental results, spheroids were grown and stained with pimonidazole, a fluorescent hypoxia marker. They were then imaged to show regions of hypoxia. Using MATLAB, these images will then be used to quantitatively characterize regions of hypoxia. Then mathematical derivations will be developed which describe pimonidazole binding as a function of radius. Lastly, conclusions will be made once all relevant data is acquired.

Linda Fou, Mechanical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Implementation of Variable Damping in Gait Rehabilitation Technology

Mentor: Panagiotis Artemiadis, assistant professor

Research Theme: Health

The objective of this research is to design a variable damping mechanism for implementation in the Variable Stiffness Treadmill (VST), which will widen the range of impedance the device provides. To achieve this, electromagnets will be used to apply a magnetic field to a rotating, conductive element on the treadmill, creating a torque opposite to its rotation and providing damping to the system, which can be varied by manipulating the current passing through the electromagnet. It is then possible to investigate the effects of varying force stimuli on inter-leg coordination during locomotion, which has potential applications in gait rehabilitation technologies.

Brett Gadberry, Chemical Engineering

Graduation: May 2016

Hometown: Cranberry Twp., Pennsylvania

Modulating Optical Properties of Two-Dimensional Lead(II) Iodide by Strain Engineering

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy

Even with well established processing steps, traditional materials used in the semiconductor industry cannot be strained easily and fracture long before they accept enough strain to achieve flexible electronics. The objective of this research project was to design a new class of two-dimensional (2D) materials using mechanical exfoliation and strain engineering to create highly luminescent Lead(II) Iodide (PbI_2) nano-wrinkle structures on flexible substrates. The resulting optical properties of PbI_2 have been modulated and investigated. Future research includes studying the micro-absorption of PbI_2 and creating novel 2D heterostructure materials for optoelectronic device applications such as solar cells and light-emitting diodes (LEDs).

Benjamin Gilloon, Electrical Engineering

Graduation: May 2017

Hometown: Mesa, Arizona

Contact Resistance Measurements

Mentor: Stuart Bowden, associate professor

Research Theme: Energy

The purpose of this research was to find an effective way to implement contact resistance measurement techniques with conditions as close to the theoretical conditions as possible. A way of measuring contact resistance is done by Transmission Line Measurements (TLM), which requires current flow to be in one direction for it to be accurate. This research attempts to isolate each TLM pattern so current only flows one way. The research has resulted in finding two effective ways of isolating the TLM patterns that gave more accurate measurements. Future work should try to find more accurate dimensions of the contact area.

Haley Gjertsen, Chemical Engineering

Graduation: May 2016

Hometown: Scottsdale, Arizona

Cationic Aminoglycoside Antibiotic-Hydrogels as throughput Drug Screening Platform for Tumor Dormancy Relapse

Mentor: Kaushal Rege, associate professor

Research Theme: Health

Relapse from tumor dormancy after prolonged remission initiates metastatic cancer spread and leads to patient mortality. This work describes the role of novel aminoglycoside-based hydrogel in isolating dormancy-relapsed metastatic cells from a heterogeneous cancer cell population. Rege lab exclusively developed an aminoglycoside-antibiotic-based hydrogel system that uniquely captures tumor dormancy, relapse and micrometastases in a high-throughput in-vitro platform. The work involves chemo-mechanical engineering of Amikagel hydrogel to induce relapse from dormancy followed by measurement of drug sensitivity of relapsed cells. The project involves identifying drug combinations that can ablate the metastatic cells that relapse from dormancy.

Christopher Gregson, Chemical Engineering

Graduation: May 2017

Hometown: Waldwick, New Jersey

Adsorption and Desorption of Biofuels Using Magnetic Mesoporous Carbon Powder

Mentor: David Nielsen, assistant professor

Research Theme: Energy, Sustainability

With the rise of oil prices, depletion of fossil fuels and concerns for the environment, a significant amount of attention has been focused on the use of renewable resources of energy. The goal of this experiment is to develop sustainable strategies to perform regeneration and reuse of novel, magnetic mesoporous carbon powder with butanol. Currently, an isotherm has been developed with various powders to determine the powder performance at numerous butanol concentrations. For the next phase of the experiment, desorption and regeneration of the powder will be performed so that they can be reused for a new adsorption cycle.

Saumya Gupta, Chemical Engineering

Graduation: May 2017

Hometown: Ahmedabad, Republic of India

Polypeptide-Templated Nanoparticles as Colorimetric Sensors of Ionizing Radiation

Mentor: Kaushal Rege, associate professor

Research Theme: Health

This project advances the field of radiation sensors by developing a visual indicator as a method to detect the amount of radiation actually reaching tumors. A gold nanoparticle solution can be used to accurately determine the amount of ionizing radiation the solution has come in contact with. However, it is acutely toxic due to the use of Cetrimonium bromide (CTAB). The toxicity can be reduced by replacing CTAB with an amino acid, as they will both act as surfactants in the solution. A few amino acids work well in the gold solution but need to be studied further.

Evan Hammac, Aerospace Engineering

Graduation: December 2015

Hometown: Towcester, England

Investigating Designs for a Subsonic Wind Tunnel

Mentor: Benjamin Mertz, lecturer

Research Theme: Education

The objective of this research is to improve upon, or design anew, a force balance for the ASU subsonic wind tunnel. This research project explores the means in which engineers gather data. The bulk of the project was composed of designing a full CAD model of a new force balance. The new design was primarily organized so that incoming Aerospace students would be more able to grasp major fundamental forces of flight. Most force balances used in industry today maintain the notion of bodies being horizontally tested, this design decided to break that convention using a vertically orientated test body.

Sofia Herrera, Chemical Engineering

Graduation: May 2017

Hometown: Tucson, Arizona

Nanocomposite Membranes for Wastewater Recovery: New Method in Membrane Casting

Mentor: Mary Laura Lind, assistant professor

Research Theme: Sustainability

The goal of this research project is to create a membrane that can withstand very acidic environments but still be used to purify water. The membrane would be able to withstand these harsh conditions due the incorporation of a resilient impermeable polymer layer. Nanoparticles called zeolites act as a water selective pathway through this impermeable layer and allow water to flow through the membrane. If this research is successful, many more water sources can be tapped since the membranes will be able to withstand hard conditions.

Undergraduate Research Travel Grant Program

Sean Holloway, Mechanical Engineering

Graduation: December 2016

Hometown: Scottsbluff, Nebraska

Utilizing Microcavities to Enhance Narrow Blue Emission of Organic Light Emitting Diodes (OLEDs)

Mentor: Jian Li, assistant professor

Research Theme: Energy, Sustainability

Organic light emitting diodes (OLEDs) are semiconductors made from layers of thin organic materials deposited on the nanometer (nm) scale, which have potential uses in flexible displays as well as solid-state lighting. The research consisted of distributed Bragg reflector (DBR) microcavity structures between 492nm and 470nm wavelengths. Efficiency enhancement was observed from 25% to 35% in the normal direction. Narrowing of the emission spectrum occurs as a result of the tuned structure. Changes from tuning the microcavity structure result in light extraction efficiency. Future studies consist of refinement of the microcavity structure.

Denton Holzer, Chemical Engineering

Graduation: May 2016

Hometown: Mesa, Arizona

An Investigation of Possible Electron Transport Pathways in <i>Thermincola ferriacetica Anodic Biofilms

Mentor: Cesar Torres, assistant professor

Research Theme: Energy, Sustainability

The mechanisms of extracellular respiration in anode-respiring bacteria (ARB) are not well understood. Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques in concert with chronoamperometry will be used to gain further insight. Thermincola ferriacetica biofilms will be grown in reactors using a glassy carbon, silver, or platinum working electrode, Ag/AgCl reference electrode, and nickel wire counter electrode. A potential-step experiment, CV, and EIS will be performed on the reactors once the biofilms grow. EIS will be performed over a range of potentials and CVs will be performed at a scan rate of 1 mV s and 5 mV s.

Ian Horvath, Mechanical Engineering

Graduation: December 2016

Hometown: Poughkeepsie, New York

A Cryogenic Method to Create Ultralight Weight High Strength Nano-Crystalline Magnesium Litium Alloys

Mentor: Kiran Solanki, assistant professor

Research Theme: Energy

Work has been focused on building a cryogenic mill for producing metal powders with grain structures in the 10's of nanometers in order to optimize the Hall Petch effect to greatly improve material properties. This process involves MgLiZr metals as they have the potential to offer ideal material properties in a package that has a density lower than that of all commercial alloys currently in production. The process takes advantage of the unusually high surface area of grain boundaries in their highly energetic state to improve cohesion of the alloy.

Kody Ioia, Industrial and Organizational Psychology

Graduation: May 2016

Hometown: Mesa, Arizona

Investigating the Effects of Vicarious Learning and Case-Based Learning Approaches Within an System for LGBT Biases

Mentor: Scotty Craig, assistant professor

Research Theme: Education

Biases can influence how someone acts toward LGBT individuals. Past research identified two effective learning strategies, Vicarious and Case-based. Both can modify potentially negative behavior. This experiment investigates whether a training program incorporating both learning methodologies is effective in reducing participants' negative biases of and actions toward LGBT people. Content for this training program is currently being developed, and, upon completion, will be validated by subject matter experts. Following this, conditions within the online training program will be evaluated to see if they are successful in scaffolding the learning process and eliciting positive change in participant attitudes toward LGBT people.

Samantha Janko, Engineering (Robotics)

Graduation: December 2015

Hometown: Gilbert, Arizona

Adaptive Control of Campus Cooling Systems

Mentor: Nathan Johnson, assistant professor

Research Theme: Energy, Sustainability

This project seeks to answer the central research question, "Can control algorithms that adapt to hourly, daily, and seasonal changes in human occupancy and environmental conditions reduce cooling system cost and energy use on the Salt River Project East Valley Central Plant?" Computational models were created by integrating two software packages together. The model can accept data inputs to analyze thermodynamic energy and cost efficiency of the system, and these analyses will be used to formulate new control strategies to optimize across technical and economical metrics.

Chenming Jiang, Electrical Engineering

Graduation: May 2017

Hometown: Jiangxi, China

PDMS Membrane Air Filter

Mentor: Junseok Chae, associate professor

Research Theme: Health

Air pollution can cause several health problems, including heart disease and lung disease. People who are exposed to polluted air for a long time may suffer permanent health effects: accelerated aging of the lungs, loss of lung function, and shortened life span. This research is focused on creating a new method that can efficiently filter out PM2.5 from air to protect people from these diseases. Polydimethylsiloxane(PDMS) has very good oxygen permeability and elasticity, so we chose to construct with an filter. Future work will focus on increasing the transparency and oxygen permeability.

Adam Johnson, Industrial and Organizational Psychology

Graduation: May 2016

Hometown: Phoenix, Arizona

The Influence of Error Patterns on Perceptions of Writing and Authors

Mentor: Rod Roscoe, assistant professor

Research Theme: Education

This study implements a 4 (error pattern) by 4 (author) within-subjects design. Error pattern will be a within-subjects variable with four levels: no errors, superficial errors only, substantive errors only, and both types of errors. All participants will assess a randomized selection of four essays with one essay exhibiting each of the four error patterns. Each of the four essays will also contain unique content pertaining to the same writing topic. Perceptions of the writing (e.g., ideas and content) and of the author (e.g., creativity) will be gathered from surveys taken after each essay has been read.

