2014 spring symposium

fulton undergraduate research initiative

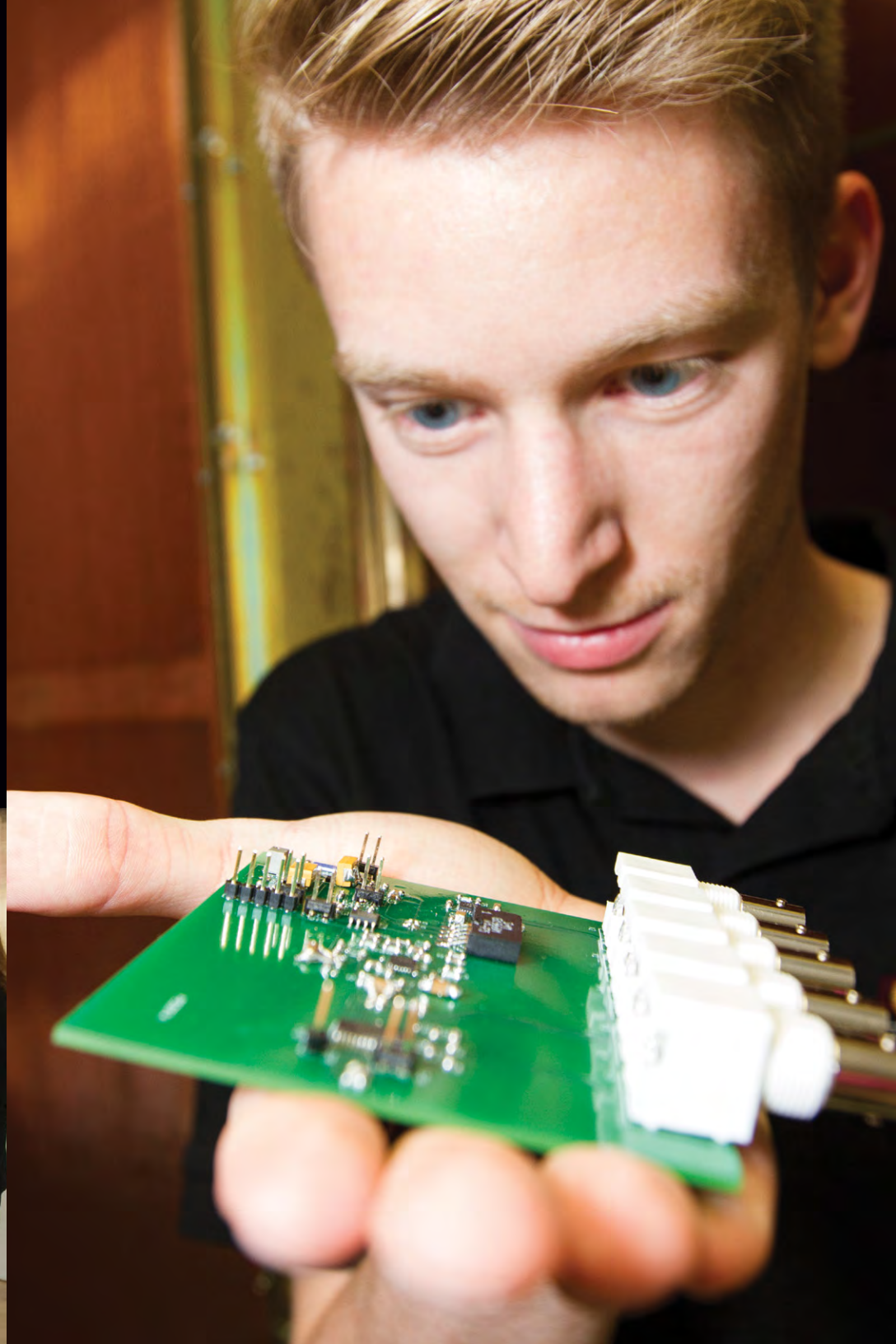
IRA A. FULTON SCHOOLS OF engineering
ARIZONA STATE UNIVERSITY

FURI

The Fulton Undergraduate Research Initiative (FURI) enhances and enriches a student's engineering 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.

engineering.asu.edu/furi



The Fulton Difference: Discover. Create. Innovate.

April 11, 2014

Thank you for joining us for the Spring 2014 FURI Symposium.

As one of our signature experiential opportunities, students in the Fulton Undergraduate Research Initiative gain valuable hands-on experience working in a lab, have the opportunity to travel to national conferences and receive faculty mentoring early in their academic career.

For many, this has opened the doors to scholarships, internships and research opportunities at other institutions.

Programs like FURI help us attract some of the brightest students from across the country and the world. When our impressive group of students work alongside our renowned faculty, exciting projects and concepts are inevitable. The 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 students' accomplishments this semester, and grateful for everyone who helps make this program such a success. We extend congratulations to all and look forward to their continued success.

Sincerely,

Paul C. Johnson, Ph.D.
Professor, Civil, Environmental and Sustainable Engineering
Dean, Ira A. Fulton Schools of Engineering

Amy Sever
Associate Director
Undergraduate Student Engagement

snapshot
spring 2014

130 FURI students

79 men **51** women

5 second semester freshmen
30 sophomores
49 juniors
46 seniors

majors
- Aerospace Engineering: **8**
- Biomedical Engineering: **22**
- Chemical Engineering: **34**
- Civil Engineering: **9**
- Computer Science: **12**
- Computer Systems Engineering: **3**
- Construction Engineering: **1**
- Electrical Engineering: **19**
- Industrial Engineering: **1**
- Materials Science and Engineering: **3**
- Mechanical Engineering: **18**

70 mentors

participants

* Honors Thesis Program

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

Engineering students in the thesis program at Barrett, The Honors College have an opportunity to fund their thesis work through FURI.

The travel grant program helps students participate in national conferences by providing financial assistance with travel expenses.

Kareem Abuobeid
Anngela Adams
Rick Ahlf
Sichun Ai
Anthony Anderson
Lisa Baer
Shantanu Bala*
Amy Baldwin*
David Barclay
Andrew Barkan
Colin Barry
Jared Becker
Amy Blatt*
Emily Bondank*
Olivia Brancati
Ryan Brazones
Andre Brewer
Kristen Brown
David Bull*
Dillon Card*
Joe Carpenter
Rohin Chabra
Santhi Priya Challa*
Eric Chang
George Chen*
Yan Chen*
Ce Cheng
Katelyn Conrad*
Javier Corral Clayton
Andrew Creighton*
Tara De Vries
Abhishek Dharan*
Ibrahima Diop
Nicholas Drake*
Kathleen Duggan*
Nicholas Dunteman*
Sabrina Freeman
Ryan Frost
Raji Ganesan
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Tyler Gavin*
Matthew Geres
Alison Gibson
Mackenzie Hagan
Andrea Hall*
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Matthew Hartenbower
Ben Havens
Alyson Hendrix
Stephen Hermens
Cruz Hernandez
Emily Herring
Andrew Hickey
Conrad Hom
Chelsea Howard*
Iordan Iordanov
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Alexandra Porter
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Brad Shoemaker*
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Cole Snider
Allison Snodgrass
Amanda Snodgrass
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Gregory Spell
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Shannon Tweedley*
Arda Unal
Xavier Vargas
Johnathan Vo*
Sandeep Vora
Alex Walsh*
Zixuan Wang*
Jason Wickham
Daniel Wilson*
Louis Wilson*
Kevin Winarta
Christopher Wong
Christopher Workman*
Weidong Ye

acknowledgements

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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:

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Tamera Cameron, business operations specialist
Hasan Davulcu, associate professor
Jhanaye Glynn, business operations specialist
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Karmella Haynes, assistant professor
Stephen Krause, professor
Cortney Loui, coordinator, undergraduate student engagement
Jenna Marturano, administrative assistant
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Cynthia Moayedpardazi, business operations manager
Bin Mu, assistant professor
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Jay Oswald, assistant professor
Trudy Perez, HR specialist
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Stephen Rippon, assistant dean
Katrina Roalson, manager, fiscal and business services
Arthur Sainz, academic financial specialist, sr.
Shevonda Shields, research advancement administrator
Sarah Stabenfeldt, assistant professor
Tomi St. John, business operations manager
Alicia Stiers, business operations manager
Cesar Torres, assistant professor
Brent Vernon, associate professor
Nellie Voise, academic financial specialist

Kareem Abuobeid, Computer Systems Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

LOW TEMPERATURE DEFECT CHARACTERIZATION OF HIGH POWER SIC MOSFETS

Mentor: Michael Goryll, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

Silicon carbide offers a potentially promising alternative material for semiconductors, however extensive testing for defects must be performed before it is ready for real world use. This research project was focused on creating a successful testing setup for silicon carbide samples. The setup has already been used to test samples of silicon carbide successfully. Future work would likely include more extensive testing of samples made by a variety of manufacturing methods.

Anngela Adams, Biomedical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

DIABETES BIOSENSOR UTILIZING CAPILLARY ACTION THROUGH A HYDROPHILIC MICROFLUIDIC

Mentor: Jeffrey La Belle, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

There are over 25 million diabetics in the United States, and they lack an effective, painless method of quickly measuring glucose levels. The TOUCH tear glucose-sensing device is noninvasive and uses tear fluid instead of blood. To get this device to market, an effective method to dry the liquid reagents must be determined. To determine the best technique, efficiency of fabrication and effectiveness of the enzyme in the reagent were considered. It was determined that a 20-minute incubation at 40°C in proximity to Drierite produced the least variability, and satisfied production standards. Future devices will implement this drying technique.

Rick Ahlf, Aerospace Engineering

Graduation: May 2016

Hometown: Olympia, Washington

COMPARATIVE STUDY OF SIMULINK DESIGN OPTIMIZATION™ (SDO) AND S-TALIRO ON PARAMETRIC MODELS OF STOCHASTIC CYBER-PHYSICAL SYSTEMS (SCPS)

Mentor: Georgios Fainekos, assistant professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Security

A comparative test was conducted between SDO and S-TaLiRo by utilizing an automatic transmission vehicle benchmark, optimized according to its respective parameters. Simulation times and robustness values were gathered by S-TaLiRo and compared to simulation data via the corresponding cost functions implemented through the SDO model verification toolbox. Realistic experimental input parameters including road grade, brake and throttle have allowed for the model optimization through restrictive specifications placed on the outputs of RPM and vehicle speed. The targeted systems of future research projects will consist of more complex powertrain systems, adaptive control for quad rotors and internal combustion engine models.

Sichun Ai, Computer Science

Graduation: May 2016

Hometown: Phoenix, Arizona

VIBROTACTILE CUEING USING WEARABLE COMPUTERS FOR OVERCOMING LEARNED NON-USE IN CHRONIC STROKE

Mentor: Sethuraman Panchanathan, senior vice president for Knowledge Enterprise Development and professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

The research objective is to develop a haptic wristband capable of enhancing awareness to overcome learned “non-use” in the paretic (weakened) arm of stroke survivors, toward more effective and efficient rehabilitation procedures. The focus has been to investigate how real-time movement analysis can drive vibrotactile stimulation reminders and instructions, and how remote monitoring and feedback can improve and guide at-home rehabilitation. A pilot test with stroke survivors has been done through CUbiC’s clinical partner, Rehab Arizona. Future research will involve developing better visualizations of arm movement data to improve therapists’ ability to review and create adaptive performance goals to advance telerehabilitation.

Anthony Anderson, Chemical Engineering

Graduation: May 2016

Hometown: Peoria, Arizona

EFFECTS OF THE ENGINEERING COMMUNITY ON FIRST YEAR RETENTION

Mentor: Benjamin Mertz, lecturer, School for Engineering of Matter, Transport and Energy

Research Theme: Education

This project seeks to explain the effects of the engineering community on factors shown to affect freshmen retention within a large engineering school. Surveys collected from a sample size of a few thousand are being analyzed using ANOVA analysis to find which factors of the engineering community affect the self-efficacy and confidence. Using data analysis software, data of interest is being analyzed for meaningful relationships. After a better idea of the relationship between the engineering community and freshmen confidence and self-efficacy is found, more specific research can be conducted to isolate individual needs of engineering freshmen.

Lisa Baer, Computer Science

Graduation: May 2017

Hometown: Chandler, Arizona

HARNESSING SOCIAL MEDIA POWER IN FINDING LOST PETS--DEVELOPING A MOBILE GEO-SPATIAL TOOL

Mentor: Huan Liu, professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Security

Missing pets can be more effectively located through faster communication assisted by social media networking. The most efficient way to utilize social media in locating pets is by analyzing data from social media and identifying which users live locally. Therefore, when owners of pets broadcast that their animals are missing, the application sends the broadcasts only to users in those areas. This technology to analyze social media users can expand to identify the networks of users that have other unifying characteristics as well as relay other locally relevant information, such as weather threats and regional epidemics, to users.

Shantanu Bala, Computer Science

Graduation: May 2015

Hometown: Glendale, Arizona

EXPLORING CUES FOR VISIO-HAPTIC SENSORY SUBSTITUTION

Mentor: Sethuraman Panchanathan, senior vice president for Knowledge Enterprise Development and professor,, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

Everyday social interactions are often inaccessible to people with visual disabilities due to the complex interplay of nonverbal cues and speech. Can we design a discreet assistive aid that conveys the nonverbal cues of a conversation using a person's sense of touch? A chair embedded with vibration motors has been expanded to use temperature and pressure to create complex multimodal touch-based cues capable of conveying the rich details of a human face. The construction of the device, the Haptic Face Display, will help guide the future design of assistive technologies capable of augmenting social interactions for people with visual disabilities.

Amy Baldwin, Computer Science

Graduation: December 2014

Hometown: Prescott, Arizona

LEARNING THE INITIAL LEXICON IN TRANSLATING NATURAL LANGUAGE TO FORMAL LANGUAGE

Mentor: Chitta Baral, professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

The objective of this research is to automate the learning of the initial lexicon used in translating natural language sentences to their health-related formal knowledge representations based on lambda-calculus expressions. Several previously-used methods have been analyzed, all of which required the use of the context-free grammar of the target language. Assuming no such grammar is available, this research will attempt to find patterns more generally by comparing similar sentences and looking for common parts of both. Future work will include developing a module that can automatically learn some of the initial lexicon and integrating the module into the current system.

David Barclay, Biomedical Engineering

Graduation: May 2016

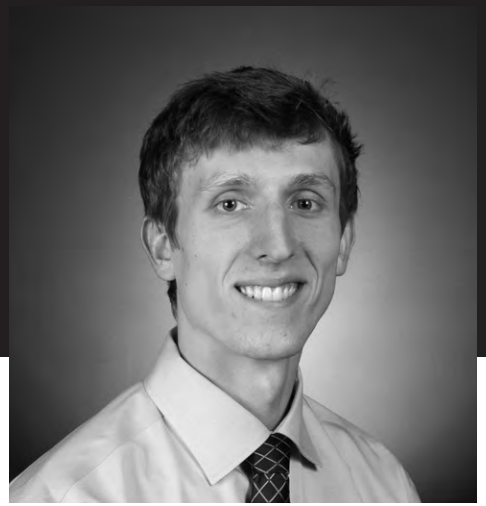
Hometown: Phoenix, Arizona

EPIGENETIC ENGINEERING OF PANCREATIC CELLS WITH DNA-PACKING ACTUATORS AND SENSORS

Mentor: Karmella Haynes, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The DNA-protein complex known as chromatin plays a central role in gene regulation and cell development. This project aims to refine epigenetic engineering by using a protein, PcTF, to target and control developmentally important genes that mediate alpha to beta-cell transformation in pancreas cells. To obtain preliminary data, protein-mapping data was used to identify genes that carry the H3K27me3 methylation mark. These marks silence beta cell-associated expression. PcTF contains methyl-histone binding and gene activation domains. PcTF binds to the methyl-histone, turning on related genes and inducing an alpha-to-beta switch. This project aims to express PcTF in mouse pancreatic alpha cells.



Andrew Barkan, Mechanical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

VARIABLE STIFFNESS TREADMILL (VST): A NOVEL TOOL FOR THE INVESTIGATION OF GAIT

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

Research in human gait characteristics is limited by the narrow ability of research instruments to investigate aspects of human gait generation such as the impact of kinetic and kinematic stimuli. The Variable Stiffness Treadmill (VST) system is a treadmill that is capable of varying stiffness of the walking surface at high speed and frequency through a large range of stiffness. By using this instrument, it is possible to investigate the influence of stiffness on human gait, and by extension, learn about the mechanisms that govern human gait. Preliminary data suggests that ipsilateral stiffness perturbations have effects on the contralateral leg.

Colin Barry, Biomedical Engineering

Graduation: May 2015

Hometown: Brooklyn, Connecticut

3-D FABRICATION TECHNOLOGIES OF LARYNX RECONSTRUCTIVE SURGICAL BIOMATERIALS FOR PERSONALIZED REGENERATIVE MEDICINE

Mentor: Vincent Pizziconi, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

The objective of this research is to develop a 3D fabricated surgical implant that can be used to regenerate a patient's tracheal wall that was removed due to cancer. This critical medical need is being addressed by developing a polyethylene surgical patch that is custom fabricated to replicate an anatomical correct tracheal structure of a patient obtained from medical images of that individual . By bioengineering an artificial tracheal wall from this patch for individual patients, this precision manufactured bioengineered trachea is able to function more similarly to its former biological counterpart.

