

The University of Iowa College of Engineering

# RESEARCH WEEK & OPEN HOUSE

April 9 - 13, 2018



# The 16<sup>th</sup> Annual College of Engineering Research Open House

### Thursday, April 12<sup>th</sup> Seamans Center for the Engineering Arts & Sciences 9:00 A.M. – 4:00 P.M.

The Research Open House will showcase, celebrate, and promote the research activities and accomplishments of the College of Engineering's faculty, staff, and students.

The event will also provide opportunities for graduate and undergraduate recruitment, development of new industrial contact, and better informing the university and the local community about the research mission and capabilities of the College.

# The 15<sup>th</sup> Annual Student Luncheon & Recognition ceremony

### Friday, April 13<sup>th</sup> Hotel Vetro, Downtown Iowa City 11:30 A.M. – 1:30 P.M.

Honoring those students who participate in research, the Student Luncheon & Recognition Ceremony is open to all undergraduate and graduate students.

Recognition will be accorded to students who have published, presented, and received awards during the past year (March, 2017 – February, 2018). As well, winners of the "Best Poster" and "Popular Choice" Awards from the poster competition held during the Research Open House will be recognized.

### College of Engineering Research Week Schedule of Events

#### Thursday, March 29, 2018 (Preliminary Event)

2:00 pm – 2:30 pm

#### "Creating a Poster for Presentation"

Presented by Scott Coffel, Director, Hanson Center for Technical Communication. Planning session for student poster creators and presenters to envision and develop research posters from concept to final layout. Session held in the Engineering Library Creative Space (2001C SC)

### **RESEARCH WEEK**

### April 9 – 13, 2018

#### Monday, April 9, 2018

2:00 pm – 3:00 pm <u>"Mars Rover Prototype Demonstration"</u> The University of Iowa Robotics Club designed, built and programmed a prototype Mars rover The rover can simulate realistic Mars rover operations and procedures. Come see it in action!

#### Tuesday, April 10, 2018

#### 11:30 am - 12:30 pm "Introduction to Systematic Reviews"

Presented by Qianjin (Marina) Zhang, Engineering & Informatics Librarian, Lichtenberger Engineering Library. Systematic Reviews is a research method that is commonly used in medical and public health but increasingly adopted by researchers in education, social sciences and, even, engineering. This workshop will introduce concepts about systematic reviews and narrative reviews, also called literature reviews, and differences between the two types of reviews. We will also discuss when and how to conduct a systematic review as well as the library services that support your systematic review project. Session held in the Engineering Library Creative Space (2001C SC)

### Wednesday, April 11, 2018

# 11:30 am – 12:00 pm <u>"20 Years of Saving Lives – Making Vehicle Safer"</u> 4602 SC Presented by National Advanced Driving Simulator (NADS) Staff. Drive the NADS simulators and discuss how they could be used in your research, education, and outreach activities. Student-led research projects may be able to use the simulators at low or no cost!

12:00 pm – 1:00 pm NADS Simulator Demonstrations

4632 SC

#### 2001C SC

### 2001C SC

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### College of Engineering Research Week Schedule of Events (Con.)

### Thursday, April 12, 2018

9:00 am - 4:00 pm

Research (	Open	House:	Student	Poster	Session	

2<sup>nd</sup> Floor Lobby, SC

**Biomedical Engineering Chemical & Biochemical Engineering Civil & Environmental Engineering** Electrical & Computer Engineering Mechanical & Industrial Engineering Center for Bioinformatics & Computational Biology Center for Computer-Aided Design Center for Global & Regional Environmental Research IIHR – Hvdroscience & Engineering Iowa Institute for Biomedical Imaging Special Programs & Studies 3111 SC 11:30 am – 12:30 pm "Going to Graduate School Workshop" Presented by Allan Guymon, DEO Chemical & Biochemical Engineering. This workshop is targeted to undergraduate students who are considering graduate school. The application process for graduate school · Information about how to get financial support through fellowships & stipends Information on BS/MS program • Future job opportunities There will be a significant amount of time devoted to questions. Undergraduate students from all disciplines are invited to attend. Refreshments provided. 5:00 pm - 6:00 pm Scholz Symposium: "Engineering and Natural Disasters" W10 PBB Panel session - three panelists will each give a 5-10 minute presentation followed by a moderated discussion and questions from the audience. The panelists are Daniel Miller from Stanley Consultants, Ron Knoche from Iowa City Public Works, and Professor Gabriele Villarini from the IIHR Friday, April 13, 2018 11:30 am – 1:30 pm Student Luncheon & Recognition Ceremony Hotel Vetro, Iowa City See p. iv for complete schedule. 2:00 pm - 4:00 pm "Living Library" 2001C SC In conjunction with National Library Week, Kari Kozak of the Lichtenberger Engineering

In conjunction with National Library Week, Kari Kozak of the Lichtenberger Engineering Library will be hosting a 'Living Library' where faculty, staff, or graduate students volunteer to serve as living 'books'. Borrow a living book and learn about each book's inspiring research! Living 'books' can be "checked out" for 10-15 minutes at a time and talk one on one with students. A fun and inviting event for all participants. Refreshments provided.

### STUDENT LUNCHEON & RECOGNITION CEREMONY FRIDAY, APRIL 13, 2018 HOTEL VETRO, DOWNTOWN IOWA CITY PROGRAM SCHEDULE

11:30 am Check-in & Registration

For graduate and undergraduate students. If you presented a poster during the Research Open House, please make sure you receive a ticket for the prizes!

11:30 am – 12:30 pm Lunch

### 12:30 pm – 1:30 pm Recognition Ceremony

We will recognize students in advanced engineering degree programs. Please join Milan Sonka, Associate Dean for Graduate Programs, Research, and Faculty at the front of the room to have a photo taken in each of the groupings listed below.

- PhD Graduates
- Master of Science Graduates
- Recognition of Milestones
  - Published
  - Presented
  - Awards for Research

### **Other Student Awards**

Department, centers, and programs will have the opportunity to recognize outstanding students and researchers by presenting annual awards.

### Best Poster Awards & Popular Choice Awards

Winners from the Research Open House poster competition will be announced and recognized by Milan Sonka, Associate Dean for Graduate Programs, Research, and Faculty.

### **Drawing for Prizes**

All students who presented posters at the Research Open House will be eligible to participate in a drawing for prizes. Tickets will be handed out at the door.

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# Poster Abstracts



### **BIOMEDICAL ENGINEERING**

### "Multiaxial Failure Studies of Biological Soft Tissues"

Brett Austin, T. Chung, and M.L. Raghavan

Understanding failure properties of biological soft tissues can help elucidate the underlying mechanisms of vascular failure in vivo such as aortic aneurysm rupture. The Bubble Inflation Test (BIT) is a method of elucidating the failure properties of biological soft tissues by applying multiaxial extension using inflation. A test apparatus and test protocol has been developed in our lab. The objective of this study is to use this apparatus to compare the multiaxial failure properties of bovine aorta (a soft tissue with a fibrous microstructure) against silicone (a soft material without fibrous microstructure). To do this, we have harvested and tested bovine aorta samples under bubble inflation conditions. Next, bovine aorta-like cylindrical constructs using silicone will be fabricated and specimens cut to test under bubble-inflation conditions. Use of cylindrical silicone constructs as opposed to flat sheets of silicone are expected to serve as better controls as they will accommodate any bending stresses imposed in the test procedure when a curved construct is flattened for testing. These studies are expected to provide us a better understanding of the validity of the test methods and shed light on the role of fibrous microstructure on the multiaxial nature of biological soft tissue failure.

### "Fat-Derived FGF21 is Dispensable for the Resistance to Diet-Induced Obesity Observed in Mice Lacking OPA1 in Adipose Tissue"

William Bui Tran, Angela Olvera, Alex Marti, Rana Hewezi, Mathew J. Potthoff, Renata Pereira and E. D. Abel

OPA1 (Optic Atrophy 1) is a mitochondrial GTPase that regulates mitochondrial dynamics, cristae structure and respiratory capacity. The role of OPA1 in adipose tissue physiology and systemic metabolism is incompletely understood. We generated mice lacking OPA1 specifically in adipose tissue by crossing OPA1 floxed mice with mice harboring the Cre recombinase under the control of the adiponectin promoter (OPA1 Ad-KO). Surprisingly, OPA1 deletion in adipose tissue resulted in loss of fat mass when mice are fed normal chow and completely prevented diet-induced obesity. These metabolic changes occurred concomitantly with increased levels of FGF21, a potent antiobesity hormone, in the adipose tissue and in the circulation. We recently reported that OPA1 deficiency in muscle results in a similar phenotype, which is completely dependent on FGF21 secretion from skeletal muscle. To test whether fat-derived FGF21 is required for the resistance to DIO observed in OPA1 Ad-KO mice, we generated mice lacking both OPA1 and FGF21 in adipose tissue (DKO). By NMR, there were no significant differences in body composition between 8-week old wild type (WT) and DKO mice, however, upon euthanasia, gonadal and inguinal fat pads were reduced, while brown adipose tissue (BAT) was enlarged in DKO mice, as previously observed in OPA1 Ad-KO mice. After 4 weeks of high-fat feeding, body weight and total fat mass were significantly reduced in DKO mice compared to WT mice. In conclusion, these data indicate that adipose tissue-derived FGF21 does not mediate the resistance to diet-induced obesity reported in mice deficient for OPA1 in adipose tissue.

### "Minimizing Radiation During Gastrojejunal Tube Placement"

James Chenoweth, Michael Garneau, Ford Minaghan, and Velarchana Santhana

The placement and replacement of Gastrojejunal (GJ) feeding tubes requires significant amounts of fluoroscopy, which can lead to cumulative radiation exposure, particularly in pediatric patients. Fluoroscopy is necessary as GJ tubes have low rigidity, are prone to misplacement in the stomach, and can get stuck at the entrance of the pyloric sphincter. Due to these complications, fluoroscopy is needed to confirm proper tube placement. The objective of this project is to

devise a way to ensure the proper placement of a GJ tube in patients over the age of one while limiting radiation exposure to staff and patients.

#### "Metered Dose Sunscreen Bottle"

Kelsi Dahms, Gregory Graham, Colton Myers, and Ellie Wallace

According to the CDC, skin cancer is the most common form of cancer in the U.S., and melanoma incidence rates are increasing. Therefore, the goal of our project is to increase the number of individuals benefiting from proper use of sun protection thus lowering the frequency of sun damage to their skin. The sunscreen bottle we created implements a metered dose strategy to output individualized amounts of sunscreen. These amounts are based on an individual's height and weight and a recommended sunscreen thickness of 2mg/cm<sup>2</sup>.

# "Visualizing and Quantifying Collagen Production Real-Time in an In-Vitro Model of Wound Healing and Fibrosis"

Mariam El-Hattab and Edward A. Sander

The goal of this research is to investigate the influence of the mechanical environment on the outcome of wound healing spatially and temporally, with our focus being fibrosis. Our experimental design includes the use of a fibrin gel seeded with skin cell aggregates as a model of the wound environment, which we pull with a micro-needle. Among several things, we have seen via microscopy that cells deposit collagen and densify preferentially between cell aggregates and that tension influences cell morphology and behavior. Better understanding of the effect of mechanics on wound healing could help shift its outcome and prevent fibrosis.

#### "A Deep Learning Approach for Lung and Lobe Segmentation in CT Images"

Sarah E. Gerard, Taylor J. Patton, Jacob Herrmann, David W. Kaczka, Junfeng Guo, Gary E. Christensen, John E. Bayouth, and Joseph M. Reinhardt

Lung and lobar segmentation in computed tomography images is an important precursor for quantitative regional analysis of pulmonary disease and lung function. In this work we propose a deep learning approach using a convolutional neural network model for lung and lobe segmentation. We evaluate the proposed method on a diverse dataset of human and animal subjects with various lung diseases. The results demonstrate the method is robust to challenging pathologies and allow for automated analysis of large datasets.

### "Prediction of Humphrey 24-2 Visual Field Thresholds in Glaucoma Patients via Structure Analysis of Optical Coherence Tomography"

Zhihui Guo, Young H. Kwon, Kyungmoo Lee, Mona K. Garvin, Michael D. Abramoff, and Milan Sonka

To further demonstrate the possibility of prediction of individual Humphrey 24-2 visual field sensitivity thresholds from Optical Coherence Tomography image analysis, we evaluated performance of 4 predictive algorithms on an independent set of 97 glaucoma subjects. Nerve fiber, and ganglion cell and inner plexiform layer were co-segmented and partitioned into 52 sectors matching HVF 24-2 test locations. Wilcoxon rank sum test was applied to test correlation R and root mean square error between actual and predicted thresholds. The proposed RGC-AC optimized predictive algorithm is superior to previous methods and its performance is close to the reproducibility of HVF 24-2.

### "Testing a Control Scheme for Multi-Frequency Oscillatory Ventilation"

Bakir Hajdarevic, Jacob Herrmann, and David W. Kaczka

We have recently proposed multi-frequency oscillatory ventilation (MFOV) as an alternative modality of lung-protective mechanical ventilation for patients with heterogenous lung injury. In this study, we designed and tested a closed-loop control scheme for generating broadband pressure and flow excitations with adjustable spectral content. Under both

healthy and injured lung conditions, this preliminary device dynamically controlled MFOV waveforms with all measured frequencies, amplitudes, and phases of airway pressure oscillations converging to user-set values. The control scheme developed in this study is scalable and translatable for clinical applications of MFOV.

### "The Effects of Subject Rigidity on Keratinocyte Colony Formation"

Spencer A. Halberg, Hoda Zarkoob, Sathivel Chinnathambi, and Edward A. Sander

Actin microfilaments, keratin intermediate filament (IF), B1, B4, vinculin, desmoplakin, and E-cadherin are strongly associated with networks that play an imperative role in cell-cell and cell matrix junctions. Our previous work has shown that keratin-deficient knockout (KO) mouse keratinocytes show strikingly different morphologies then wild type (WT) keratinocytes on substrates with different stiffnesses. The current colocalization study of B1, B4 and vinculin along with desmoplakin and E-cadherin suggests that morphology changes are due to the role played by intermediate filaments in cell mechanosensitivity and cell force generation.

### "Modeling Lung Tissue Interdependence and Collapse During Mechanical Ventilation" Jacob Herrmann, Merryn H. Tawhai, and David W. Kaczka

Respiratory flow and gas transport are distributed throughout the lung in accordance with regional mechanical properties of lung tissue. In this study, we develop a nonlinear circuit system to simulate distributed flows during mechanical ventilation in a computational model of the lungs using an anatomically structured airway network and viscoelastic tissues. Injurious parenchymal stretch and collapse were quantified during several modalities of mechanical ventilation in healthy and injured lung conditions. This model is useful for predicting optimal lung-protective ventilation modalities and ventilator settings for patients with various pathological types and severities.

### "Mechanisms of Norepinephrine and Serotonin in Prevention of Seizure-Induced Respiratory Arrest" Stephen Kruse, Kyle Dayton, Benton Purnell, Nicole Leibold, and Gordon Buchanan

One-third of epilepsy patients will not respond to treatment. These patients are at risk of dying from sudden unexpected death in epilepsy (SUDEP). A likely cause of SUDEP is seizure-induced respiratory arrest (S-IRA). Serotonin is thought to modulate breathing following seizures. However, norepinephrine could also modulate S-IRA. We used drugs to manipulate levels of norepinephrine in mice while seizures were induced. We found that an increase in norepinephrine reduced S-IRA while pretreatment with a norepinephrine blocker extinguished this effect. These results support the importance of norepinephrine in S-IRA and may be a basis for further studies involving norepinephrine in seizure.

### "What's Behind the Pink Ribbon: Tackling Truncal Lymphedema"

Maria Fernanda Larraga Martinez, Anna Rodriguez, Genevieve Goelz, and Ashten Sherman

Unilateral mastectomy patients are at risk to develop truncal lymphedema. This is painful and disfiguring swelling in the trunk region due to damage in the lymphatic system. We have developed and tested several prototypes in order to arrive at the best solution. Through a compression bra and improved education for patients, this secondary complication for patients will have a solution.