Kaleigh Johnson, Chemical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Production of p-Coumaric Acid from Yeast/E. Coli Co-cultures

Mentor: David Nielsen, assistant professor

Research Theme: Sustainability

The food, pharmaceutical and cosmetic industries use p-Coumaric acid due to its versatile properties. However, the usable form exists in plants in low concentrations. This research aims to produce Coumarate using a co-culture of Yeast and E. Coli to reduce the use of water and other resources for production. Methods used in this study include: designing optimal media for bacterial growth, genetically modifying bacteria to produce the compound with maximum yield, and analyzing the presence of Coumarate using High Performance Liquid Chromatography. The hope for this project is to create a feasible method for producing Coumarate sustainably.

Serena Kaplan, Biomedical Engineering

Graduation: May 2016

Hometown: Tempe, Arizona

Eliminating The Barriers To Effective Ophthalmic Drug Administration Using Polymeric Drug Delivery Methods And Porcine Corneal and Sclera Tissue As A Device For Improved Drug Delivery

Mentor: Brent Vernon, associate professor

Research Theme: Health

The aim of this research is to eliminate the barriers to effective drug administration via eye drops by developing a new method for ophthalmic drug delivery, employing polymeric drug delivery methods. The polymer PDLG 5004 was combined with active drug agents and was tattooed onto porcine corneal and sclera tissue in order to form an in situ implant in the tissue. By studying drug release patterns, this device was found to deliver active drug agents to the eye for 7-10 days successfully. These findings show the efficacy of releasing active drug agents from tissue samples.

Nathan Kirkpatrick, Biomedical Engineering

Graduation: May 2016

Hometown: Tempe, Arizona

To Err is Human: The Impact of Self-Grading and Homework Corrections on Content Learning

Mentor: Michael Caplan, associate professor

Research Theme: Education

Today's engineering instructors are charged with a difficult task; successfully convey conceptual knowledge and promote critical thinking skills to an ever-expanding student population. One way to optimize instructor-student interactions is to update the homework process. Accordingly, the researchers' objective was to design a homework system that is scalable for large class sizes. Exploratory use of this method in an upper-division engineering course enables the researchers to conclude that self-grading homework with self-explanation and contrasting corrections presents an effective homework process under the constraints of the modern engineering classroom environment.

Undergraduate Research Travel Grant Program

Katelyn Kline, Chemical Engineering

Graduation: May 2017

Hometown: Horsham, Pennsylvania

Construction of Thin, Amorphous Metallic Film Using Ligand-Stabilized Nanoparticles

Mentor: Mary Laura Lind, assistant professor

Research Theme: Education

This project looks to create a thin, amorphous metallic film with the use of ligand-stabilized nanoparticles. Utilizing nanoparticles allows for the film to be amorphous despite being constructed at room temperature. The methodology for this project begins with a "quick and dirty" experimentation, which provides preliminary data from which more structured experimentation can be determined. Currently, the greatest challenge is in the aggregation of the particles. Further research and experimentation is being done to minimize aggregation in order to get the particles to form an array for the film.

Shota Kuwabara, Biomedical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Bioreactor Design for Electrical and Mechanical Stimulation of Cardiac Constructs

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

The potential for cardiac constructs for therapeutic use in patients with myocardial infarction has been receiving increased attention in recent years. However, specific challenges such as cell viability, structure, and functionality are still major impediments to any successful clinical application. To this end, a bioreactor device capable of providing electrical and mechanical stimulation to cardiac cultures was created. Theoretical and computational models were developed to explore the exact conditions of mechanical strain and electrical stimulation in an attempt to correlate with construct efficacy. It is hoped this device platform will contribute to future studies in cardiac tissue engineering.

James Kyeh, Biomedical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

Computational Models for Multiple Optogenetic Constructs in Neurons

Mentor: Jitendran Muthuswamy, associate professor

Research Theme: Health

Optogenetics entails the usage of genetically modifying neurons in order to make them responsive to light stimulation. However this process is both expensive and far from perfect in regards to the cell yield and quality of data one receives in comparison to the time investment. Therefore it would be beneficial to explore the possibility of an optogenetic computational model and specifically, the possibility of a simple method of translating opsin models. This would allow for various optogenetic tests to be done efficiently while also being capable of being updated with the new opsins continuously entering the field.

Alexandria Lam, Biomedical Engineering

Graduation: May 2016

Hometown: Glendale, Arizona

Point-of-Care Traumatic Brain Injury Sensor

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

Currently, there is no cheap and minimally invasive way to quantify traumatic brain injury for accurate assessment and triage. Multiple biomarkers that correlate to the stress and cranial trauma have been characterized and detected. However, there is a large issue with detection in blood due to the high noise and presence of other proteins. Current work involves modifying the sensor surface either through Nafion or mesoporous carbon, which shows to improve both the sensor's sensitivity and specificity in whole blood. Future work will involve stability testing of the sensor, movement towards disposable screen-printed sensors, and multiplexing markers.

Undergraduate Research Travel Grant Program

Jayse Langdon, Chemical Engineering

Graduation: May 2017

Hometown: Chandler, Arizona

Characterization of Ruthenium/Ruthenium-Oxide Core/Shell Nanoparticles as Catalysts for CO Oxidation

Mentor: Peter Crozier, associate professor

Research Theme: Energy

Carbon monoxide is a common impurity in hydrogen gas fuels, and is a poison for the platinum catalysts used in proton exchange membrane fuel cells. Silica-supported ruthenium/ruthenium-oxide core/shell nanoparticles preferentially oxidize CO over H2, but the surface structures responsible for this activity are debated. This research explores the effects of reaction conditions, such as temperature and stoichiometry, on the activity and behavior of a Ru/RuO2 catalyst. This serves to characterize the kinetics of catalysis, and will inform the selection of ideal reaction conditions for future operando TEM studies. These future studies will give insight into the catalyst's active surface structures.

Shane Larson, Chemical Engineering

Graduation: May 2016

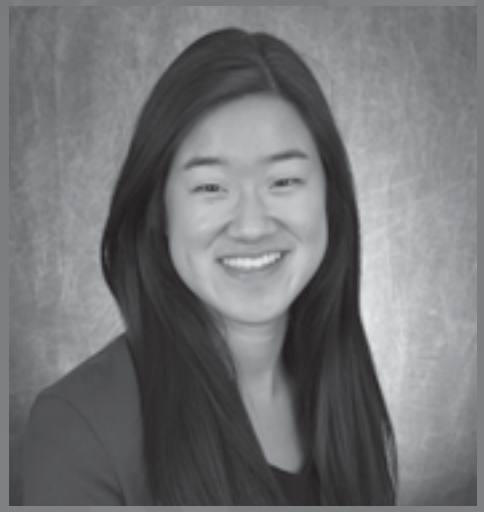
Hometown: Phoenix, Arizona

2-Dimensional Materials Research

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy

The research's purpose is to stack atomically thin monolayers of molybdenum disulfide to form 3-dimensional structures using electrospinning and chemical vapor deposition techniques. The 3-D monolayer structure is developed on top of a nanofiber base. The nanofiber base is produced using sol-gels containing MoO3 expelled through a syringe onto a target using high voltage. After the nanofibers are produced, they undergo treatment in a CVD chamber in order to layer MoS2 on top of them. The experiment's goal is to produce 3-D structures of MoS2 with high surface areas that will be effective semiconductors used in electrochemical and photovoltaic applications.



Madeline Lent, Chemical Engineering

Graduation: May 2017

Hometown: Gilbert, 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 to create electrospun fibers as functional drug delivery mats to enable disease-tailored therapies with targeted delivery to reduce side effects in patients. 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 nanoscale fibers are used as drug delivery mats and the kinetics of the peptide's release-time are tuned to occur between an hour and a week. Observing electrospun polymers under different conditions brings about many positive results in reducing side effects and improving the comfort of patients.

Rubin Linder, Aerospace Engineering

Graduation: May 2017

Hometown: Danville, California

Next-Generation Antifreeze Coating

Mentor: Konrad Rykaczewski, assistant professor

Research Theme: Security

This research best supports the FURI theme of security and involves many disciplines of engineering including mechanical, aerospace, and material sciences. The goal of this work is to develop a next-generation antifreeze coating to be applied to drones in order to increase their reliability and to improve their performance. If successful, this work could change the way people see autonomous aircraft and potentially even improve the aerospace industry and many others.

Alison Llave, Biomedical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

The development of a microfluidic chamber to observe cell migration

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

A microfluidic device was developed for cancer metastasis studies. The purpose of this investigation was to further understand the functions, morphology, and migration profile of highly invasive cells interacting with stromal components. After a few iterations of the experiments, the protocols were optimized to ensure the migration of the cells within the microfluidic chamber. These devices can be modified to accommodate for more complex studies such as vascularization or anti-cancer drug testing.

Marisol Luna Aguero, Civil Engineering

Graduation: May 2017

Hometown: Cd. Obregon, Mexico.

How can a city integrate food waste-to-energy thechnologies into already exsiting waste infrastucture efficiently?

Mentor: Amy Landis, associate professor

Research Theme: Energy, Sustainability

This work evaluates the feasibility for a city to implement waste reducing technologies into their existing infrastructure by creating a decision tool for policy makers. Food waste and green organics are observed as two types of input into a compost-to-energy technology, the outputs are high-grade composting, high-grade biochar, and renewable energy. The decision tool will be created by using tools such as Excel and ArcGIS. The final decision tool will serve local governments in their decision-making to implement food to energy infrastructures in their already existing waste facilities to reduce their waste, create revenue, and create renewable energy.

Ryan Madler, Electrical Engineering

Graduation: May 2016

Hometown: Prescott Valley, Arizona

Designing an FPGA to preform optimized filtering, linearization, and amplification of EEG probe signals

Mentor: Troy McDaniel, assistant professor

Research Theme: Health

Gathering readings from external EEG probe readings is difficult due to small signal readings and large amounts of noise. This research aims to resolve this issue by employing an FPGA to digitally filter and amplify the signal. This filter has been designed and is undergoing testing to confirm how the FPGA filtering works and if the ADC is compatible. Once this testing is complete the filter will be refined and the filter system will be implemented into the larger EEG probe project at Cubic.

Ryan Magnuson, Biomedical Engineering

Graduation: May 2016

Hometown: Thatcher, Arizona

Multimodal integration of visual and proprioceptive feedback in the parietal cortex of rhesus monkeys associated with limb positioning

Mentor: Christopher Buneo, associate professor

Research Theme: Health

The goal of this project was to investigate the multimodal basis of arm positioning in the parietal cortex of rhesus monkeys. This was achieved by measuring neural activity from a microarray implanted in Brodmann area 7B of the monkey's cortex while its arm was held at various locations in the frontal plane both with and without the presence of visual feedback. It was hypothesized that in the presence of visual feedback, visual modulation will result in decreased firing rate and variability of neurons. Offline spike sorting software was utilized to characterize neurons, and subsequent rate analysis was performed with MATLAB.