Jared Becker, Electrical Engineering

Graduation: May 2014

Hometown: Denver, Colorado

TRAVEL GRANT

DEVELOPING A BROADBAND AMPLIFIER FOR ANALYSIS OF DNA STRUCTURAL AND MOLECULAR CHARACTERISTICS

Mentor: Michael Goryll, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

The recent emergence of DNA-based diagnostics increases the need for rapid DNA sequencing technologies. One method to achieve this is to pass DNA through a nanopore, recording the trans-membrane current with a low-noise current amplifier. This research will demonstrate a design of a custom amplifier that offers a wider bandwidth than the current designs, enabling the study of DNA translocation without the need to limit the speed of translocation. The amplifier will be designed to allow direct integration of a nanopore sensing area on the same physical substrate, eliminating the need for external electrode wiring, forming a single device.

Amy Blatt, Biomedical Engineering

Graduation: May 2014

Hometown: Hamilton, New Jersey

IN SITU MRNA EXPRESSION ANALYSIS USING TWO-PHOTON (2P) LASER LYSIS AND MICROFLUIDIC QRT-PCR

Mentor: Deirdre Meldrum, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

A major goal of the Center for Biosignatures Discovery Automation is to design a diagnostic tool that detects novel cancer biosignatures at the single-cell level. Specifically, a combined two-photon laser lysis system and microfluidic quantitative reverse transcription-PCR platform is used to identify early molecular changes from intact tissues. This project focuses on detecting picogram levels of mRNA, which is the amount found in single-cells, and reducing mRNA absorption in the microfluidic platform.

Emily Bondank, Civil Engineering

Graduation: December 2014

Hometown: Scottsdale, Arizona

OPTIMIZATION OF ELECTRON DONORS AND BUFFERS FOR GROWTH OF TRICHLOROETHENE BIOAUGMENTATION CULTURES CONTAINING DEHALOCOCCIDES

Mentor: Rosa Krajmalnik-Brown, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

Bioremediation of trichloroethene (TCE) polluted using Dehalococcides containing cultures is a successful remediation method. Currently the electron donor being used in our laboratory is lactate with TCE delivered in methanol, which is also an electron donor. Methanol is not safe and lactate is expensive for field-scale use. In this study, molasses and ethanol were tested as alternative electron donors to support dechlorination. These two electron donors were tested with TCE delivered both neat and with methanol. Results show that molasses, the cheapest electron donor, supported faster rates of dechlorination than the traditionally used lactate with methanol.

Olivia Brancati, Civil Engineering

Graduation: May 2014

Hometown: Scottsdale, Arizona

FOREST THINNING IMPACT ON WATER YIELD IN ARIZONA

Mentor: Enrique Vivoni, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

The objective of this project is to establish a relation that demonstrates how water yield changes with the amount of forest coverage. The analysis was conducted using data from the Beaver Creek Experimental Watershed where historical treatments of forest thinning were performed. Similar watersheds were selected from this database with one watershed acting as a control for the other watershed which received treatment. A relation was established using an analysis of precipitation events and stream flow. By comparing the relation established by an untreated watershed versus a watershed that underwent forest thinning it was concluded that forest coverage impacts water yield.

Ryan Brazones, Electrical Engineering

Graduation: May 2015

Hometown: Glendale, Arizona

ENERGY CONSUMPTION RELATED TO DATA MOVEMENT IN SMART PHONE DEVICES

Mentor: Carole-Jean Wu, assistant professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Energy and Sustainability

While the performance of smart phone devices continues to increase, one area that has been relatively overlooked is the energy efficiency of these devices. The objective of this research is to characterize the energy cost of data movement in the cache hierarchy of a smart phone device in order to develop energy-saving insights. Running benchmarking applications on a desktop computer processor serves as a reference point to which smart phones can then be compared. Porting these benchmarking applications to mobile devices will thus allow meaningful energy consumption data to be collected and analyzed.

Andre Brewer, Chemical Engineering

Graduation: May 2015

Hometown: Gilbert, Arizona

CARBONATION OF THERMALLY ACTIVATED SERPENTINE MINERALS: POTENTIAL FOR PORTLAND CEMENT REPLACEMENT

Mentor: Hamdallah Bearat, adjunct faculty, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

By thermally activating and carbonating serpentine minerals, a viable Portland cement substitute which produces water as a byproduct and has negative carbon footprint can theoretically be produced. The reaction kinetics of activation has been thoroughly studied by varying parameters including time, mass, powder bed thickness and temperature of the serpentine samples for optimization. Carbonation testing has been done by placing the activated material in a CO2-rich environment to produce the Portland cement substitute. The first 'concrete' pellet that showed significant carbonation was produced and is being studied. The activation and carbonation processes will continue to be optimized.

Kristen Brown, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

CHEMICAL COMPOSITION AND LIPID QUANTIFICATION OF ALGAE STRAINS SUBJECT TO BIOFUEL INTEREST

Mentor: David Nielsen, assistant professor, School for Engineering of Matter, Transport and Energy

Research Themes: Energy and Sustainability

With the push for biofuels growing steadily every day, algae (microalgae) are a sustainable choice for a green fuel source because they outperform other bio-based alternatives in their energy density to produce biodiesel precursors. The goal of this project is to optimize parameters to overproduce lipids in Aurantiochytrium sp. T66, a relatively uncharacterized strain. A single-step method for extraction allows for quick extraction of lipids found in Aurantiochytrium sp. T66. These lipids can then be quantified and characterized to help create a basis to determine the appropriate growth parameters necessary for the overproduction of lipids.

David Bull, Chemical Engineering

Graduation: May 2014

Hometown: Phoenix, Arizona

DOPING ZINC OXIDE

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

One of the major engineering challenges of today is energy. This project aims to solve this by developing transparent solar panels that could replace windows. However, development of transparent zinc oxide solar panels in the future require a better material to conduct electricity to create an ideal p/n type relationship for power generation, so this project focuses on altering the electrical properties of zinc oxide nanowires through doping that will allow more energy to be generated from the solar panels than current zinc oxide solar panels.

Dillon Card, Mechanical Engineering

Graduation: May 2014

Hometown: Montrose, Colorado

BIO-INSPIRED CONTROL FOR ROBOT HAND CATCHING AND GRASPING

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

This research project focused on bio-inspired control of a robotic hand. Human trends in catching a rolling object were studied and quantified via a bio-inspired model. This model related temporal trends in human catching with kinematic properties of the moving object. The model was applied to the robot hand using optical tracking feedback and Bluetooth communication. Overall, the robot hand was successfully controlled to catch the object. This project had an ultimate goal of increasing robot fidelity and expanding the range of achievable robot tasks.

Joe Carpenter, Chemical Engineering

Graduation: May 2014

Hometown: Gilbert, Arizona

NANOCRYSTALLINE SI GROWTH ON SI NANOPARTICLES FOR SI HETEROJUNCTION SOLAR CELLS

Mentor: Zachary Holman, assistant professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy, Sustainability

Silicon (Si) heterojunction solar cells (SHJs) with efficiencies approaching 25 percent are poised to replace Si diffused junction solar cells. Nanocrystalline Si (nc-Si) can replace amorphous Si (a-Si) layers of SHJs. Replacing a-Si with nc-Si could increase effective doping, conductivity and decrease parasitic absorption, improving the efficiency of the solar cell. Absorbance of nc-Si on glass was reduced to 1.5 percent from a minimum of 5 percent a-Si on glass. The crystallinity and resistance of 1.5kΩ improved from doped a-Si with a low resistance of 10kΩ.

Rohin Chabra, Chemical Engineering

Graduation: May 2015

Hometown: Irvine, California

FLEXIBLE SENSOR

Mentor: Kaushal Rege, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The objective of this research is to optimize a sensor to be used in prosthetics. The sensor is flexible so it can be adapted to the human body in order to measure pressure points. The experiment uses different layers of substrate thickness and different thickness of gold for the best possible measurements. Depending on the stress applied to the sensor different voltage difference values are observed. Thus far research has shown that compression stress will decrease the voltage difference and tensile stress will increase the voltage difference. Future work should be on a function of voltage difference and material substrate.

Santhi Priya Challa, Aerospace Engineering

Graduation: May 2014

Hometown: Sandy, Utah

INVESTIGATION OF MULTIMODAL TACTILE CUES FOR MULTIDIGIT ROTATIONAL TASKS

Mentor: Veronica J. Santos, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The goal of this project was to use the sense of touch to investigate tactile cues during multidigit rotational manipulations of objects. A robotic arm and hand equipped with three multimodal tactile sensors were used to gather data about skin deformation during rotation of a haptic knob. Three different rotation speeds and two levels of rotation resistance were used to investigate tactile cues during knob rotation. In the future, this multidigit task can be generalized to similar rotational tasks, such as opening a bottle or turning a doorknob.

Eric Chang, Mechanical Engineering

Graduation: May 2015

Hometown: Tempe, Arizona

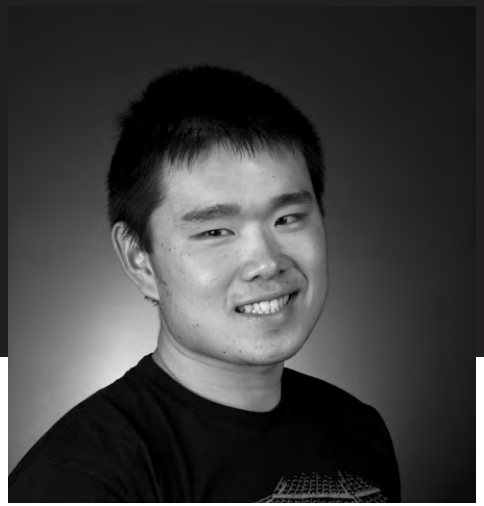
TRAVEL GRANT

DEVELOPMENT OF AN ANTHROPOMORPHIC ROBOT HAND TESTBED FOR ARTIFICIAL GRASP AND MANIPULATION

Mentor: Veronica J. Santos, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The “BairClaw” introduced here is a tendon-driven robot hand capable of real-time multimodal sensing. A Hall Effect sensor-based proprioception system measures the four joint angles on the index finger while a biomimetic tactile sensor measures temperature, vibration and skin deformation. Tendon tensions are directly measured using cantilever-based load cells. The exoskeleton-like design of the BairClaw finger enables rich tactile sensing in concert with a functional distal interphalangeal joint. The testbed will be used for neurorehabilitation of body scheme in subjects with upper limb impairment, human-in-the-loop haptic exploration, and sensory event-driven grasp and manipulation.



George Chen, Electrical Engineering

Graduation: May 2014

Hometown: Karlsruhe, Germany

ULTRAHIGH SENSITIVITY STRAIN SENSING IN SEMICONDUCTOR CHIP APPLICATIONS

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

The objective of this research is to introduce a new strain sensing technique that can detect very small amounts of localized strain across a large area. This new technique uses a grating in conjunction with an optical setup to measure strains on different substrates such as various polymers or silicon. There have been several advancements made since last semester that has allowed the researchers to obtain experimental data from scanning patterns with multi-domain periodicities as well as a pattern composed of composite materials. The next task is to test the optical setup on commercially available electronic packages.

Yan Chen, Mechanical Engineering

Graduation: December 2014

Hometown: Zhejiang, China

NUMERICAL STUDY OF MATERIAL STRENGTH EFFECTS ON HYDRODYNAMIC INSTABILITIES IN DYNAMICALLY-LOADED SAMPLES

Mentor: Pedro Peralta, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The project aims to perform finite element simulations of shock loading instabilities that provide information on material dynamic strength, which is crucial for many engineering applications. The simulations have produced results that closely matched the experimental data and predicted the dynamic yield strength of metallic samples and have led to the discovery of a new experimental technique to lower the impact velocity required to induce instability. Thus, shock experiments to measure strength will become easier to conduct and span a wider range of conditions. The existing simulations should be further modified to study different material hardening behaviors under dynamic loadings.

Ce Cheng, Chemical Engineering

Graduation: May 2014

Hometown: Wuhan, China

INTEGRATED INFORMATION FOR PROTEIN ANALYSIS

Mentor: Zoé Lacroix, associate research professor, School of Electrical Computer and Energy Engineering

Research Theme: Health

Proteins take an important role in performing different functions in human bodies. Proteins can be classified according to their common ancestors, similar structures, evolution process, chemical component, functionality and ways of folding. The objective of the project is to identify the resources needed to extend the SPROUTS portal devoted to the prediction of structural changes due to point mutations. Scientific literature has been researched and existing resources have been evaluated.

Katelyn Conrad, Biomedical Engineering

Graduation: May 2015

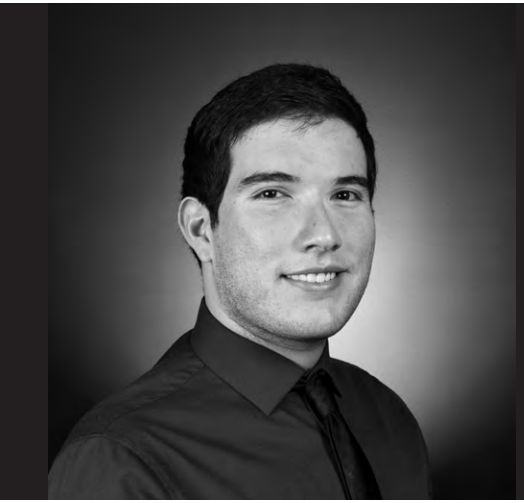
Hometown: Gilbert, Arizona

THE DEVELOPMENT OF BIOMUSCLES IN PROSTHETICS

Mentor: Jeffrey La Belle, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The objective was to design a second prototype of a prosthetic finger, utilizing nitinol actuators, which would allow for more dexterity than that of current prosthetics and be more biomimetic than the previous hand prototype. To do so, an artificial finger was designed to emulate the bones and muscles of the hand. Various polymers were investigated for use as cartilage in the design, and Mimics software was utilized to model the bones. Future studies include constructing the remainder of the hand and investigating the use of electromyography to control the hand and pressure sensors to provide feedback.



Javier Corral Clayton, Chemical Engineering

Graduation: May 2015

Hometown: Hermosillo, Mexico

DEVELOPMENT OF AFFORDABLE CHEMICAL BASED COLORIMETRIC HUMIDITY BIOSENSORS

Mentor: Erica Forzani, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

Keeping objects at low humidity levels can significantly increase the lifespan and quality of food and electronics. Having an accurate, non-toxic and affordable method to measure humidity would allow better storage capabilities. On this project, colorimetric humidity biosensors are being developed using a solution of a redox indicator as a starting sensing element and silica gel as a substrate. The sensor's color changes from a yellow to shades of blue in the presence of humidity. These sensors are highly selective and sensible to really low humidity. Methods of calibrating and improving these biosensors are being currently developed.

Andrew Creighton, Aerospace Engineering

Graduation: May 2014

Hometown: Gilbert, Arizona

ANALYSIS OF REGULATIONS ON THE LANDING AND TAKE-OFF OF COMMERCIAL AIRCRAFT

Mentor: Timothy Takahashi, professor of practice, School for Engineering of Matter, Transport and Energy

Research Theme: Security

The objective of the conducted research was to investigate the current practices of commercial aircraft landing and take-offs with focus on determining how to decrease the frequency of runway excursions. Research took the form of background investigations, case-study of reported excursions and interviews. The prominent factors to excursions were defined as with the current state of affairs on reducing the effect of these factors. Only one factor was found to be problematic in its current handling, and an in-depth analysis was preformed to yield possible solutions. A solution was determined and proposed and defended within the conclusion of this research.

Tara De Vries, Computer Science

Graduation: May 2016

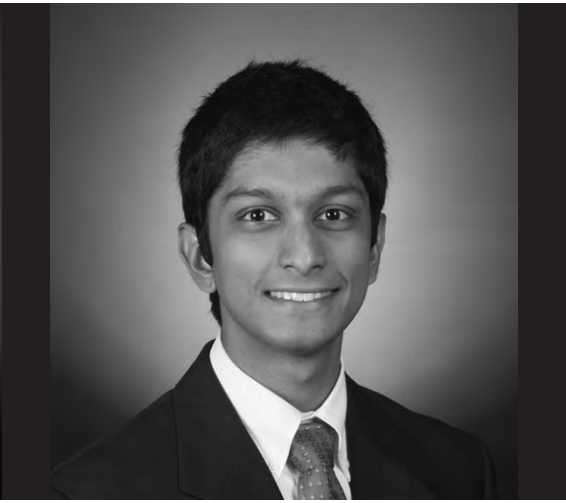
Hometown: Phoenix, Arizona

GENDER DIFFERENCES IN K-12 STUDENT ENGINEERING OUTREACH EFFECTIVENESS

Mentor: Martin Reisslein, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Education

This research project addresses the underrepresentation of women in STEM fields. The goal is to understand how male and female students in grades K-12 respond differently to engineering outreach activities. A 6-week engineering outreach program for grades 3-5 has been developed and implemented. Evaluation data from the outreach activity has been collected and is being statistically analyzed. One preliminary finding indicates low knowledge level of "what engineering is" In order to rigorously examine the knowledge levels of elementary school students of the term "engineering" and what engineers do, a follow-up study with K-5 students is currently being conducted.



Abhishek Dharan, Electrical Engineering

Graduation: May 2014

TRAVEL GRANT

CELL TO CELL COMMUNICATION PLATFORM USING BIOMINERALIZED NANOPORES

Mentor: Michael Goryll, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

By analyzing communication between cells at the single cell level, researchers can pinpoint the response cells have to chemical stimuli. It is envisioned that cells on biomineralized nanopore substrates can be stimulated so cell to cell communication can be observed, allowing researchers studying diseases to better understand interactions between cells. This research demonstrates how cells grow on biomineralized nanopore substrates using cell culture methods common in similar studies.