### "Using Zebrafish to Test Potential Drugs for Their Efficacy Against Epileptic Seizures"

Russell Martin, Morgan Sturgeon, Alex Bassuk, and Robert Cornell

Epilepsy is a disorder whose primary symptom occurs when the brain sends erratic signals throughout the nervous system, causing seizures. In our work, we study the effectiveness of drugs as anti-epileptics in a zebrafish model. Drugs are chosen based on their performance in a collaborator's gene expression experiment in cells. Antiepileptic effectiveness is tested by inducing seizures in zebrafish and tracking their movement with and without a test drug. The

overall goal of this work is to learn more about anticonvulsant drugs, and ultimately find some that may be used to treat epilepsy in the future.

### "Imaging Marker for Predicting Post-Operative Complication in Brain Aneurysm Treated with Flow-Diverting Stent"

Daichi Nakagawa, Edgar Samaniego, David Hasan, and Madhavan Raghavan

Flow-diverter (FD) stents is a less invasive treatment for brain aneurysms that obstruct blood flow and help clot/occlude the aneurysm sac which minimizes rupture risk. However, one post-operative complication is recurrence - when blood continues to flow into the aneurysm sac even many months after FD deployment. Objective of this retrospective cohort study is to develop an imaging maker that could help predict recurrence using 2-D digital subtraction angiography. The hypothesis that the time constant of contrast medium wash out from aneurysm sac during angiography is indicative of recurrence will be tested in this retrospective study population.

### "Mechanical Testing of Neurovascular Stents"

Elizabeth Niedert, Anna Schumacher, and M.L. Raghavan

Flow diverters have had a lot of success at treating cerebral aneurysms with their low porosity and braided structure to prevent blood flow. For these implantable devices, patients must go on anticoagulation medication which becomes a daily struggle. An antithrombotic coating was developed to reduce the need for anticoagulation therapy. With no specific testing standards set in place, the challenge is also in performing the tests. In this study, the mechanical properties of a coated flow diverter will be compared with an uncoated flow diverter to understand whether or not the coating affects the abilities of the device.

#### "The Talon Surgical Retractor"

Sarah Cooper, Tom Rashid, Bryan Tanner, Greg Malicki, and Dr. Douglas Storm

The Talon Retractor project revolves around the improvement of the Army/Navy Surgical Retractor, which is commonly used by medical personnel today. Though versatile, a major issue reported with the current design is frequent incidences of tissue slipping during retraction. This poses a significant hazard because as the tissue slips, problems, such as lost sight of surgical field, possible tissue damage to the patient, and increase surgical time, may arise. The Talon retractor aims to reduce the frequency of the retractor slipping by incorporating an ergonomic handle attachment and a textured hook attachment to increase friction at the tissue interface.

### "Incorporation of MicroRNA-200c and Collagen into 3D Printed Tricalcium Phosphate Scaffolds to Promote Bone Formation"

M.T. Remy, A. Akkouch, L. He, X. Song, B.A. Amendt, and L. Hong

Bone tissue engineering involves the incorporation of biological and cellular components with biocompatible matrices to promote bone regeneration. Tricalcium phosphate (TCP) is a ceramic material that can serve as a bone substitute due to its chemical similarity to native bone, biocompatibility, and osteoconductive properties. The goal of this study is to observe how the incorporation of collagen and miR-200c into 3D printed TCP scaffolds can benefit the osteogenic differentiation process and contribute to new bone formation in rats with critical-sized calvarial defects. The 3D printed TCP scaffolds resulted in increased new bone formation when incorporated with collagen fibers and microRNA.

### "Flow Monitoring Can Be Effective in a Heart-Lung Machine"

Srivats Sarathy, Jian Chu, Aditya Badheka, Madhavan L. (Suresh) Raghavan, and Dr. Joseph W Turek

Extracorporeal membrane oxygenation (ECMO) is a form of cardiopulmonary bypass circuit that acts as a heart-lung machine, usually administered to critically ill patients with cardiac and/or respiratory failure. Thrombogenic clot

formation within the membrane oxygenator and eventual oxygenator obstruction is a complication associated with its prolonged usage. We hypothesized that blood flow monitoring in a shunt tubing in the circuit – which are continuous and safer – could serve as an effective early indicator of oxygenator obstruction during ECMO. The hypothesis was tested in this study using a 0D computational model and experiments. Results of both the computational model and experiments showed a clear and measurable increase in shunt flow with elevated oxygenator resistance. The results were consistent with our hypothesis that shunt flow can serve as a marker for ECMO circuit obstructions.

#### "Endogenous Progenitor Cell-Based Temporomandibular Joint Cartilage Repair"

Dongrim Seol, Ino Song, Khanidtha Chitphet, Aliasger K. Salem, James Martin, and Kyungsup Shin

The objective of this study was to determine the optimal conditions of WBC lysates and hydrogel for migration of progenitor cells, and to develop sustained delivery of DAPT from PLGA microspheres. Progenitor cells from bovine TMJ cartilage were isolated and processed for cell migration assay with various concentrations of WBC lysate. Releasing kinetics of DAPT-encapsulated PLGA microspheres were tested. Progenitor cell migration can be enhanced by optimizing WBC lysates concentration and composition of fibrin/HA gels. In future work, for optimal chondrogenic differentiation of migrating cells, we will modify PLGA microspheres to reduce the initial burst of DAPT.

### CHEMICAL & BIOCHEMICAL ENGINEERING

### "Critical Thermal Shock for Eradication of *Pseudomonas Aeruginosa* Biofilms" Haydar Aljaafari and Eric Nuxoll

When bacteria colonize a medical implant surface, they form a biofilm which cannot be eradicated chemically. The current standard of care is surgical explanation of the device and surrounding tissue, with eventual re-implantation of a replacement device with twice the probability of infection. These infections are a \$5 billion problem in the U.S. alone, impacting over 100,000 patients annually. By applying a localized thermal shock, we have shown that these biofilms can be eradicated. Results from thermal shocking biofilms prepared using different protocols indicate that, if the original bacterial population dropped by four orders of magnitude, biofilms would continue dying off, with no viable CFU after a few hours, despite being able to form colonies when immediately re-suspended and plated.

# "Low-Loading of Pt Nanoparticles on Carbon Foam Support for Highly Active and Stable Hydrogen Production"

**Sattar Alsaedi**, Abdulsattar H. Ghanim, Jonathan G. Koonce, Bjorn Hasa, Alan M. Rassoolkhani, Wei Cheng, David W. Peate, Joun Lee, and Syed Mubeen

Pt nanoparticles in low loading amounts were synthesized on inexpensive, large surface area 3D carbon foam (CF) support, and their activity for electrolytic hydrogen production was evaluated in acidic and alkaline conditions. The optimized Pt/CF catalyst with 0.06 mgPt/cm2 showed enhanced catalytic activity (up to 67 times) compared to state-of-the-art commercial Pt/C catalyst (0.5 mgPt/cm2), with less than 8% loss in activity @100 mA/cm2 after 60 hours of constant operation.

### "3-D Flow Through Electrodes for Rapid and Current Efficient Electrodialysis"

Sattar Alsaedi, Abdulsattar H. Ghanim, and Syed Mubeen

Surging population and climate change will push society, ever more urgently, to harvest lower quality or impaired water supplies (e.g., sea water or brackish groundwater) for drinking water. For example, desalination of sea water has become a promising technique for providing additional sources of fresh water along coastal communities. However, the widespread adoption of desalination technologies (Reverse Osmosis and Electrodialysis) is currently limited due to its energy intensive nature and/or limited membrane lifetime and performance, especially during high operation rates. This work focuses on developing a novel, cost-effective, electrodialysis (ED) unit. Specifically, we have replaced planar electrodes in traditional electrodialysis units with 3-D electrodes. We hypothesize that the 3-D electrode bed configuration provides large surface area per unit volume, thereby allowing high currents to be drawn at current densities short of the diffusion-limited regime. Further, IR losses due to mass transfer limitation will be minimal.

### "Effects of pH and Concentration in Protein Adsorption onto Gold Nanoparticles"

Hsien Chou, Michael Leyden, Killian Tracey, Benjamin King, and Jennifer Fiegel

While nanotechnology has shown promise as a drug delivery device to treat lung diseases, when inhaled the nanoparticles adhere to the proteins in the mucous membrane, causing them to stick in areas they are not wanted decreasing their efficiency. In order to optimize the conditions of the nanoparticles to have the least amount of protein adherence, pH and concentration of protein was varied. Properties, such as surface charge and the diameter, of the nanoparticles were also monitored.

#### "Comparison of PM2.5 measurements during the Lake Michigan Ozone Study 2017 (LMOS 2017)" Megan Christiansen, Charles Stanier, Nathan Janechek, Nathan Bryngelson, Dagen D. Hughes, Elizabeth A. Stone

The Lake Michigan Ozone Study 2017, occurred during summer 2017. Aerosols were continuously measured 45 miles downwind of Chicago to help characterize air pollution in the region. Continuous electronic aerosol measurements (without chemical speciation) were compared to 12-hour filter samples (with chemical species measurement). The two measurement techniques agreed well. High ozone events, days exceeding the NAAQS standard of 70 ppb, occurred on June 2nd and June 10-16. A significant diurnal variation of PM2.5 and total number concentrations were observed during the event periods while no significant variation was observed during the non-event periods.

### "Combining Ultrasound and Intratumoral Administration of Doxorubicin-loaded Microspheres to Enhance Tumor Cell Killing"

Anh-Vu Do, Sean M. Geary, Dongrim Seol, Phillip Tobias, Daniel Carlsen, Nattawut Leelakanok, James Martin, and Aliasger K. Salem

Metastatic melanoma is an incurable disease for which alternative treatments to chemotherapy alone are sought. Here, using a melanoma model, we investigated the antitumor potential of combining ultrasound (US) with poly(lactic-coglycolic acid) (PLGA) microspheres loaded with doxorubicin (DOX). The aim was to achieve synergistic tumoricidal activity through direct and indirect US-mediated damage of tumor cells combined with sustained and potentially controllable release (when combined with US) of DOX from microspheres. An in vitro release assay demonstrated an ability of US to affect the release kinetics of DOX from DOX-loaded PLGA microspheres by inducing a 12% increase in rate of release. In vitro viability assays demonstrated that combining US with DOX-loaded PLGA microspheres resulted in synergistic tumor cell (B16-F10 melanoma cells) killing. Melanoma-bearing mice were treated intratumorally with DOX (8 µg)-loaded microspheres and subjected to US treatment at the tumor site. This treatment could significantly extend survival (mean survival (MS) = 22.1 days) compared to untreated mice (MS = 10.4 days) and most other treatments, such as blank microspheres plus US (MS = 11.5 days) and DOX (8 µg)-loaded microspheres alone (MS = 13 days). The findings that immune checkpoint blockade did not significantly extend survival of mice treated with DOX (8 µg)-loaded microspheres plus US, and that tumor-free ("cured") mice were not protected from subsequent tumor rechallenge suggests minimal involvement of the adaptive immune response in the observed antitumor activity. Nevertheless, the synergistic increase in survival of melanoma-challenged mice treated with the combination of US and DOX-loaded microspheres implicates such a treatment methodology as a promising additional tool for combatting otherwise currently incurable cancers.

### "Physical and Model-Based Characterization of NPF Events and Sensitivity of CN and CCN to Changes in Anthropogenic Emissions in the Midwestern United States"

Can Dong, Robert Bullard, Ashish Singh, Scott Spak, Hitoshi Matsui, Charles Stanier

New particle formation (NPF) is a frequently observed phenomenon worldwide. Ten months of continuous measurements of particle number size distribution were performed at Bondville, Illinois. As a test of the NPF explicit version of the WRF-Chem model, particle number concentrations were simulated using different emissions that are representative of the past and the present scenarios. Observed NPF behavior at Bondville is similar to other mid-latitude sites in the world. Switching emissions from the past to present led to significant decrease of CN10 (particles with sizes larger than 10 nm) number concentrations, especially in April, September and November (over 20% decrease).

### "Characterizing Toxicity for Industrial Engineered Nanomaterials"

**Givens, Brittany E.**; Areecheewakul, Sudartip; Wang, Yifang; Steines, Benjamin R.; Dodd, Andrea A.; Altmaier, Ralph; O'Shaughnessy, Patrick T.; Salem, Aliasger K., Thorne, Peter S.

Engineered nanomaterials (ENMs) are commonly used in many products in order to improve their quality and/or lifetime. This results in high exposure for employees manufacturing these products. We aim to systematically characterize ENMs that are commonly used in industrial processes for their toxicity according to the physicochemical properties and toxicity in vitro and in vivo. To date, we have worked with upwards of ten materials and found that many are non-toxic at the current industrial exposure levels using various cell-based and animal-based studies. One material has been shown to be toxic both in vitro and in vivo, supporting the idea that rapid-in vitro screening can be used as a first-line prior to intensive animal studies.

### "Modifying Anisotropic Properties of Objects Printed via Stereolithography"

Brian Green, Robert McLeod, and Allan Guymon

Stereolithography (SL) is an additive manufacturing technique that involves using ultraviolet or visible light to solidify a liquid material into thin layers and subsequently build a 3D object layer upon layer. In this research, we examine the effect of incorporating a small amount of reversible addition-fragmentation chain transfer (RAFT) agent into a standard acrylate system to control the network formation. It was found that including a trithiocarbonate RAFT agent in the 3D printed formulation lead to a 45% increase in elongation and toughness with a corresponding 20% decrease in Young's modulus when compared to a 3D printed dog bone with no RAFT. To measure the anisotropic properties of SL, "horizontal" dog bones were printed with the long axis in the x-direction and "vertical" dog bones were printed with the long axis in the x-direction and "vertical" dog bones were printed with the long axis in the x-direction and "vertical" dog bones were printed with the RAFT agent was included in the formulation, leading to a 10% increase in modulus upon UV post cure. This indicates that the inclusion of a RAFT agent in our model acrylate formulation facilitated improved interlayer adhesion and modified anisotropic properties based on print orientation.

# "Light-Controlled Phase Separation Using Different Monomer Compositions of a Radical/Cationic System"

Erion Hasa, Julie L. P. Jessop, C. Allan Guymon, and Jeffrey W. Stansbury

Phase separation is of great interest due to the ease of altering polymer morphology and consequently favoring desired properties. In this work, we investigate the effect of irradiation intensity on polymer structure and thermomechanical properties of varying monomer compositions. Phase separation is induced using hybrid radical/cationic systems comprised of butyl acrylate (BA) and di-functional oxetane (DOX). Our investigation reveals that irradiation intensity has little to no effect on polymer structure for formulations with low concentrations of BA. On the other hand, different nano-/micro-structured domains are formed depending on irradiation intensity for formulations with intermediate concentrations of BA, resulting in significant increase in modulus and toughness. For the systems that do not exhibit phase separation, irradiation intensity has little effect on the mechanical properties.

### "Lung Cell Responses to Protein-Resistant pMPC-Coated Gold Nanoparticles"

Benjamin King and Jennifer Fiegel

Polymer systems are highly useful tools in drug delivery systems. They can shield payloads from degradation, control release, and even mediate physiological responses. We have been developing polymethacryloyloxyethyl phosphorylcholine (pMPC) coatings for gold nanoparticles to stabilize suspensions, reduce protein adsorption, and mediate cellular interactions. We have investigated the effect of this polymer coating on gold nanoparticle stability, protein adsorption in blood and lung fluid, and lung cell toxicity. Resistance to protein adsorption and the absence of significant toxicity at appreciable dose levels make pMPC-coatings strong candidates for various pulmonary drug delivery applications.

### "Predicting Dose Rate Effects in EB Polymerizations Based on Monomer Structure"

#### Nicole Kloepfer and Julie Jessop

Dose rate effects (DREs), or changes in polymer properties due to changes in dose rate, can be problematic during scale-up of electron-beam-initiated polymerization. DREs are not apparent for all formulation chemistries and processing parameters, and predicting when they will occur is challenging. Using glass transition temperature as measured by dynamic mechanical analysis, DREs were characterized for various acrylate monomers polymerized at different dose rates. Results show monomers with more easily abstractable hydrogens have smaller DREs.