Alexander Maltagliati, Chemical Engineering

Graduation: May 2017

Hometown: Avondale, Arizona

Optimization of thin polymer-zeolite layer on a polysulfone support for water purification

Mentor: Mary Laura Lind, assistant professor

Research Theme: Sustainability

This research project focuses on the first step of the membrane synthesis, which is creating the initial polymer-zeolite thin layer on the substrate. The ultimate goal is to optimize the coverage of zeolites on the support layer with the spin coating approach. The primary parameters investigated include the weight percent of polyacrylonitrile and LTA zeolites used in addition to spin coating time and rotations per minute. Although a lot of information has been gathered from this semester's research, this process has room for improvement by continuing to explore the parameters.

Allison Marley, Biomedical Engineering

Graduation: May 2017

Hometown: Albuquerque, New Mexico

Binding Affinity Optimization of Fibrin Targeting Nanoparticles

Mentor: Sarah Stabenfeldt, assistant professor

Research Theme: Health

Traumatic Brain Injuries (TBI) contribute to the deaths of over 52,000 people annually in America. Current diagnostic techniques such as MRI and CT scans leave a disparity in diagnosis of these injuries. The objective of this research is to conjugate a nanoparticle with a single chain variable fragments (scFv) that specifically targets fibrin, a non-globular protein involved in the clotting of blood, to improve TBI diagnostics. The focus of this semester's work has been in validating that the correct scFv has been obtained and beginning conjugation studies based upon thiol and amine-based chemistry.

John McCrea, Aerospace Engineering

Graduation: May 2016

Hometown: Napa, California

Structural Health Monitoring of Fiber Reinforced Composite Structures under High Velocity Impact Loads

Mentor: Aditi Chattopadhyay, professor

Research Theme: Security

The immediate localization and quantification of ballistic impact damage is essential to determine an aircraft's current state of health and decide if it is necessary to land for repairs. Current literature defines methods of both active and passive damage localization. This research explores the detection and localization of impact damage induced by the high velocity gas gun. A piezoelectric sensor array was used on quasi-isotropic, carbon fiber polymer matrix laminates and the sensor outputs were studied to localize the damage and understand the severity.

Sanya Mehta, Chemical Engineering

Graduation: May 2016

Hometown: San Jose, California

Optimization of the membrane-biofilm reactor performance for mine wastewater treatment

Mentor: Bruce Rittmann, professor

Research Theme: Sustainability

Wastewater accumulation in mining industry through various operations poses the risk of contamination of surrounding environments and inhabitants. The major contaminants of concern in mining wastewater are metals, nitrate, selenate, sulfate, arsenic, and the Total Dissolved Solids, such as calcium and magnesium. The objective of this research project is to treat mining wastewater with Membrane Biofilm Reactors (MBfR) that employ the growth of a biofilm that is comprised of microbes responsible for the reduction of oxidized contaminants such as nitrate (NO_3^-) and selenate (SeO_4^{2-}), in the surrounding fluid. The use of biological microbial reduction of NO_3^- and SeO_4^{2-} is a promising alternative to many other treatment options for remediating water contaminated with such compounds.

Jason Mende, Chemical Engineering

Graduation: May 2016

Hometown: Derby, New York

Investigation of the Relationship in Particle Characterization of Mixtures

Mentor: Heather Emady, assistant professor

Research Theme: Health

There is little research known for the general mixing properties of powders. Knowing mixing properties can lead to a streamlined process for making uniform dosages of tablets of pharmaceutical products. This leads to saving time, money, and materials that can be used toward progressing the health of the public. The properties of bulk and tapped density of various mixtures of acetaminophen and microcrystalline cellulose were tested for their behavior. The relationship of the mixtures resulted in a linear form. This could be used for designing better operating conditions, which will lead to less wasted material and greater uniformity of product.

Becca Mercer, Industrial Engineering

Graduation: May 2017

Hometown: Tucson, Arizona

Drinking Water Quality, Management, and Distribution in Arizona

Mentor: Tirupalavanam Ganesh, assistant dean of engineering education, associate research professor

Research Theme: Sustainability

This project examined how drinking water is managed and distributed in the Greater Phoenix area. Knowledge of local water sources, quality, and distribution was gained with a systems-based approach to water management. An analysis of water source mix for years 2012-14 from Salt River, Verde River, and the Central Arizona Project revealed that the water management process by the Salt River Project is based on reservoir levels in the Arizona watershed and the City of Tempe's water demand. An exploratory data analysis was conducted to identify trends in water sources and quality measures of total dissolved solids and arsenic.

Anna Moe, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Targeting Tumors: Inclusion of Functional Groups on IBCPs to Combat Cancer

Mentor: Matthew Green, assistant professor

Research Theme: Health

This research attempts to determine the most effective method of synthesizing a peptide and attaching it to a micelle to engineer targeted cancer treatments. Two melanoma-associated peptides with high in vitro and in vivo reactivity have been identified and synthesized, and will be attached to a micelle. Matrix Assisted Laser Desorption/Ionization-Time Of Flight Mass Spectroscopy was used to verify the identity of both peptides, which were purified using Reverse Phase High Performance Liquid Chromatography. After successful purification of the peptides, they will be attached to a micelle; experimentation to determine the most stable attachment method will be necessary.

Aaron Molina, Aerospace Engineering

Graduation: May 2016

Hometown: Tonopah, Arizona

Aerodynamics of Propulsion

Mentor: Timothy Takahashi, professor of practice

Research Theme: Energy

Testing aerodynamic efficiency has always been an essential aspect of anything that encounters significant loads from lift, drag or any kind of wind resistance. Testing the aerodynamics of propulsive devices has always been a process left ignored due to its lack of significance in comparison to testing thermodynamic cycles of propulsive engines. This work will provide a foundation for determining drag that is produced from these engines and what can be done to minimize it. There will need to be work done to ensure that a system can measure the pressure profiles surrounding and following a small-scale engine nacelle.

Matthew Mortensen, Biomedical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

An In Vitro Study of Hemodynamics in Vascular Models for Comparison Against Computational Fluid Dynamics

Mentor: Michael VanAuker, associate professor

Research Theme: Health

This study validates a Computational Fluid Dynamics (CFD) application that simulates the flow of a realistic level of blood cells by utilizing Particle Image Velocimetry (PIV). The models that were studied include two patient-specific femoral arteries and two idealized bifurcations. Qualitatively, the PIV results of the idealized models validate the flow loop of this experimental setup due to the uniform velocity vector fields observed when even flow splits were applied. These PIV techniques are expected to both quantitatively and qualitatively validate CFD results from the aforementioned application, as well as ANSYS Fluent.

Rohan Murty, Chemical Engineering

Graduation: May 2017

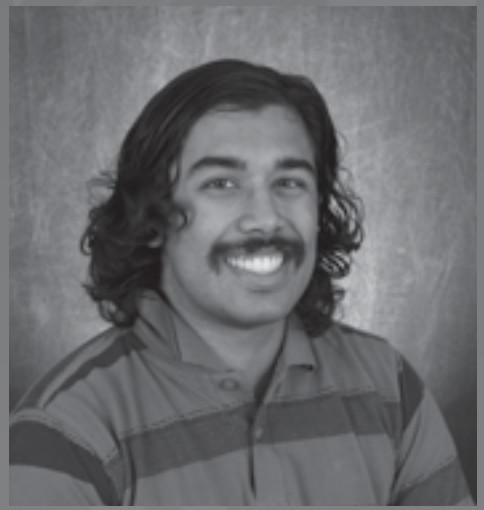
Hometown: Phoenix, Arizona

Adsorption Modeling of Butanol Production Components on Mesoporous Carbon Powders

Mentor: David Nielsen, assistant professor

Research Theme: Energy, Sustainability

The overall goal of this project is to maximize the in situ recovery of second-generation butanol from bacteria. To accomplish this, the adsorptivities of various Carbon-Nickel powders will be characterized using thermodynamic models like the multi-site Langmuir, Freundlich, and BET isotherms. Once these systems are fully characterized, the models may be used to predict the behavior of these powders in actual in situ conditions, which could result in an increase in second-generation butanol production.



Karthik Nambiar, Biomedical Engineering

Graduation: May 2018

Hometown: Scottsdale, Arizona

Generation of Stably Transfected Cell Lines for MR Genes

Mentor: Vikram Kodibagkar, assistant professor

Research Theme: Health

This research is on the reaction between S-Gal, Beta-Gal, and Ferric Ammonium Citrate to form iron nanoparticles that are particularly visible in an MRI. In particular, the research tries to move to experimentation in a genuine biological setting. The generation of the protein Beta-Gal in cells and using that to analyze transfection efficiency is helpful for this purpose. Observation of nanoparticles to better understand their geometric shape is also being undertaken. These nanoparticles have promising results with regards to being used for potential cancer imaging based on these properties.

Fatima Naveed, Computer Science

Graduation: May 2017

Hometown: Tempe, Arizona

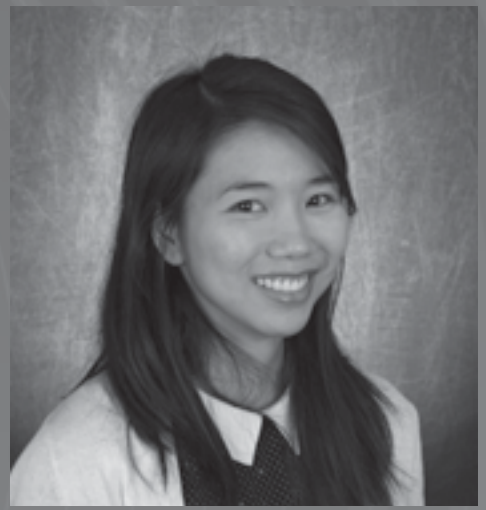
Modeling Programming Learning in Online Discussion Forums

Mentor: Sharon Hsiao, assistant professor

Research Theme: Education

The massive volumes of online programming discussion forum threads harbor tremendous amounts of information, but at the same time increase the complexity of search and navigation. In this work, we make use of programming discussions' syntactic, semantic and social features to model content associated with learning activities based on the ICAP learning framework. The main goal is to detect useful content for learning programming in a large scale of questions and answers, while at the same time experiment with an artificial intelligence approach to detect learning-inductive content. A user study will be conducted to validate the significance of the model.

Undergraduate Research Travel Grant Program



Thanh Nguyen, Chemical Engineering

Graduation: May 2017

Hometown: Hanoi, Vietnam

Evaluation of Resistance Change and Normal Force upon Bending in Stretchable Interconnects

Mentor: James Abbas, associate professor

Research Theme: Health

This research will contribute to the development of the flexible, multi-electrode or multi-interconnect resistive sensor, which consists of thin, microcracked, conductive gold films patterned and embedded in soft elastomeric polydimethylsiloxane (PDMS). Upon stretching, such interconnects demonstrate significant changes in resistance, allowing for simultaneous detection of normal contact force, shear force, and bending. Such sensors – soft, elastic, biocompatible, and capable of concurrent detection of various types of stresses – can serve as an effective interface with neurons and mechanically active tissues and be adapted for numerous biomedical applications such as enhanced prosthetic tactile perception, plantar pressure sensor.