Ibrahima Diop, Electrical Engineering

Graduation: December 2014

Hometown: Dakar, Senegal

COMBINED GENERATION OF SOLAR AND WIND ELECTRICITY

Mentor: Meng Tao, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy and Sustainability

While using solar and wind as main sources of electricity, the goal of this research is to conduct technical studies that will produce a more stable power output over a 24-hour period. Data on both solar intensity and wind speed have been collected for our region of study in order to demonstrate the concept. Moreover, real time electricity demand of the region will be the defining factor of our final design. Using real efficiencies, both systems will be combined to generate power over 24 hours. This study will provide advice for policy makers on effective deployment of sustainable energy sources.

Nicholas Drake, Aerospace Engineering

Graduation: December 2014

Hometown: Phoenix, Arizona

CHARACTERIZATION OF HELICOPTER BLADE WAKE PHENOMENA

Mentor: Valana Wells, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

The purpose of this investigation is to computationally investigate instabilities appearing in the wake of a simulated helicopter rotor. Existing data suggests further understanding of these instabilities may yield design changes to the rotor blades to reduce the acoustic signature and improve the aerodynamic efficiencies of the aircraft. Currently, the initial stages of the project are underway, including the installation of the necessary computational software and the integration of post processing software. This will allow theoretical test cases to be run and post-processed to identify further test cases of interest for understanding the flight/physical conditions under which the instabilities occur.

Kathleen Duggan, Industrial Engineering

Graduation: May 2014

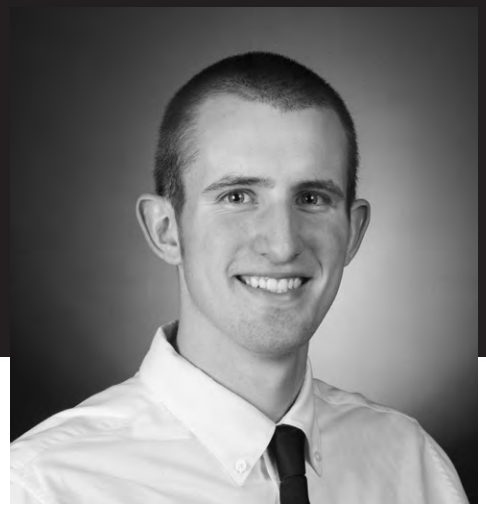
Hometown: Arvada, Colorado

BUILDING BETTER ENGAGEMENT — AN APPROACH TO IMPROVING STUDENT ENGAGEMENT IN HIGHER EDUCATION ENVIRONMENTS

Mentor: Kristen Parrish, assistant professor, School of Sustainable Engineering and the Built Environment

Research Theme: Education

This project explores variables that may influence the relationship between a person's overall comfort in their built environment and their engagement in a higher education classroom setting. The project identifies these variables, proposes a method for quantifying the impact of the built environment on students, and shows preliminary results from students surveyed in Spring 2014. Evidence of a relationship between human comfort and student engagement can provide an argument for how green building designs can improve student success and engineering education.



Nicholas Dunteman, Chemical Engineering

Graduation: May 2014

Hometown: Phoenix, Arizona

CARBON DIOXIDE SEPARATION BY CERAMIC-CARBONATE DUAL-PHASE MEMBRANES

Mentor: Jerry Lin, Regents' Professor, School for Engineering of Matter, Transport and Energy

Research Themes: Energy and Sustainability

Currently, approximately 40 percent of the world's electricity is generated from coal, and coal power plants are one of the major sources of CO_2 emissions. Research was done to improve plant efficiency, thus, reducing greenhouse gas emissions into the atmosphere. This project focuses on the development and classification of a CO_2 separation membrane and the design of a power plant to incorporate this membrane. A successful design was proposed where a membrane reactor was incorporated into the Integrated Gasification Combined-Cycle power plant. Future work will focus on improving the selectivity of the membrane allowing for greater CO_2 separation.

Sabrina Freeman, Biomedical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

THE INFLUENCE OF INJURY SEVERITY ON ENDOGENOUS REGENERATION AFTER TRAUMATIC BRAIN INJURY

Mentor: Sarah Stabenfeldt, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The objective of this project was to evaluate chemotactic chemical signals that may influence the migration of neural stem cells after brain injury (TBI). A rodent TBI model was used to generate tissue samples that were homogenized to assess protein levels based on anatomical region. Specifically, the level of stromal cell derived factor-1α (SDF-1α) was investigated with respect to injury severity. In general, the level of signal increases acutely after injury. The future work for this project is to utilize information on protein expression and other factors to develop therapeutic treatment for TBI.

Ryan Frost, Mechanical Engineering

Graduation: May 2016

Hometown: Harvard, Massachusetts

THE EFFECTS OF VISUAL ANTICIPATION OF CHANGES IN FLOOR STIFFNESS ON GAIT

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

This project is a supplement to an existing experimental setup, the Variable-Stiffness Treadmill, and seeks to answer the question, does advance warning of a coming change in floor stiffness affect how we walk? To answer this query, a virtual world was created for the subject to experience through an Oculus Rift virtual reality headset. While walking on the treadmill, the subject is given the visual stimulus of walking along a path with different floor materials, such as sand or concrete, corresponding to different levels of treadmill floor stiffness. Early tests show definite potential, but much remains to be done.

Raji Ganesan, Computer Science

Graduation: May 2016

Hometown: Chandler, Arizona

SERIOUS GAMES FOR STROKE REHABILITATION USING SIFTEO CUBES

Mentor: Sethuraman Panchanathan, senior vice president for Knowledge Enterprise Development and professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

Stroke rehabilitation often times includes repetitive tasks that are boring, frustrating and not motivating for stroke survivors. The lack of engagement hinders their ability to heal since they do not feel compelled to repeat the tasks enough times to inform their bodies and improve their range of motion. The exploration of how "gamified" tasks emulated on unique, interactive smart devices instead of their less compelling analog counterparts is driven by the desire to motivate patients to "heal themselves." Further exploration involves a wider selection of analog tasks being emulated on digital devices, and the incorporation of competitive gaming profiles to allow for stroke patients to interact with each other.

Cameron Gardner, Biomedical Engineering, Finance

Graduation: May 2015

Hometown: Phoenix, Arizona

COMBINATORIAL LIBRARY OF SYNTHETIC TRANSCRIPTION FACTORS

Mentor: Karmella Haynes, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The question this research seeks to answer is how the binding strength of the H3K27me3 binding site varies with Polycomb domain (PCD) homologues. To present date, 10 Polycomb transcription factors (PcTFs) have been constructed and verified using gel electrophoresis. CMV (insert) and MV9 (vector backbone) have been cut with XbaI, PstI and SpeI, PstI respectively, verified using gel electrophoresis, and purified using gel purification. The next steps are to finish building each construct by inserting the PcTF plasmid and then running a thermostability assay to assess binding strength. This will determine how methyl-histone binding can be controlled in engineered proteins.

Tyler Gavin, Aerospace Engineering

Graduation: May 2014

Hometown: Phoenix, Arizona

VALIDATION AND REFINEMENT OF A DRAG BUILD UP METHOD FOR UNMANNED AERIAL VEHICLES

Mentor: Valana Wells, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

With the emerging market for unmanned aerial vehicles, or UAVs, an effective design method is necessary for small scale aircraft. This research seeks to validate a previously developed drag build-up method for small air vehicles. Using the method a drag prediction was made for an off-the-shelf, remotely controlled aircraft. Flight tests were then conducted using the RC plane, and the aircraft performance data was compared with the predicted performance data. Although there were variations in the data due to flight conditions and equipment, the drag build up method was capable of predicting the aircraft's drag. Moving forward this method can be used to create conceptual designs of UAVs to explore the most efficient designs, without the need to build a model.

Matthew Geres, Electrical Engineering

Graduation: May 2015

Hometown: Casa Grande, Arizona

MOLECULE CHARACTERIZATION USING NANO-FLUIDIC TRANSISTORS

Mentor: Michael Goryll, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

The objective of this project was to use existing MOSFET transistor manufacturing technologies to create a Nano-fluidic transistor device using bio-mineralized Nano-pore membranes. Samples were coated first with a titanium adhesion layer, followed by an electrically conductive Aluminum layer using electron-beam evaporation, and finally an electrically insulating layer, deposited via Atomic Layer Deposition. This arrangement allowed an electrostatic bias to be applied to the Nano-pores to change their permeability for salt ions and molecules. The samples were then checked, experimentally, to ensure the Nano-pores remained open and that the aluminum layer remained insulated. Future work will be aimed at electrical biasing for selective passing of Nano-particles.

Alison Gibson, Aerospace Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

CROSS-MODAL HAPTIC FEEDBACK FOR BRAIN-MACHINE INTERFACES

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

Due to the growing field of brain-machine interfaces that employ anthropomorphic control schemes, it has become a priority to design sensor and actuation mechanisms that relay haptic information to the user. This project developed and tested a novel feedback method where tactile information is perceived through multi-frequency auditory signals. To examine its learnability and practicality, the feedback was implemented in closed-loop experiments involving neural control of a robotic hand. Results show that users adapted and learned the feedback technology after short use, and could eventually use auditory information alone to control grasping forces of the robot.

Mackenzie Hagan, Civil Engineering

Graduation: May 2015

Hometown: Scottsdale, Arizona

GROWTH OF DEHALOCOCCOIDES IN A SHORT HYDRAULIC RETENTION TIME CONTINUOUS STIRRED TANK REACTOR FOR THE REDUCTIVE DECHLORINATION OF TRICHLOROETHEYLENE

Mentor: Rosa Krajmalnik-Brown, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

Growth of chlorinated ethene-respiring Dehalococcoides using a short hydraulic retention time in continuous stirred tank reactor (CSTR) represents an efficient way for the production of fast-rate, high-density bioremediation cultures. In this study, this CSTR growth method was reproduced using the mixed microbial culture containing Dehalococcoides, ZARA-10. Analyses of the CSTR performance revealed cultures containing high-cell density Dehalococcoides and TCE conversion mostly to ethene. Kinetic parameters for Dehalococcoides related to growth and reductive dechlorination were also obtained in order to develop a CSTR mathematical model. These findings further validate the method and will be projected to large-scale CSTRs in future work.

Andrea Hall, Mechanical Engineering

Graduation: May 2014

Hometown: Tempe, Arizona

A STUDY OF THE MECHANICAL BEHAVIOR OF NANOCRYSTALLINE METALS USING MICROELCTOMECHANICAL SYSTEMS (MEMS) DEVICES

Mentor: Jagannathan Rajagopalan, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The study of the mechanical behavior of nanocrystalline metals using microelectromechanical systems (MEMS) devices lies at the intersection of nanotechnology, mechanical engineering and material science. The extremely small grains that make up nanocrystalline metals lead to higher strength but lower ductility as compared to bulk metals. Effects of microstructural heterogeneity and strain-rate dependence on the mechanical behavior of nanocrystalline metals are explored. Knowing the strain rate dependence of mechanical properties would enable optimization of material selection for different applications and lead to lighter structural components and enhanced sustainability.

Joseph Hanson, Mechanical Engineering

Graduation: December 2015

Hometown: Florence, Arizona

DEVELOPMENT AND TESTING OF A HIGH-TEMPERATURE EMISSIOMETER

Mentor: Liping Wang, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy and Sustainability

The goal of this project was to develop a high-temperature emissiometer to experimentally study the spectral-directional emissivity of various materials under elevated temperatures in the infrared. A heater that can hold a sample and rotate on the sample axis was designed and built to attain a temperature of 1200K. A blackbody was utilized as a reference source and an optical system was designed and built to transfer and collimate the thermal radiation into a Fourier transform infrared spectrometer for analysis. The device has been calibrated and tested for accuracy and will be used to test new materials upon arrival.

Matthew Hartenbower, Computer Systems Engineering

Graduation: May 2015

Hometown: Gilbert, Arizona

EXPLORATION OF EARLY DETECTION AND REPORTING OF TRAUMATIC BRAIN INJURIES IN STUDENT ATHLETES

Mentor: Sethuraman Panchanathan, senior vice president for Knowlege Enterprise Development, and professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

The focus of this project is to investigate how pervasive mobile computing software can aid in the detection of traumatic brain injuries in student athletes. An Android application was created that communicates with sensors in a football helmet. This application uses the Head Injury Criterion algorithm to detect when a traumatic brain injury has likely occurred and then displays this data in a readable way. Future work will include modifying this application for different sports and using different algorithms and methods to better detect traumatic brain injuries.

Ben Havens, Civil Engineering

Graduation: December 2015

Hometown: Lewiston, Idaho

3D MODELING OF SELF SUSTAINING TOWER VIA COMPLEX IMAGING SOFTWARE

Mentor: Keith Hjelmstad, professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

The intent of The Tall Tower project is to create a feasible model of a 20 kilometer tall structure with the purpose of launching rockets at a reduced cost. The basic concept was fostered on verifying the idea that it is possible to build something this extravagant using only the materials currently available today. From these initial steps, the project has become a cornerstone of breakthrough constructional and sustainable concepts such as welding in extreme sub-freezing temperatures and attempting to harness the jet stream's wind energy blowing at speeds of more than 400 kilometers per hour.

Alyson Hendrix, Civil Engineering

Graduation: May 2014

Hometown: Chandler, Arizona

DEVELOPING NOVEL BINDER SYSTEMS THROUGH THE UTILIZATION OF IRON CARBONATION

Mentor: Narayanan Neithalath, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

In the current research, metallic iron powder waste and CO_2 are used to form a sustainable binder for construction. This research helps reduce CO_2 and metallic iron powder solid waste while ensuring similar or improved strength of the binder as compared to conventional construction material with cement. Fracture mechanics testing has proceeded on specimens composed of sustainable binder and Portland cement. Current results have determined that the fracture behavior of the novel binder system has increased strength, toughness and ductility compared to Portland cement. Future impedance testing will determine how various ions percolate throughout the material.

Stephen Hermens, Chemical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

SUSTAINABLE SOIL IMPROVEMENT VIA ABIOTIC CARBON DIOXIDE SEQUESTRATION

Mentor: Hamdallah Bearat, adjunct faculty, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

This research is about creating environmentally-friendly, durable cement substitutes. The carbonation of calcium hydroxide was studied to create a solid matrix around a sand aggregate. Samples of calcium hydroxide were mixed with water and sand to form a thick paste and reacted at varying CO_2 pressures. The amount of carbonation in these samples was studied by x-ray diffraction to determine the quantity of carbonation occurring. It proved to be difficult to achieve consistent amounts of carbonation in the cement samples. However, carbonation was achieved in demonstrable quantities. Future work would study the effects of different aggregates on the carbonation process.

Cruz Hernandez, Materials Science and Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

CALCIUM DOPED CERIA FOR SOLID OXIDE FUEL CELL

Mentor: Peter Crozier, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The objective of this research project is to determine how different levels of Ca^{2+} doping of ceria will affect the ionic conductivity and microstructure of the electrolytes for solid oxide fuel cells. Samples with doping levels 2, 5 and 10 percent Ca have been synthesized by spray drying. The resulting powders have been pressed and sintered at 1400°C for 24 hours. XRD performed on the 10 percent Ca sample confirmed a fluorite structure. Future work includes analysis of ionic conductivity by impedance spectroscopy and studying the microstructure by scanning electron microscopy.

Emily Herring, Biomedical Engineering

Graduation: May 2016

Hometown: Litchfield Park, Arizona

EFFECTS OF PROPRIOCEPTIVE FEEDBACK ON LEARNING

Mentor: Jennie Si, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

The objective of this research is to investigate the effects of proprioceptive feedback on learning rate and learning technique when learning a new task that requires attention and control. Proprioception is the relative positioning of one's own body part to something else and the strength of movement. This study was done using data from two sets of rats. One set was given a task to learn that involved the rat moving while learning the task and the other set was given a similar task but no motion was involved. This research will continue to allow for definitive conclusions to be made.

Andrew Hickey, Mechanical Engineering

Graduation: May 2016

Hometown: Cottonwood, Arizona

ROTARY CYLINDER ENGINE

Mentor: Steven Trimble, professor of practice, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The objective of the research is to analyze the feasibility of the Rotary Cylinder Engine design. This engine design offers the benefits of potentially less parts count and higher efficiencies. The research consisted of exploring the friction analysis, preliminary design and materials selection. The engine was redesigned to minimize friction and stress. Materials for the engine were also considered to maximize its performance. The research found that piston-to-cylinder forces were higher than anticipated and more parts are needed than planned to prevent piston binding. The basic concept is still valid. Future research will focus on combustion valuing and timing.

Conrad Hom, Chemical Engineering

Graduation: May 2015

Hometown: Tucson, Arizona

NOVEL SYNTHESIS OF CORE-SHELL COMPOSITE POLYMERIC IONIC LIQUID MICROGELS VIA ONE-STEP PICKERING EMULSION POLYMERIZATION

Mentor: Lenore L. Dai, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

Pickering emulsions (or solid stabilized emulsions) have received increased attention due to their differences from conventional emulsions and tremendous applications. Ionic liquids are unique liquid materials composed of large, sterically hindered ions, with polymeric ionic liquids being their polymerized form. We explored the creation of novel polymeric ionic liquid-gold core-shell composite microparticles via a one-step Pickering emulsion polymerization route. These core-shell microparticles are anticipated to yield unique applications due to the charged nature of the polymeric ionic liquid and the robustness of the gold shell.