### "Determining Parameters for Optimal Shadow Cure Polymerization"

Eric Knapp, Sara Kaalberg, Nicole Kloepfer, and Julie Jessop

The lab group has developed a syringe-like device to take advantage of some of the unique attributes of cationic photopolymerization. Because cationic polymerization has slower kinetics than other types of polyermization, and because the cationic active centers are long lived and will react hours or days after they are formed, polymers will cure long after the polymerization reaction is initiated with UV light. This is known as dark cure. The device is designed so that liquid monomer is illuminated by UV light in the syringe, initiating the polymerization reaction, and then uncured liquid monomer is expelled while leaving solid polymer in the syringe. The expelled liquid is then allowed to shadow cure. The volume of monomer used, the intensity of UV light, and the time of UV light exposure were all varied over multiple trials. Central composite design (CCD) was utilized to determine the best parameters to minimize solid polymer remaining in the syringe while maximizing conversion of dark cured polymer.

### "Integrated Device for Stable Solar Water Splitting"

Jonathan Koonce and Syed Mubeen

Demonstrated is an integrated and truly wireless device for solar water splitting. This device integrates an oxygen evolution reaction (OER) catalyst and a hydrogen evolution reaction (HER) catalyst on a commercially available triplejunction amorphous silicon (TJ-Si) solar cell that is stable in alkaline (pH 13) conditions. This device has shown spontaneous hydrogen production under 1 sun illumination for 5 hours with a solar-to-hydrogen (STH) efficiency of 2.9%.

### "Connecting the Dots: A Method to Determine Radiation Yield during EB Polymerization via Raman Spectroscopy"

Renae Kurpius, Nicole Kloepfer, and Julie Jessop

For photopolymerization, many methods exist to determine kinetic parameters, such as quantum yield of photoinitiators and rate of photoinitiation. However, due to the harsh conditions of the electron beam (EB), relatively few studies have examined the kinetics of EB polymerization. Here, a new method for determining rate of initiation and radiation yield (the number of radicals per 100 eV delivered) using Raman spectroscopy is presented, which will enable more detailed kinetic studies of EB polymerization. Understanding of the kinetics of EB polymerization will allow EB to expand to more advanced applications.

### "Proteins and Gold"

Michael Leyden, Sarah Chou, and Benjamin King

This research was focused on determining how various proteins adsorb to gold nano particles at various pH and concentration values. BCA assay was used to compare the protein concentrations of solutions before and after being contacted with gold nanoparticles. The zeta potential and size of the particles was also measured to see the extent to which the proteins adsorbed on each particle.

# "Photopolymerization Kinetics and Polymer Network Structure Impact on the Electro-Optical Properties of Polymer Stabilized Cholesteric Liquid Crystals"

Daniel Lippert, Dr. Allan Guymon, and Dr. Timothy White

Liquid Crystals (LCs) are widely used in optical screens and devices due to their structural and electro-optical properties. Currently, very little is known about how or why specific structure, reaction kinetics, molecular orientation and photopolymerization affect polymer stabilized cholesteric liquid crystal (PSCLC) electro-optical properties. The goal of this research is to determine the relationship between PSCLC electro-optical properties and the chemical structure, polymer network, molecular orientation and reaction kinetics of the system.

### "Electron Beam Radiation Yield Determination: Kinetic Method"

Kyle McCarthy, Nicole Kloepfer, and Julie Jessop

Electron beam polymerization has great potential to introduce a cleaner and lower energy method of bulk film polymerization, but has been hindered by a lack of research and understanding in the prediction of polymer properties from monomer composition. By developing a method for finding the radiation yield, or number of propagating radicals formed per unit energy, a greater understanding of monomer composition's role can be brought to light. The method developed uses radical kinetics with ebeam cured samples to develop a reliable method that measures the radiation yield of an ebeam cured sample.

### "Plasmon Mediated Carbon Dioxide Reduction Pathways"

Austin McKee, Alan Rassoolkhani, Will Elliot, Wei-Chuan Shih, Martin Moskovits, and Syed Mubeen

There has been an increase in atmospheric  $CO_2$  over the years since the industrial revolution resulting in an increase in the average global temperature. Our proposed research attempts to combine high-pressure electrochemistry with the field of plasmonics to develop plasmon-mediated electrocatalytic systems for selective and efficient conversion of  $CO_2$  to liquid fuels. The preliminary results show that both high-pressure electrochemistry and plasmonics increase the overall  $CO_2$  reduction rates.

### "Evaluation of Atrazine Bio-Degradation Kinetics by *Pseudomonas Sp.* ADP Biofilms and Planktonic Cells"

Emily Pattee, Michael Delcau, and Tonya Peeples

Atrazine is an herbicide used to control broad-leaved and grassy weeds. The EPA limits the concentration of atrazine in drinking water to 3ppb due to its classification as an endocrine disrupter compound. Pseudomonas sp. ADP (PADP) cells are used to degrade atrazine via six enzymatic steps. To determine the highest possible biodegradation efficiency of atrazine using PADP, analytical kinetic data for both planktonic cells and biofilms were compared. Samples were collected in for each cell type periodically to compare the overall degradation of atrazine and its metabolites over time.

### "Formulation and Analysis of Novel Dry Powder Antibacterial Aerosols"

Ojas Pradhan, Christine Czarnecki, Benjamin King, Sachin Gharse, and Jennifer Fiegel

Bacterial infections of the lungs are often difficult to eradicate due to the presence of bacterial biofilms which severely reduce the effectiveness of traditionally administered antibiotics. Our lab is working on developing combination therapies which increase the susceptibility of the biofilm bacteria to antibiotics. The objective of this study is to develop a dry powder aerosol containing an antibiotic and nutrient dispersion compound that has high yield, good aerodynamic properties, and high drug loading. The powders in this study were generated using a spray drier and analyzed using high-powered liquid chromatography (HPLC) and impaction.



### CIVIL & ENVIRONMENTAL ENGINEERING

### "Snapshot of Lead and Copper in Iowa Drinking Water"

Amina Grant, Drew Latta, Susie Dai, David Cwiertny, and Michelle Scherer

Since the Flint water crisis, public attention to the health effects of lead (Pb) and copper (Cu) in drinking water has increased. Small water systems are not required to provide corrosion control treatment (CCT) under the EPA's Lead and Copper Rule. 90% of Iowa's public water systems (PWSs) are small. CCT is only required in small systems if the action levels for Pb and Cu are exceeded. The lack of continuous CCT endangers the health of these communities. We are analyzing available Pb and Cu data for small community PWSs in Iowa to explore potential causes of elevated Pb and Cu.

# "Emissions of Tetrachlorobiphenyls (PCBs 47, 51 and 68) from Polymer Resin on Kitchen Cabinets as a Non-Legacy Source to Residential Air"

Nicholas J. Herkert, Jacob C. Jahnke, and Keri C. Hornbuckle

We identified finished cabinetry to be a novel and major source of PCB-47, PCB-51 and PCB-68 to residential home air. These neurotoxins are present in air at levels higher than anticipated from legacy sources. In our study, these compounds accounted for up to 50% of indoor PCB levels (2700 pg m-3). We hypothesize these congeners are produced from the decomposition of 2,4-dichlorobenzoyl peroxide as inadvertent byproducts in the production of polyester resin. The presence of these compounds in polymers, such as silicone, has been widely noted, but has never been shown to be a significant environment source of PCBs.

# "PCB Emissions from Paint Pigments: The Effect of Chemical and Surface Properties on Volatilization"

Jacob Jahnke and Keri Hornbuckle

Polychlorinated Biphenyls (PCBs) are inadvertently created in the manufacturing process of pigments used in commercial paints and other consumer products. We hypothesize that applied paint is a modern source of PCBs to air. Here we report an investigation of PCB emissions from freshly applied paint pigment. Preliminary results indicate PCBs are released from pigment samples into the air and their mass increases over time. We use emissions data to probe the chemical and surface properties of the system and their effects on volatilization. We conclude that non-legacy PCBs associated with pigments readily volatilize and contribute to indoor air PCB concentrations.

### "Degradation of TCE by Iron Minerals and Aquifer Materials"

**Thomas Robinson**, Michelle Scherer, Drew Latta, Tim Mattes, Patrick Richards, Anke Neumann, James Entwistle, Eric Suchomel, Rula Deeb, and Lea Kane

Trichloroethylene (TCE) is one of the more toxic and most frequently detected groundwater contaminants. Natural attenuation of TCE through biological degradation has been extensively studied and is widely accepted to contribute to TCE degradation. It is still unclear, however, whether abiotic degradation of TCE by reduced iron (Fe) minerals, natural organic matter, and reduced sulfur species contributes to natural attenuation. Of these reactions, reduction by reduced Fe minerals has been discussed as a particularly promising pathway for natural attenuation of chlorinated solvents. In particular, magnetite, a common mixed-valent Fe mineral, has been suggested to be responsible for TCE

attenuation at some field sites despite slow rates of TCE reduction by magnetite observed in laboratory experiments. Here we measured the reduction of TCE by magnetite, clay minerals, and soil samples collected from a TCE plume at the Middlefield-Ellis-Whisman (MEW) site in California. We tracked TCE loss, as well as accumulation of products, including dichloroethenes, acetylene, ethene, and ethane in sterilized, untreated, and amended microcosms. We used DNA biomarkers for dehalogenating organisms to determine if TCE degradation pathways were predominantly biotic or abiotic. In addition, we characterized the aquifer samples using wet chemical extractions, X-ray diffraction, and 57Fe Mössbauer spectroscopy. Our work provides insight into how aqueous Fe (II) and sulfide impact abiotic reduction of TCE by Fe-minerals and Fe-bearing sediments.

### "Development of a MRM Method to Detect OH-PCBs in Environment Samples"

Panithi Saktrakulkla and Keri C. Hornbuckle

Hydroxylated polychlorinated biphenyls (OH-PCBs) are oxidative metabolites of persistent organochlorines PCBs. OH-PCBs are usually found in either human tissues, other organisms, or environmental matrices at low quantities (pico-tonanogram scale). Measurement of OH-PCBs is therefore challenging. Using gas chromatography equipped with tandem mass spectrometer (GC-MS/MS) for the quantification of OH-PCBs, here we present the optimization process of multiple reaction monitoring (MRM) mode. By investigating the correlation between ion fragmentations and collision energy in a calibration solution of 81 compounds (72 OH-PCB congeners, 2 Surrogate, and 2 Internal Standards; 50 ng/mL), we obtained the optimum ion transitions that provide the highest peak responses. Compared to the published method, the new method showed relatively greater peak responses (up to 119 times): 72 congeners were higher (68 were statistically different); 6 congeners were equal; and 3 congeners were less than 10% lower (2 were statistically different). The novel method is composed of 37 acquisition time segments during a typical chromatographic run time of 70.3 minutes (Agilent J&W DB-1701 capillary column: 30 m, 0.25 mm i.d., 0.25 µm film thickness). The effectiveness of the method was examined in environmental sample extracts, and the results show that the method enables the quantification of OH-PCB congeners at lower concentrations.

### "Comprehensive Flood Loss Assessment and Visualization System"

Enes Yildirim and Ibrahim Demir

In this study, web-based flood damage assessment and visualization system was developed. Through the system, decision makers are able to analyze potential financial loss due to flood on a user-friendly web-based environment.

### ELECTRICAL & COMPUTER ENGINEERING

#### "Impact of Diffuse Shading Conditions on the Performance of Bifacial PV Modules" Amir Asgharzadeh Shishavan, Chris Deline, Joshua Stein, and Fatima Toor

Horizon obstructions can decrease the diffuse and direct light received by photovoltaic (PV) modules. Here, we investigate the effect of obstructions on the annual diffuse energy loss for two bifacial PV system orientations: optimally tilted facing south/north (BiS/N), and vertically installed facing east/west (BiE/W). We considered multiple locations with different latitudes and weather types and observed that without any horizon obstructions, BiS/N outperforms BiE/W for most locations and by up to 115 kWh/year. However, certain types of obstructions cause BiE/W to have higher energy yield (up to 3.7 kWh/year) than BiS/N for high latitude locations (e.g. Anchorage, and Paris).

#### "Accelerated Parameter Mapping of the Brain Using Structured Matrix Completion" Arvind Balachandrasekaran and Mathews Jacob

We introduce a structured low rank matrix completion algorithm to recover a series of images from their under-sampled measurements, where the signal along the parameter dimension at every pixel is described by a linear combination of exponentials. We exploit the exponential behavior of the signal at every pixel, along with the spatial smoothness of the exponential parameters to derive an annihilation relation in the Fourier domain. This relation translates to a low-rank property on a structured matrix constructed from the Fourier samples. We enforce the low rank property of the structured matrix as a regularization prior to recover the images. Since the direct use of current low rank matrix recovery schemes to this problem is associated with high computational complexity and memory demand, we adopt an iterative re-weighted least squares (IRLS) algorithm, which facilitates the exploitation of the convolutional structure of the matrix. Novel approximations involving two dimensional Fast Fourier Transforms (FFT) are employed to drastically reduce the memory demand and computational complexity, which facilitates the extension of structured low rank methods to large scale three dimensional problems. We demonstrate our algorithm in the MR parameter mapping setting and show improvement over the state-of-the-art methods.

### "Bootstrapping Using Machine Learning to Create Training Datasets for Automatic Cerebellum Segmentation"

Kevin Blicharski, Alexander Powers, and Hans Johnson

Manual segmentation of the cerebellum is prohibitively time-consuming and thus infeasible for big data applications. However, traditional methods are poorly suited for automatic segmentation due to the cerebellum's tree-like, branching structure. Our approach used high-probability label maps generated by a machine learning algorithm and extensive data augmentation to supplement manual labels. This is necessary to produce the large and diverse set of data needed for deep learning. This data curation has laid the groundwork necessary to train a deep learning algorithm to perform said automatic segmentation.

### "Mie Scattering-Based Analytical Model to Compute Plasmon Resonances of Metal Nanoparticles" Joshua Deutsch, Aaron Silva, and Fatima Toor

Plasmonics is the study of the excitation of free electrons in metals by incident light inducing collective oscillations resulting in strong local field enhancements called resonances. Metallic nanoparticles have variable scattering and absorption properties based on their size and incident light frequency. In this work we developed an analytical MATLAB

model based on Mie scattering theory and plasmonics to understand the interactions of spherical metal nanoparticles and visible light wavelengths of 300 nm to 1000 nm. Our results indicate that we can accurately predict the metal nanoparticle resonances using the developed model by comparing it to our experimental results.

# "Sol-Gel Films for Biosensors: Process Development and Characterization of Morphology and Optical Properties"

Fatima Toor and Clarissa Dietz

Silica-based sol-gels are transparent, mechanically robust, chemically inert, resistant to thermal degradation, photochemical degradation, and biodegradation and can be doped with a variety of sensing elements. The silica framework prevents guest molecules from leeching without inhibiting substrate-binding. They are an ideal candidate for integration into silicon nanowire biosensors. This project focuses on acid-catalyzed sol-gels that utilize a tetraethyl orthosilicate (TEOS) precursor. We will develop sol-gel films that adhere to silicon surfaces and characterize these films using atomic force microscopy (AFM), scanning electron microscopy (SEM), and UV-VIS-NIR spectroscopy to determine the morphology and optical properties of the fabricated sol-gel.

### "Green Roof Policy Urban Microsimulations in San Francisco"

Harrison Freund and Scott Spak

As the Green Economy slowly gains its footing, developers will be expected to change current building practices to reflect the increasing demand to adapt to sustainability challenges. One such are the installation of green roofs. This project addresses the question of what is expected to happen for cities and municipalities if green roofs were either required of new development and/or incentivized with the end goal of increasing their usage using several urban simulation experiments in San Francisco based off policies observed in real cities. San Francisco and Toronto are used as examples of locations where green roofs are mandated (exceptions are made for residential buildings), and Chicago is used as an example of a location with an incentive.