Spencer Offenberger, Electrical Engineering

Graduation: May 2017

Hometown: Anthem, Arizona

Using Social Media to Analyze Hacktivist Tendencies

Mentor: Paulo Shakarian, assistant professor

Research Theme: Security

Hacktivism, or hacking in order to spread a message, has grown rapidly since 2010 and because of the simplicity of the attacks most of the popular groups consist of inexperienced, young programmers. Even without high proficiency in computer science, attacks have caused widespread damage and groups are still growing in popularity. With the younger influx of hacktivists and the emphasis on publicity, they are heavily involved in social media. This research will use social media information from and about these groups to analyze the connection between social media and the attacks to use as a potential indication of future attacks.

James Oplinger, Engineering

Graduation: May 2016

Hometown: Apache Junction, AZ

Leadership Characteristics within the Making Community

Mentor: Micah Lande, assistant professor

Research Theme: Education

Leadership is a key quality for future engineers; proactiveness, confidence, motivation, communication, and coaching are important skills for engineers to effectively lead. The Maker community offers a broad spectrum of individuals interacting in informal engineering within a connected community. This study explored leadership using a theoretical framework of competing values. The study relied on qualitative interviews across four flagship Maker Faires to determine leadership qualities of Makers. The research showed that Makers excel in relating to people, leading change, and producing results. Future work will explore leadership characteristics of engineering professionals and students to compare with those of Makers.

Undergraduate Research Travel Grant Program

Joshua Oremland, Aerospace Engineering

Graduation: May 2017

Hometown: East Brunswick, New Jersey

Generating Representative Volume Element of Nickel Superalloys by 3-D Reconstruction

Mentor: Aditi Chattopadhyay, professor

Research Theme: Security

The goal of this research is to generate an accurate 3D Representative Volume Element (RVE) of the nickel superalloy Inconel 718 using computational modeling. The information necessary to generate the 3D RVE will come from electron back scatter diffraction (EBSD) scans as well as microscopy. An accurate RVE can be meshed and analyzed using Finite Element Analysis (FEA), which means that laboratory experiments performed on the material (that involve high temperatures and high stresses) can be matched computationally. To confirm the accuracy of the RVE, uniaxial and biaxial tension tests will be performed on the superalloy.

Meilin Ossanna, Biomedical Engineering

Graduation: May 2017

Hometown: Tucson, Arizona

Examining Range of Motion and Movement Trajectory in the Arm

Mentor: Claire Honeycutt, assistant professor

Research Theme: Health

Limited range of motion and stunted movement planning are large problems for stroke survivors. Recognizing the significance of these two obstacles, this study has designed an experiment that investigates an individual's ability to move accurately when performing a reaching task within a specified region. This research uses the startReact reflex phenomenon, which examines voluntary and involuntary movements, and electromyography (EMG) electrodes, which record muscle activity, to understand a subject's movement plan and execution. Current results thus far support designed data collection methodology. This study will continue to test subjects and will also develop methods for quantifying and analyzing movement trajectory.

Kai Ozawa, Aerospace Engineering

Graduation: May 2018

Hometown: Tokyo, Japan

Analysis of Long-Term Changes in the Environmental Flow System Over Arizona

Mentor: Huei-Ping Huang, associate professor

Research Theme: Energy

This project will shed light on the increase of temperature and the surface wind speed over the past decade. The project revolves around the hypothesis that long-term environmental changes are strongly influenced by local land use caused by economic growth/decay. This problem can be approached by using the data collected by ArizonaMET and re-creating a chart representing the Surface temperature and wind-speed of urban locations. There has been an upward trend in temperature for the last two decades and a decrease in surface wind speed causing a change in the medium that people of Arizona live in.

Amodini Pathak, Chemical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Characterizing and Synthesizing Ion-Containing Block Copolymers with Potential Applications in Immunostimulatory Cancer Treatment and Water Desalination

Mentor: Matthew Green, assistant professor

Research Theme: Energy, Health, Sustainability

Immunostimulatory therapeutics applied specifically to cancer treatment, and improved purification membranes for water desalination are just two of the many applications of ion containing block copolymers. This specific research project involves the synthesis of a novel ionene whose highly branched structure may result in unique thermo-mechanical and solution properties, giving it potential to be used for one of the aforementioned applications. The polymer will be formed through a multistep synthesis and characterized using size-exclusion chromatography and rheology to determine if it can be a useful purification membrane material or if it has potential in the field of targeted therapy.

Nitish Peela, Biomedical Engineering

Graduation: May 2017

Hometown: Chandler, Arizona

Cell Tracking in a Three-Dimensional (3D) Microengineered Tumor Model

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

Utilizing a novel, multi-step microengineering technique, a three-dimensional tissue-engineered tumor model was created. In order to validate this model, three different breast cancer cell lines were tested and the cells were tracked in real-time as they migrated through the 3D matrix. The phenotypal expression of the cell lines within the model correlated with prior clinical studies, serving as a testament to the model's ability to recreate an accurate phenotype in vitro. Owing to the model's novel functionality in independently fine-tuning the stiffness of micropatterned regions, it is particularly useful in future studies of fundamental biophysics.

Undergraduate Research Travel Grant Program

Andrew Perez, Mechanical Engineering

Graduation: December 2016

Hometown: San Bernardino, California

Excimer Based White Organic Light Emitting Diode

Mentor: Jian Li, assistant professor

Research Theme: Energy, Sustainability

According to the United States Energy Information Administration, lighting accounts for almost one quarter of the country's energy consumption. Single doped white organic light emitting diodes have the potential to save a significant amount of electricity, but they must be optimized to produce a higher emission intensity with a longer lifetime. The variation of molecular structure and device design produced devices with external quantum efficiencies over 25% and operational lifetimes of hundreds of hours. Single doped white organic light emitting diodes possess the capability to reach a sufficient balance between emission intensity and lifetime.

Joseph Pezzi, Engineering (Electrical Systems)

Graduation: December 2016

Hometown: Mesa, Arizona

Building Energy Management

Mentor: Nathan Johnson, assistant professor

Research Theme: Energy

In Arizona, most consumption of power comes from the use of A/C units to try and beat the heat. This poses a problem for the compressor in A/C units as it uses the most power in an A/C unit and tends to be overworked which often leads to failure. To solve this issue, a process known as thermal energy storage will be used to replace the compressor during peak hours. This process will help drive the cost down in A/C units during peak hours and prolong the life of compressors.

Chad Plymale, Mechanical Engineering

Graduation: December 2015

Hometown: Yuma, Arizona

The Effect of Mode Mixity and Print Orientation on the Fracture Toughness of 3-D Printed Materials

Mentor: Kiran Solanki, assistant professor

Research Theme: Security, Sustainability

This research is focused on observing the fracture of polymers printed at different orientations and deducing if the print has any effect on the Fracture Toughness. Currently, several samples have been fractured using a Split Hopkinson Pressure Bar and analyzed to find the force and displacement. During the test, the samples were filmed at high frame rates to find the Preferential Angle of the crack as well as the velocity; these are two key components in finding the fracture toughness. Future work will focus on techniques for printing polymer composites and the benefits of doing so.

David Probst, Biomedical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

Tuning Electrochemical Impedance Spectroscopy

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

The goal is to create an integrated device that can simultaneously measure multiple biomarkers using Electrochemical Impedance Spectroscopy (EIS). EIS is a rapid and label free detection method taking advantage of elctrochemical properties of protine interactions. Biomarker interactions have been researched, during which we have identified a potential challenge of overlapping optimal detection frequencies of each biomarker-MRE interaction. The use of nanoparticle-biomarker conjugation to tune the detection frequencies of the biomarker-MRE interaction away from each other is being investigated. This project explores the use of gold, silver, magnetic, and quantum dot nanoparticles as tools to shift optimal biomarker-MRE interaction frequencies.

Undergraduate Research Travel Grant Program

Elizabeth Quigley, Materials Science & Engineering

Graduation: May 2016

Hometown: Plano, Texas

Development of Novel Nanoscale Self-Healing Materials

Mentor: Aditi Chattopadhyay, professor

Research Theme: Health

Self-healing materials are a new, interesting area of research because of the ability of the material to repair itself, allowing their safer implementation in aircraft and buildings by preventing catastrophic failure due to internal damage. These materials heal fractures by utilizing microcapsules that release the healing agent when a stress or load is applied to the material. This research project will focus on a novel technique that uses carbon nanotubes (CNTs) filled with a healing agent to provide self-healing capabilities. This proposal will focus on creating an optimal fabrication procedure for filling CNTs with a self-healing agent.

Divya Raghani, Civil Engineering

Graduation: December 2015

Hometown: Ottawa, Canada

Ending Bullying With Multiple Architectures

Mentor: James Shraiky, director of healthcare design initiatives

Research Theme: Education, Health, Sustainability

Ending Bullying with Multiple Architectures translates existing bullying strategies (social architecture) into physical architectural intervention, in an effort to mitigate bullying at the critical age when behavioral habits take birth. Pre-fabricated design has revolutionized our building efficiency, influenced our methodology of construction, and created healthier and safer environments. This project challenges efficiency-based design in order to complement the human experience. By creating healthier spaces that foster wholeness, we can heal violence at this critical age, and thus hopefully reduce future societal violence as a whole.

Undergraduate Research Travel Grant Program

Abhishek Rajadas, Aerospace Engineering

Graduation: May 2017

Hometown: Chandler, Arizona

Characterization, Detection, and Analysis of Damage in Novel Foam Core Composites

Mentor: Aditi Chattopadhyay, professor

Research Theme: Security

As composite materials become increasingly complicated in structure, damage detection subsequently increases in difficulty. In order to identify damage in a sandwich composite using carbon fiber reinforced polymers and Boeing K-COR composites, traditional damage detection techniques using macro fiber composites (MFCs) are being used. The results collected from MFC testing will be used to develop a novel sensing technique utilizing buckypaper, an isotope of carbon. Additionally, a technique will be developed that can identify the position and severity of damage relative to the location of the sensors. The ultimate goal is to be able to use the sensing mechanism in situ.

Samarth (Sam) Rawal, Computer Science

Graduation: May 2018

Hometown: Chandler, Arizona

BioParser - A Biomedical Knowledge Parser

Mentor: Chitta Baral, professor

Research Theme: Health

The goal of this research project is to design and develop an accurate system that can parse biomedical sentences and output the result as a human-friendly graph that illustrates the relationships between the entities in the sentence. Although an English-language Knowledge Parser exists, biomedical sentences are difficult to parse accurately. For instance, certain biological terms are often not interpreted correctly. This project, which is still in progress, aims to create a tool, based on the existing Knowledge Parser project, which is both accurate and efficient for biomedical sentences. Following completion, a deeper integration with the biomedical field will be considered.