Chelsea Howard, Chemical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

ANALYSIS OF FREE STANDING ZEOLITIC IMIDAZOLATE FRAMEWORK INCLUSION NANO COMPOSITE (ZIFINC) MEMBRANES ON ETHANOL/WATER SEPARATIONS

Mentor: Mary Laura Lind, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The objective of this research project is to develop free-standing Zeolitic Imidazolate Framework Inclusion Nano Composite (ZIFINC) membranes and quantify their abilities to recover ethanol from water/ethanol solutions through pervaporative processes. Ethanol is a biofuel that, when burned, produces fewer greenhouse gas emissions than other fuels. These Mixed Matrix Membranes would enhance current ethanol manufacturing techniques, which would thus reduce total energy expenditures of production. The components to these membranes have been synthesized and characterized. They were tested on the pervaporation system and their ethanol separation performances were analyzed.

Iordan Iordanov, Chemical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

NOVEL REACTOR DESIGN TO ENHANCE THE CONVERSION OF CO_2 TO FUELS

Mentor: Jean Andino, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

TiO_2 can photocatalytically convert CO_2 into useful products—such as methane—in the presence of UV radiation and water vapor. The Andino Research Group hypothesizes that fluidization of TiO_2 will improve useful product yields by increasing available catalytic surface area required for photoreduction. A small scale fluidized bed reactor (FBR) was designed and assembled to fluidize TiO_2 in the presence of UV radiation and $H_2O(g)$. Preliminary fluidization experiments resulted in four times bed expansion compared to packed bed reactors. Photocatalytic experimentation is currently ongoing. Future work will include testing modified titania catalysts—TiO_2-SiO_2 and I-TiO_2—in the FBR.

Melissa Ip, Computer Science

Graduation: May 2017

Hometown: Chandler, Arizona

ESTIMATING TRIO MODEL PARAMETERS TO IMPROVE DETECTION OF DE NOVO MUTATIONS

Mentor: Jieping Ye, associate professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

This project seeks to improve the identification of de novo mutations by estimating mutation rates and associated trio model parameters from sequencing of related individuals. The trio model was initially simplified. Then, an expectation-maximization algorithm was implemented to find expected sufficient statistics and maximum-likelihood estimates of the model parameters. The parameter estimating model was applied to both simulated and biological data to calculate its accuracy. The resulting program may be used as a tool to analyze if a child has a unique mutation or if it was inherited from the parents, which could be helpful in diagnosing and treating mutation-related diseases.

Lisa Irimata, Biomedical Engineering

Graduation: May 2015

Hometown: Peoria, Arizona

THE EFFECTS OF BILATERAL NIGROSTRIATAL DEPLETION ON MOTOR FUNCTION IN THE RAT

Mentor: Jeffrey Kleim, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

Parkinson Disease is associated with a robust pattern of motor impairments attributed to the depletion of nigrostriatal dopamine. A comprehensive animal model mimicking behavioral impairments is critical in advancing motor functionality treatments. Current models are constrained to unilateral depletion. In this study we examined the effects of bilateral depletion. A behavioral assay to measure limb and cranial motor function in rats was developed and tested in response to unilateral and bilateral dopamine depletion. The results showed a differential pattern of motor impairments in animals receiving unilateral and bilateral lesions suggesting that our animal model better mimics the human clinical disease.

James Jensen, Aeronautical Engineering

Graduation: May 2014

Hometown: San Jose, California

DEVELOPMENT OF MAXIMUM LIFT AIRFOIL DESIGN METHODOLOGY

Mentor: Valana Wells, associate professor, School for Engineering of Matter, Transport and Energy

Research Themes: Sustainability, Security and Education

This research is aimed at developing a method for designing high lift airfoils based on maximizing the pressure difference across their upper and lower surfaces through the use of Liebeck's method. This pressure distribution can then be used to generate an airfoil using an optimization method. The method works by using an arbitrary location for the airfoil points, calculating the pressure difference and then comparing it to the ideal pressure distribution. The process is iterated until the solution has reached convergence. The ultimate goal of the research is to develop a robust airfoil design methodology.

Cassandra Jones, Aerospace Engineering

Graduation: May 2016

Hometown: Kingman, Arizona

EFFICIENCY, ECONOMICS AND THE URBAN HEAT ISLAND

Mentor: Patrick Phelan, professor, School for Engineering of Matter, Transport and Energy

Research Themes: Energy and Sustainability

The efficiency and lifespan of refrigeration and power cycles suffer with rising temperatures induced by the Urban Heat Island (UHI) effect. During Phoenix summers with elevated ambient temperatures, efficiencies decrease and life spans of the exposed devices shorten. This impact was modeled by applying the first principles of thermodynamics to available data on relevant devices and systems. It is shown that a marginal UHI temperature increase of 1 degree Celsius decreases efficiency and lifespan on the order of 6 to 9 percent, with large and inhomogeneous economic costs. Further understanding of the costs of UHI would be beneficial, particularly in developing economies.

Gregory Jones, Mechanical Engineering

Graduation: May 2014

Hometown: Phoenix, Arizona

QUANTIFYING BAUSCHINGER EFFECT IN LIGHTWEIGHT MATERIALS

Mentor: Kiran Solanki, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

As industry develops more energy efficient structures demand increases for models with higher accuracy. Reversed loading effects at high strain rates have not been fully quantified at a depth necessary for this modeling. The researchers performed preliminary analysis to examine the feasibility of reversed loading for strain rates on the order of $10^3 s^{-1}$. To verify the analysis, the researchers modified the existing Split Hopkinson Pressure Bar (SHPB) for reversed loading. Results confirm the feasibility of reverse loading at high strain rates. This testing will be used to create a database for many materials, improving the quality of design.

Scott Jones, Electrical Engineering

Graduation: May 2014

Hometown: Tucson, Arizona

PHASE RECOVERY AND UNIMODULAR WAVEFORM DESIGN

Mentor: Douglas Cochran, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

It is possible, with high probability, to recover phase from magnitude only measurements. Two algorithms were compared on a basis of robustness in the presence of noise: alternating projections, iterative Fourier transformation of zero-padded measurements, and phase lifting, transforming quadratic measurements into linear convex optimization. Additionally, it was shown that in an operator radar model under a finite power constraint, phase only waveforms can be constructed to produce greater return than normalized eigenvectors, which are optimal when the only system constraint is finite energy.

Jason Kam, Electrical Engineering

Graduation: May 2015

Hometown: Chandler, Arizona

HIGH EFFICIENCY ELECTRONICS FOR SPACE APPLICATIONS

Mentor: Trevor Thornton, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

Radiation tolerant electronics have been developed so that complex electrical systems, such as satellites, can function in space. Thornton's research group develops radiation tolerant transistors, known as MESFETs that are fabricated at commercial semiconductor foundries. Once returned, the electrical characteristics of the devices are measured. Radiation measurements have been performed on the latest devices from IBM's 32-nanometer process. Future work includes commercializing the MESFET on the 180-nanometer process by making it low cost and more efficient.

Sanketh Kamath, Chemical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

BIOLOGICAL PHOTOLUMINESCENT NANOPARTICLES

Mentor: Zachary Holman, assistant professor, School of Electrical, Computer and Energy Engineering

Research Theme: Health

The purpose of this research is to use silicon nanoparticles that glow at infrared wavelengths to image cancerous tissue. Research underway is focused on synthesizing and characterizing the silicon nanoparticles. Training has been done on the Fourier transform infrared spectrometer, the UV-vis-NIRspectrophotometer, and LabView. Programs are currently being written to control the new instrument that will synthesize the nanoparticles. Future work will include characterizing silicon nanoparticles to determine optimal size for photoluminescence.

Ajay Karpur, Electrical Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

IDENTIFYING ELECTROPHYSIOLOGICAL BIOMARKERS OF GENE MODULATION IN THE ALZHEIMER'S DISEASE PATHWAY

Mentor: Jitendran Muthuswamy, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

Gene therapy experiments are typically evaluated using conventional protein measurements in cultures of neurons. Electrophysiology can be used instead as a real-time, non-invasive assessment. The objective of this project is to assess the electrophysiological impact of modulating the genes GAPDH and BACE1, which are implicated in the Alzheimer's disease pathway. Electrical signals were recorded from rat hippocampal neurons cultured on microelectrode devices. Continuous, 24-hour recordings of these extracellular signals were taken before and immediately after gene modulation. Analysis of these signals indicates a measured increase in activity relative to baseline levels for BACE1 and negligible change for GAPDH.

Morgan Kelley, Chemical Engineering

Graduation: May 2016

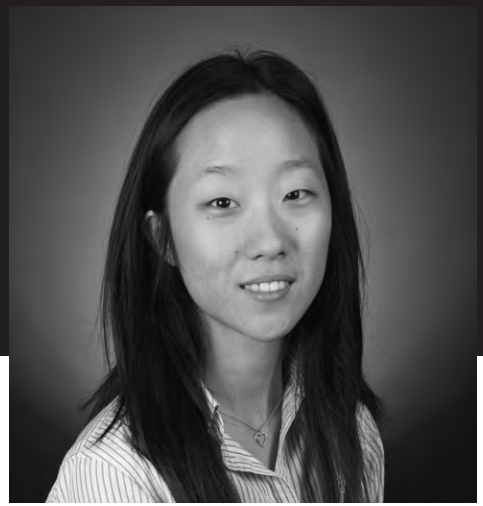
Hometown: Glendale, Arizona

ADSORPTION AND RELEASE OF ACTIVE SPECIES INTO AND FROM MULTIFUNCTIONAL IONIC MICROGEL PARTICLES

Mentor: Lenore L. Dai, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The objective of this research project is to utilize the intrinsic properties of microgels, or "smart" materials, to engineer oil-water interfaces and uptake harmful surfactants. Microgels have been synthesized and they possess either one or both positive and negative charges with the addition of different constituent copolymers. The microgels undergo size transitions in response to changes in pH and temperature that allow for controlled uptake and release of active species. This environmentally responsive system has potential to alleviate the hazardous effects of oil spills in the ocean by better engineering the oil-water interface.



Lilian Kim, Electrical Engineering

Graduation: May 2014

Hometown: La Palma, California

FEATURE SELECTION AND TIME-FREQUENCY PROCESSING OF BIOLOGICAL MICROARRAY DATA FOR CLASSIFYING DISEASES

Mentor: Antonia Papandreou-Suppappola, professor, School of Electrical, Computer and Energy Engineering

Research Themes: Health and Security

Immunosignature is a diagnostic medical tool that detects and identifies diseases. A large microarray of peptide sequences bind to antibodies in a blood sample associated with a disease. The overall data of peptide intensities, based on the strength of the bindings, is reduced and randomly sampled through an adaptive algorithm and grouped into clusters by an unidentified disease. Given a pre-existing algorithm, the approach is to integrate additional methods that can improve the classification of diseases. These methods are developed by utilizing signal processing techniques that takes into account of varying metrics and determining a threshold of intensity values.

Kody Klimes, Mechanical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

TRAVEL GRANT

ENHANCED EXTERNAL QUANTUM EFFICIENCY EMPLOYING ORGANIC ANODE INTERFACIAL LAYERS

Mentor: Jian Li, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

Research into the field of small molecular organic photovoltaics has experienced steady growth over the past decade. This growth can be attributed to the wide range of potential donor/acceptor materials available, the potential for low cost manufacturing and the possibility for high power conversion efficiencies.
This project demonstrates the simultaneous enhancement in fill factor, open circuit voltage and short circuit current in planer heterojunction devices of metal phthalocyanines and C60 through the introduction of organic anode interfacial layers. By utilizing such templating layers we achieved a VOC above 1.1V while maintaining a power conversion efficiency over 3.5 percent.

Jonathan Lai, Mechanical Engineering

Graduation: December 2014

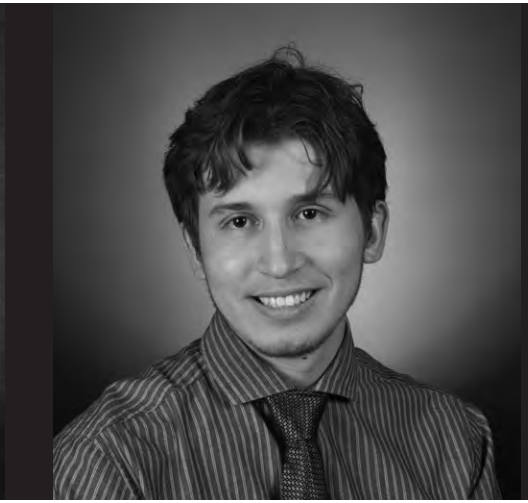
Hometown: Chandler, Arizona

EFFECT OF MICROSTRUCTURE ON TOUGHNESS OF 3D PRINTED SPECIMENS

Mentor: Jay Oswald, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

The researchers have exploited the flexibility of 3D printing to study connections between impact toughness and microstructure of polymer composites. Out of the nearly infinite microstructure geometries attainable by high-resolution 3D printing, candidate microstructures were created with solid modeling software and fabricated by a local vendor. These composite specimens were then compressed at high strain rate with a split Hopkinson pressure bar. The simulation results were compared with finite element analysis models to provide insight on which geometric features impart specimens with improved toughness. From these structure-property relations, optimized designs will be investigated in the final phase of the project.



Luis Laitano, Biomedical Engineering

Graduation: May 2014

Hometown: Tegucigalpa, Honduras

CHARACTERIZATION OF GELATIN-HYALURONIC ACID HYDROGELS FOR THREE-DIMENSIONAL GLIOMA CELL CULTURE AND ISOLATION

Mentor: Brent Vernon, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

Regarding brain cancer, the most frequent and deadly is Glioblastoma multiforme. In order to effectively test different treatments on these tumors, a 3D cell culture platform that mimics the cerebral extra-cellular matrix (ECM) can be devised through Hyaluronic Acid (HA) and Gelatin hydrogels. To find the most appropriate hydrogel strength to mimic cerebral ECM, different parameters such as concentrations and pH must be modulated, and the resulting hydrogels tested. The strength of the hydrogels increases as the concentration increases; these range from 5Pa to 15kPa. In the future, different treatments will be tested on tumor cells cultured in the hydrogels.

Alexandria Lam, Biomedical Engineering

Graduation: May 2016

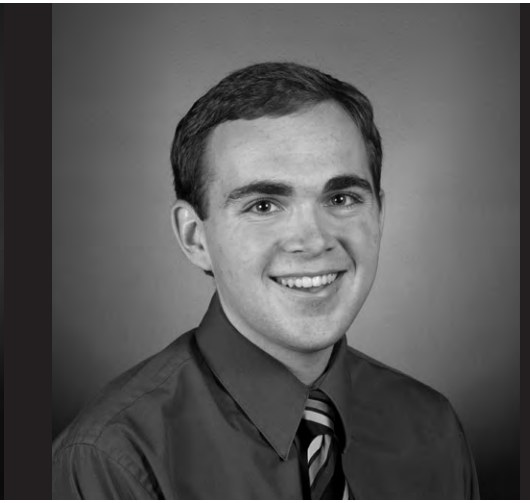
Hometown: Glendale, Arizona

ELECTROCHEMICAL ASSESSMENT OF GLUTAMATE AS A TARGET FOR BIOSENSOR DETECTION OF TRAUMATIC BRAIN INJURY

Mentor: Jeffrey La Belle, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

Glutamate is found in high levels within the brain following traumatic brain injury. A blood biosensor continuously monitoring glutamate concentrations would allow physicians to more rapidly and accurately assess the degree of the TBI. Previous work determined the optimal binding frequency between glutamate and glutamate oxidase at 117.20 Hz. Current work involves testing the sensor's reactivity with non-targets and ability to detect glutamate in the presence of interferents and whole blood. It was found that glutamate can be detected in the presence of glucose, albumin and epinephrine and addition to 25 percent whole blood at an R^2 value of 0.81.



Brett Larsen, Electrical Engineering

Graduation: May 2015

Hometown: Chandler, Arizona

TRAVEL GRANT

DEVELOPING A FLEXIBLE ELECTRIC FIELD IMAGING BLANKET FOR PERSONNEL DETECTION AND CLASSIFICATION

Mentor: David Allee, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

Electric field (E-field) sensors measure how much an object disturbs an electric field between a transmitter and receiver and have recently come of interest to the military for detecting individuals passing through a doorway. One of the main challenges in working with these sensors is that electric fields are ubiquitous in modern society. Thus, a lock-in amplifier was constructed to amplify signals in a very narrow band around the frequency of interest. Measurements were taken using a D-Dot sensor and sinusoidal signals at various amplitudes and frequencies; future work will focus on taking measurements using an array of sensors.

Ching Yan Lau, Chemical Engineering

Graduation: May 2015

Hometown: Hong Kong, China

CHARACTERIZATION OF THIN SUPPORTED ZIF-71/PDMS MEMBRANES FOR PERVAPORATIVE BIOFUEL RECOVERY

Mentor: Mary Laura Lind, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

Pervaporative biofuel recovery is a promising and sustainable alternative to burning fossil fuels, which has detrimental effects on the planet. Pervaporation is a membrane process driven by chemical activity that separates a solution through a semi-permeable membrane layer. This membrane layer is synthesized from polydimethylsiloxane (PDMS) which allows thermal stability and chemical inertness and Zeolite Imidazolate Framework nanocrystals (ZIF-71) which allows precisely defined pore structures suitable for biofuel separations. Future work includes testing different parameters to determine the critical constraints and further efficiently separate additional biofuels.