### "Electrical and Optical Performance Optimization of Nanostructured 'Black Silicon' Solar Cells" Bingtao Gao, Wenqi Duan, and Fatima Toor

In this study, we develop techniques to optimize the electrical and optical properties of nanostructured "black silicon" (b-Si) solar cells. The electrical performance is optimized by process development of the formation of uniform aluminum (AI) back surface field (BSF). We find that lower temperature annealing results in higher quantum efficiency due to the formation of a uniform BSF. The optical performance optimization is achieved by developing a one-step silver (Ag) metal assisted chemical etching (MACE) method for etching dense and uniform nanowires with the approximate length of 2.6 µm. We also tailor the process for metal removal after MACE such that the nanowires are not impacted.

### "IOT Irrigation Control"

Justin Hoehne, Shane Trautsch, and Daniel Levitt

Continued growth in the field of internet of things has created a position for niche devices capable of controlling appliances and systems in way previously not possible. Our objective was to create a self-contained IOT device capable of making use of any water source, be it rain barrel, river, or lake, solar power, and internet connection to precisely manage irrigation of a garden, crop, or lawns.

### "Automated Identification and Shape Analysis of Chorus Elements in the Van Allen Radiation Belts" Ananya Sen Gupta, Craig Kletzing, Robin Howk, William Kurth, and Morgan Matheny

An important goal of the Van Allen Probes mission is to understand wave-particle interaction by chorus emissions in terrestrial Van Allen radiation belts. To test models, statistical characterization of chorus properties, such as amplitude

variation and sweep rates, is an important scientific goal. The Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) instrumentation suite provides measurements of wave electric and magnetic fields as well as DC magnetic fields for the Van Allen Probes mission. Signal processing techniques for automated identification, shape analysis, and sweep rate characterization of high-amplitude whistler-mode chorus elements in the Van Allen radiation belts statistical characterization of detected chorus elements across a case study of a 6 s epoch will be discussed.

### "Multi-Atlas Transfer Segmentation from Human Brain to Minipig Brain"

Hui Xie and Hans Johnson

Animal models of human diseases play an important role in biomedical research for new therapies. Mini-pig is more affordable than primate models, and its brain is a gyrencephalic brain, sharing a number of anatomical, physiology, and metabolism characteristics with human brain. In particular, minipig brain show similarity with regard to size, grow, development, and vascularization with human brain. Multi-atlas brain segmentation deformed registers selected atlases into a same target image, and then uses same registration algorithm to register each corresponding segmentation labels of atlases, finally use majority vote or weight vote to fuse these registered labels to get the segmentation label of the target image. This poster uses multi-atlas expert-segmented human brain data and landmarks of mini-pig to deformed register human brain into a brain of minipig, then same register the labels of human brain atlases, finally uses major vote to fuse the labels to get a segmentation of a minpig brain.

# "Development of a Broadband Visible Spectrum Metal-Dielectric Metamaterial Film for Solar Window Coating Applications"

Xin Jin and Fatima Toor

We present the electromagnetic design of an aluminum-based frequency selective surface (FSS) for use in solar control window coatings. Solar control films save energy through passive cooling of a building by reflecting or absorbing heatgenerating infrared (IR) radiation. The FSS we design and fabricate in this work is based on nanostructured metallic antennas patterned on quartz substrate utilizing electron beam lithography. We will present the nanofabrication process optimization needed to fabricate the nanostructured window coating. The resulting coating reflects more than 70% of the IR radiation, while maintaining the transmission of visible light to above 94%.

### "Separation-Free Super-Resolution from Compressed Measurements: An Orthonormal Atomic Norm Minimization Approach"

Weiyu Xu, Jirong Yi, Soura Dasgupta, Jian-Feng Cai, Mathews Jacob, and Myung Cho

We want to recover the mixture of a group of complex exponentials from its compressed non-uniform time-domain samples. By reformulating the problem as a Hankel matrix completion problem, the MUltiple SIgnal Classification (MUSIC) algorithm identifies the underlying continuous frequencies after applying the orthonormal atomic norm minimization (OANM) approach to recovery all time-domain data. The OANM approach can super-resolve the underlying frequencies with arbitrary separation and sets the successful super-resolution free from the separation condition required by previous method. The orthonormality of the atoms in OANM accounts for the success of OANM without requiring separation among frequencies.

### "Recreating Real Time Weather Conditions on a Physical 3D Model (The KnowGlobe)"

Stephanie Krogh, Jacob Thompson, and Sawyer Goetz

The KnowGlobe is a connected device that gathers and recreates weather conditions in real time upon a 3D model. Snow, rain, temperature, and the position of the sun are represented using LED's and sounds controlled by a Raspberry Pi. The KnowGlobe is inspired by the classic knick-knick, the snow globe, with a digital twist to bring it into the modern era.

### "Comparing Modality Combinations of PET-CT Images In Cerebellum Segmentation with Deep Convolutional Neural Networks" Timothy Linhardt

The segmentation of the cerebellum in PET-CT scans enables an improved quantitative analysis of cancer, because the cerebellum's tracer uptake can be utilized as a reference region, showing a normal rate of metabolism. Since segmentation of the cerebellum is a tedious task, automation of this process helps to simplify the analysis process. In this work, a deep convolution neural network is utilized for implementing the segmentation process. Specifically, different approaches for network architectures, training, and data utilization are investigated based on several segmentation performance metrics to enable a direct comparison of the usefulness of each approach.

# "Analysis of Human and Animal Soft Tissue Sarcoma in the Mid-Infrared Utilizing an FTIR Spectrometer"

Fatima Toor, Suram Liyanage, Constance Erickson, Rebecca Dodd, Munir Tanas, and Ben Mill

Mid-infrared (MIR) light refers to wavelengths ranging from 3  $\mu$ m to 30  $\mu$ m and is the most attractive spectral region for surgical ablation of both soft and hard tissues. In this project we measure the absorption spectra of formalin-fixed and paraffin-embedded healthy and cancerous tissue sections mounted on Mirr-IR slides using a Fourier Transform Infrared (FTIR) spectrometer. We measure both human and mice tissues. Our measurements to-date indicate that sarcoma tissues compared to healthy exhibit higher absorption around 3  $\mu$ m - 4  $\mu$ m. The measurements will help identify a candidate wavelength for a compact surgical laser ablation system.

### "Exploring Electronic Properties of Ionic Liquids to Improve Components in Solar Cells, OLEDs and Optical Sensors"

Seth Lopez, Jianchao Xu, Bingtao Gao, Scott Shaw, and Fatima Toor

In this work, we study the electronic properties of ionic liquids (ILs) by utilizing various experimental techniques. ILs are ionic salts in the liquid state. They exhibit high capacitance, high ionic conductivity, wide electrochemical window, high thermal stability and non-volatile nature. These properties of ILs can enable performance enhancement of optoelectronic devices, such as, solar cells, organic light emitting diodes (OLEDs) and optical sensors. We conducted capacitance/conductance versus voltage measurements in microchannels patterned in glass and metal films utilizing nanofabrication techniques. We also developed nanocuvettes and imaged using atomic force microscopy (AFM) for studying the changes in electrical properties of ionic liquids in nanoconfined structures.

### "Designing and Fabricating a Capable Robot Pianist" Caleb Marting

I've always loved the piano as an instrument, but I never had the drive to learn how to play. To solve this problem, I am constructing a robot to play songs for me. The machine takes in a MIDI input, allowing computers, phones, and even other digital MIDI devices (like keyboards) to control it. The onboard Arduino microcontroller interprets the MIDI signal and actuates the piano keys, creating the sound. This system is designed to be entirely modular and thus could be ported to many piano/keyboard models, and could also be modified for other instruments.

### "Analysis of Gas Chromatography–Mass Spectrometry and Key Associations from Chicago Air Data Sets"

Ryan McCarthy, Andrew Awad, Andres Martinez, Josh Larson, Rachel Marek, Ananya Sen Gupta, and Keri Hornbuckle

Analytical tools to discover information within a gas chromatography–mass spectrometry (GC-MS) have been utilized to discover polychlorinated biphenyls (PCBs), which are harmful environmental contaminants. The process to discover PCBs manually is time and labor intensive, vulnerable to human error, and can miss some analytes. We aim to develop a method that models peaks within the multiple reaction monitoring (MRM) data to uncover hidden information within both the MRM and total ion chromatograph (TIC) data. Specifically, we use principal component analysis (PCA) and a modified k-means clustering techniques to discover associations between PCBs, sample locations, and PCBs and non-target analytes within the MRM and TIC data.

### "Electromagnetic Simulation of Transcranial Magnetic Stimulation"

Kumar Digvijay Mishra, Anton Kruger, Dr. Hiroyuki Oya

Transcranial magnetic stimulation(TMS) is a process that uses coils to cause electric currents to flow inside some region of brain. Repetitive TMS(rTMS) has been successfully used to treat depression in patients. Our goal is to simulate rTMS and quantify intensity of electromagnetic(EM) fields and electric currents inside brain. Current study demonstrates that such simulations are possible, but computationally expensive. Benchmark problem took 8 hours to produce results with EM solver, FEKO, on 26 cores.

### "Robust Stability of Spreading Blocks in Aggregate Programming"

Yuanqiu Mo, Dasgupta, and Jacob Beal

Self-stabilizing information spreading algorithms are an important building block of many distributed systems featuring in Aggregate Computing. Yet a characterization of the dynamics of their convergence has largely remained elusive, except in a special case of a distance finding variant known as the Adaptive Bellma-Ford (ABF) Algorithm. As a step towards understanding their behavior in interconnections with other building blocks, it is important to develop a framework to demonstrate their robust stability. Accordingly, this paper analyzes a very general block of which ABF is a special case. It provides a proof of global uniform asymptotic stability, upper bound on the time to converge and ultimate bounds on the state error in face of persistent perturbations.

# "Topological Leakage Detection and Freeze-and-Grow Propagation for Improved CT-Based Airway Segmentation"

Syed Ahmed Nadeem, Eric A. Hoffman, and Punam K. Saha

Numerous large multi-center studies are incorporating the use of computed tomography (CT)-based characterization of the lung parenchyma and bronchial tree to understand chronic obstructive pulmonary disease status and progression. To the best of our knowledge, there are no fully automated airway tree segmentation methods, free of the need for user review. Failure in a fraction of segmentations necessitates manual revision of all segmentation masks; a laborious task given the thousands of data sets evaluated in large studies. We present a novel CT-based airway tree segmentation algorithm using topological leakage detection and freeze-and-grow propagation requiring no manual inputs or post-segmentation editing.

### "Varifolds-Based Registration of Pulmonary Vessel Trees and Surfaces"

Yue Pan, Wei Shao, Christopher Guy, Gary E. Christensen, Oguz C. Durumeric, Sarah G. Yeary, Joseph M. Reinhardt, and Geoffrey D. Hugo

In this poster, we provide a multi-resolution framework for varifold-based deformable registration of human pulmonary Computed Tomography (CT) images. The framework of varifolds is well-suited for representing any non-oriented shapes, such as non-oriented curves or surfaces. We show that the discrete varifolds-approximated as a sum of delta Dirac varifold converge to the continuous varifold in the dual of Reproducing Kernel Hilbert Space (RKHS) and the distance between the discrete and continuous varifolds is related to the complexity of the shape and Gaussian kernel size. We also investigate the minimum number of delta Dirac varifolds which can accurately represent non-oriented

shapes, e.g. the skeletons of the blood vessel trees and the triangulated surfaces of human lung and give a good alignment of the shapes. In the experiment section, firstly we use the varifold-based registration results of 2D human eye fundus images to give us a guidance to choose parameters in R^3. Finally, we registered a collection of 18 human lung CT images with collapsed lobes, which are really hard to be registered using intensity-based metric. We show that using the multi-resolution framework varifold based not only is faster, but also gives a better alignment of the shapes.

### "Clustering of Data in the Presence of Missing Entries"

Sunrita Poddar and Mathews Jacob

The amount of data being generated and stored globally is growing inconceivably every year. Thus algorithm development for analyzing and finding patterns within large datasets is a very active area of research. However, many of these algorithms do not take into account the fact that real-world datasets contain a lot of missing entries. This could happen due to a number of reasons such as sensor malfunction, time and resource limitations on the data collection etc. We propose and theoretically analyze an algorithm to cluster and find patterns in datasets in the presence of missing entries. Using simulated data, we show the stability of our clustering algorithm with change in the fraction of missing entries. The utility of the proposed algorithm is also demonstrated on real datasets.

### "Effects of High Q Resonant Coils in MIMO Wirless Power Transfer Systems" Michael Salino-Hugg

The effects of High-Q Resonant Coils on single input single output (SISO) Wireless Power Transfer (WPT) systems has been well documented and shown to significantly increase the range and power that can be delivered to a load. However as more coils are added to the system, the model needed to tune such a system becomes difficult to construct. This research presents a method of using receiver feedback to adaptively perform this tuning in multiple intput multiple output (MIMO) WPT systems to increase transfer efficiency and power delivered to the load.

### "Knowledge Discovery, Integration and Communication for Extreme Weather and Flood Resilience Using Artificial Intelligence: Flood Expert"

Yusuf Sermet and Ibrahim Demir

This abstract presents our project on developing a resilience framework for flooding to improve societal preparedness with objectives; (a)develop a generalized ontology for extreme events with primary focus on flooding; (b)develop a knowledge engine with voice recognition, artificial intelligence, natural language processing, and inference engine (c)develop a data acquisition and processing framework from existing environmental observations, forecast models, and social networks. (d)develop a communication framework to support user interaction and delivery of information to users. The interaction and delivery channels will include voice and text input via web-based system (e.g. IFIS), agent-based bots (e.g. Microsoft Skype, Facebook Messenger), smartphone and augmented reality applications (e.g. smart assistant), and automated web workflows (e.g. IFTTT, CloudWork) to open the knowledge discovery for flooding to thousands of community extensible web workflows.

#### "Enhanced Absorption of Nano-Textured Silicon through Silver Nanoparticle Decoration" Aaron Silva, Wengi Duan, and Fatima Toor

Nanowire (NW) textured silicon (Si) is utilized for biosensors since NWs exhibit large surface area to volume ratio and light capturing properties. We seek to enhance the optical absorption of Si NWs by coating them with silver (Ag) nanoparticles (NPs). Ag NPs exhibit plasmon resonance due to electrons collectively oscillating at wavelengths of 400 to 530 nm causing more light to be absorbed at these wavelengths. The higher absorption due to Ag NPs can increase the detection sensitivity of our Si NW biosensors. Results show that larger sized and a greater quantity of silver NPs cause a larger plasmon resonance effect.

# "Clustering of Largely Right-Censored Oropharyngeal Head and Neck Patients to Improve Prognosis"

Joel Tosado, Guadalupe Canahuate, David Vock, G. Elisabeta Marai, Clifton Fuller, and Dr. Abdallah S. R. Mohamed

Right-censored outcomes, such as overall survival or recurrence, refer to the fact that for many patients only a lower bound on the time-to-event is known. With an increased number of features and relatively small number of patients, the sparsity of the data diminishes the effectiveness of standard approaches such as the Cox Proportional Hazards model. The goal of clustering here is to identify similar groups of patients that exhibit the same response to treatment or expected outcomes in order to improve the prediction accuracy for new patients.

### "InAs Nanowires for Infrared Optics: Selective Area Epitaxy Growth and Capacitance-Voltage Devices"

Alex Walhof, Kailing Zhang, John Prineas, and Fatima Toor

Group III-V nanowires (NWs) are an exciting 1-D structure for infrared optical devices due to control over band structure and the potential for new lattice-mismatched material combinations. Using selective area epitaxy growth allows for catalyst-free, ordered growth which minimizes defects. We use electron beam lithography to precisely write nanohole patterns which are transferred through an aluminum layer (that prevents charging during exposure) into a SiNx hard mask, uncovering a Si [111] surface for InAs NW nucleation. After growth by molecular beam epitaxy, the NW background carrier concentration, a critical parameter affecting non-radiative recombination rates, is measured using the capacitance-voltage technique.