Carlos Renteria, Biomedical Engineering

Graduation: May 2016

Hometown: Litchfield Park, Arizona

Testing the Efficacy of GdDO3NI: A Novel Hypoxia-Binding MRI Contrast Agent

Mentor: Vikram Kodibagkar, assistant professor

Research Theme: Health

GdDO3NI is a novel hypoxia-binding magnetic resonance imaging (MRI) contrast agent. Hypoxia-binding contrast agents are helpful for non-invasively imaging potentially cancerous tumors. Since cancerous tumors typically show very low tissue oxygenation levels (hypoxia), enhancing contrast of hypoxic regions through use of these agents provides clinicians and researchers information concerning a tumor's metastatic potential. This project aims to test the efficacy of this novel contrast agent against PimonidArizonaole—an immunohistochemical stain currently deemed the gold standard for imaging tissue hypoxia. By processing images acquired via MRI using GdDO3NI and correlating these to PimonidArizonaole-stained images, GdDO3NI's efficacy can be validated.

John James Robertson, Computer Science

Graduation: December 2016

Hometown: Prescott, Arizona

Data Driven Game Theoretic Cyber Threat Mitigation

Mentor: Paulo Shakarian, assistant professor

Research Theme: Security

The recent prevalence of markets specializing in zero-day exploits on the darknet make exploits widely available to potential attackers. The cost associated with these sophisticated kits generally precludes penetration testers from simply obtaining such exploits, so an alternative approach is needed to understand what exploits an attacker will most likely purchase and how to defend against them. Instead, a data-driven security game framework that models an attacker and provides policy recommendations to a defender can be leveraged. Evaluating this formal framework on real-world exploit market data actively mined from the darknet provides insight into the thread landscape for different platforms.

Felicia Romero, Chemical Engineering

Graduation: May 2016

Hometown: Redmond, Washington

Engineering Ion-Containing Block Copolymers as Next Generation Water Purification Membranes

Mentor: Matthew Green, assistant professor

Research Theme: Sustainability

Ionic liquids (ILs) are a class of chemicals praised for numerous physical properties including low volatility, high conductivity, and low flammability; these properties make them particularly useful as solvents, surfactants, and catalysts. While development of ILs is encouraged, IL toxicity is not fully understood. Current data suggests many ILs are toxic yet still typically considered “green” due to their negligible vapor pressures. To gauge industrial recognition of IL toxicity, patents pertaining to IL toxicity (n=112) were extracted from the whole body of patents utilizing ILs (n=3358) from the United States Trademark and Patent Office. The results are presented and discussed.

Susan Sajadi, Biomedical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Developing a Virtual 3D Heart Library for Use in Expanding the Donor Pool for Pediatric Heart Transplant

Mentor: Michael VanAuker, associate professor

Research Theme: Health

Heart transplants have become the gold standard of care, however the donor pool is limited. Donor to recipient size matching relies on weight, which in pediatric patients can range between a 0.7-4 donor to recipient ratio. A 3D method developed to better predict ideal donor size utilized a 3D heart library of CT/MRI data including normal hearts of patients up to 22.5 kilograms, which was used to create a linear model (R2=0.983) to predict donor heart volumes and therefore ideal donor weight. It is concluded that this 3D method has potential for improving donor recipient size matching for transplant.

Christina Salas, Biomedical Engineering

Graduation: May 2018

Hometown: St. Marys, Pennsylvania

Developing Methods of Electrochemical Detection on Paper-based Diagnostic Devices

Mentor: Barbara Smith, assistant professor

Research Theme: Health

Human Papillomavirus (HPV) is the most common sexually transmitted infection in the United States. Currently, 79 million Americans have been diagnosed with this infection, which is estimated to increase by 14 million annually. If left untreated, HPV can cause genital warts, infertility, and various HPV-related cancers, including: cervical, vulvar, vaginal, penal, anal, and oropharyngeal. Current methods of diagnosing HPV involve invasive procedures by highly trained clinicians. The development of a paper-based diagnostic device will provide a low cost means of testing microliter-sized samples, at the point-of-care. Our project aims to develop a simple and accurate measure of HPV diagnostics.

Kari Sanford, Engineering Management

Graduation: May 2018

Hometown: Surprise, Arizona

Analysis of Silicon Nanoparticle Monolayers For Use In Solar Cells

Mentor: Zac Holman, assistant professor

Research Theme: Energy

In efforts to increase the electrical current of solar cells, the objective of this investigation is to create one layer of nanoparticles, a monolayer that will act as a "seed" for nucleating crystalline silicon films. The changes of the state of polarization of light when it reflects off a surface [silicon monolayer] will be observed and the data will be used to calculate the thickness and density of the silicon monolayer through ellipsometry analysis. Thin, crystalline silicon layers will form a p-n junction with the silicon wafer, creating the absorber of a solar cell that yields a higher current output.

Michael Saxon, Electrical Engineering

Graduation: May 2018

Hometown: Mesa, Arizona

Nanoscale Strain Sensing with Optical Grating

Mentor: Hongbin Yu, assistant professor

Research Theme: Security

Utilizing microscale optical gratings thermal strain on computer chip components was measured. Unlike other strain measurement processes this method is cheap, broad, and precise. A microscale optical diffraction grating is deposited on chip samples using FIB (Focused Ion Beam). A red laser, incident on the optical grating, produces a diffraction pattern that is measured using a camera. Based on the location of the peak intensity of the spacing between the diffraction lines, can be ascertained. Thus the strain on the sample can be calculated from the difference between the normal "peak position" and the one measured when the sample is heated.

Gizelle Setovich, Chemical Engineering

Graduation: May 2017

Hometown: Surprise, Arizona

An Investigation of Factors that Inhibit Quagga Mussel Infestation of the Salt River Project Canal System

Mentor: Peter Fox, professor

Research Theme: Sustainability

The research's purpose is to understand what conditions of Salt River Project (SRP) waters are hindering the growth of quagga mussel populations. Three smaller experiments have been conducted to understand mussel survival and growth including measuring survival rates in model canals with SRP and Central Arizona Project (CAP) waters, inducing spawning in the lab using serotonin, and counting copepods to see if high predator concentrations would result in a lack of quagga mussel presence. All three experiments showed inconclusive results but have inspired possible new experiments focusing on temperature ranges and dissolved oxygen requirements for quagga mussels need to survive.

Riha Shah, Engineering Management

Graduation: December 2015

Hometown: Phoenix, Arizona

Machine Learning through K-Clustering Algorithm in Netlogo

Mentor: Luke Achenie, professor, Virginia Tech

Research Theme: Health

The concentration of this research is working with the Netlogo software on the K-Clustering algorithm used to cluster homogenous groups of data. The simple code in Netlogo has been revised to allow import of data, allow the user to plot any two features, and cluster in several dimensions with minimal clustering error. Simulations and analytic models were used to modify the code and the Euclidean norm was used as the distance metric. The main implication of this research is to allow researchers to do realistic K-Clustering in the Netlogo environment, which is used heavily for agent-based modeling and simulations.

Undergraduate Research Travel Grant Program

Ema Shqalsi, Civil Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Productivity Analysis on Construction Methods

Mentor: David Grau, assistant professor

Research Theme: Sustainability

The main objective of this research is to measure and analyze the performance and efficiency in production of a construction site using two different techniques: crew balance and activity analysis. Crew balance will utilize the 5-minute tool rating, which is implemented by collecting data from at least five cycles of a short term, repetitive activity (pouring concrete into slabs, for instance). Activity analysis will be used to assess the management effectiveness. The purpose is to study and identify possible productivity barriers, and then to implement improvements to reduce barriers.

Joana Sipe, Chemical Engineering

Graduation: May 2016

Hometown: Gilbert, AZ

Synthesis and Lifecycle Analysis of Layer-by-Layer Silver Nanoparticle Coated Fabrics

Mentor: Paul Westerhoff, professor

Research Theme: Sustainability

Silver Nanoparticles (Ag NPs) are used in fabrics to achieve antibacterial properties. Therefore understanding their life cycle is imperative to comprehending their impact on the ecosystem. Ag NPs were synthesized with a diameter of 15 nm and Zeta potential of -45.33 mV. An electrostatic layer-by-layer process, using positively charged Polydiallyldimethylammonium Chloride (PDADMAC) and negatively charged Ag NPs, was used to coat fabric. A fabric matrix determined 20-100 mg Ag/g of fabric was needed to minimize silver and maximize antibacterial properties. Washing tests found 75% silver was lost in six washes and use phases were tested with the USEPA LCNano project.

Undergraduate Research Travel Grant Program

Bryan Smith, Chemical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

The Measuring of the Contact Angle of Liquids on Catalytic and Pharmaceutical Powders

Mentor: Heather Emady, assistant professor

Research Theme: Education

The wettability of a powder is an important property to know and be able to measure to better understand the interaction between the powder and liquid when mixing. The wettability is most commonly observed by measuring the contact angle of a single droplet has with the surface of the powder, which can sometimes be difficult thing to measure. This research looks to investigate two methods of measuring the contact angle of various liquids and powders, the Washburn method and the use of a goniometer apparatus, and comparing the accuracy and repeatability of the results.

Cassandra Steeno, Electrical Engineering

Graduation: December 2016

Hometown: Gilbert, Arizona

Enhanced Voltage Transistors using low cost CMOS Technologies

Mentor: Trevor Thornton, professor

Research Theme: Energy

In accordance with Moore's Law, the operating voltage of transistors has significantly decreased throughout time, making analog circuit design difficult. The objective of this research is to find a transistor that requires a low operating voltage while maintaining good DC characteristics. Thornton's research group is investigating a Metal-Semiconductor Field Effect Transistor (MESFET) using the 180nm process. So far a DC characterization of the transistor has been conducted in the lab. These measurements have been extracted and will be used to create a Cadence and PSpice Models. These simulated results will be analyzed for effective circuit design.

Ryan Sullivan, Biomedical Engineering

Graduation: May 2016

Hometown: Tempe, Arizona

Gold Nanorod Embedded Hydrogels for Cardiac Tissue Engineering

Mentor: Mehdi Nikkhah, assistant professor

Research Theme: Health

This project aims to improve the characteristics of cardiac cells by embedding gold nanorods into the hydrogel construct onto which the cells are grown. Different gold nanorod concentrations were tested in order to determine the amount that resulted in favorable tissue properties. Hydrogels were mixed with gold nanorods, UV crosslinked, and seeded with isolated cardiomyocytes. It was found that the hydrogels with higher concentrations of gold nanorods (1 and 1.5 mg/mL of gold nanorods) exhibited increased electrical conductivity and mechanical stiffness leading to improved cardiomyocyte phenotypes. Future testing will include altering the topography of the hydrogel constructs to promote cell alignment.

Vaasavi Sundar, Mechanical Engineering

Graduation: May 2017

Hometown: Chandler, Arizona

Using COMSOL to Model Digestive Breakdown

Mentor: Hanqing Jiang, associate professor

Research Theme: Energy, health

This project focused on using different kinds of foods, such as rice paper and cheese, and analyzing those properties to determine how well they would function as basic circuit components, such as a capacitor. It is important to see how these materials would break apart in the stomach. COMSOL, a software package used to model real-world Multiphysics situations, such as reaction kinetics, is used to simulate the enzyme kinetics within the stomach. This is done by modeling Michaelis-Mentin equations, which represent the enzyme pepsin's kinetic reactions. Future work involves finalizing this model along with seeing how the circuit component functions.