Long Le, Biomedical Engineering

Graduation: May 2014

Hometown: Saigon, Vietnam

IMAGE ANALYSIS OF GLIOBLASTOMA MULTIFORME INVASION INTO 3D HYDROGEL

Mentor: Brent Vernon, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

Glioblastoma multiform (GBM) is dangerous primary brain tumor due to invading cells that invade the local brain tissue. A Matlab program was developed to count GBM cells invading through layers of a brain-like 3D-hydrogel. Important factors such as cell numbers, cell area and distance away from primary tumor were quantified with this program. The results showed that the expression of the TROY protein was found to modulate the proliferation and 3D invasion of T98G GBM cells. This program is also being used to determine the shape of cells to gather information about how they move through the environment.

Chiao May Lee, Biomedical Engineering

Graduation: May 2015

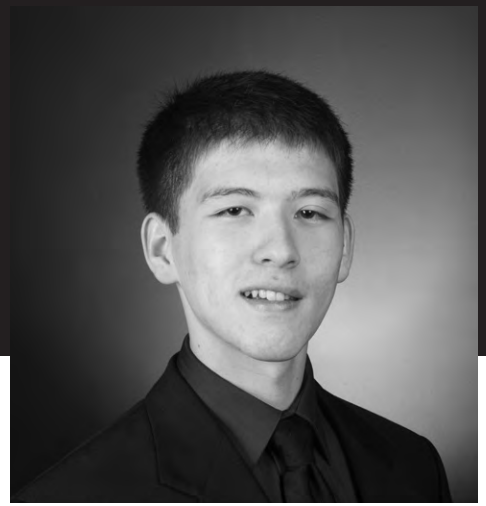
Hometown: Penang, Malaysia

DIETARY AND NUTRITIONAL TREATMENT STUDY FOR AUTISM

Mentor: Jim Adams, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

Autism, or autism spectrum disorder (ASD), is a general term for a developmental disorder characterized by varying degrees by difficulties in social interaction, communication and repetitive/stereotypical behaviors. The Pervasive Developmental Disability Behavior Inventory (PDD-BI) form was used to evaluate the patients' behavioral traits and data correlation analysis was performed based on age, gender and other factors. The role of dietary and nutritional treatments do have an impact in improving some symptoms of autism, especially on a behavioral aspect. Future work might include a more in-depth study of autism that will potentially find a more permanent treatment to autism.



Mathew Lee, Chemical Engineering

Graduation: May 2016

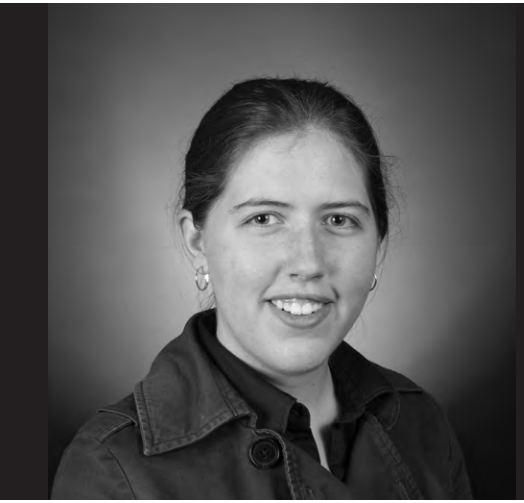
Hometown: Fountain Hills, Arizona

PASSIVATION OF SILICON USING NOVEL SPRAY PYROLYSIS OF ALUMINUM OXIDE

Mentor: Meng Tao, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

The objective behind this research is to utilize spray pyrolysis to increase the efficiency of solar cells. The first stage of research involves testing the method on soda lime glass for desired film quality and thickness. The second stage is aimed to investigate the film's effect on silicon. Thus far, aluminum oxide metal thin-films have been deposited onto glass substrate. It has been found that, however, the film quality is poor and the thickness is too large. After refining experimental parameters, it is expected that the method will produce consistent quality results so that deposition can be conducted on silicon.



Lydia Letham, Electrical Engineering

Graduation: May 2014

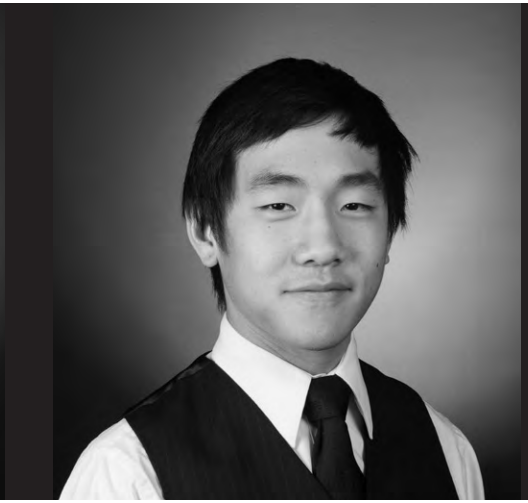
Hometown: Gilbert, Arizona

SIGNAL PROCESSING OF BIOLOGICAL MICROARRAY DATA FOR DISEASE DETECTION AND CLASSIFICATION

Mentor: Antonia Papandreou-Suppappola, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security, Health

The research project focuses on analyzing large biological data-sets such that disease can be identified from patient blood samples alone. Using signal processing techniques, diagnosis can be faster and more accurate than symptom-based methods. When blood is bonded to the peptides in a large micro-array, the type and intensity of that bond (features) indicates possible diseases. Thus far, the Bayesian algorithm we use clusters each unknown data-set according to its most distinctive features. The clusters can then be identified as containing a specific disease. Future work involves exploring new feature extraction methods which will allow greater accuracy in disease clustering.



Owen Ma, Electrical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

ELECTROENCEPHALOGRAPHY BASED CLASSIFICATION OF CREATIVE STATES

Mentor: Daniel Bliss, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Education

With hopes of learning how new ideas synthesize physiologically, this study attempts to classify human electroencephalography signals recorded while the subject was in a creative state. A better picture of the information can be constructed using independent component analysis, which transforms the observed random variables into statistically independendent sources. It allows for dimensional reduction and better feature extraction. Confident detection of two states based on spectral power was demonstrated by receiver operating characteristic curves.

Gabrielle Maestas, Biomedical Engineering

Graduation: May 2015

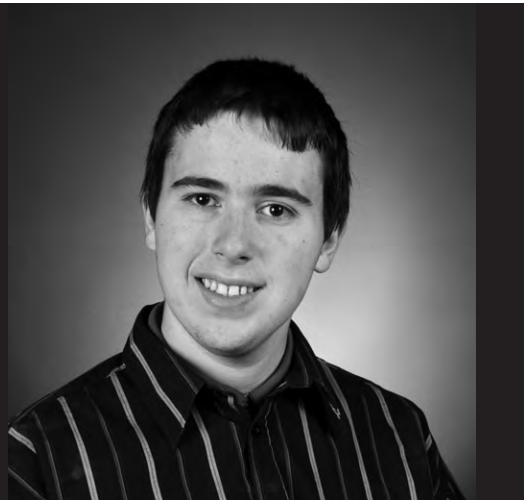
Hometown: Colorado Springs, Colorado

DIFFERENTIATING AMONG A HARDNESS SCALE GIVEN A TWO-FINGERED PINCHING MOTION

Mentor: Stephen Helms Tillery, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

The inspiration for this project is derived from the action of determining the ripeness of fruit, and how individuals perceive and differentiate hardness. Ultimately, it aims to explore the possibility of delivering these sensations to prosthetic devices. By analyzing an individual's approach to a hardness scale given a one-fingered pressing motion, subjects easily differentiated gelatin cubes that had a large change in hardness, but began guessing when gelatin cubes had a small change in hardness (as expected). Subjects will now be tested using a more natural two-fingered pinching motion with a haptic device, exploring a larger range in the hardness scale.



Elan Markov, Chemical Engineering

Graduation: May 2015

Hometown: Phoenix, Arizona

USING OPTIMIZATION TECHNIQUES IN PROBABILISTIC BASED METHODS FOR SUSTAINABLE ENGINEERING DESIGNS

Mentor: S.D. Rajan, professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

For many engineering problems, a better structural design can be created by using computer models in order to mathematically find the optimal solution to best suit a certain set of criteria. Here, these models will be created using techniques from the mathematical branches of optimization and probability. This will be used to create more accurate tools for solving such problems in the future and for creating more effective engine containment systems for commercial jets.

Grant Marshall, Computer Science

Graduation: May 2015

Hometown: Phoenix, Arizona

PREDICTING TRENDS ON TWITTER USING TIME SERIES AND SOCIAL NETWORK INFORMATION

Mentor: Huan Liu, professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Security

Predicting whether a particular topic will "trend" or not on Twitter is an interesting and relevant problem because of its applications in advertising and national security. In this work, trends were modeled as time series where in every time window, the count, change in count from the last point in time (delta), and change in delta are the features. The data were then classified using k-means, logistic and linear classifiers. Using these algorithms, unlabeled trends were able to be successfully classified. In future work, exploring other features could yield interesting results.

Sanya Mehta, Chemical Engineering

Graduation: May 2016

Hometown: San Jose, California

LEGIONELLA GROWTH, SURVIVAL AND TRANSPORT PHENOMENA IN RECLAIMED WATER THROUGH RECHARGE BASIN MEDIA

Mentor: Morteza Abbaszadegan, professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

Due to minimal understanding of Legionella, a waterborne pathogen, this research has undertaken a series of physiological experiments and column studies to examine the survival, growth and transport of L. pneumophila under groundwater recharge conditions. This investigation has been split into a laboratory scale column study and field research. The study was initiated to provide key information concerning potential transport to groundwater sources and possible exposure to this pathogen. The study demonstrated the growth and survival in reclaimed water, and transport of Legionella under recharge basin conditions, providing significant contributions that could be utilized for future engineered water reuse applications.

Sami Mian, Computer Systems Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

HARDWARE ACCELERATED LOW POWER VIDEO PROCESSING AND TRANSMISSION FOR REAL WORLD HUMAN SENSOR NETWORKS

Mentor: Martin Reisslein, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

This research involves the evaluation and improvement of wireless video sensor networks, utilizing hardware acceleration and open source video processing libraries to improve wireless video transfer between devices. This semester's work has been developing a network using the ZigBee network protocols and the GStreamer video processing library to stream video files from a server to an external client. Currently, this method seems to have the potential to integrate video elements into the Internet of Things ecosystem and to integrate video networks with traditional sensor networks. Future plans include utilizing other video processing libraries and testing server-side video capture/ streaming software.

Emilee Miller, Aeronautical Engineering, Aeronautics

Graduation: December 2014

Hometown: Tehachapi, California

CHAIN BRANCHING IN POLYMERS

Mentor: Jay Oswald, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

This project studies the effect that chain branching in polymers has on material stiffness; ultimately, this research will be used by the U.S. Navy in order to improve protection systems for soldiers to combat blast and ballistic threats. To study these effects, a python script is used to build representative branching polymer chains. These chains are then studied using an open source coarse-grain molecular dynamics simulation code, LAMMPS. These results are then compared to experimental data; it is expected that chain branching will increase the stiffness of the material. It is recommended that the U.S. Navy incorporates this research when designing protection systems for soldiers in order to ensure optimum safety.

Jennifer Mincieli, Mechanical Engineering

Graduation: May 2014

Hometown: Prescott, Arizona

CREATING A BIO-INSPIRED CONTROL FOR ROBOT HAND CATCHING AND GRASPING

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The focus of this research project is on grasping tasks with the goal of investigating, analyzing and quantifying human catching trends by way of a mathematical model. The model relates human catching trends to the kinematic characteristics of an object, which has been created and proved successful previously. The focus this semester was to estimate the effect of distance on the bio-inspired model. The various distances confirmed the shape of the mathematical model found and varied as expected.

Amanda Moore, Biomedical Engineering

Graduation: May 2015

Hometown: Gilbert, Arizona

ROBOTIC MICROELECTRODES FOR INTRACELLULAR RECORDING IN VIVO

Mentor: Jitendran Muthuswamy, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

The overall goal of this project is to create an automated process that performs intracellular recordings of single cells. Neurons from the abdominal ganglia of Aplysia were dissected and used for this experiment. Initially, extracellular recordings were collected from the ganglion, and eventually successful intracellular recordings were gathered. The effect on electrical recordings due to different drugs such as Magnesium Chloride, Glutamate and GABA were tested. Future work for this project involves automating the process of positioning a microelectrode inside a neuron.

Jeffery Morgan, Computer Science

Graduation: May 2014

Hometown: Phoenix, Arizona

A CROSS PLATFORM FRAMEWORK FOR SEGMENTED VIDEO RETRIEVAL AND PLAYBACK ACROSS WIRELESS SENSOR NETWORKS

Mentor: Martin Reisslein, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security and Health

The goal of this research is to develop and evaluate a video player for streamed video segments, which will be a critical component of a comprehensive project for the WVSNP Group. The web-based video player will function as a remote interface to the video surveillance network and will permit the remote monitoring of a wide range of critical infrastructure. Initially, in-depth research guided the design of the video player directing the implementation of key components. The final stages of research involved performing crucial multi-platform testing and necessary updates.

Anoosha Murella, Materials Science and Engineering

Graduation: May 2016

Hometown: Phoenix, Arizona

SOLUTION-SYNTHESIS AND CHARACTERIZATION OF ZNO NANOWIRES FOR MORE EFFECTIVE THIN-FILMS

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

Many researchers are looking towards ZnO as a possible material for cheap and effective solar panels. This semester, the goal was to improve the growth conditions for ZnO nanowires to decrease grain-boundaries and increase the efficiency of the resulting thin-film. Factors tested were stirring rate, run time, temperature and concentration. Conductivity measurements were then taken and the substrates characterized via Scanning Electron Microscopy (SEM). Future research will be focused toward converting the ZnO to ZnS and making a Schottky contact with gold.

Miranda Ngan, Chemical Engineering

Graduation: May 2015

Hometown: Chandler, Arizona

THE APPLICATION OF AN IONIC LIQUID ELECTROLYTE FOR SEISMOMETER DEVELOPMENT

Mentor: Lenore L. Dai, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The objective was to investigate ionic liquids (ILs) as novel electrolyte solvents to replace traditional water in a seismic sensor. ILs provide thermal stability, critical for space applications. Differential scanning calorimetry (DSC) was performed on samples of KI in water to determine the melting and crystallization temperatures. These temperatures were compared to the values from samples of KI in ethylammonium nitrate (EAN), an IL. The results show that the presence of EAN in the sample allowed for a wider range between the melting and crystallization temperatures. Future work includes the investigation of KI in a mixture of EAN and water.

Hoa Nguyen, Electrical Engineering

Graduation: May 2015

Hometown: Gilbert, Arizona

MICRO STRAIN SENSING ON THERMALLY INDUCED OPTICAL GRATING

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

This project focuses on using diffracted laser beam from the optical grating fabricated on silicon substrate to measure the amount of strain induced on the optical grating. In so far the method has proven to work with one-dimensional optical grating of uniform wavelength. We are able to setup a two-dimensional data acquisition scheme using CMOS camera and LabVIEW to map the strain contour of an optical grating with multiple domains of different wavelength. From the new setup, we are able to distinguish optical grating features as small as using laser spot size that is five to six times larger. The next step of the project is to thermally induce the substrate to generate different wavelength so comparison can be made with the known CTE of the substrate in order to verify the effectiveness of the method on multi-domain optical grating.

Jeffrey Nguyen, Chemical Engineering and Material Science Engineering

Graduation: May 2015

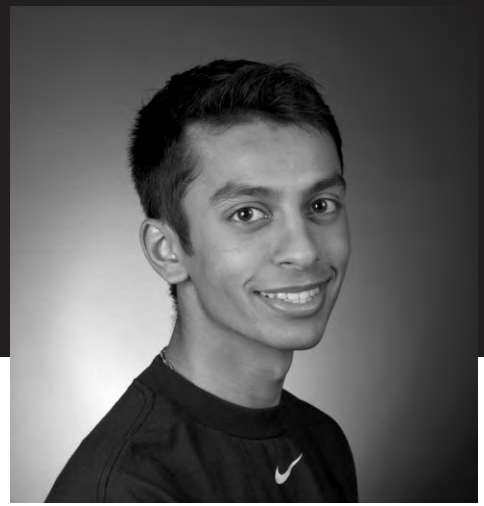
Hometown: Tempe, Arizona

IRON COMPOSITE CEMENT AND APPLICATIONS FOR SUSTAINABILITY

Mentor: Hamdallah Bearat, adjunct faculty, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

Iron powder is abundant industrial waste. It has potential to produce iron-based concrete that can replace current ordinary Portland cement (OPC), meanwhile reducing CO_2 emissions to which OPC is a main contributor. Preliminary physical iron composites have been formed and analyzed with X-Ray Diffraction whose results indicate effective chemical characteristics and thermal stability of iron carbonate cement product. Optimization of the carbonation reaction will be determined by manipulating different parameters (P_{CO2}, temperature, time, particle size) controlling the carbonation process. In addition to these parameters, various aggregates compositions and mechanical testing will determine a final product that yields sustainable applications.



Girish Pathageny, Biomedical Engineering

Graduation: May 2015

Hometown: Scottsdale, Arizona

IMPROVING PHYSIOLOGICAL VELOCITY WAVEFORM ACCURACY IN AN AORTIC FLOW PUMP SYSTEM

Mentor: David Frakes, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The main objective of this research is to improve upon the accuracy of replicating physiological velocity waveforms in a computer-controlled aortic flow pump system. A LabVIEW program was developed to convert cardiac waveforms from its accustomed voltage readings to position in order prevent drift or unconditional backflows. The program not only directs the piston motion of the pump but also provides information on theoretical and real-time values on acceleration, velocity and position of the piston. This in vitro representation of human blood flow elects as a potential evaluative model for assisting in complex diagnosis and treatments of cardiovascular diseases.