#### "High Sensitivity Silicon Nanowire Biosensor for Estrogen Detection in Water Streams"

Wenqi Duan, Bingtao Gao, Hui Zhi, Gregory LeFevre, and Fatima Toor

Discharged estrogens are not filtered out in water treatment plants, leaking into water streams, disrupting the local wildlife and raising concerns of excess estrogens entering the human food chain. In this work, we are developing vertically oriented silicon nanowires (SiNWs) based biosensors for detecting natural (E1) and synthetic (EE2) estrogen. The SiNWs are etched into Si substrates and converted into optoelectronic SiNW sensors utilizing microfabrication process steps. By functionalizing the SiNW sensors with estrogen receptors, we can detect as low as 10 µg/mL of E1. Next steps include testing with EE2 and androgens such as testosterone to confirm sensor selectivity.

#### "TSAT - Terrestrial Satellite Acquisition and Tracking"

#### Bram Williams and Justin Hoehne

The TSAT (Terrestrial Satellite Acquisition & Tracking) system is a portable offline satellite tracking platform built in response to recent advances in satellite production and implementation. With the dramatic increase in the number of satellites being sent into space, the possibility of global private communication networks will become a reality. The TSAT system will become the durable, reliable link used by governments and companies to access these global networks.

### "Evaluating the Effect of Right Censored End-Point Transformation for Radiomic Feature Selection of Oropharyngeal Cancer Patient Data"

Luka Zdilar, David Vock, G. Elisabeta Marai, Dr. Clifton D. Fuller, and Guadalupe Canahuate

This study investigates the effect of transforming a right-censored outcome into binary, continuous, and censoredaware representation on radiomics feature selection and subsequent prediction of overall survival (OS) and relapsefree survival (RFS) of oropharyngeal cancer patients. Different feature selection techniques were applied using a binary outcome indicating event occurrence prior to median follow-up time, a continuous outcome using the Martingale residuals from a proportional hazards model, and the raw right-censored time-to-event outcome. Radiomic signatures combined with clinical variables were used for risk prediction. Three metrics for accuracy and calibration were used to evaluate eight feature selectors and six predictive models.



### MECHANICAL & INDUSTRIAL ENGINEERING

### "Autonomous Robotic Control Under Linear Temporal Logic"

Mingyu Cai, Siddhartha Mehta, Chau Ton, and Zhen Kan

In this research, we present a hybrid control strategy for autonomous vehicle that is required to perform a rich mission specification over service requests occurring at the regions of a partitioned environment. The overall mission consists of surveillance tasks and exploration with reward collection in a uncertain and dynamic environment.

### "Effects of Ships Motions and Atmospheric Boundary Layer on Ship Aerodynamics"

Gregory M. Dooley, Juan E. Martin, and Pablo M. Carrica

Interactions between a ship's super structure and the incoming airflow form a complex and highly turbulent airwake, which aircraft must encounter during at sea flight operations. Ship motions and turbulence in the atmospheric boundary layer add to the complexity of modeling the dynamic interface between a ship and an aircraft. Full scale simulations using the ONR Tumblehome geometry have been done to quantify the effects of different magnitudes of ships motions and airflow turbulence.

### "Wheel Profile Optimization to Mitigate Wear and Rolling Contact Fatigue for Railroad Vehicles"

Chris Feldmeier, Yosuke Yamazaki, Takanori Kato, Takahiro Fujimoto, Osamu Kondo, and Hiroyuki Sugiyama

One of the challenges in rail vehicle maintenance and operation is well-balanced mitigation of wheel wear progression and rolling contact fatigue (RCF). If wear progression rate is higher than crack propagation rate, surface-initiated cracks can be removed. However, this leads to frequent re-profiling and replacement of wheels. To address this problem, a wheel profile optimization procedure is developed in this study. The proposed procedure allows for considering wheel wear evolution in the optimization process, while the damaged-based RCF model is integrated to account for the effect of wear rate on the crack growth.

### "Investigating Methods for Acoustic Fire Suppression"

Nicholas Hsiao and Patrick Madalinski

Two years ago, students at GMU designed and built the "Wave Extinguisher," an acoustic device built around a subwoofer capable of extinguishing a small alcohol fire from a distance of 14 inches. The goal of this experiment is to recreate the device and investigate its ability to extinguish a fire using non-sinusoidal waveforms. The device operates on the principle that rapid changes in air pressure disrupt the fire's ability to "breathe" oxygen from the air. We aim to discover a relationship between the device's performance and the properties of the sound waves emitted.

### "Stable Eyes - Handheld Camera Stabilizer for University of Iowa Film Students"

#### Sy Butler and Dylan Ponomar

The Stable Eyes is a handheld, lightweight camera stabilizer made by and for students of the University of Iowa. Our stabilizer uses a precisely balanced and adjustable system comprised of a moment arms and weights with a free rotating ergonomic handle to allow filmmakers to capture smoother footage. As the handle is moved by the camera

operator, the weights will act as counterbalance to external movement providing stability for the camera mount atop the central axis of weights. Upon completion, we plan to donate our stabilizer to the University's Film Department for students to use on class projects.

### "ELM-SOM: A Continuous Self-Organizing Map for Visualization"

**Renjie Hu**, Venous Roshdibenam, Hans J. Johnson, Emil Eirola, Anton Akusok, Yoan Miche, Kaj-Mikael Björk, and Amaury Lendasse

This paper presents a novel dimensionality reduction technique: ELM-SOM. This technique preserves the intrinsic quality of Self-Organizing Maps (SOM): it is nonlinear and suitable for big data. It also brings continuity to the projection using two Extreme Learning Machine (ELM) models, the first one to perform the dimensionality reduction and the second one to perform the reconstruction. ELM-SOM is tested successfully on six diverse datasets. Regarding reconstruction error, ELM-SOM is comparable to SOM while bringing continuity.

#### "Experimental Investigation of Ship Airwake Aerodynamics"

Austin Krebill, Gregory Dooley, J. Ezequiel Martin, Pablo Carrica, and James Buchholz

The airwake of a ship presents a hostile and dangerous environment for aircraft operating from the flight deck due to interactions between the vortex shedding dynamics from the bluff ship superstructure, the atmospheric boundary layer, and the ship's motion in waves. In this investigation, an ONR Tumblehome ship's airwake is studied experimentally to identify dominant flow structures, characterize airwake dynamics, and to produce an extensive CFD validation data set for airwake research.

#### "Audio-Tactile Warning Systems Based on Learnability and Perceived Urgency of Tactile Stimuli: Implications for Design of Audio-Tactile Medical Warning Systems" Amirmasoud Momenipour and Privadarshini Pennathur

Audible signals are highly used in medical warning systems. However, because of the human auditory sensory limitations as well as the nature of medical environments, audible warnings are often missed, turned off, unrecognized, and intertwined with noises in the environment. By applying multiple resources theory and cross-modal learning, the potential of using multisensory warning signals (audio-tactile) in medical environment is investigated. In this study, a method in receiving the urgency level of audible signals with tactile inputs are proposed. This study has implications for designing multisensory warning systems in medical settings.

### "Molecular Dynamics Simulation of Diffusion Bonding During Ultrasonic Welding of Dissimilar Materials"

Avik Samanta, Shaoping Xiao, and Hongtao Ding

The bonding mechanism during ultrasonic welding between dissimilar materials has been prime research areas in recent years because of the complex thermomechanical loading condition at the bonding interface as well as the difficulty to join dissimilar materials. Diffusion has been observed as one of the mechanisms of bond formation at the interface between copper and aluminum undergoing ultrasonic welding. In this study, Molecular dynamics (MD) simulations are carried out to analyze the diffusion bonding between Copper/Aluminum and Nickel/Aluminum interfaces subjected to ultrasonic welding. The simulation result shows that the thickness of the diffusion bonded area is temperature dependent, with higher the temperature resulting in larger bond thickness. It also indicates that the bond thickness depends on the difference between melting temperature of the two materials.

#### "Wall Stress Estimation in Cerebral Aneurysm-Geometric Feature Learning via Zernike Convolutional Neural Networks" Zhiyu Sun

In this paper, we introduce a novel concept of Zernike convolution on two-dimensional manifolds for geometric machine learning on 3D graphical models, enabling a design of deep neural model to extract and learn the correlations between geometric features and wall stress distribution in Cerebral Aneurysm.

### "Characterization of Vorticity Transport in the Leading Edge Vortex During a Roll Maneuver"

Kevin Wabick, Randall Berdon, James Buchholz, Kyle Johnson, and Brian Thurow

The interaction of the vortices with the surface of an aerodynamic body is an inherent feature in unsteady aerodynamics and is observed in many aerospace structures. The evolution of vortices is a highly nonlinear process in which the underlying mechanisms are not well understood. Plenoptic Particle Image Velocimetry measurements were taken to examine the growth and evolution of a leading edge vortex on a rectangular plate of aspect ratio 2, articulated pure roll in the presence of a free-stream for J=05 and J=1.25. A circulation budget is formulated and analyzed with a control region surrounding the leading edge vortex (LEV).

### "Enhancement of Surface Functionality Using Laser Nano-Structuring of Engineering Metal Alloy" Qinghua Wang, Avik Samanta, and Hongtao Ding

Multi-functional metal surfaces are increasingly employed in biomedical, optical, energy, transportation, aerospace and naval applications. Emerging laser-based surface texturing methods demonstrate significant potential for manufacturing these surfaces, with the additional advantages of maintaining high precision and flexibility. In this work, random nanoscale surface structures are achieved surface features are achieved on engineering metal surface using an innovative time-efficient and cost-effective laser nano-structuring method. The enhancement of surface functions, such as micro-hardness, corrosion resistance and self-cleaning performance on these nanostructured metal surfaces will be presented and discussed.

### "Characteristics of Airflow and Particle Deposition in COPD Current Smokers"

Chunrui Zou, Jiwoong Choi, Babak Haghighi, Sanghun Choi, Eric A. Hoffman, and Ching-Long Lin

A recent imaging-based cluster analysis of CT lung images in COPD cohort identified four clusters, viz. disease subpopulations. To better understand the characteristics of airflow and particle deposition in these clusters, we perform computational fluid and particle dynamics analyses on representative cluster patients and healthy controls using CTbased airway models and subject-specific 3D-1D coupled boundary conditions. The results show that particle deposition in central airways of cluster 4 was noticeably increased. This study demonstrates the potential application of cluster-guided CFD analysis in disease populations.



# CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

### "Machine Learning Models for Cancer Prediction: Clinical and Genomic Data"

Michael C. Rendleman, Chibuzo Nwakama, Reinhard Beichel, Bart Brown, John Buatti, Terry A. Braun, and Thomas L. Casavant

Tumor characterization is an integral part of personalized oncological medicine. Machine learning has been previously applied to this topic in the context of cancer imaging and radiomics, yielding results showing significant association with gene expression in lung cancer patients. In this research, machine learning algorithms and techniques were applied to the publicly-available clinical data to infer missing values and to predict positive patient outcomes. The data are sourced from The Cancer Genome Atlas Head and Neck Squamous Cell Carcinoma (TCGA-HNSC) dataset. The predictive models will serve as a baseline for future tumor characterization using a combination of a patient's clinical, imaging, and genetic information. This approach will ultimately provide a novel path for clinical decision support and ultimately more informed, precise oncological treatment in the age of personalized/precision genomic medicine.

# "GPU Accelerated Protein Structure Optimization and Its Application to Genes Associated with Hearing Loss"

Mallory R. Tollefson, Jacob M. Litman, Hernan V. Bernabe, Claire E. OConnell, Guowei Qi, Richard J. H. Smith, and Michael J. Schnieders

Optimization of protein structural models plays an important role in preparing models for use in downstream analytic algorithms such as missense variant thermodynamics. Rotamer Optimization (RO) is an algorithm that uses dead-end elimination with the polarizable AMOEBA force field to optimize side-chain positioning in protein structural models at atomic resolution. Optimization of protein models with RO is computationally expensive and creates a high demand for computing resources. In this work, we describe a parallelization method utilizing Nvidia graphical processing units (GPUs) and the GPU amenable OpenMM molecular simulation library to accelerate our side-chain optimization algorithm. With the use of one Intel Xeon E5-2680v4 central processing unit (CPU) equipped with a GPU, our side-chain optimization algorithm achieved a 25 times speed-up compared to using two Intel Xeon E5-2680v4 CPUs. Our parallel algorithm utilizes 94 percent GPU capacity according to the Nvidia device monitor. We then applied our accelerated RO algorithm to a set of 164 protein structural models and improved the mean MolProbity score from 2.65 Å (42nd percentile) to atomic resolution at 1.41 Å (95th percentile). We expect our fast and efficient RO GPU accelerated algorithm to lessen the demand for computing resources dedicated to protein structure optimization efforts.



### CENTER FOR COMPUTER-AIDED DESIGN

### "Multi-Scale Additive Manufacturing: A 3D-Printing Method Based on Digital Light Processing" Fan Fei, Wenbo Wang, and Xuan Song

Digital light processing (DLP) is a type of 3D printing method utilizing digital projector screen to flash a single image to turn liquid resin into a solid object. It has advantages such as fast speed and high resolution. However, traditional DLP method has drawback of small fabrication size, which is limited by the size of the digital projector. In this article, a multi-scale DLP method is introduced, with which the fabrication size is improved by 30 times, and the fabrication accuracy is controlled to 10 um at the same time.

### "Predicting Manufactured Shapes of a Projection-Based Stereolithography Process via Convolutional Encoder-Decoder Networks" Yusen He and Stephen Baek

Projection-based stereolithgorphy (pSLA) processes have been widely utilized in three-dimensional (3D) digital fabrication. However, various uncertainties of a photopolymerization process often deteriorates the geometric accuracy of fabrication results. A predictive model that maps input shapes to actual out-comes in real-time would be immensely beneficial for designers and process engineers, permitting rapid design exploration through inexpensive trials-anderrors, such that optimal design parameters as well as optimal shape modification plan could be identified with only minimal waste of time, material, and labor. However, no computational model has ever succeeded in predicting such geometric inaccuracies to a reasonable precision. In this regard, we propose a novel idea of predicting output shapes from input projection patterns of a pSLA process via deep neural networks. To this end, a convolutional encoder-decoder network is proposed in this paper. The network takes a projection image as the input and returns a predicted shape after fabrication as the output. Cross-validation analyses showed the root-mean-square-error (RMSE) of 10.72 µm in average, indicating notice-able performance of the proposed convolutional encoder-decoder network.

### "Controllability Ensured Leader Group Selection on Signed Multi-Agent Networks"

Baike She, Zhen Kan, Siddhartha Mehta, and Chau Ton

Leader-follower controllability of signed multi-agent networks is investigated, where the agents interact via neighborbased Laplacian feedback and the interactions between agents admit positive and negative weights capturing cooperative and competitive interactions. To enable full control of the leader-follower signed network, graph-inspired topological characterizations of the controllability of signed networks are investigated. Specifically, sufficient conditions on the controllability of signed path and cycle networks are developed based on the investigation of the interaction between network topology and agent dynamics. Constructive examples are provided to illustrate how the developed controllability result on signed path and cycle networks can be potentially extended to general signed networks.



### CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL SCIENCE

### "Investigating Pollution Around Lake Michigan Using Continuous Emissions Monitoring Systems" Austin Doak

The 2017 Lake Michigan Ozone Study (LMOS) was a field campaign to expand observations of ozone and other pollutants in areas where air quality standards were repeatedly violated, specifically Zion, IL. Using data from continuous emission monitoring systems (CEMS) we could inspect how industrial emissions in neighboring states effect the Lake Michigan area. SO2, NOx and CO2 emissions from industrial factories and wind meteorological data were plotted in MATLAB to assess how plumes travel across the region. CEMS data paired with remote sensing measurements from aircraft and ground sites creates a comprehensive look at the pollutants in the area.