Amanda Thart, Electrical Engineering

Graduation: May 2018

Hometown: Crystal Lake, Illionis

Dark Net Marketplace Analysis

Mentor: Paulo Shakarian, assistant professor

Research Theme: Security

In recent years, cybersecurity has experienced a dramatic shift because threats have spread from big entities to any person with a computer. Due to this risk, it is necessary to change our approach from reactionary to proactive when it comes to counterattacking threats. In this project, the researchers are analyzing the dark net marketplaces by using webpage scraping and parsing to collect data into a universal format. With this unified information, the researchers perform rule-learning techniques to examine if the sales of malware corresponds to major cyberattacks and the probability of attacks occurring with a given change in the marketplaces.

John Tindell, Chemical Engineering

Graduation: May 2017

Hometown: Gilbert, Arizona

Optimization of the Synuclein Antibody Stability through the Isoelectric Point

Mentor: Michael Sierks, professor

Research Theme: Health

The creation of a stable α-synuclein antibody will provide needed medical advances within the Parkinson's disease research field, and applying the most ideal dialysis method could potentially create a more stable protein. Identifying an ideal isoelectric point through dialysis will benefit the overall stability of the structure. After a series of analytical tests to confirm identity, functionality, and concentration, the results of the project were inconclusive. Further studies must focus on the improvement of the stability of α-synuclein through varying laboratory courses of action.

Tanguy Toulouse, Aerospace Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Analysis of the Power Efficiency and Aerodynamics of Propulsion of Electric-Ducted Fan (EDF)

Mentor: Timothy Takahashi, professor of practice

Research Theme: Sustainability

The conducted research's objective is to better understand the airflow and forces acting on a small-scale airplane electric-ducted fan engine (EDF). Testing this engine with different nacelle shapes provides data to analyze. A unique base was built that snuggly fits in the ASU wind tunnel allowing no air to escape to test the EDF engines. Key instruments used for the data recording include a load cell, measuring both compression and tension forces, and pitot probes at the wind tunnels entrance. Accurate data from this research could aid in redesigning both small scale and commercial airplane engine nacelles.

Frank Tsang, Electrical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

Broadband Amplifier for Nanopore-based Biomolecular Analysis

Mentor: Michael Goryll, associate professor

Research Theme: Health

Nanopores are at the heart of molecular transport and identification. Molecular transport can range from single proteins to whole strains of DNA. For example, while trying to categorize an illness for a patient, important analysis could be overlooked due to a time resolution that is too small. One critical problem with nanopores is that molecular transport can be faster than the time resolution of our measurement tools. Currently the maximum bandwidth range is 1 MHz. An assessment of our amplifier showed the bandwidth range going beyond the 1 MHz range with low noise performance. Experiments were conducted using Bovine Serum Albumin during molecular passage.

Adam Tse, Computer Science

Graduation: May 2016

Hometown: Tempe, Arizona

Cyber Attack Prediction

Mentor: Paulo Shakarian, assistant professor

Research Theme: Security

The objective of the research is to create a system that takes URLs as a parameter to gather system data of a webpage and traces its system configurations to both current or newly founded exploits and gives a rating of the possibility of cyber-attacks on that particular domain. Essentially, the software will predict the possibility of cyber-attacks. The application is targeted toward investors and companies for predicting possible cyber-attacks. Later features include integrating a dynamic crawler that searches through hacker forums and hacker group social media for newfound exploits and predicting hacker group's actions.

Kevin Tyler, Electrical Engineering

Graduation: December 2015

Hometown: Mesa, Arizona

Interconnection of Conventional and Flexible Solar Cell Modules Using Wires

Mentor: Stuart Bowden, associate professor

Research Theme: Energy

Wire connected solar cells are a promising new technology that can increase efficiency and reduce the cost of solar modules. The use of wires over conventional bus bars has several benefits, such as reduced shading, reduced series resistance, better light reflection, and reduced material costs. Wire interconnections are particularly useful in flexible modules, as they are much more malleable than ribbons, increasing the flexibility of the module and preventing the cell from being damaged when bent. This research investigates the manufacturability of wire connected solar modules using a fully planar process on both conventional and flexible cells.

David Tze, Biomedical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

Synthetic Chromatin for Cancer Research

Mentor: Karmella Haynes, assistant professor

Research Theme: Health

The purpose of this project is to modify a synthetic protein created by Dr. Haynes to increase the expression of certain genes. 32 of the final 36 constructs have been made and an in-vitro assay is being conducted. This in-vitro assay will illustrate the effect a second polycomb chromodomain (PCD) has on the binding strength. The second PCD is expected to increase the binding strength of the protein, which will increase the gene expression. After sufficient data has been collected from the in-vitro assay the synthetic proteins will be transfected into mammalian cells to be tested.

Delaney Van Winkle, Mechanical Engineering

Graduation: May 2017

Hometown: Palm Desert, California

The Impact of Water Content in Soil for Ozonation Performance

Mentor: Bruce Rittmann, professor

Research Theme: Sustainability

Large areas of soil have been contaminated from accidental releases of crude oil. Advanced oxidation processes with ozone as an oxidant, can break down complex structures and weaken the recalcitrance of organic molecules, ultimately changing the chemical structures of the hydrocarbons to make them more biodegradable. Small-scale samples of contaminated soil have been used to determine the efficiency of ozonation of TPH under different water content. As the soil samples are ozonated at differing times, the concentration of TPH will be measured and analyzed. It has been concluded that the TPH concentration decreases over ozonation time, but water hindered this process.

Sydney Vanda, Computer Systems Engineering

Graduation: December 2015

Hometown: Mesa, Arizona

Optimal Implementation/Design of a Portable and Economical EEG Communication Device

Mentor: Troy McDaniel, assistant professor

Research Theme: Health

Electroencephalogram (EEG) based Brain-Computer Interface systems are a growing field of research. This technology needs to be applied toward the design of a portable, low-cost medical communication device targeting paralyzed persons who are highly functioning neurologically/mentally. The main design will include a 4-electrode system targeting the occipital lobe and Steady State Visually Evoked Potential (SSVEP), steady state visually evoked potential, as a control signal. Using low cost hardware and incorporating an iPad application with flashing universal icons, a patient can simply look at what he or she wants or needs - such as food, pain relief, etc. - and be understood.

Aimen Vanood, Biomedical Engineering

Graduation: May 2016

Hometown: Tempe, Arizona

Multimodal Integration of Visual Cues and Proprioception in Brodmann Area 7B of Rhesus Monkeys.

Mentor: Christopher Buneo, associate professor

Research Theme: Health

The purpose of this research was to study multimodal integration in rhesus monkeys by observing the relationship between visual cues, proprioception, and arm movement in regards to accurate limb positioning. A fixed microelectrode array was implanted in the posterior parietal cortex of the monkey and was used to collect neural data while the monkey performed a simple reaching task. The data was then sorted using the offline spike sorter and the resulting Plexon files were analyzed via MATLAB. All spikes were aligned to the holding period and filtered based on whether they were tuned for vision or position.

Edward Vinciguerra, Mechanical Engineering

Graduation: May 2017

Hometown: Goodyear, Arizona

Flexible Nanomaterials: Graphene and MoS_2 Heterojunctions for Single Junction Solar Cells

Mentor: Sefaattin Tongay, assistant professor

Research Theme: Energy, Sustainability

This research investigates the material properties of Graphene and 2-D MoS_2 and the qualities created when they are layered in junction. There is a possibility of this being a Schottky junction that may or may not supply current that could be used for micro devices in the future. The goal of this research is to grow these materials, layer them, and then test to see if they can create current. Graphene and MoS_2 were both grown and transferred successfully in the lab. There only remains to be seen if a current can be produced.

Edward Votroubek, Mechanical Engineering

Graduation: May 2016

Hometown: Gilbert, Arizona

Design of Pneumatically Actuated Torsional Loading for High Strain Rate Testing

Mentor: Kiran Solanki, assistant professor

Research Theme: Energy, Sustainability

In real world applications, materials undergo a simultaneous combination of tension, compression, and torsion as a result of high velocity impact. The split Hopkinson pressure bar (SHPB) is an effective tool for analyzing stress-strain response of materials at high strain rates. Currently little can be done to produce a synchronized combination of these varying impacts. This research focuses on fabricating a flange to be mounted on the incident bar and struck perpendicularly thus allowing for torsion without interfering with the simultaneous compression or tension. Timing will then be established such that the waves impact the specimen at the same time.

Nolan Walker, Materials Science & Engineering

Graduation: May 2016

Hometown: Lake Havasu City, Arizona

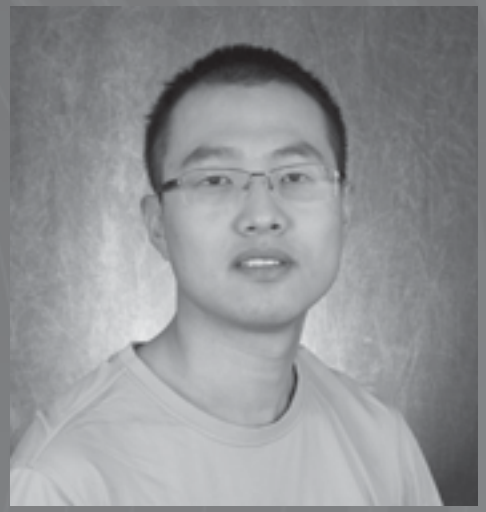
Analysis of Surface Structures in Ru Nanocatalysts

Mentor: Peter Crozier, associate professor

Research Theme: Energy

Ruthenium (Ru) nanocatalysts are a promising candidate for converting CO into carbon dioxide (CO_2) in fuel cell feedstocks. However, debate exists in catalysis literature about the Ru active structure. Hypothesized structures include bulk Ru, bulk rutile RuO_2, monolayer rutile RuO_2 on Ru, and the metastable O-Ru-O tri-layer. In order to bridge the gap between structure and catalytic performance, the surface structure of particles is experimentally observed in transmission electron microscopy (TEM) and simulated.

Undergraduate Research Travel Grant Program



Xinyu Wang, Mechanical Engineering

Graduation: May 2016

Hometown: Taiyuan, China

Design and Implementation of a Marker-Depositing Module for a Small Mobile Ground Robot

Mentor: Spring Berman, assistant professor

Research Theme: Education, Security

The fundamental objective of this research is making a group of robots run the simple robot behavior (Search/Perform Activity) and film the resulting distribution of dropped markers using an overhead camera. The researcher has designed a mechanism for the robots to deposit a single marker at its location when it stops and has built a designer module assembly in Soildworks. Next, the researcher will order components using the research budget and print out and assemble the parts on the robots by a 3D printer. Then the researcher will design a control system by Raspberry Pi and test the module.