Richard Phan, Chemical Engineering

Graduation: May 2016

Hometown: Peoria, Arizona

SQUEEZING OUT ELECTRICITY: COMPUTER-AIDED DESIGN AND OPTIMIZATION OF ELECTRODES OF SOLID OXIDE FUEL CELLS

Mentor: Yang Jiao, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The implementation of multi-scale physics-based computer simulations was used to generate virtual 3D microstructure models of the composite electrode of solid oxide fuel cells from 2D micrographs. Key structural information in forms of correlation functions are extracted from the available 2D micrographs and an inverse optimization method has been employed to evolve a random microstructure to one possessing the specified structural features. Subsequent analysis will be performed on the reconstructed virtual material to obtain the effective properties and performance of the electrode.

Shih-Ling Phuong, Mechanical Engineering

Graduation: May 2014

Hometown: Goodyear, Arizona

STATISTICALLY BASED REGISTRATION IN SENSOR NETWORKS

Mentor: Douglas Cochran, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

In recent years, networked systems have become prevalent in communications, computing, sensing and many other areas. In a network composed of spatially distributed agents, network-wide synchronization about the physical environment and the network configuration must be maintained using information collected locally by the agents. This poses numerous challenges, particularly due to availability of direct communication only between neighboring agents. These are exacerbated by uncertainty in the measurements imperfect communication links. This research explored statistically based registration in a sensor network. The approach developed takes into account that the true offsets around any closed cycle must sum to zero.

Alexandra Porter, Computer Science

Graduation: May 2017

Hometown: Albuquerque, New Mexico

PERSONAL VISUALIZATION FOR DIETARY ANALYSIS

Mentor: Ross Maciejewski, assistant professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

Obesity is becoming a critical issue, but presenting people with individualized nutritional information can give them the necessary tools and encouragement to make healthier choices. The application created in this project makes an approximation of a user's most probable diet based on statistics for their inputted information, such as height, weight and gender. The interface allows them to adjust this estimate, compare themselves to others in their demographic, and compare their consumption to an ideal diet. Extending the application to track a user's progress over time and present specific recommendations will make it an even more effective educational tool.

Noelle Rabiah, Chemical Engineering

Graduation: May 2014

Hometown: Scottsdale, Arizona

PROPERTIES AND SYNTHESIS OF ASYMMETRIC POLYSTYRENE/PNIPAM-GOLD COMPOSITE PARTICLES

Mentor: Lenore L. Dai, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

Asymmetric particles are particles that contain an irregularity which prevents them from having uniform characteristics across their surface. Due to their irregularity, these particles have interesting applications, such as the self-assembly of advanced materials, catalysis, stabilization of emulsions and several others. This research project focuses on the synthesis of asymmetric particles that contain a "smart" polystyrene/PNIPAM core which allows the particles to change in size with temperature variance. The particles are organic-inorganic hybrid with a single gold nanoparticle serving as the irregularity on the particle, formed via one-step Pickering emulsion polymerization.

Kitt Roney, Mechanical Engineering

Graduation: May 2016

Hometown: Scottsdale, Arizona

DEVELOPING A LOW ENERGY PHOTOBIOREACTOR SYSTEM USING SHAPE MEMORY ALLOY MOTORS

Mentor: David Nielsen, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

While algae-derived lipids are a promising biofuel, their production requires the supply of ample light and carbon dioxide. Mixing aids in their delivery, but is energy intensive. As a lower energy alternative, a new photobioreactor will be developed using shape memory alloy motors to provide mixing while using very little energy. This is a small scale model to prove that these motors can handle the loading. It is also being used to analyze how closely an ideal wave can be mimicked.

Julie Rorrer, Chemical Engineering

Graduation: May 2014

Hometown: Corvallis, Oregon

INVESTIGATION OF PHOTOCATALYTIC PROPERTIES OF AMORPHOUS SODIUM TANTALUM OXIDE

Mentor: Candace Chan, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The focus of this project was to investigate the water splitting capabilities of sodium tantalum oxide and to investigate the effects of particle morphology on photocatalytic activity. Sodium tantalum oxide is of interest because of its stability and catalytic activity for water splitting, especially in the ultra-violet range. Amorphous and crystalline sodium tantalum oxide nanoparticles were formed using a hydrothermal synthesis. The structures were characterized with X-Ray Diffraction (XRD), RAMAN Spectroscopy and FTIR. The photocatalytic activity was characterized using Methylene Blue and Methyl Viologen assays. Future work involves further characterization and optimization of the photocatalytic materials.

Michael Rozowski, Chemical Engineering and Chemistry

Graduation: May 2015

Hometown: Glendale, Arizona

SYNTHESIS AND CHARACTERIZATION OF PDMS/ZIF-71 MMMS FOR PERVAPORATION OF DILUTE 1-BUTANOL/WATER SOLUTIONS

Mentor: Mary Laura Lind, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The effect of zeolitic-imidazolate framework-71 (ZIF-71) mass fraction in a supported poly(dimethylsiloxane) (PDMS) thin film on the membrane's capability to separate 1-butanol from dilute aqueous solutions via pervaporation was investigated. Using a modified dip coating procedure, ZIF-71/PDMS mixed-matrix membranes were synthesized and characterized via ATR-FT-IR for functionality of the thin film material, and then performance testing was conducted in a custom batch pervaporation system. It was found that selectivities toward 1-butanol increase as the mass fraction of the filler material increases, but these values do not reflect the magnitude of selectivities represented by similar materials in the literature. More tests will be performed to improve synthesis technique.

Kailey Rumbo, Biomedical Engineering

Graduation: May 2014

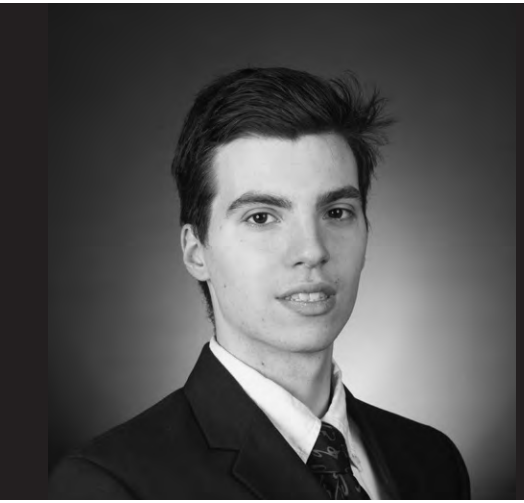
Hometown: Phoenix, Arizona

UTILIZATION OF NANOPARTICLES FOR IDENTIFYING FIBRIN DEPOSITION IN NEURAL TISSUE

Mentor: Sarah Stabenfeldt, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The main objective of this research is to develop and characterize a targeted contrast agent that will recognize acute neural injury pathology (i.e. fibrin) after traumatic brain injury (TBI). Single chain fragment variable antibodies (scFv) that bind specifically to fibrin have been produced and purified. DSPE-PEG micelles have been produced and the scFv has been conjugated to the surface of the micelles; this nanoparticle system will be used to overcome limitations in diagnosing TBI. The binding and imaging properties will be analyzed in the future to determine functionality of the nanoparticle system in vivo.



Francesco Ruta, Civil Engineering

Graduation: May 2015

Hometown: Bari, Italy

ADSORPTION OF VARIOUS INORGANIC CONTAMINANTS WITH SYNTHETIC FAU ZEOLITE FILTERS

Mentor: Narayanan Neithalath, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

Three different types of FAU-type zeolite, labeled X, P and S were synthesized for adsorption studies. Each was made from solution of various proportions of NaOH, NaCl and coal fly ash heated for 24 hours at various temperatures. The samples were submitted to FTIR and TGA testing for material characterization. After having confirmed that the samples were zeolite, large quantities of the X and S varieties were produced and then observed under a scanning electron microscope (SEM). Pore structures were studied to predict ion exchange phenomena. The next step will be to select a contaminant using the SEM results.

Jessica Schiltz, Biomedical Engineering

Graduation: May 2015

Hometown: Scottsdale, Arizona

EFFECTS OF UNILATERAL VERSUS BILATERAL NIGROSTRIATAL DOPAMINE DEPLETION WHEN MODELING PARKINSON'S DISEASE

Mentor: Jeffrey Kleim, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

The exact pathology underlying the impairments associated with Parkinson's Disease (PD) is still not fully understood. This study examines whether the current model of PD, chemical inducing disruption of the brainstem's dopaminergic system in one hemisphere, best represents the physiological progression of Parkinson's. The Parkinson's-like-symptoms observed prior and following both unilateral and bilateral treatments exhibited different patterns of behavioral impairments. Immunohistochemistry performed on sections of brain tissue quantified the extent of dopamine depletion and intracortical mapping (ICM) showed loss of motor maps in all animals.

John Schrilla, Chemical Engineering

Graduation: May 2015

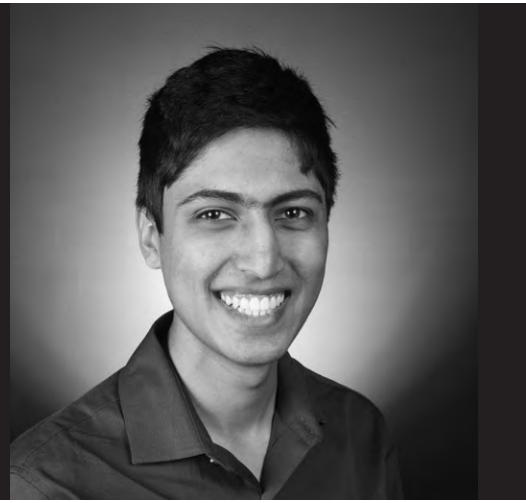
Hometown: Geneva, Illinois

ELECTROCHEMICAL PROPERTIES OF JAROSITE-BASED MATERIALS

Mentor: Candace Chan, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The electrochemical performance of lithium-ion batteries is currently limited by a lack of high capacity cathode materials. Jarosite $[KFE^{3+}_3(OH)_6(SO_4)_2]$ and its analogues have potential for high lithium insertion and diffusion and are therefore promising for this application. This research project investigates the potential of jarosite-based materials as cathodes through synthesis and electrochemical testing. Initial testing identified sodium-based vanadium analogue as the highest capacity variant, and its performance has been improved through alternate synthesis techniques which decrease its particle size. Future research will focus on further increasing the observed capacity of jarosite to match currently used cathode materials.



Sumbhav Sethia, Computer Science

Graduation: May 2016

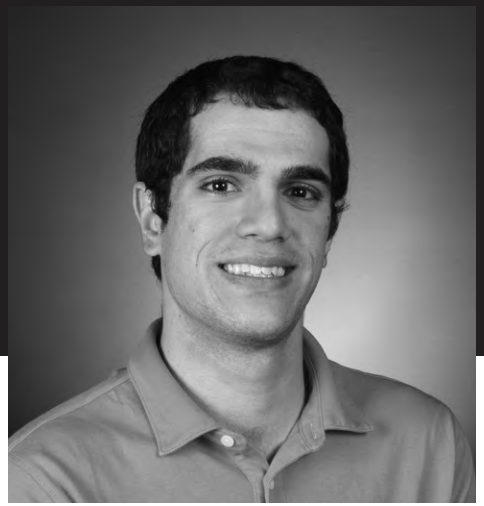
Hometown: Chandler, Arizona

TEACH ME HOW TO WORK: NATURAL LANGUAGE MODEL UPDATES AND ACTION SEQUENCING

Mentor: Subbarao Kambhampati, professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Health

The objective of this research is to use human speech to extend the list of actions a robot can use to execute a plan. An algorithm was written to process human speech dictating the high level planner action and add it to the planner. Another algorithm was written to create the physical implementation of the high level action. After testing the algorithms, it was determined that though the algorithms worked, limitations in the robot's speech processing caused dictation to take too long. An Android application will be developed in the future to handle dictation using Google's speech processing systems.



Andrew Shabilla, Chemical Engineering

Graduation: May 2014

Hometown: Scottsdale, Arizona

MODEL MEMBRANE SYSTEM TO DETERMINE WATER PERMEABILITY OF LTA ZEOLITES

Mentor: Mary Laura Lind, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

Nanocomposite membranes hold promise in decreasing the costs associated with reverse osmosis purification of water through increased life and higher water flux. LTA zeolites have often been used in these membranes. However, a value for the water permeability of LTA zeolites has not yet been determined. This value is needed to establish a theoretical upper bound of permeability for nanocomposite reverse osmosis membranes utilizing zeolites. A model membrane system has been created which allows for the direct measurement of water flow through these zeolites. Collected data do not show clear trends. More work must be done.

Ankush Sharma, Chemical Engineering

Graduation: May 2016

Hometown: Chandler, Arizona

EARLY DIAGNOSIS OF ALZHEIMER'S DISEASE: UTILIZATION OF MOLECULAR CLONING TO CORRECT A FAULTY ANTIBODY GENE REGION AND TO OPTIMIZE SINGLE CHAIN VARIABLE FRAGMENT YIELD AND FUNCTIONALITY

Mentor: Michael Sierks, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The objective of this research is to increase the output and performance of an antibody that has been linked to Alzheimer's disease using molecular cloning techniques. Currently, the DNA vector correlating to the antibody has been cut from its donor plasmid via restriction enzymes, but has not successfully been ligated to its host vector. Upon, ligation of the two fragments, the resultant antibody will be harvested and tested in comparison to its predecessor. The DNA sequence for the antibody will be further modified or kept the same depending on if the improvement was of significance or not.

Warren Shearman, Chemical Engineering

Graduation: May 2015

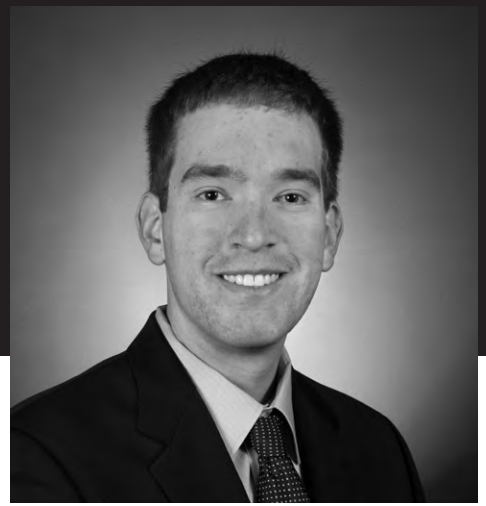
Hometown: Tucson, Arizona

WASTEWATER TREATMENT USING MICROBIAL FUEL CELLS WITH PEROXIDE FORMATION

Mentor: Cesar Torres, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The breakdown of solids in wastewater is called hydrolysis and may be the rate limiting step of the wastewater treatment process. The microbial fuel cells used have the capability to produce hydrogen peroxide which can potentially be used to speed up the hydrolysis process. Tests have been conducted on wastewater with hydrogen peroxide to determine if it speeds up the process. The tests indicate that it does not dramatically change the speed of the process, however a microbial fuel cell will be constructed and hydrogen peroxide treated wastewater will be used to determine the positive effects of this method.



Brad Shoemaker, Mechanical Engineering

Graduation: May 2014

Hometown: Gilbert, Arizona

MODELING OF ENGINEERED SHOCK ABSORBING MATERIALS

Mentor: Jay Oswald, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

The main field of study research through this project is to study the effect of history of deformation in materials subjected to complex loading, useful for producing lightweight alloys and composites optimized for absorbing shock and impact. This is accomplished by creating a digital model of a system in which the material undergoes tension and compression through colliding bars. The results show that the system generated is accurate when compared to real tests, so the program used to create the model can be used in the future for simulated tests using different materials or applied loads.

Victoria Smith, Biomedical Engineering

Graduation: May 2014

Hometown: Scottsdale, Arizona

ELECTROCHEMICAL DETECTION OF ESTRADIOL FOR THE DEVELOPMENT OF A FERTILITY SENSOR

Mentor: Jeffrey La Belle, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

Using gold disk electrodes and electrochemical impedance spectroscopy the optimal binding frequency of estradiol and anti--estradiol was determined to be 37.46Hz. At this frequency a logarithmic relationship between concentration and impedance were established creating a concentration calibration curve with a slope of 211 ohm/ln(pg/mL), an R^2 value of 0.986 and a lower limit of detection of 742 fg/mL. The specificity and cross-reactivity of the antibody with other hormones were tested through interferent and non-target experiments. The results of these tests allow for the possibility of using anti--estradiol and-estradiol for detecting multiple fertility biomarkers on a single sensor.

Cole Snider, Mechanical Engineering

Graduation: May 2015

Hometown: Richland, Washington

EFFECT OF SPUTTERING CONDITIONS ON THE MICROSTRUCTURE OF NANOCRYSTALLINE METAL AND ALLOY FILMS

Mentor: Jagannathan Rajagopalan, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Sustainability

This research aims to understand how the grain size, distribution and orientation of alloy films vary with different sputtering parameters. TiAl films were synthesized using sputtering and the microstructure of the films was characterized using an X-ray Diffraction machine. The data was analyzed and used to explain how various sputtering parameters affect the microstructure. It was established that if a single crystal substrate is used the orientation of the grains differs greatly from a substrate that is amorphous. In the future, films will be synthesized with different sputtering parameters, including temperature and rate of the sputtering.