### "Experimental Characterization and Hygroscopicity Determination of Secondary Aerosol from D5 Cyclic Siloxane Oxidation"

**Nathan Janechek**, Nathan Bryngelson, Rachel F. Marek, Traci Lersch, Kristin Bunker, Gary Casuccio, H. Brune, Keri C. Hornbuckle, and Charles O. Stanier

Cyclic volatile methyl siloxanes (cVMS) are widely used chemicals in personal care products such as antiperspirants and hair conditioners. Widely released to the atmosphere by personal care product use, cVMS undergo oxidation reactions forming aerosols which may play an important role in evaluating human health exposure and environmental fate. In this study, we generate and characterize the aerosols from oxidation of pure cVMS and personal care products. The aerosol elemental composition, morphology, size, concentration, volatility, hygroscopicity, and aerosol yield are reported. Measured aerosol yields were 20-50%, concentrations up to 220 µg m-3, 30-90 nm, low volatility, and were slightly hygroscopic.
# **IIHR - Hydroscience & Engineering**

# "Modeling Cavitation with a Probabilistic Boltzmann Transport Equation Approach"

Mehedi Hasan Bappy, Jiajia Li, and Pablo Carrica

Cavitation is critical in naval applications as it causes undesirable effects like acoustic noise, vibration, erosion, and bubbly wake. Current simulation methods are not accurate enough to reliably predict some features of cavitating flows. Better prediction models for cavitation are therefore required for high-fidelity simulations. This study is aimed at developing a PDF-based approach where a Boltzmann transport equation is used to solve for the bubble distribution with a multi-group approach. The model is currently being implemented and will be tested for both one and two-dimensional cavitating flows.

# "Characterization of the Initial LEV for a Maneuvering Wing"

Randall Berdon, Kevin Wabick, James Buchholz, Brian Thurow, and Kyle Johnson

The leading-edge vortex (LEV) is a characteristic structure that has been shown to increase lift on a maneuvering wing. An understanding of the LEV behavior can eventually contribute to manipulation and augmentation of the LEV which has many applications in micro air vehicle (MAV) stability. Flow visualizations were recorded of an aspect ratio 2 wing in the presence of a free stream. Non-dimensional radius of gyration included Rg/c = 2, 2.5, 3.25, and 3.5. Advance ratios were varied as J = 0.2, 0.3, 0.5, .75, 1, 1.25, and 1.44. Classifications of the LEV behavior were categorized into 3 categories which included Conical, Transitional, and Non-Conical. Classifications were created as to provide a framework to understanding LEV evolution. Interestingly, a non-dimensional velocity gradient defined as  $\pi$ Rot that was proposed, separates the Conical and Non-conical classifications. A hypothesis is that this non-dimensional velocity gradient is the governing parameter in the initial LEV evolution. Future work includes creating a wing with through holes that act as jets and augment the evolution of the LEV.

# "SaferTrek: System Development for Farm Vehicle Road Safety Study"

Grace Milroy and Nichole Griffith

In order to evaluate the effectiveness of public awareness campaigns, data involving farm equipment interactions with other highway vehicles is needed. The SaferTrek project's goal is to create a device to collect this data and to then quantify driver behavior in these vehicle interactions. Our solution is a box that attaches to multiple types of farm vehicles with an adaptable magnet-based mounting system. While the farm vehicles are on the road it records GPS data and videos with time-stamp information.

# "Investigation of the Relationship Between the Wind Turbine Operating Conditions and Bat Fatality" Jian Teng and Corey Markfort

Wind energy is the fastest growing renewable energy source in the U.S. However, bat fatalities associated with wind turbines are a rising concern in the development of wind energy industry. The purpose of this research is to identify the weather and wind turbine operating conditions associated with measured bat fatality. We will present analysis of meteorological and wind turbine operational data compared with bat fatality cases identified in carcass surveys for two large wind farms in Iowa. The results will provide a range of wind turbine operating conditions that are linked with bat fatality. This information will be used to develop mitigation strategies to limit wind energy impacts on bats.

# "An Investigation on Boundary Layer Transition Models for Naval Hydrodynamics"

Dongyoung Kim, Juan E. Martin, Yagin Kim, Jiajia Li, Robert V. Wilson, and Pablo M. Carrica

Boundary layer transition is a complex phenomenon that involves multiple physical mechanisms. In naval hydrodynamics problems, boundary layer transition can have considerable effects on skin friction, noise, propulsion efficiency and maneuverability. It is especially so for model scale and small craft such as unmanned and autonomous surface or underwater vehicles. To investigate capabilities and limitations of boundary layer transition models for naval hydrodynamics application, several recently developed models are implemented to the overset computational naval hydrodynamics code REX and validated against experimental results. Correlation-based transition models using local variables, including extended models for crossflow transition effects, and methods based on stability theory using an amplification factor were implemented in one- and two-equation RANS turbulence models. Extensive validation is conducted for 2- and 3-dimensional geometries with experimental data including flat plates at zero-pressure gradient, an ellipsoid, and a sickle wing. Additionally, computations on model propeller 4119, which has some experimental data, and the much more complex generic submarine Joubert BB2 were performed and analyzed.

# "CFD Simulation of a Generic Submarine Operating Near the Surface"

Yagin Kim, Pablo M. Carrica, and J. Ezequiel Martin

A submarine operating near the free surface experiences very complicated hydrodynamic forces induced by the presence of the air/water interface. Unlike in deep operation, an underwater vehicle moving at periscope depth interacts with the free surface to form gravity driven waves which may adversely affect the propulsion efficiency, sea keeping ability and maneuverability. In this study, the generic submarine BB2 Joubert with actual discretized propeller and sail and tail planes is studied numerically for near-surface operation. The CFD code REX, developed at the University of lowa, is used, focusing on effects on resistance and propulsion, motions and flow characteristics.

# "Modeling Bubble Entrainment and Transport Using Hybrid RANS/LES Methods"

Ben Yuan, Jiajia Li, and Pablo Carrica

Prediction of bubbly flow is of crucial importance in naval hydrodynamics. While simulations using Large Eddy Simulation (LES) methods provide details of the flow field that cannot be achieved with Reynolds-averaged Navier-Stokes (RANS) models, they lack the turbulent kinetic energy and dissipation used by bubbly flow models. We propose a new Hybrid RANS/LES method based on the standard Delayed Detached Eddy Simulation (DDES) approach, which to some extent can remove the limitations described above. The resulting turbulent kinetic energy and dissipation are in good agreement with RANS and two-phase results are validated against experiments. Such improvements enable insights into the bubble generation mechanisms and result in better predictions with current bubbly flow models.

# "Sedimentation Mitigation at Multi-Box Culverts"

Marian Muste and Haowen Xu

Sediment deposition at culverts is a prominent problem for multi-box culverts located in areas where streams convey substantial sediment loads, such as the watersheds in the US Midwest. Sediment accumulated at culverts can eventually lead to partial blockage and the reduction of their effective cross-section with adverse consequences on culvert capacity to convey the design flows. Site visits at more than 250 threebox culverts in the state of lowa revealed that the vast majority of multibox culverts in the state experience severe blockage due to sedimentation. Illustrations of typical sedimentation cases are provided below for two lowa culverts. Culvert surveys repeated over time show that sedimentation develops relatively fast, sometimes within the first year after complete cleanup.



# IOWA INSTITUTE FOR BIOMEDICAL IMAGING

# "Model Based Deep Learning in Free Breathing, Ungated, Cardiac MRI Recovery"

S. Biswas, H.K. Aggarwal, S. Poddar, and M. Jacob

We introduce a model-based reconstruction framework with deep learned (DL) and smoothness regularization on manifolds (STORM) priors to recover free breathing and ungated (FBU) cardiac MRI from highly undersampled measurements. The DL priors enable us to exploit the local correlations, while the STORM prior enables us to make use of the extensive non-local similarities that are subject dependent. We introduce a novel model-based formulation that allows the seamless integration of deep learning methods with available prior information, which current deep learning algorithms are not capable of. The experimental results demonstrate the preliminary potential of this work in accelerating FBU cardiac MRI.

# "Differentiation Between Papilledema and Non-Arteritic Anterior Ischemic Optic Neuropathy Using Retinal Layer Shape and Regional Volume Features in Spectral-Domain Optical Coherence Tomography"

John W. Miller, Jui-Kai Wang, Matthew Thurtell, Randy Kardon, and Mona K. Garvin

Swelling of the optic disc can result from a number of conditions. Papilledema, caused by raised intracranial pressure (ICP), and nonarteritic anterior ischemic optic neuropathy (NAION), which presents without raised ICP, are two such conditions. Determining the cause of optic disc edema can be difficult, and in the case of papilledema may require a lumbar puncture to diagnose. A noninvasive, computer-based method for determining the cause of optic disc edema could save doctors and patients time, avoid painful invasive procedures, and provide an objective measure of confidence when deciding on possible treatments. We used retinal layer shape information acquired from spectral-domain optical coherence tomography (SD-OCT) scans from 20 patients (10 papilledema, 10 NAION) to train a random forest classifier to distinguish between two causes of optic disc swelling. Our classifier was able to distinguish between papilledema and NAION with an average accuracy of  $81.2 \pm 3.6\%$ , confirming the usefulness of retinal layer shapes for differentiating between causes of optic disc edema. The results of this experiment are encouraging for future studies that will include more patients and additional causes of optic disc edema.

# "Sensitivity Analysis of Jacobian Determinant Used in Treatment Planning for Lung Cancer"

Wei Shao, Sarah E. Gerard, Yue Pan, Taylor J. Patton, Joseph M. Reinhardt, Oguz C. Durumeric, John E. Bayouth, and Gary E. Christensen

The Jacobian determinant of the correspondence map between the end inhalation and the end exhalation CT image volumes can used as a surrogate for lung function. We study sensitivity of the Jacobian determinant to small registration errors. We present a linear approximation of the relative Jacobian error and give a formula for the sensitivity matrix of the system. Preliminary sensitivity analysis results are presented using 4DCT scans from 10 individuals. For each subject, we generated 6400 random smooth biologically plausible perturbation vector fields. We showed that high-functioning regions are less sensitive to noise and even small perturbation (0.5 mm) can lead to large errors in Jacobian calculation (10%).

# "Biomarker Discovery for Head and Neck Cancer using Positron Emission Tomography"

Ethan J. Ulrich, Brian J. Smith, John M. Buatti, and Reinhard R. Beichel

A biomarker is an objective measurement of an underlying biological process. In the clinical setting, a biomaker can identify high-risk patients, quantify response to treatment, or predict patient outcome. In this work, we present techniques for biomarker discovery in positron emission tomography (PET) scans of patients with head and neck cancer. A biomarker discovery framework was developed that extracts 105 quantitative imaging biomarkers from tumor segmentations and evaluates performance using Cox regression and machine learning models. We then applied our framework to 59 FDG-PET and 30 FLT-PET scans to identify biomarkers with the potential to predict outcomes.

# "High Performance Lung Cancer Computer-Aided Diagnosis with Optimized Perinodular Parenchyma Features"

**J. Uthoff**, M. J. Stephens, J. D. Newell Jr., E.A. Hoffman, J. Larson, N. Koehn, F. A. De Stefano, C. Lusk, A.S. Wenzlaff, D. Watza, C. Neslund-Dudas, L.L. Carr, D. A. Lynch, A.G. Schwartz, and J. C. Sieren

With growing use of low-dose computed tomography for lung cancer screening, the detection frequency of lung nodules has increased dramatically. Non-invasive distinction of malignant from benign nodules will result in notable reduction in procedure-related morbidity and healthcare costs. We developed a computer-aided diagnosis (CADx) tools for pulmonary nodule assessment. A CADx development pipeline was employed using k-medoids clustering and information theory to determine efficient predictor sets for different amounts of parenchyma inclusion and build an artificial neural network classifier. Through optimization of feature extraction regions from the parenchyma, CADx validation performance of 100% sensitivity and 96% specificity was achieved.



# SPECIAL PROGRAMS & STUDIES

# College of Engineering Dean's Graduate Fellowships

The Dean's Graduate Engineering Fellowship provides four years of support to the brightest incoming PhD students in the College of Engineering. These students demonstrate the greatest promise to significantly improve the quality, productivity, and research involvement of the departmental graduate student cohort. Beginning in 2017, fellowships will be awarded every year; one per graduate program (six total) as well as one or two additional fellowships with a diversity-enhancing focus. Reflecting the highest quality, each Dean's Fellow is expected to complete her/his research, publish the results, and successfully defend his/her PhD thesis within four years. An overview of each of this year's Dean's Graduate Fellowship recipients research is provided in the following.

#### Marisol Contreras, Diversity, Chemical & Biochemical Engineering

Research interest in determining the economic and environmental impacts of the photoelectrochemical production of chlorine.

#### Rae Corrigan, Biomedical Engineering

Understanding molecular interactions via automatic parameterization of large, arbitrarily complex, organic molecules based on the state-of-the-art polarizable AMOEBA force field and applying machine learning techniques to determine binding partners.

#### Isaac Miguel Di Napoli, Mechanical Engineering

Research interest based in fluid structure supporting development of methods to monitor real-time deflections in marine structures and applications to structuring health monitoring and optimal performance of these structures.

#### "Multi-Scale Additive Manufacturing: A 3D-printing Method Based on Digital Light Processing" Fan Fei, Industrial Engineering

Digital light processing (DLP) is a type of 3D printing method utilizing digital projector screen to flash a single image to turn liquid resin into a solid object. It has advantages such as fast speed and high resolution. However, traditional DLP method has drawback of small fabrication size, which is limited by the size of the digital projector. In this article, a multi-scale DLP method is introduced, with which the fabrication size is improved by 30 times, and the fabrication accuracy is controlled to 10 um at the same time.

#### "Electrical and Optical Performance Optimization of Nanostructured 'Black Silicon' Solar Cells" Bingtao Gao, Electrical & Computer Engineering

In this study, we develop techniques to optimize the electrical and optical properties of nanostructured "black silicon" (b-Si) solar cells. The electrical performance is optimized by process development of the formation of uniform aluminum

(AI) back surface field (BSF). We find that lower temperature annealing results in higher quantum efficiency due to the formation of a uniform BSF. The optical performance optimization is achieved by developing a one-step silver (Ag) metal assisted chemical etching (MACE) method for etching dense and uniform nanowires with the approximate length of 2.6 µm. We also tailor the process for metal removal after MACE such that the nanowires are not impacted.

# "Snapshot of Lead and Copper in Iowa Drinking Water"

Amina Grant, Diversity, Civil & Environmental Engineering

Since the Flint, Michigan, water crisis, public attention to the health effects of lead (Pb) and copper (Cu) in drinking water has increased. Unlike large water systems, small and medium-sized water systems are not required to provide corrosion control treatment under the U.S. EPA's Lead and Copper Rule (LCR). About 93% of Iowa's public water systems are either small or very small water systems. Corrosion control treatment is only required in these smaller systems if the action levels for Pb and Cu are exceeded. The lack of continuous corrosion control treatment endangers the public health of consumers in these communities. Several water quality parameters, such as high chloride levels, low pH levels, high nitrate in pipes, household piping materials, type of water source, and treatment methods, are suspected to contribute to elevated concentrations of Pb and Cu. To explore potential causes of elevated concentrations of Pb and Cu data for small community water systems in Iowa. Our goal is to provide a publicly accessible database as well as evaluate potential causes of elevated concentrations of Pb and Cu in Iowa drinking water. We hope the analysis will help inform and educate communities on how to keep their drinking water safe.

# Alex Morrison, Civil & Environmental Engineering

Ms. Morrison is currently a graduate student in the Civil and Environmental Engineering Department and a member of the newly established Sustainable Water Development Program. She is currently researching climate change impacts on extreme rainfall events.

# "WRF-Hydro"

# Beiming Tang, Chemical & Biochemical Engineering

As a first year graduate student, Beiming Tang researches the use of WRF-hydro package to simulate the hydrologic patterns in the state of Iowa. Our aim is to pave way for further analysis of nitrogen absorption, by first acquiring a precise model of how water is distributed in Iowa. Through investigating precipitation, evapotranspiration, runoff and soil moisture, we could solve the related differential conservation equations by applying the most convincing boundary and initial conditions. We anticipate this project shall help both the researchers and local farmers.

# "DARE TO DISCOVER"

In January 2016, the Office of Research and Economic Development launched the "Dare to Discover" campaign showcasing researchers, scholars, and creators from across the University of Iowa, including a series of banners throughout downtown Iowa City. The College of Engineering was represented by 11 graduate and undergraduate students from all five Engineering academic departments:

# "Iowa Air Quality Sampling"

Maeve Bittle, Civil & Environmental Engineering

The focus of this research concerns environmental pollutants and how they interact with the environment and with people. Learning more about the toxicological importance of persistent organic pollutants (or POPs) will help us to find how they can be safely removed to help the health of the public. Our lab is focusing on airborne Polychlorinated Biphenyls (PCBs).