Alexander Wenderlich, Mechanical Engineering

Graduation: May 2017

Hometown: Phoenix, Arizona

In Situ SEM Fatigue Crack Growth Testing for Inconel 617

Mentor: Yongming Liu, associate professor

Research Theme: Energy, Security

The nuclear power industry is looking to Inconel 617 as a potential material for a critical component in the next generation of power plants. However, the current models of crack growth for the metal are based off of the average crack growth seen over the course of hundreds of cycles of loading. The goal of this research is to provide a more detailed model for the crack growth in Inconel 617, one based off of the crack growth seen on the sub-cycle level. This will provide a more precise model for the safe design of efficient nuclear power plants.

Jason Wickham, Chemical Engineering

Graduation: May 2016

Hometown: Boise, Idaho

Early Damage Detection in Epoxy Matrices Via a Dimeric Anthracene Mechanophore

Mentor: Lenore Dai, professor

Research Theme: Sustainability

The goal of this research project was to utilize fluorescent anthracene in order to detect early damage in materials so as to avoid catastrophic failure. The anthracene was first synthesized and then added to epoxy mixtures. The samples were then subjected to compression tests and the fluorescence change was measured. After several iterations, a linear response in fluorescence to applied stress was obtained, demonstrating that the new material was an effective indicator of early damage. Future work should involve application level challenges, tuning fluorescent properties and applying the material to a surface.

Undergraduate Research Travel Grant Program

Steven Elliott, Aerospace Engineering

Graduation: May 2017

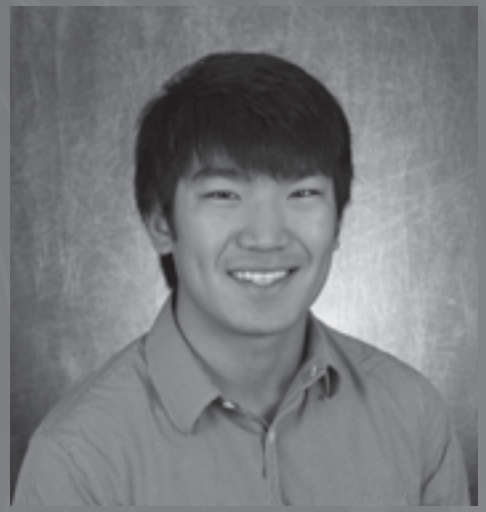
Hometown: Gilbert, Arizona

Parametric Modeling of Aircraft Bodies

Mentor: Timothy Takahashi, professor of practice

Research Theme: Education

During fall 2015, a broad foundation was made into the knowledge of parametric modeling. The focus of the early parts of design were targeted specifically on the construction of the model with variable inputs. The research will also focus on the extraction of data from the constructed models; data used to accurately predict the behavior of the parametric models. Through experimentation with three different CAD systems and two different coding languages, the most efficient and beneficial for the highlighted topics of research was chosen. The schedule is on track despite minor changes in the order of the modeling.



Andrew Park, Mechanical Engineering

Graduation: May 2017

Hometown: Albuquerque, New Mexico

Mechanical Testing and XFEM Simulation for Fracture Analysis of Polyamide 11

Mentor: Yongming Liu, associate professor

Research Theme: Energy

Currently, polyethylene materials are being used to make pipelines, but research has shown that failures and leakages occur as service time increases. Polyamide 11, is currently being researched to replace polyethylene materials. Our main objective is to investigate the fracture behavior for PA-11 gas pipelines caused by rock impingement. Using the Standardized tensile testing method i.e. ASTM-D638, we have been able to test for tensile properties of PA-11. A general methodology combining extended finite element method and cohesive zone modeling will be used to accurately perform a reliability assessment.

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 course work, 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 both 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.

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 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 of silver. This is an essential element in the production of solar cells, but 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. Plating Nickel to silicon as a barrier layer is necessary, but adhesion is very poor. Future research will determine if sputtering instead of plating improves adhesion.

Ji Sue Han, Chemical Engineering

Graduation: May 2018

Hometown: Phoenix, Arizona

Flexible Load Cell

Mentor: Jeffrey La Belle, assistant professor

Research Theme: Health

The purpose of the research is to improve upon the current models of pressure sensors by experimenting on types of conductive materials with a flexible prototype with an opening to allow for switching out of the materials. It was determined that a pressure-sensitive carbon sheet is the most reliable and consisted of the widest range in detecting amounts of weight placement on it. Future work will consist of creating a prototype of a pressure mapping system that will include the carbon material.

Tyrine Jamella Pangan, Software Engineering

Graduation: May 2018

Hometown: Mesa, Arizona

Engineering Design Across Navajo Culture, Community, and Society

Mentor: Shawn Jordan, assistant professor

Research Theme: Education

The goal of this study was to explore and understand the ways that Navajo students and Navajo industry professionals experience and comprehend the engineering design process in the context of their culture, community, and society. In this phase, twenty adult Navajo engineers living off-reservation were sampled. Transcripts from their interviews were analyzed through a phenomenographic lens, resulting in an emergent taxonomy that describes how these participants experience engineering design in Navajo culture. These results will be used to help create future engineering curriculum for middle schools in the Navajo Nation based on the development of a culturally contextualized theory of learning.

Bhavik Patel, Mechanical Engineering

Graduation: May 2018

Hometown: Phoenix, Arizona

Thermoelectric Generator

Mentor: John Rajadas, associate professor

Research Theme: Energy

There are1.2 billion people in the world that do not have access to electricity. Thermoelectric generators can help bring the number down to zero, by creating a cheap, scalable design that anyone can use, anywhere. The simple premise of the design works by having a peltier chip, where one side is hot and the other side is cold. Electricity is created by the electrons from the high-energy state of the hot side flowing toward the low energy state of the cold side. The flow of the electrons creates the electricity and the greater the temperature difference the more power is created.

Maria Jose Quezada Valladares, Biomedical Engineering

Graduation: May 2017

Hometown: Mexico City, Mexico

Utilizing the Startle Reflex to Evaluate Motor Planning

Mentor: Claire Honeycutt, assistant professor

Research Theme: Health

According to the Center for Disease Control and Prevention, strokes are a crucial cause of disability, reducing mobility in more than half of stroke survivors who are over 65 years old. This research aims to evaluate finger movements and enhance better motor planning by mapping neural connections and brain activity. Sound stimuli were used to trigger typing planned movements, activating the startle reflex, which allows the study of the brainstem rather than parts of the damaged cortex. Analyzing electromyography signal determined susceptibility to startle reactions. This research has further implications in the development of movement therapies for stroke survivor patients.

Swetha Swaminathan, Biomedical Engineering

Graduation: May 2016

Hometown: Chicago, Illinois

Project Build-a-Hero: Enhancing Biomedical Engineering as a Socially Relevant Discipline

Mentor: Tirupalavanam Ganesh, assistant dean of engineering education, associate research professor

Research Theme: Education

The goal is to empirically study the impact of a project-based learning approach and assess its effectiveness in conveying the scope of biomedical engineering to upper elementary school students. Biomedical engineering juniors and seniors at ASU were interviewed and their message distilled to a socially relevant message: "I dream to do ____" or "I want to build _____". The next stage of the project aims to enhance the social relevance of biomedical engineering through engaging activities that not only stimulate building and creating but also emphasize design-aesthetic appeal and engineering habits of mind such as creativity, teamwork, and communication.

Courtney Van Bussum, Biomedical Engineering

Graduation: May 2017

Hometown: Boulder, Colorado

Walking Intervention Through Text Messaging for Adolescents (WalkIT-A)

Mentor: Marc Adams, assistant professor

Research Theme: Health

The purpose of the WalkIt Adolescent mobile health study is to determine the efficacy of a walking intervention to shape physical activity behavior through adaptive goal setting. Current research expands upon a previous single-case design study to now include a larger participant pool. Recent research efforts have been toward redesigning recruitment and survey materials and gaining renewed IRB approval. In previous research, the intervention concluded with a 30 percent increased mean baseline step count. In the expanded intervention, the effectiveness of an adaptive goal-setting model versus a static model will be observed in the step trends of the adolescent participants.

Shaun Wootten, Biomedical Engineering

Graduation: May 2017

Hometown: Kingman, Arizona

Understanding Multi-Enzymatic Metabolic Pathways Using DNA Technology

Mentor: Hao Yan, professor

Research Theme: Health

Functional synthetic metabolic pathways are advancing with the application of DNA nanotechnology. DNA nanotechnology establishes that with the programmability and the manipulation of inter-enzyme distance, DNA can be formulated as the foundation for assembling enzymatic pathways for substrate channeling. Advancing the idea, the group attached multiple enzymes onto a 4x4 DNA origami to measure the activity of the multi-enzymatic network based on lengths of the swinging arm system, inter-enzyme distance, and spatial arrangement of the enzymes. The proposed goal constitutes a spatially specific metabolic pathway to produce a product that would benefit the health, energy, or sustainability spectrums of society.

Where are they now?

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 (Materials Science and Engineering '12, FURI Spring '12) is pursuing a Ph.D. in Materials at the University of California, Santa Barbara.

Joel Ayala (Biomedical Engineering '13, FURI Fall '11-Spring '12) is currently pursuing a Master of 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.

Zack Berkson (Chemical Engineering '13, FURI Summer '11-Fall '12) is a first-year Ph.D. 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.

Amy Blatt (Biomedical Engineering '14, FURI Spring '13-Spring '14) is currently pursuing a Ph.D. 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 a materials science and engineering Ph.D. student at Arizona State University and is a National Science Foundation Graduate Research Fellow.

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 Cai (Chemical Engineering and Statistics '13, FURI Spring '10-Fall '12) is a Ph.D. student in the Statistics program at Arizona State University.

Dillon Card (Mechanical Engineering '14, FURI Spring '12- Fall '13, Spring '14) works at Lockheed Martin Aeronautics Company in Fort Worth, Texas on the F-35 program.

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.

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

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 a senior field engineer with Schlumberger, working on drilling rigs across the globe with her current assignment in Doha, 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 Ph.D. at Harvard University in the Speech and Hearing Bioscience and Technology program.

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.

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 Ph.D. in industrial engineering at Arizona State University where he is developing new algorithms to analyze medical images.

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.

Omar Habib (Electrical Engineering '10, FURI Spring '10) is a senior process design engineer at Qualcomm Inc. and pursuing a Ph.D 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.

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

Brittney Haselwood (Biomedical Engineering '12, FURI '10-Spring '12) is currently a research associate and Ph.D. student at Arizona State University and is continuing her FURI research working toward a point of care diagnostic biosensor based on nanotechnology for traumatic brain injury.

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/MS in the Industrial Engineering program at ASU.

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

Lisa Irimata (Biomedical Engineering '15, FURI Fall '12-Spring'14) is currently pursuing a Ph.D. in bioengineering at the University of Notre Dame.

Sebastian Husein (Materials Science and Engineering '13, FURI Fall '11-Fall '12) is currently a Ph.D. 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.

Joshua James (Chemical Engineering & Finance '12, FURI Summer '10-Fall '10) is currently a 2nd year PhD 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.