Allison Snodgrass, Chemical Engineering

Graduation: May 2015

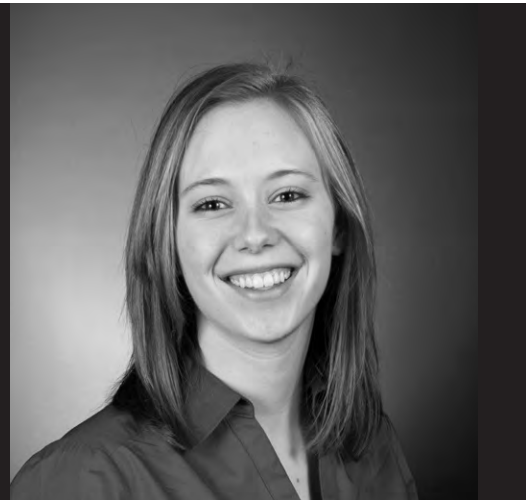
Hometown: Peoria, Arizona

MODIFICATION OF THE ALGAE-BASED BIODIESEL GROWTH PROCESS

Mentor: Cesar Torres, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The purpose of this project is to improve the efficiency of algae growth to produce triacylglycerols (TAGs), which are removed from algae for use in biodiesel production. The algae grow as biofilms on plates that have been modified throughout the semester to fix their transport and drainage limitations. Additionally, it was learned that transport limitations prevent the algae at the end of the plate from receiving proper nutrition. Therefore, the medium, which provides nutrients to the algae, was also modified. Future work will be done to grow even biofilms consistently at high rates.



Amanda Snodgrass, Chemical Engineering

Graduation: May 2014

Hometown: Peoria, Arizona

STEREOTYPES IN ELEMENTARY SCHOOL STUDENTS: DO THEY EXIST, AND CAN THEY BE MODIFIED?

Mentor: Martin Reisslein, professor, School of Electrical, Computer and Energy Engineering

Research Theme: Education

This research project focused on engineering stereotypes in third through fifth grade students. A six-week afterschool program at a local elementary school was established and evaluated. In the outreach program, 24 students engaged in hands-on activities that use basic electrical engineering. Analysis of the quantitative survey data is ongoing. Open-ended feedback indicated mixed understanding levels of the term “engineering.” This is currently being investigated in a follow-up study with K-5 students.

Lena Snyder, Biomedical Engineering, Mathematics

Graduation: May 2014

Hometown: Sierra Vista, Arizona

MODELING GLIOBLASTOMA MULTIFORME IN MICE

Mentor: David Frakes, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

Glioblastoma Multiforme is an aggressive and deadly form of brain cancer with a median survival time of about one year. Treatment planning is often difficult due to the unique growth of each tumor. To address this problem a computational model is being formed that will predict tumor growth based on initial growth location and patient specific images. Preliminary work with animal trials has shown promising results in terms of model accuracy and potential for future human use.

Gregory Spell, Electrical Engineering

Graduation: May 2015

Hometown: Tucson, Arizona

FOVEAL SENSING AND ESTIMATION

Mentor: Douglas Cochran, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Security

This research project is an investigation of the estimations that may be used in optimizing an image sensor that has a small region of high acuity (the foveal region) surrounded by a periphery of lesser acuity. This semester's efforts have involved examining a method (the Kalman filter) that combines predictions of a target's position with measurements of the position to produce new predictions. The Kalman filter is designed for linear systems, but the foveal sensor does not have a linear output map. Approximating the output map as linear has established a baseline for future investigations into the problem. The next step in the work is to observe the use of the Kalman filter when the foveal region is mobile.

Daniel Stehlik, Chemical Engineering

Graduation: May 2014

Hometown: McLean, Virginia

GRAPHENE NANOCOMPOSITES FOR THERMALLY SAFE LITHIUM-ION BATTERIES

Mentor: Candace Chan, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The project objective is to optimize internal heat transfer in lithium-ion batteries by utilizing nanocomposite materials. Graphene was used a conducting additive with high-performance cathode materials and thermal conductivity was compared to standard graphite conducting additives. In situ synthesis of graphene/nanocomposites was also performed. Thermal conductivity and electrochemical performance were compared between the nanocomposites and industry standard materials. Testing is still in progress, and further work will focus on optimization of the nanocomposites and thermal testing methodology development.

Giresse Tchegho, Chemical Engineering

Graduation: May 2015

Hometown: Yaoundé, Cameroon

PRESENTATION OF THE MOST INTERACTING RESIDUES METHOD AS A TOOL

Mentor: Zoé Lacroix, associate research professor, School of Electrical Computer and Energy Engineering

Research Theme: Health

Previous works on the Most Interacting Residues method have significantly had several publications by many scientist and scholars across the globe. Unfortunately none of the publications have presented the MIR algorithm as a method and tool that could actually be used by the general scientific public. Present work focuses on developing and improving the method in order to potentially be the first to present it as a stand alone algorithm tool instead of presenting the results of a research that was obtained through the MIR method as it has been seen in several publications. MATLAB algorithm of the method is also being fixed and will potentially be a contribution.

Claire Tilton, Civil (Environmental) Engineering

Graduation: December 2015

Hometown: Tempe, Arizona

AN EMPIRICAL ASSESSMENT OF LEED VERSUS NON-LEED ENERGY CONSUMPTION FOR THE ASU CAMPUS

Mentor: Mounir El Asmar, assistant professor, School of Sustainable Engineering and the Built Environment

Research Theme: Energy and Sustainability

The Leadership in Energy and Environmental Design (LEED) rating system intends to recognize buildings that are designed to "save energy, use fewer resources and reduce pollution." This study tests whether LEED buildings are actually saving energy throughout their life by measuring the energy consumption of LEED-certified buildings against that of non-LEED counterparts. Energy performance was calculated by collecting heating, cooling and electricity data from all metered buildings on the ASU Tempe campus. Preliminary results show LEED-certified residential buildings consume less energy compared to non-LEED buildings, LEED-certified research buildings use more energy, while LEED office buildings display no major differences. These preliminary results are currently being analyzed statistically and will constitute a performance indicator to help improve the LEED rating system.

Jason Trevithick, Chemical Engineering

Graduation: May 2014

Hometown: Lake Havasu City, Arizona

PHASE CHANGE NANOCOMPOSITES FOR THERMAL ENERGY STORAGE

Mentor: Robert Wang, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The primary objective of this research project is to synthesize and characterize phase change nanocomposites for thermal energy storage and to tune the amount of stored heat by changing the diameter and volume fraction of the metallic nanoparticles embedded into the composites. This technology could be applied to solar thermal systems and buildings thermal management. Colloidal synthesis of bismuth and indium nanocrystals has taken place and gave high monodispersity with diameters ranging from 12 – 16 nm. The particles will then be embedded into polyimide resin for latent heat measurements. Future experiments could investigate alloyed particles for thermal storage.

Shannon Tweedley, Civil Engineering

Graduation: May 2014

Hometown: Phoenix, Arizona

UNDERSTANDING THE INFLUENCE OF FLY ASH AND ACTIVATOR CHEMISTRY ON GEOPOLYMERIZATION KINETICS AND PROPERTY DEVELOPMENT

Mentor: Narayanan Neithalath, associate professor, School of Sustainable Engineering and the Built Environment

Research Theme: Sustainability

It is the intent of this research to determine the feasibility of utilizing industrial byproducts in cementitious systems in lieu of Portland Cement to reduce global CO_2 emissions. Class F Fly Ash derived from industrial coal combustion was selected as the replacement material for this study. Sodium, sulfate and calcium oxide were used as activators. In the presence of sulfate, added calcium increased reactivity and compressive strength at early ages, particularly at elevated temperatures. It is believed that sulfate and calcium react with alumina from fly ash to form ettringite, while heat overcomes the activation energy barrier for fly ash.

Arda Unal, Computer Science

Graduation: May 2015

Hometown: Ankara, Turkey

E-SDMS: ENERGY SIMULATION DATA MANAGEMENT SYSTEM SOFTWARE

Mentor: Kasim Candan, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Energy

The overarching goal of the project is to support efficient and effective energy simulations to impact sustainable building designs. This research develops highly parallelizable data processing algorithms to extract features from large energy simulation data sets to enable scalable search and analysis over these data sets. Building on the robust multi-variate temporal (RMT) features (which extend 2D SIFT features to multi-variate time series), in this work applicabilities of 2D GLOH, SURF and Gist features to multi-variate temporal feature extraction domain have been investigated. The future work will include evaluation of the efficiency and effectiveness of alternative features using energy simulation data sets.

Xavier Vargas, Mechanical Engineering

Graduation: May 2014

Hometown: Mesa, Arizona

ROBUST ACCURATE LIMB POSITION TRACKING SYSTEM

Mentor: Panagiotis Artemiadis, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

The Microsoft Kinect system provides a variety of benefits over traditional motion tracking systems, however the results it provides as a single device are too inaccurate for limb tracking in sensitive systems. Through use of an Advanced NDI 3D Infrared Camera System and Kalman filter training a model of human limb motion was created to correct for noise in the Kinects tracking. This creates a software extension to the Kinect that improves its accuracy and ensures data robustness. The methodologies explored will allow enhanced development of systems for human orientated control of robotics aimed at co-operative tasks, prosthetics and rehabilitation.

Johnathan Vo, Mechanical Engineering (Computational Mechanics)

Graduation: December 2014

Hometown: Scottsdale, Arizona

FINITE ELEMENT ANALYSIS OF SHOCK-INDUCED DAMAGE IN METALLIC MATERIALS

Mentor: Pedro Peralta, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

Understanding damage evolution, particularly as it relates to local nucleation and growth kinetics of spall failure in metallic materials, is critical to national security. This work uses computational modeling to elucidate what characteristics have the highest impact on damage localization in the microstructure. So far, simulations have shown differences in void growth and nucleation rates between the boundary and the bulk of a bicrystal with high property mismatch across the interface, suggesting that the void nucleation may be the dominant characteristic. Further work in recalibrating the simulation parameters and model different bicrystals orientations must be done to verify these results.

Sandeep Vora, Electrical Engineering

Graduation: December 2014

Hometown: Albuquerque, New Mexico

ONCHIP INDUCTORS WITH FERRO-MAGNETIC MATERIAL

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

Miniaturization and energy saving in electronics devices require research into ways to create smaller inductors with a higher inductance and a higher ratio of stored energy to energy lost (Quality-Factor). Completed the effect of various material property changes on the quality factor and inductance values and changed permittivity and permeability of magnetic material along with distance to see higher quality factors occurred from changing permeability of dielectric without having any magnetic material. Next task is to attempt to cancel flux through magnetic material caused by inductor by placing current line above.

Alex Walsh, Biomedical Engineering

Graduation: May 2014

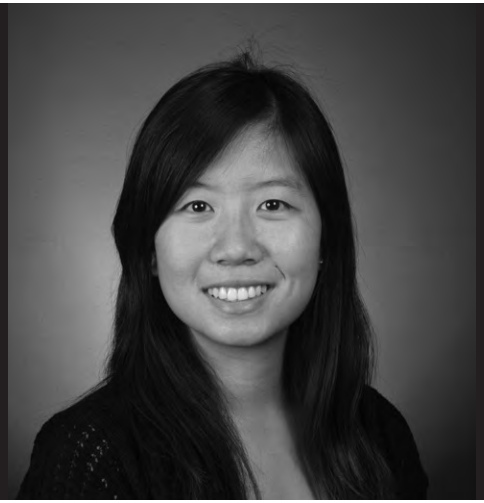
Hometown: Chandler, Arizona

THE EVALUATION OF DIFFERENT FOAMS AND THERMOPLASTICS TO DEVELOP A BIOFIDELIC CPR MANIKIN

Mentor: Jeffrey La Belle, assistant professor, School of Biological and Health Systems Engineering

Research Theme: Health

The aim of this project is to evaluate the biofidelity of cardio-pulmonary resuscitation (CPR) training manikins in terms of their physical response during chest compressions and develop an improved design that better mimics a human body response. The properties of several types of foam and thermoplastic, including force deflection and compression set, are being tested to determine which material effectively characterizes a human torso. Future work will be the construction of a physical prototype of the manikin that incorporates the best material and an artificial, casted rib cage.



Zixuan Wang, Chemical Engineering

Graduation: May 2016

Hometown: Flagstaff, Arizona

PHOTOCATALYTIC REDUCTION OF CO_2 TO FUEL USING A NOVEL I-TiO_2 BASED CATALYST

Mentor: Jean Andino, associate professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy and Sustainability

The scope of this project entails converting CO_2 into valuable compounds that can be used to create useful fuels and materials such as methane (CH_4) and carbon monoxide (CO). Synthesis of the I-TiO_2 and GO (graphite oxide) were completed in this study; then the two were mixed at different ratios and the resulting mixture was reduced in order to create the novel catalyst. X-ray diffraction (XRD) was also used to characterize structure of the material. The products formed from UV irradiation were identified by using DRIFTS. Different factors will be applied for future comparative experiments.

Jason Wickham, Chemical Engineering

Graduation: May 2016

Hometown: Boise, Idaho

POLY (IONIC LIQUIDS) AS NOVEL DISPERSANTS AND PROPERTY ENHANCERS IN POLYMER COMPOSITES

Mentor: Lenore L. Dai, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Energy

The objective of this research project is to synthesize ionic liquid polymers with an electrically conductive backbone, exchange the anion in order to vary the polymers' properties, and disperse carbon nanotubes. The first chemical portion of the ionic liquid has been synthesized. This component will be used to create the ionic liquid and then polymerized. Experience gained from synthesis of the first chemical portion will be invaluable for the future creation of more ionic liquid. Future work will include exchanging the anion on the poly (ionic liquid), dispersing the carbon nanotubes, and performing the various electrical, mechanical and thermal tests.

Daniel Wilson, Mechanical Engineering

Graduation: December 2014

Hometown: Brea, California

INVESTIGATION OF THERMODYNAMIC PRESSURE IN COARSE-GRAINED MOLECULAR DYNAMICS

Mentor: Jay Oswald, assistant professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

The objective of this research is to better understand the differences in thermodynamic pressures computed in fully atomistic and coarse-grained molecular systems. This is done through a series of molecular dynamics simulations using simple one-dimensional. The simulations will be created with both fully atomistic and coarse-grained properties. Through a comparison of the simulations, the research hopes to gain a better understanding of how coarse-grained models react to different pressures in comparison to fully atomistic models.

Louis Wilson, Computer Science

Graduation: May 2014

Hometown: Madison, Wisconsin

CONDITIONAL EXPECTATION ALGORITHMS FOR MATRICES

Mentor: Charles Colbourn, professor, School of Computing, Informatics, and Decision Systems Engineering

Research Theme: Security

Covering arrays, matrices where every set of columns includes every combination of symbols, are useful in computer, network and communications security. Current techniques for creating them generate rows at random. Past research has found ways of generating related rows from a small number of concretely stored rows. Approaches were investigated for further reducing storage requirements and boosting dissimilarity between rows. Future research entails finding more efficient methods and reducing randomness.

Kevin Winarta, Biomedical Engineering

Graduation: May 2015

Hometown: Scottsdale, Arizona

CALIBRATION AND VERIFICATION OF A PULSATILE PISTON-PUMP FOR AORTIC FLOW SIMULATION IN A PARTICLE IMAGE VELOCIMETRY SYSTEM

Mentor: Ronald Adrian, Regents' Professor, School for Engineering of Matter, Transport and Energy

Research Theme: Health

Simulation of natural fluid flow within the aortic system requires precise movement from a pump to recreate waveforms accurate enough for analysis. Through the conversion of an existing piston-driven pump from a velocity waveform input response system to a position input along with response rate, accuracy of cardiac flow replication increases, while a more bounded linear system is created. Data collected supports linearity with a Pearson correlation coefficient between 0.985-1.000, denoting a more controlled and accurate system. Through the accurate simulation of fluid flow created by the system, a critical diagnostic tool will be available to explore intricate cardiovascular diseases.

Christopher Wong, Materials Science and Engineering

Graduation: May 2016

Hometown: Tempe, Arizona

THE CHARACTERIZATION OF DIFFERENT MATERIALS THROUGH X-RAY SYNCHROTRON TOMOGRAPHY

Mentor: Nikhilesh Chawla, professor, School for Engineering of Matter, Transport and Energy

Research Theme: Security

It is vital to understand how radome materials behave at elevated temperatures because of their use in missile applications. The objective of this research is to study the microstructure of different radome materials using x-ray synchrotron tomography, a technique used to nondestructively characterize materials at high temperatures. Data from three different radome materials have been collected and a computer program that analyzes image slices obtained from the tomography is in the works. Future work includes the completion of the program and the reconstruction of different samples' microstructure through the combination of analyzed image segments.

Christopher Workman, Biomedical Engineering, Biochemistry

Graduation: May 2014

Hometown: Kingman, Arizona

HEMODYNAMIC PROFILING OF ENDOVASCULAR EMBOLIZATION POLYMER TREATMENT OF CEREBRAL ANEURYSMS

Mentor: Brent Vernon, associate professor, School of Biological and Health Systems Engineering

Research Theme: Health

Cerebral aneurysms, sac-like lesions in cerebrovasculature, can rupture to cause subarachnoid hemorrhaging. These lesions that cause over 14,000 deaths annually in the United States are treated unsuccessfully up to 50 percent of the time. One factor attributed to the low success rate is the low occlusion provided by metal coiling. Liquid-to-solid gelling polymer embolization has been proposed for more complete occlusion. The purpose of this study is to characterize the effect of polymer embolization on hemodynamics in an aneurysm. This task is achieved by deploying a polymer into a polyurethane aneurysm model to sense changes in pressure transduction under pulsatile flow.