# "Indoor Air Toxin Measurements"

# Dana Boesen, Mechanical & Industrial Engineering

An aspect of a collaborative effort among a team of UI researchers, this program investigates PCBs, a class of pollutants banned in the 1970s but still found in the environment, with the specific objective of preparing filters used in a study of air toxins in indoor air. In simple terms, why does this research matter? This research is important because it helps inform the public about potential hazards present in the environment. Additionally, it aids government entities, such as the EPA, in policy making and remediation efforts.

# "Tissue Engineering - Combining Ultrasound and Intratumoral Administration of Doxorubicin-Loaded Microspheres to Enhance Tumor Cell Killing"

Anh-Vu Do, Chemical & Biochemical Engineering

Metastatic melanoma is an incurable disease for which alternative treatments to chemotherapy alone are sought. Here, using a melanoma model, we investigated the antitumor potential of combining ultrasound (US) with poly(lactic-coglycolic acid) (PLGA) microspheres loaded with doxorubicin (DOX). The aim was to achieve synergistic tumoricidal activity through direct and indirect US-mediated damage of tumor cells combined with sustained and potentially controllable release (when combined with US) of DOX from microspheres. An in vitro release assay demonstrated an ability of US to affect the release kinetics of DOX from DOX-loaded PLGA microspheres by inducing a 12% increase in rate of release. In vitro viability assays demonstrated that combining US with DOX-loaded PLGA microspheres resulted in synergistic tumor cell (B16-F10 melanoma cells) killing. Melanoma-bearing mice were treated intratumorally with DOX (8 µg)-loaded microspheres and subjected to US treatment at the tumor site. This treatment could significantly extend survival (mean survival (MS) = 22.1 days) compared to untreated mice (MS = 10.4 days) and most other treatments, such as blank microspheres plus US (MS = 11.5 days) and DOX (8 µg)-loaded microspheres alone (MS = 13 days). The findings that immune checkpoint blockade did not significantly extend survival of mice treated with DOX (8 µg)-loaded microspheres plus US, and that tumor-free ("cured") mice were not protected from subsequent tumor rechallenge suggests minimal involvement of the adaptive immune response in the observed antitumor activity. Nevertheless, the synergistic increase in survival of melanoma-challenged mice treated with the combination of US and DOX-loaded microspheres implicates such a treatment methodology as a promising additional tool for combatting otherwise currently incurable cancers.

# "Fighting Muscular Dystrophy"

Sara El-Hattab, Chemical & Biochemical Engineering

This research effort focuses on determining the effects of systemic gene delivery by adeno-associated viral vector on muscle phenotype in a model of congenital muscular dystrophy. This research could potentially provide a means to improve the lives of those suffering from certain types of muscular dystrophy.

# "Lung Cancer Imaging - A Deep Learning Approach for Lung and Lobe Segmentation in CT Images" Sarah Gerard, Biomedical Engineering

Lung and lobar segmentation in computed tomography images is an important precursor for quantitative regional analysis of pulmonary disease and lung function. In this work we propose a deep learning approach using a convolutional neural network model for lung and lobe segmentation. We evaluate the proposed method on a diverse dataset of human and animal subjects with various lung diseases. The results demonstrate the method is robust to challenging pathologies and allow for automated analysis of large datasets.

# "Cancer DNA Molecular Editing"

#### Brittany Givens, Chemical & Biochemical Engineering

Mutated DNA is common in diseases such as muscular dystrophy, sickle-cell anemia, and cancers. DNA editing is a powerful treatment for these diseases, because it is believed that changing the mutated DNA to match healthy DNA will prohibit the disease from persisting. However, there are two major challenges for treatment that edits DNA, including (1) protecting healthy DNA from enzymes that break it down and (2) specificity of the healthy DNA for the diseased cells instead of healthy cells. A relatively new way of editing DNA uses the same technique that prokaryotes use for phage resistance. The DNA sequence in this technique is termed clustered regularly-interspaced short palindromic repeats (CRISPR). It is coupled with the Cas9 enzyme, and CRISPR-Cas9 was just used in the first human clinical trial in China in 2016 to treat lung cancer. CRISPR-Cas9 has high specificity for the mutated DNA, but by itself is still at risk for degradation by enzymes. Therefore, it is often packaged in a polymer that provides a protective layer outside the CRISPR-Cas9 construct.

It is our aim to combine CRISPR-Cas9 plasmids with high molecular weight (PEI). This compacts the plasmid to about a 100 nm diameter sphere, protects the plasmid from degradation, and induces a positive charge which improves delivery into mammalian cells. By design, when the CRISPR-Cas9 construct integrates with the host DNA, the mutated DNA altered such that any signs and symptoms of disease are inhibited. We have begun testing these in endometrial cancers. According to the National Cancer Institute, approximately 61,000 new cases of endometrial cancer were reported in 2017 and endometrial cancer was responsible for approximately 11,000 deaths. Endometrial cancer is a great model because there are many different types of endometrial cancer cell lines and there is a protein that is over-expressed and is a suggested marker for metastases. This protein, is the target of our studies. The goal of the project is to reduce the viability of endometrial cancer cells both in vitro and in an animal model.

# "Understanding Epilepsy"

# Stephen Kruse, Biomedical Engineering

Epilepsy affects an estimated 3 million Americans and around 1/3 of these cases will not respond to treatment. A chemical messenger in the brain called serotonin is thought to prevent death through the recovery of breathing after the seizure by preventing seizure-induced respiratory arrest (S-IRA). Our study focused on norepinephrine, another chemical messenger, and the role it plays in prevention of S-IRA. We used pharmacological agents to manipulate levels of both serotonin and norepinephrine in mice. Mice underwent an artificial seizure while breathing was recorded. We found that an increase in norepinephrine reduced S-IRA and death while pretreatment with a norepinephrine blocker extinguished this effect. An increase in serotonin was not sufficient to prevent S-IRA and death in mice with depleted noradrenergic systems. These results support the importance of norepinephrine in recovery of post-seizure breathing and may be a basis for further studies involving norepinephrine in seizure.

# "Innovations in Virtual Reality"

Sophia Mallaro, Electrical & Computer Engineering

Conducted in collaboration with faculty from the UI Speech and Hearing School, this research effort focuses on the application of virtual reality tools and methodologies to develop a virtual reality upper-endoscopy training tool for students. Virtual reality has a plethora of applications in fields such as medicine and education. Improving the quality of virtual reality improves the quality of these applications.

# "Using Zebrafish to Test Drugs for their Efficacy Against Epileptic Seizures"

Russell M. Martin, Biomedical Engineering

Epilepsy is a seizure disorder whose primary symptom occurs when the brain sends erratic signals throughout the nervous system, which can cause convulsions. The severity of these convulsions can range from inconvenient to life-threatening and can have a variety of underlying causes, therefore there is strong motivation to seek novel anticonvulsant drugs. New drug development is an expensive and time-consuming process, so a central goal in this work is to repurpose drugs that are already FDA-approved. We are using a database from a research group that tested how various drugs would normalize abnormal seizure-associated gene expression levels in seizing cells. We test these drugs on Zebrafish that have been given a proconvulsant to induce seizures and track their movement in a seizure assay, with the goal of finding a drug that will reduce those seizures. We are also working with CRISPR/Cas9 methods to create a loss-of-function mutation in genes linked to epilepsy, which will allow further testing of potential anticonvulsants. The overall goal of this work is to learn more about what drugs can be used to prevent seizures, and ultimately might one day be used to treat epilepsy.

# "Investigating the Role of Mitochondrial Stress in the Pathophysiology of Diabetes and Obesity" Angela Olvera, Biomedical Engineering

More than 30 million people in America have diabetes. There is a strong correlation between the obesity epidemics and the increase in the incidence of diabetes the United States. For that reason, our work in the Abel Laboratory aims to better understand how tissue-specific mitochondrial stress affects whole body metabolism in the context of obesity and diabetes. Mitochondria have an important role in maintaining whole body metabolism because they utilize glucose and fatty acids as fuel to provide energy in the form of ATP to support cellular function. To study the role of mitochondrial stress we generated mice lacking the mitochondrial protein OPA1 (Optic Atrophy 1) in a tissue-specific manner. OPA1 is a GTPase that regulates mitochondrial dynamics, cristae structure and respiratory capacity. The deletion of OPA1 reduces mitochondrial function, and therefore results in energy stress in the cell. Surprisingly, we recently demonstrated that mitochondrial stress in skeletal muscle can trigger an adaptive response that ultimately improves whole body metabolism and protects mice from diet-induced obesity and insulin resistance, via induction of fibroblast growth factor 21 (FGF21), a potent anti-obesity and anti-diabetes hormone. Further studies have shown that OPA1 deletion in adipose tissue also leads to an adaptive response that prevents diet-induced obesity and attenuates diet-induced insulin resistance, in this case by mechanisms that are independent of FGF21 secretion. Our ongoing research focuses on understanding the mechanisms underlying the metabolic protection observed in mice lacking OPA1 specifically in adipose tissue. Taken together, our studies reveal that mitochondrial stress induced by OPA1 deletion triggers compensatory mechanisms to promote metabolic protection. These mechanisms involve inter-tissue communication, which, in the case of our muscle studies, was mediated by FGF21. Ultimately, we hope that from better understanding the mechanisms by which tissue-specific mitochondrial stress ameliorates metabolic function in mice, we can uncover new treatments for obesity and diabetes.

# "Artificial Intelligence Deployment – Knowledge Discovery, Integration and Communication for Extreme Weather and Flood Resilience Using Artificial Intelligence: Flood Expert" Muhammed Yusuf Sermet, Electrical & Computer Engineering

This abstract presents our project on developing a resilience framework for flooding to improve societal preparedness with objectives; (a)develop a generalized ontology for extreme events with primary focus on flooding; (b)develop a knowledge engine with voice recognition, artificial intelligence, natural language processing, and inference engine (c)develop a data acquisition and processing framework from existing environmental observations, forecast models, and social networks. (d)develop a communication framework to support user interaction and delivery of information to users. The interaction and delivery channels will include voice and text input via web-based system (e.g. IFIS), agent-based bots (e.g. Microsoft Skype, Facebook Messenger), smartphone and augmented reality applications (e.g. smart assistant), and automated web workflows (e.g. IFTTT, CloudWork) to open the knowledge discovery for flooding to thousands of community extensible web workflows.

# CREATIVE "KICK-START" PROGRAM

Creative Kick Start is a program developed by the Engineering Library and the Engineering Technology Centers for engineering students (undergraduate and graduate) to submit a proposal to receive funding for prototyping/finishing their projects using the services offered through the Creative Space, Engineering Electronic Shop, and Machine Shop. Kick-Start award winners for 2017 – 2018 are:

# "Acoustic Fire Suppression Device" Nicholas Hsiao and Patrick Madalinski

The Wave Extinguisher has many limitations, namely the size of the fire it can extinguish and the distance at which it is effective. The goal of this experiment is to create an acoustic fire-suppression device and investigate its ability to extinguish a fire using non-sinusoidal waveforms. The device operates on the principle that rapid changes in air pressure disrupt the fire's ability to "breathe" oxygen from the air. By changing the waveform of the sound, we can manipulate the air pressure surrounding the fire in different ways, such as the intensity and duration of pressure spikes/drops. We aim to discover a relationship between the device's performance and the properties of the sound waves emitted.

Sponsor: Dr. Justin Garvin, Mechanical & Industrial Engineering

# "The Bugle Chip" James Chenoweth, Ford Minaghan, Michael Garneau, and Velarchana Santhana

The idea my team and I would like to pursue is a solution to the following problem: The placement and replacement of gastrojejunal (GJ) feeding tubes requires significant amounts of fluoroscopy, which can lead to cumulative radiation exposure, particularly in pediatric patients. Essentially, we are designing a way to ensure the proper placement of a gastrojejunal tube in patients over the age of one while limiting radiation exposure to staff and patients. Our preliminary design is a small device which would help hold open the pyloric valve, which separates the stomach from the small intestine. Resistance from this valve can cause complications while inserting the feeding tube, which requires the hazardous fluoroscopy to image the procedure in real time.

Sponsor: Dr. Sarah Vigmostad, Biomedical Engineering

# "Convert Any Piano to a Player Piano" Caleb Marting

I want to design and manufacture a machine that can be set on any piano's keys, transforming the piano into a midi instrument, which is an instrument that can be controlled by a computer. This project is personal to me because, being someone who is not very musically inclined, it would augment the abilities of myself and others to perform music. The first stage would be designing the mechanics to drive the keys of the piano. Once constructed, code and electronics would be created to take midi data from a controller. This would then be routed into the mechanics to produce sound. After this idea is realized, it could be incorporated into multiple other projects: a jukebox, an instrument in a robotic band, or even a demonstration of STEM principles. This machine is the "easy way" out of taking piano lessons.

Sponsor: Dr. Justin Garvin, Mechanical & Industrial Engineering

# "Irrigation Control System" Justin Hoehne, Daniel Levitt, and Shane Trautsch

A solar powered, internet connected irrigation management system for household use that runs on solar energy entirely independent of an electric grid.

Sponsor: Dr. Anton Kruger, Electrical & Computer Engineering

# "Recreating Real Time Weather Conditions on a Physical 3D Model (The KnowGlobe)" Stephanie Krogh, Jacob Thompson, and Sawyer Goetz

The KnowGlobe is a connected device that gathers and recreates weather conditions in real time upon a 3D model. Snow, rain, temperature, and the position of the sun are represented using LED's and sounds controlled by a Raspberry Pi. The KnowGlobe is inspired by the classic knick-knick, the snow globe, with a digital twist to bring it into the modern era.

Sponsor: Dr. Gary Christensen, Electrical & Computer Engineering

# "Metered Dose Sunscreen Device" Kelsi Dahms, Gregory Graham, Colton Myer, and Ellie Wallace

With one out of five Americans developing skin cancer in their lifetime, current sun protection options need to be reevaluated. Therefore, our team aims to improve current sun protection modalities. We will do so by creating a sunscreen bottle that is able to dispense recommended amounts of sunscreen individualized to the user. It is internationally agreed upon that sunscreen should be applied at a thickness of 2 mg/cm2. Hence, because everyone's surface area differs, everyone's needed amount of sunscreen differs. Our bottle will take this factor into account by using an individual's height and weight to predict their surface area. In turn, the amount of recommended sunscreen can be accurately dispensed from the bottle based on each person's unique surface area. The need for an improved sun protection modality was identified and referred to our team by a local otolaryngologist (ENT physician) who has seen the devastating effects of the sun firsthand in his patients. Additionally, everyone on our team has been personally affected by the sun's harmful ultraviolet radiation which strengthens our commitment to achieving a successful outcome.

Sponsor: Dr. James Ankrum, Biomedical Engineering

# "Stable Eyes - Handheld Camera Stabilizer for University of Iowa Film Students" Sy Butler and Dylan Ponomar

The Stable Eyes is a handheld, lightweight camera stabilizer made by and for students of the University of Iowa. Our stabilizer uses a precisely balanced and adjustable system comprised of a moment arms and weights with a free rotating ergonomic handle to allow filmmakers to capture smoother footage. As the handle is moved by the camera operator, the weights will act as counterbalance to external movement providing stability for the camera mount atop the central axis of weights. Upon completion, we plan to donate our stabilizer to the University's Film Department for students to use on class projects.

Sponsor: Matias Perret, Mechanical & industrial Engineering

# "The Talon Retractor" Sarah Cooper, Greg Malicki, Bryan Tanner, and Tommy Rashid

The current design of the Army/Navy Surgical Retractor causes significant tissue slipping throughout surgery, causing underlying tissue damage, possible patient bleeding, and increased surgical time. Our idea is to improve on the current design in order to prevent unintentional slipping from occurring.