Paul Juneau (Biomedical Engineering '14, FURI Spring '13 - Summer '13) is currently a software engineer for Tata Consultancy Services.

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.

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

Dwight Lane (Biomedical Engineering '12, FURI Summer '11-Spring '12) is currently a second-year Ph.D. 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 pursuing a master's in chemical engineering at the University of Maryland.

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 Ph.D. in chemical engineering at Arizona State University in fall 2014.

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 chemical review to ensure proper wastewater, air and waste management.

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

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, creating engineering art structures, high rises, and more.

Megan Mincieli (Mechanical Engineering '14, FURI Fall '12-Spring '14) is a product engineer in component engineering at Medtronic in Fort Worth, Texas, on precision drills for cranial and spinal surgery.

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) finished a master's in mechanical engineering at Arizona State University and is working as a marketing and product manager at Honeywell Aerospace.

Elizabeth Nofen (Walker) (Chemical Engineering '12, FURI Summer '10-Spring '11), a prestigious National Science Foundation Graduate Research Fellow, is currently a third-year Ph.D. candidate in chemical engineering at ASU.

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

Brian Perea (Chemical Engineering '12, FURI Spring '09-Spring '11) is a Ph.D. Candidate in chemical engineering at the University of California, Berkeley, and his research focuses on developing a highly automated system for the rapid investigation of stem cell responses to environmental stimuli.

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.

Spencer Prost (Computer Science '13, FURI Fall '11-Spring '13) is currently a post bachelor's research associate at Pacific Northwest National Laboratory, engineering robust acquisition software for Agilent Acqiris digitizers for use with ion mobility spectrometry.

Tim Reblitz (Electrical Engineering '12, FURI Summer '11-Spring '12) is a graduate research assistant and Ph.D. candidate studying silicon photovoltaics at Arizona State University in the QESST Engineering Research Center, working to develop solar cells using only aluminum for metallization to minimize the use of costly and/or toxic materials typically used.

Mariela Robledo (Chemical Engineering '13, FURI Summer '11-Spring '13)) is a manufacturing engineer at General Mills-Albuquerque. She is involved in the community as the Vice-President of External Affairs for the Society of Hispanic Professional Engineers NM Professional Chapter, and as Chair for the SHPE National Conference Meals and Podium committee. She is actively involved in STEM outreach and is passionate about promoting post-secondary education.

Josh Romero (Aerospace Engineering '12, FURI Fall '10-Fall '11) is a Ph.D. candidate in the Aerospace Computing Laboratory at Stanford University and his current research focus is on the development of high-order methods for computational fluid dynamics simulations.

Neil Saez (Biomedical Engineering '13, FURI Spring '10-Spring '12) is pursuing an M.D. at the University of California, Irvine's School of Medicine, and is also a member of the Program in Medical Education for the Latino Community (PRIME-LC).

Rafael Santana (Computer Science '13, FURI Spring '12-Spring '13) is currently a consultant for Avolve Software to develop electronic planning with a focus on planning and building plan reviews.

Jared Schoepf (Chemical Engineering '13, FURI Spring '12-Spring '13) is currently pursuing a Ph.D. in chemical engineering at Arizona State University. He is also the co-founder and president at SafeSIPP, which both transports and purifies contaminated water in developing countries. He is also the president of Sustainable Storm Solutions which works to remove trash from stormwater before it contaminates fragile aquatic ecosystems.

Tyler Stannard (Materials Science and Engineering '13, FURI Summer '12-Fall '12) is a National Science Foundation Fellow and Ph.D. research assistant at Arizona State University, researching stress corrosion cracking in aluminum alloys.

Eric Stevens (Chemical Engineering '13, FURI Summer '11-Spring '12) is a Ph.D. candidate in chemical engineering at North Carolina State University.

Matt Summers (Aerospace Engineering '11, FURI Fall '09-Spring '10) is currently working as the Lab Manager for the Advanced Propulsion Lab and a Principle Investigator of multiple R&D projects at Raytheon Missile Systems in Tucson, AZ. He is also pursuing a PhD in Mechanical Engineering at the University of Arizona.

Ben Teplitzky (Biomedical Engineering '11, FURI Fall '08-'09) is a fourth year Ph.D. student and NSF Graduate Research Fellow in biomedical engineering at the University of Minnesota studying applications and mechanisms of deep brain stimulation using computational, translational, and clinical models neural pathologies.

Michael Thompson (Mechanical Engineering '12, FURI Fall ' 10 - Spring '11) is pursuing a PhD in mechanical engineering on modeling, analyzing, controlling, designing micro air vehicle robotic systems at Arizona State University.

Luan Trinh (Aerospace Engineering '11, FURI Fall '11) is finishing a master's in mechanical engineering at Arizona State University.

Logan Van Engelhoven (Mechanical Engineering '12, FURI Fall '11-Fall '12) is a M.S./Ph.D. student at University of California, Berkeley working with the Human Engineering and Robotics Laboratory.

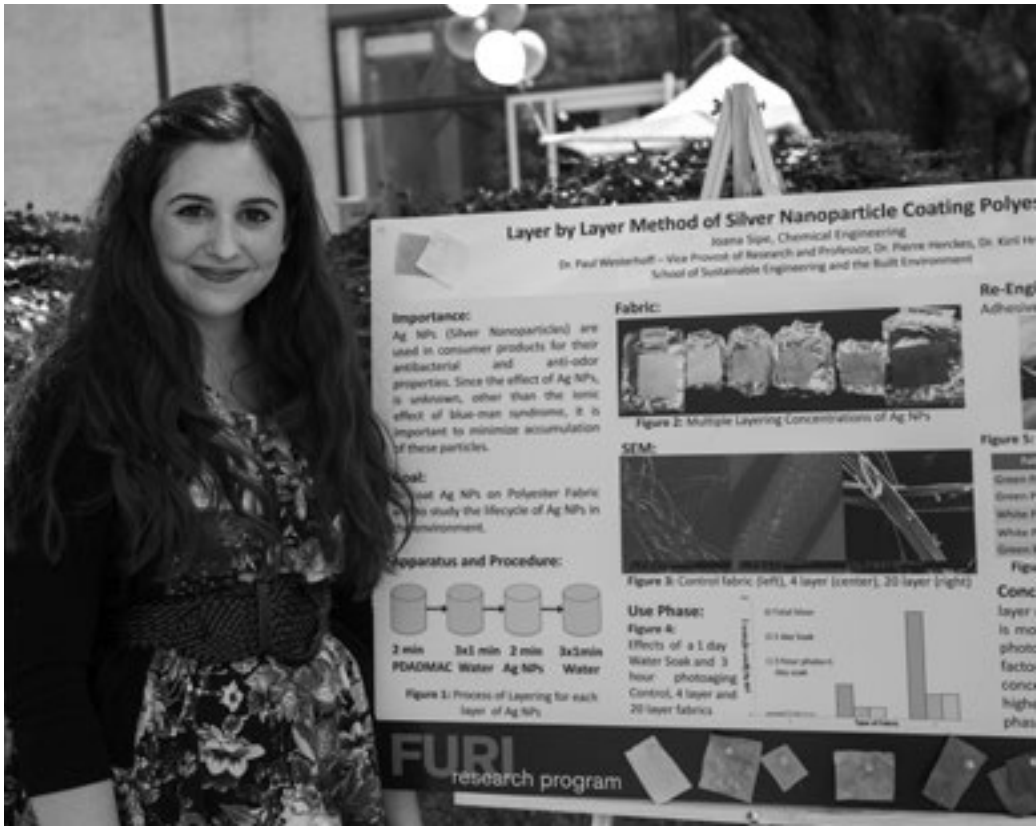
Stephen Warren (Mechanical Engineering '13, FURI Spring '12-Fall '12) is participating in the 4+1 Graduate Program at Arizona State University in mechanical engineering and works with the Human Oriented Robotics and Control Laboratory.

Reed Wittman (Material Science and Engineering '13, FURI Fall '12-Spring '13) is a Bredesen Scholar pursuing a Ph.D. at the University of Tennessee.

Diane Wu (Electrical Engineering '13, FURI Spring '11-Spring '13) is currently a test engineer at Microchip.

Chuan Xu (Industrial Engineering '12, FURI Fall '11-Spring '12) is a senior associate buyer/planner at Life Technologies and graduated from University of California, Berkeley with a Master of Engineering degree in industrial engineering and operations research.

Weidong Ye (Electrical Engineering '15, FURI '12-Spring '14) is pursuing a Ph.D. in Computer Engineering at the University of Illinois at Urbana-Champaign.



FURI is one of the innovative programs that make up the Fulton Difference

60+ Student organizations
Ranging from honors and professional associations to groups creating underwater robots, concrete canoes and launching rockets, student organizations offer excellent opportunities to learn about career possibilities and network with industry professionals.
studentorgs.engineering.asu.edu

4+1 Accelerated programs
4+1 programs provide students with the opportunity to combine advanced undergraduate course work with graduate course work to earn both bachelor's and master's degrees in five years.
engineering.asu.edu/accelerated

Engineering Career Center
Serving as a central point of contact to connect students and employers, the Career Center connects employers with engineering students for full-time job opportunities and internships and provides comprehensive career coaching services for Fulton Schools students and alumni.
engineering.asu.edu/career

Student Support Services
The Fulton Schools Tutoring Centers offer free tutoring in math, physics, chemistry and engineering courses.
tutoring.engineering.asu.edu

Engineering Projects in Community Service
EPICS organizes teams of undergraduate students to design, build and deploy systems to solve engineering-based problems for not-for-profit organizations.
epics.engineering.asu.edu

Grand Challenge Scholars Program
The Fulton Schools Grand Challenge Scholars program combines innovative curriculum and cutting-edge research for an academic experience that spans disciplines and includes entrepreneurial and service-learning opportunities.
engineering.asu.edu/gcsp

Study Abroad
Fulton Schools students are encouraged to take full advantage of the study abroad opportunities offered by ASU and the Fulton Schools.
engineering.asu.edu/studyabroad

Acknowledgments

Financial support for FURI programs is made possible by Ira A. Fulton.

Special thanks to all of the mentors, family and friends for supporting our students through this program.

We appreciate the efforts of all who helped make this program a success, especially:

Susan Baldi
Sabrina Beck
Kevin Buck
Tamera Cameron
Scotty Craig
Hasan Davulcu
Jhanaye Glynn
Michael Goryll
Robert Grondin
Debra Gower
Jane Humble
Keng Hsu
Peggy Kilgore
Cortney Loui
Jenna Marturano
Kelly McManus
Barbara Minich
Cynthia Moayedpardazi
Barbara Jean Montgomery
Bin Mu
Beverly Naig
Narayanan Neithalath
Jay Oswald
Trudy Perez
Shannon Pete
John Rajadas
Shaunna Price
Cara Rickard
Katrina Roalson
Arthur Sainz
Shevonda Shields
Barbara Smith
Tomi St John
Alicia Stiers
Sefaattin Tongay
Cesar Torres
Brent Vernon
Qing Hua Wang
Gary Waissi
Nellie Voise

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, 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