Weidong Ye, Electrical Engineering

Graduation: May 2015

Hometown: Fuzhou, China

INAS NANOWIRE FIELD EFFECT TRANSISTORS

Mentor: Hongbin Yu, associate professor, School of Electrical, Computer and Energy Engineering

Research Theme: Energy

The purpose of this project is to explore the potential of III-V compound semiconductors. Compared to silicon based transistors, transistors made with III-V compound semiconductors theoretically have higher performance and efficiency. There are many different types of III-V semiconductors, but this project focuses on one, Indium Arsenide. InAs nanowires were transferred from their vertical growth substrate to a planar silicon substrate to fabricate field effect transistors (FET). After fabrication, the devices are characterized to evaluate performance.

where are they now?

Teagan Adamson (Biomedical '12 – FURI Fall '10-Spring '12) is performing antibody engineering research for cancer therapeutics at Academia Sincia's Institute of Biomedical Sciences in Taipei, Taiwan through the support of a Fulbright and Whitaker Fellowship.

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

Jaclyn Avallone (Material Science '12 – FURI Spring 2012) is pursuing a Ph.D. in Materials at University of California-Santa Barbara.

Celia Barker (Biomedical '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 '13 – FURI Summer '11- Fall '12) is a first-year PhD student in Chemical Engineering at University of California, Santa Barbara and beginning to get involved in research in molecular interactions in organic solar cells.

Katherine Cai (Chemical and Statistics '13 - FURI Spring 2010 - Fall 2012) is in the PhD program in Statistics at Arizona State University.

Amelia Celoza (Civil '13 – FURI Summer '09; Fall '11-Spring '13) is pursuing a Master's in Sustainable Design and Construction at Stanford University.

Katherine Driggs-Campbell (Electrical '12 – FURI Summer '10-Spring '12) is currently a Ph.D. student in Electrical Engineering at University of California-Berkeley.

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 '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 YCombinator startup in Mountain View, CA that lets people get their car fixed at home or at work by mechanics.

Rachel Ginn (Biomedical '12 – FURI Fall '11) is currently working toward a Master of Science in Biomedical Informatics at Arizona State University and Mayo Clinic Hospital.

Tina Hakimi (Biomedical '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.

Brittney Haselwood (Biomedical '12 - FURI '10-'12) is currently a Research Associate and PhD 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 '13 – FURI Spring '12-Spring '13) is currently employed as an Post Market Quality Engineer for Stryker Sustainability Solutions in Tempe, Arizona.

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

Sebastian Husein (Materials Science and Engineering '13 - FURI Fall '11-Fall '12) is currently working in a Dean's Fellowship at ASU, pursuing a PhD through QESST, and working at a National Science Foundation and DOE funded Engineering Research Center for solar technology.

Amit Jha (Biomedical '13 – FURI Fall '12-Spring '13) is currently pursuing a Master's in Biomedical Engineering at Arizona State University and is also working at a start-up venture.

Eric Kincaid (Materials Science '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 '12 – FURI Fall '10- Spring '12) is graduating with a Master of Science in Environmental Fluid Mechanics from MIT this spring.

Dwight Lane (Biomedical '12 – FURI Summer '11-Spring '12) is currently a second-year Ph.D. student in Bioengineering at the University of Utah.

Kevin LaRosa (Electrical '12 – FURI Spring '10-Spring '12) is working toward a Ph.D. at the University of Texas in Dallas, where he is researching thin film technologies.

Xuan Liang (Chemical '13 - FURI Spring '12) is starting a Master's in chemical engineering at University of Maryland this Semester.

Michael Machas (Chemical '13 – FURI Fall '11-Spring '13) will be receiving his Masters in Chemical Engineering in the spring and will be pursuing his PhD in Chemical Engineering at Arizona State University in fall 2014.

Beth Magerman (Mechanical '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.

Michael Mast (Aerospace/Aeronautics '12 – FURI Spring '11-Fall '11) is currently a systems engineer at Honeywell Aerospace, the lead focal for Autothrottle and Flight Director for the Gulfstream program, and is pursuing a master's in Aerospace Engineering at Arizona State University.

Isha Mehta (Civil '12 – FURI Fall '11-Spring '12) is currently working as a structural designer, creating engineering art structures, high rises, and more.

Divya Geetha Nair (Materials Science '12 - FURI Fall '10- Spring '12) is working as a Process Engineer in Intel Micron Flash Technologies, in Utah.

Alisha Nanda (Chemical/Biochemistry '13 – FURI Summer '10-Spring '12) is currently a medical student pursuing an M.D. at University of Arizona – Phoenix.

Meelad Nikpourian (Mechanical '12 - FURI Fall '11-Spring '12) finished a master's in mechanical engineering at Arizona State University and will be working at Honeywell Aerospace.

Gabe Oland (Biomedical '13 - FURI Summer '11-Spring '13) is a first year medical student at the Medical College of Wisconsin, Milwaukee.

Guy Pickett (Mechanical '12 – FURI Summer '11-Fall '11) is currently pursuing a Master's of Science in Electrical Engineering while conducting research on solar cell fabrication processes at Arizona State University's Solar Power Lab.

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 '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 '13 - FURI Summer 2011-Spring 2013) is getting ready to begin her new adventure as a manufacturing engineering associate with General Mills in 2014.

Neil Saez (Bioengineering '13 – FURI Spring '10- Spring '12) is pursuing an M.D. at 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 '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 storm water before it contaminates fragile aquatic ecosystems.

Tyler Stannard (Materials Science '13 – FURI Summer '12-Fall '12) is a graduate student research assistant at Arizona State University, researching stress corrosion cracking in aluminum alloys.

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

Luan Trinh (Aerospace '11 – FURI Fall '11) is finishing a Master's in Mechanical Engineering at Arizona State University.

Logan Van Engelhoven (Mechanical '12 – FURI Fall '11-Fall '12) is a MS/PhD student at University of California-Berkeley working with the Human Engineering and Robotics Laboratory.

Stephen Warren (Mechanical '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 '13 – FURI Fall '12-Spring '13) is a Bredesen Scholar pursuing a Ph.D. at the University of Tennessee.

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

Chuan Xu (Industrial '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.

customize your experience at fulton schools of engineering

One of our top priorities is providing you with an outstanding student experience. We believe that you need more than traditional coursework to be competitive and successful in your career. Experiential opportunities are integral components of your Fulton Schools experience and the skills you gain will help prepare you for whatever you choose to do after graduation.

e2
E2 is an innovative program that welcomes all freshmen to our community. You'll venture off-campus to meet other new freshmen, upper-division students who serve as counselors, faculty in your major, alumni and Fulton Schools staff who can help you learn skills that are important to your success as a student in the Fulton Schools of Engineering through a variety of fun and interactive activities.

peer mentors
All freshmen—whether living in one of our residential communities, commuting to campus, or enrolled in our online programs—are assigned a peer mentor who will refer you to academic resources across campus, host events to ensure you feel connected to the Fulton Schools and guide you through your transition to ASU.

peer career coaches
Peer Career Coaches are trained to help you explore career options in your major through one-on-one meetings and by facilitating workshops that will help you prepare for your future in engineering and technology. These upper-division students can help you navigate the career-related opportunities available in your first year and connect you to resources for internships, jobs and career events.

undergraduate teaching assistants
The Undergraduate Teaching Assistant (UGTA) program selects successful undergraduate students to serve as teaching assistants in freshman-level classes. UGTAs assist faculty members by leading, engaging and mentoring students in exploratory and collaborative learning activities within the classroom and lab environment.

tutoring
Tutors are undergraduate and graduate students employed to help you with your math, science and engineering classes. Newly-remodeled locations on both campuses offer plenty of free tutoring for all of your homework needs. ASU also offers tutoring online and in your residential hall.

student organizations and teams
If you are interested in fun, leadership, outreach, career growth and networking opportunities, you should check out opportunities with the more than 60 student organizations in the Fulton Schools. There are honors and professional organizations, diversity organizations, service organizations, major-specific groups and competitive teams—ample opportunity to find a group that suits your needs, whether it is gaining hands-on experience working on a team or socializing with peers who share the same passion.

engineering student council
The Engineering Student Council serves as an umbrella group for all engineering student organizations in the Fulton Schools. Students involved in the Engineering Student Council have the opportunity to develop leadership skills, understand organizational structures, network with Fulton Schools faculty and staff and serve as a conduit for communication between students, student organizations and Fulton Schools administration to help shape the future of the Schools.

academic bowl
The Academic Bowl pits teams from ASU's colleges and schools against each other in lightning-fast question-and-answer rounds. Questions can cover any topic—from world politics and pop culture, to history and geography, to world literature. If you have a passion for learning, possess a wide range of knowledge about various (possibly obscure) topics, and can quickly hit a buzzer, consider auditioning to join the team. Not only will you have a blast firing off answers in a fast-paced event, but you have a chance to win great rewards: substantial scholarship money and the coveted championship title.

fulton ambassadors
Fulton Ambassadors are a select group of students who support the Fulton Schools as representatives at recruitment events with prospective students and outreach activities. In addition to developing professional and leadership skills, as a Fulton Ambassador, you'll also receive a letter of recommendation from the Dean.

fulton schools and barrett honors
About 20 percent of Fulton undergraduate students are part of the unique community at Barrett, The Honors College. Honors students enjoy select opportunities to travel abroad, earn scholarships, attend special events specifically for honors students, and receive funding to travel and complete their creative project/thesis. Students have the opportunity to stretch their learning capabilities through a customized honors curriculum.

epics: engineering projects in community service
The Engineering Projects in Community Service program, known as EPICS Gold at ASU, is an award-winning community service and social entrepreneurship program. Through EPICS, you have the opportunity to get a hands-on approach to problem solving while making an impact in the community. You'll enter the workforce with the ability to design innovative solutions to meet clients' needs in a dynamic environment.

grand challenge scholars program
Grand Challenge Scholars receive the well-rounded preparation needed to tackle complex social issues, in areas of health, energy, sustainability, security and education. Students admitted to the Grand Challenge Scholars Program combine experiences in research, service learning, entrepreneurship and leadership, with the development of a global perspective and interdisciplinary thinking. Grand Challenge Scholars receive a unique endorsement from the National Academy of Engineering upon completion of the program.

4+1 accelerated programs
Fulton Engineering's 4+1 programs offer the opportunity to combine advanced undergraduate coursework with graduate coursework to earn a bachelor's and a master's degree in only five years.

study abroad
Experience a new culture, learn methods used outside of the U.S., become competitive in a global job market and see the world in a new way. Visiting a different country is a valuable opportunity to expand your world views and gather insight and inspiration from a different perspective. From exchange and partnership programs, to faculty-directed summer programs, the study abroad experience will enhance your understanding of technical concepts, global business perspectives, world issues and societies.career fairs.

career fairs
volunteer/employer liaison
As a volunteer at one of the Fulton Schools career fairs, you'll be able to network with recruiting managers and learn more about positions available with their companies. Another way to get involved is through student organizations as an employer relations representative working directly with employers, honing your business communications, customer service and event planning skills.

summer camp counselors
Each summer, we host a number of summer camps designed to engage K-12 students in science, technology, engineering and math-related activities. From robotics to mobile application creation, our goal is to share the excitement of engineering and technology with aspiring future problem solvers.

outreach
Work with other outreach programs such as DiscoverE Day, our Fulton Schools open house, FIRST LEGO League and more to promote science, technology, engineering and math in the community and engage younger students in the excitement of what we do every day. This is a chance to gain valuable mentoring skills, volunteer experience and inspire others to pursue studies or careers in engineering and technology.

order of the engineer
Order of the Engineer is an association that emphasizes integrity, pride and responsibility in the engineering profession. Graduating seniors in engineering programs make a commitment to these ideals and receive a ring symbolizing this commitment. Students have an opportunity to be involved at a national level and to join engineers throughout the country to uphold the commitment they have taken.

internships and cooperative education program (co-op)
Gain practical work experience related to your major through experiential learning programs offered by our industry partners in conjunction with the Fulton Schools of Engineering and our Career Center. Internships are usually one summer of supervised work experience related to your chosen career field. The Cooperative Education Program (co-op) is an extended time commitment that alternates semesters of formal classroom education with major-related practical work experience, thereby helping students make the school-to-work transition. These opportunities foster professional, personal and skill development, and are usually paid.

engineering.asu.edu/customize

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

50 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

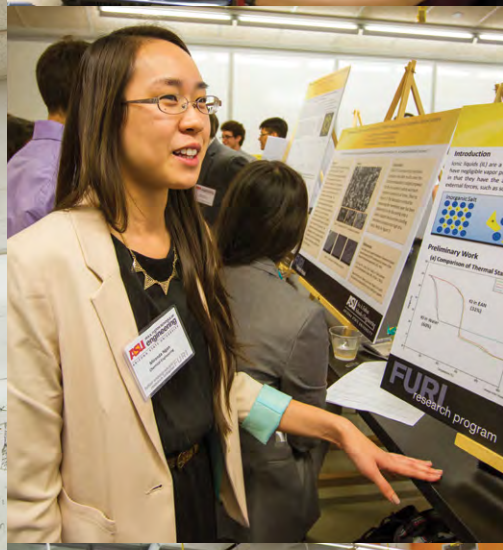
ENGINEERING CAREER CENTER
Serving as a central point of contact to connect students and employers, the Career Center connects employers with engineering students for full-time job opportunities and internships and provides comprehensive career coaching services for Fulton students and alumni.
engineering.asu.edu/career

STUDENT SUPPORT SERVICES
The Engineering Tutoring Center offers 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.
engineering.asu.edu/epics

GRAND CHALLENGE SCHOLARS PROGRAM
The Fulton 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.
more.engineering.asu.edu/grandchallengescholars

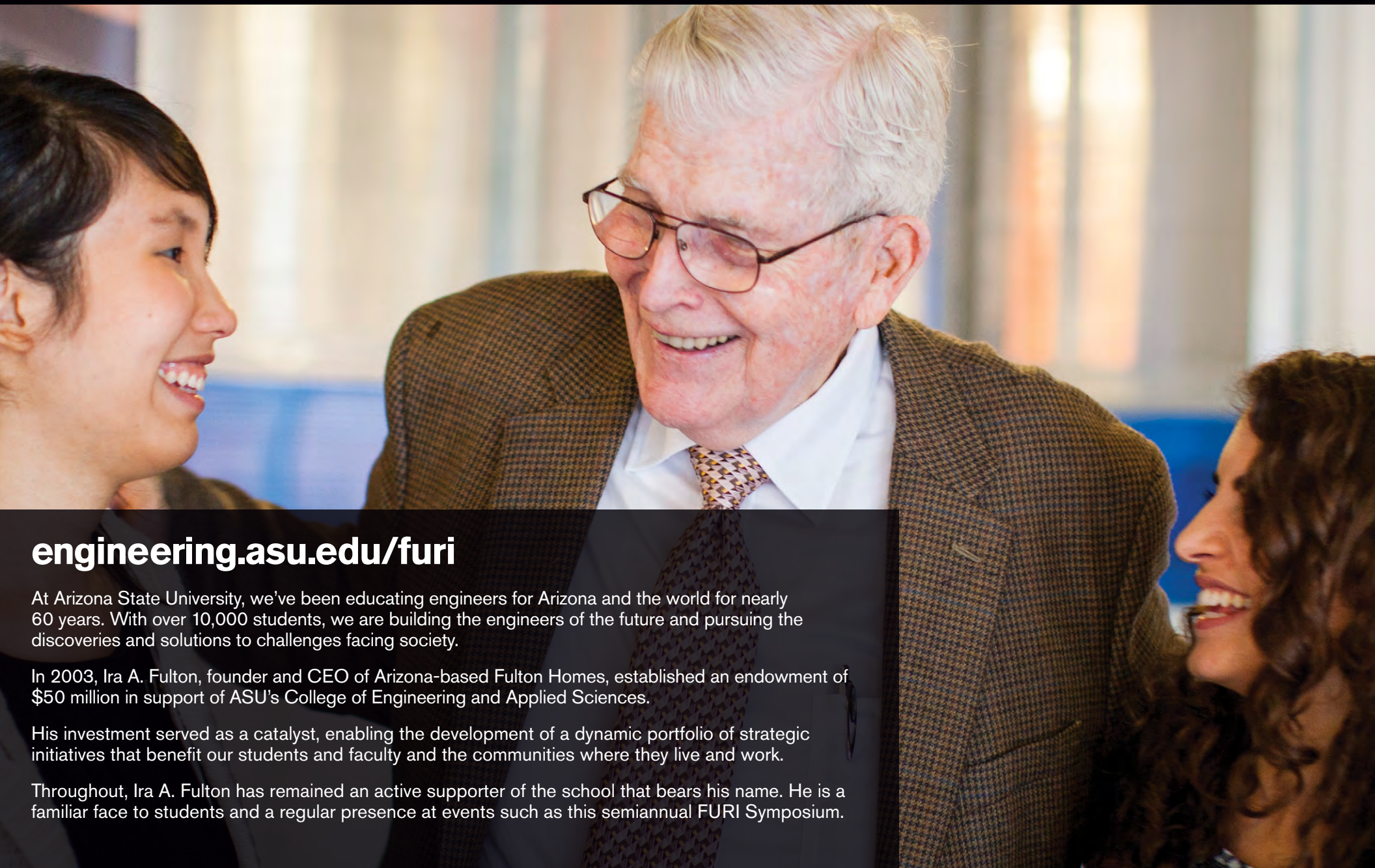
STUDY ABROAD
Engineering students are encouraged to take full advantage of the study abroad opportunities offered by ASU and Fulton Engineering.
engineering.asu.edu/studyabroad



fueling innovation
building engineers

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

Ira A. Fulton



engineering.asu.edu/furi

At Arizona State University, we've been educating engineers for Arizona and the world for nearly 60 years. With over 10,000 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.