Sponsor: Dr. Colleen McHenry/Dr. Seth Dillard, Biomedical Engineering

# "TSAT – Terrestrial Satellite Acquisition and Tracking" Bram Williams and Justin Hoehne

The TSAT platform will be a portable offline satellite tracking platform capable of fitting inside a backpack. Powered by software defined radio, GNU radio companion, MATLAB, and G-Predict, the TSAT platform will be able to use the computers RTC in combination with MATLAB and a local database of Keplerian elements, in combination with a GPS, the platform would calculate the location of relevant radio/weather satellites.

Sponsor: Dr. Anton Kruger, Electrical & Computer Engineering

# "What's Behind the Pink Ribbon: Tackling Truncal Lymphedema" Maria Fernanda Larraga Martinez, Genevieve Goelz, Anna Rodriguez, and Ashten Sherman

We want to come up with a way to prevent the development of truncal lymphdema in at-risk unilateral mastectomy patients to avoid its adverse health effects. We hope to achieve this through a wearable compression garment to address the asymmetrical anatomy of these patients.

Sponsor: Dr. Colleen McHenry, Biomedical Engineering

# LIST OF POSTER PRESENTERS BY ACADEMIC DEPARTMENT

#### **BIOMEDICAL ENGINEERING**

Austin. Brett Bui Tran. William Chenoweth, James Dahms, Kelsi El-Hattab, Mariam Gerard, Sarah Guo. Zhihui Hajdarevic, Bakir Halberg, Spencer Herrmann, Jacob Kruse, Stephen Larraga Martinez, Maria Fernanda Martin. Russell Nakagawa, Daichi Niedert, Elizabeth Rashid, Tom Remy, Matthew Sarathy, Srivats Silva, Aaron Sona. Ino Tollefson, Mallory Ulrich, Ethan Uthoff, Johanna

#### **CHEMICAL & BIOCHEMICAL ENGINEERING**

Aljaafari, Hydar Alsaedi. Sattar Chou. Hsien Christiansen, Megan Delcau, Michael Do. Anh-Vu Doak, Austin Dong, Can Givens, Brittany Green, Brian Hasa, Erion Janechek, Nathan King, Benjamin Kloepfer, Nicole Knapp, Eric Koonce, Jonathan Kurpius, Renae Levden, Michael Lippert, Daniel McCarthy, Kyle McKee. Austin Pattee, Emily

Pradhan, Ojas

# **CIVIL & ENVIRONMENTAL ENGINEERING**

Grant, Amina Herkert, Nicholas Jahnke, Jacob Krogh, Stephanie Robinson, Thomas Saktrakulkla, Panithi Xu, Haowen Yildrim, Enes

# ELECTRICAL & COMPUTER ENGINEERING

Albaggal, Yasir Asgharzadeh Shishavan, Amir Balachandrasekaran, Arvind Biswas, Sampurna Blicharski, Kevin Deutsch. Joshua Duna, Wengui Freund, Harrison Gao, Bingtao Griffith, Nichole Hoehne, Justin Howk, Robin Hui, Xie Jirong, Yi Linhardt, Timothy Liyanage, Ganegma Lopez. Seth Marting, Caleb Miller, John Mishra, Kumar Digvijay Mo, Yuangui Nadeem, Syed Ahmed Pan. Yue Poddar, Sunrita Rendleman, Michael Salino-Hugg, Michael Sermet, Yusuf Shao, Wei Tosado, Joel Walhof, Alexander Williams. Bram Zdilar, Luka

# MECHANICAL & INDUSTRIAL ENGINEERING

Bappy, Mehedi Hasan Berdon, Randall Cai, Mingyu Dooley, Gregory Fei, Fan Feldmeier, Christofer He, Yusen Hsiao, Nicholas Hu, Renjie Jian, Teng Jin, Xin Kim, Dongyoung Krebil, Austin Momenipour, Amirmasoud Ponomar, Dylan Samanta, Avik She, Baike Sun, Zhiyu Wabick, Kevin Wang, Qinghua Yagin, Kim Yuan, Ben Zou, Chunrui

# **OTHER DEPARTMENT**

Dietz, Clarrisa (Physics)



# Graduate Degree Candidates

# **BIOMEDICAL ENGINEERING**

# MASTER OF SCIENCE

# Blackburn, Robert

Graduation Date: Summer, 2017 Degree: Thesis: Advisor:

MS (Non-Thesis) N/A N/A

# Brown, Alex

Graduation Date:	Summer, 2017
Degree:	MS
Thesis:	Maintenance and Modification of
	Mesenchymal Stromal Cell
	Immunosuppressive Phenotype
Advisor:	James Ankrum

# McLaughlin, Ryan

Fall, 2017
MS (Non-Thesis)
N/A
N/A

# Michael, John

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Characterizing Occupational
	Instabilities Induced By a Four
	Degree of Freedom All-Terrain
	Vehicle Simulator
Advisor:	Salam Rahmtalla

# Ong, Chung Hoe

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Electrostatic Precipitator to
	Collect Large Quantities of
	Particulate Matter
Advisor:	Thomas Peters

# Permeswaran, Palani

Spring, 2018
MS
Electrostatic Precipitator to
Collect Large Quantities of
Particulate Matter
Jessica Goetz

# Roach, Devin

Graduation Date:	Fall, 2017
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	N/A

# Tessmann, Jonathan

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	Neuroendocrine Tumor Variant
	Discovery
Advisor:	Terry Braun

# Thomas, Holly

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	A Computational Investigation of
	Patient Factors Contributing to
	Contact Stress Abnormalities in
	the Dysplastic Hip Joint
Advisor:	Jessica Goetz

# Thompson, Jessica

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	2D and 3D Control of
	Photopolymerized Polycapro-
	lactone Scaffolds for Cell
	Replacement Therapy in Retinal
	Disease
Advisor:	Budd Tucker, Kristan
	Worthington

# Tollefson, Mallory

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Accelerated Many-Body Protein
	Side-Chain Repacking Using
	GPUs: Application to Proteins
	Implicated in Hearing Loss
Advisor:	Michael Schnieders
VanDenBosch,	Leah

Graduation Date:	Spring, 2018
Dearee:	MS
Thesis:	Investigating the Effect of Fluid
	Shear Stress on the Failure of

Cancer Cell Membranes: An
Experimental and Computational
Analysis
Sarah Vigmostad

# Wadkins, David

Advisor:

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Nanoparticles: Nanoscale Systems for Medical Applications
Advisor:	James Ankrum

# **DOCTOR OF PHILOSOPHY**

# Chung, Timothy

• … • … • • … • • … •	
Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	Study of Multi-Axial Failure
	Properties of Planar Biological
	Soft Tissues
Advisor:	M.L. Suresh Raghavan

# Dadkhah, Hossein

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	Developing Novel Techniques for
	Next Generation Rotating Shield
	Brachytherapy
Advisor:	Ryan Flynn

# Deng, Wenxiang

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Automated Measurements of
	Vasculature in Mouse and
	Human Retina
Advisor:	Mona Garvin

# Goddard, Aaron

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Image-Based Modeling of the
	Heart: An Eulerian Means of
	Applying Left Ventricular Motion
	for Patient-Specific CFD Studies
Advisor:	Sarah Vigmostad

# Kalantari, John

Graduation Date:	Fall, 2017
Degree:	PhD

Thesis:

Advisor:

A General Purpose Artificial Intelligence Framework for the Analysis of Complex Biological Systems Michael Mackay

# Kern, Andrew

Graduation Date:	Summ
Degree:	PhD
Thesis:	Large
	Conta
	۰

Summer, 2017 PhD Large Population Evaluation of Contact Stress Exposure in Articular Joints for Prediction of Osteoarthritis Onset and Progression Donald Anderson

# Zarkoob, Hoda

Advisor:

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	Mechanobiology of Keratinocyte
	Aggregate Formation and its Role
	in Wound Healing
Advisor:	Edward Sander

# CHEMICAL & BIOCHEMICAL ENGINEERING

#### MASTER OF SCIENCE

#### Do, Anh-Vu

Graduation Date: Degree: Thesis: Advisor: Fall, 2017 MS N/A Aliasger Salem

# Du, Lingyun

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Analyzing the Impact of
	Resolution and Aerosol Radiation
	Feedback on Air Quality
	Simulating During a Winter Haze
	in Northern China
Advisor:	Gregory Carmichael

#### Haas, Abigail

Graduation Date: Spring, 2018 Degree: MS (Non-Thesis) Thesis: N/A Advisor: Charles Stanier

# Lennartson, Elizabeth

Graduation Date: Spring, 2018 Degree: MS Thesis: Diurnal Variation of Aerosol Optical Depth in Korea: A Synthesis from AERONET, Satellite, KORUS-AQ Observation and WRF-Chem Model Advisor: Jun Wang

# Lewis, Devyn

Graduation Date: Degree: Thesis: Advisor: Fall, 2017 MS (Non-Thesis) N/A Charles Stanier

# Tor, Austin

Graduation Date:Spring, 2018Degree:MS (Non-Thesis)Thesis:N/AAdvisor:Charles Stanier

DOCTOR OF PHILOSOPHY

#### Algharrawi, Khalid

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Production of Methylxanthine by
	Metabolically Engineered E. coli
Advisor:	Venkiteswaran Subramanian

# Delcau, Michael

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Differentiation of Pseudomonas
	Sp Strain ADP Biofilms and
	Planktonic Cells Using Methods
	in Gene Expression Analysis
Advisor:	Tonya Peeples

# Dong, Can

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	A Modeling Study of Nucleation
	and Air Quality in the Midwestern
	United States
Advisor:	Charles Stanier

# Janachek, Nathan

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Atmospheric Modeling and
	Experimental Characterization of
	Gas and Aerosol Phase Cyclic
	Volatile Methyl Siloxanes
Advisor:	Charles Stanier

# Kaalberg, Sara

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Improving Photopolymerization
	Outcomes Through Control of
	Cationic Ring-Opening Systems
Advisor:	Julie Jessop

# Leigh, Braden

Graduation I	Date:
Degree:	

Spring, 2018 PhD

Thesis:	Engineering Surfaces Using
	Photopolymerization to Improve
	Cochlear Implant Materials
Advisor:	C. Allan Guymon

# McLaughlin, Jacob

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Controlling and Modeling the Properties of Photopolymers
	Through Structure
Advisor:	C. Allan Guymon

# Sobhani, Negin

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Applications, Performance
	Analysis, and Optimizations of
	Weather and Air Quality Models
Advisor:	Gregory Carmichael

# CIVIL & ENVIRONMENTAL ENGINEERING

#### MASTER OF SCIENCE

#### Culpepper, Johnathan David

Graduation Date:Summer, 2017Degree:MSThesis:Reduction of Tetrachloroethylene<br/>and Trichloreothylene by<br/>Magnetite RevisitedAdvisor:Michelle Scherer

# Figus, Matthew John

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Salam Rahmatalla

#### Gerst, Zahary Russell

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Christopher Stoakes

# Grimley, Lauren E.

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	Urban and Rural Flood
	Forecasting: A Case Study in a
	Small Town in Iowa
Advisor:	Witek Krajewski

# Habib, Mohamed Ahmed Fouad Abdelmoez

Summer, 2017
MS (Non-Thesis)
N/A
Allen Bradley

# Haines, Bryce Jordan

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Characterization of Hydrology
	Oxbow: Ecosystem Services
	Achieved in Year One
Advisor:	Larry Weber

# Johns, Adam Jospeh

Graduation Date: Spring, 2018

Degree:	MS
Thesis:	N/A
Advisor:	David Cwiertny

# K C, Ashok

Graduation Date:Summer, 2017Degree:MS (Non-Thesis)Thesis:N/AAdvisor:Allen Bradley

# Klarich, Kathryn Leigh

Fall, 2017
MS
Transformation and Fate of
Neonicotinoid Insecticides During
Drinking Water Treatment
David Cwiertny & Gregory
LeFevre

# Kral, Andrew Edward

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	N/A
Advisor:	David Cwiertny

# Kueny, Adam T. R.

Spring, 2018
MS (Non-Thesis)
N/A
Salam Rahmatalla

# Lombardo, Jerald Michael

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Salam Rahmatalla

# Markland, Kendra Marie

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	Relating Functional Microbial
	Diversity to Eastern Iowa Alluvial
	Aquifer Groundwater Chemistry
Advisor:	Craig Just

# Mattson, Rebecca Ruth

Graduation Date:	Spring, 2018
Degree:	MS
Thesis:	Submerged Attached Growth
	Reactors as Lagoon Retrofits for
	Cold-Weather Ammonia Removal
Advisor:	Craig Just

# Miller, Kory James

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Christopher Stoakes

# Nielsen, Jacob Kevin

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Evaluating Spatial and Temporal Nitrate-Nitrogen Patterns Across
Advisor:	Larry Weber

# Odegard, Cooper Thomas

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Gabriele Villarini

# Tsai, Heng-Wei

Graduation Date:	Summer, 2017
Degree:	MS
Thesis:	Development of Methodology to
	Support Estimation of Snow
	Drirting with Application to Snow
	Fence Design
Advisor:	William Eichinger

# Vishwakarma, Srishti

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Witek Krajewski

# Yildirim, Enes

Graduation Date:	Summer, 2017
Degree:	MS
Thesis:	Hazus-MH Flood Loss Estimation on a Web-based System
Advisor:	Ibrahim Demir

# Xu, Canyu

Fall, 2017
MS (Non-Thesis)
N/A
Salam Rahmatalla

# DOCTOR OF PHILOSOPHY

# Black, Ellen M.

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	The Impact of Native Freshwater
	Mussels on Nitrogen Cycling
	Microorganisms in Upper
	Mississippi River Sediment
Advisor:	Craig Just

# El Saadani, Mohamed Elsayed Ali Elbasuoni

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	A Spatio-Temporal Dynamical
	Evaluation of Satellite Rainfall
	Products in Hydrologic
	Applications
Advisor:	Witold Krajewski

# Herkert, Nicholas John

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Development of the Polyurethane
	Foam Passive Air Sampler for
	Novel Applications in Ambient Air
	Across the Globe
Advisor:	Keri Hornbuckle

# Horna Munoz, Daniel Vicente

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Investigation of Floodwave
	Propagation Over Natural
	Bathymetry Using a Three-
	Dimensional Numerical Model
Advisor:	George Constantinescu

# Qiao, Guandong

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Identification of Physical
	Parameters of Biological and
	Mechanical Systems Under

	Whole-Body Vibration Using
	Modal Analysis
Advisor:	Salam Rahmatalla

# Schroer, Hunter William

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Biotransformation and Photolysis
	of 2,4-Dinitroanisole, 3-Nitro-
	1,2,4-Triazol-5-One, and
	Nitroguanidine
Advisor:	Craig Just

# **ELECTRICAL & COMPUTER ENGINEERING**

# **MASTER OF SCIENCE**

#### Archer, Alec Christopher

Graduation Date: Spring, 2018 MS (Non-Thesis) Degree: Thesis: N/A Advisor: David Andersen

#### Asgharzadeh Shishavan, Amir

Spring, 2018 Graduation Date: Dearee: MS (Non-Thesis) Thesis: N/A Advisor: Fatima Toor

#### Bharathi, Kunal

Graduation Date: Degree: Thesis: Advisor:

Fall. 2017 MS (Non-Thesis) N/A David Andersen

#### Duan, Wengi

Graduation Date: Fall, 2017 Degree: MS (Non-Thesis) Thesis: N/A Advisor: Fatima Toor

#### Greene, Amanda

Graduation Date: Fall, 2017 Degree: MS (Non-Thesis) Thesis: N/A Advisor: David Andersen

#### Haque, K. A. S. M. Ehteshamul

Graduation Date: Degree: Thesis: Advisor:

Fall, 2017 MS (Non-Thesis) N/A Fatima Toor

#### Joshi, Apoorva

Graduation Date: Spring, 2018 Degree: MS Thesis: N/A Advisor: Sudhakar Reddy

#### Miller, John William

Graduation Date: Spring, 2018 Degree: MS

Thesis:

**Differentiation Between Causes** of Optic Disc Edema Using Retinal Layer Shape Features in Spectral-Domain Optical Coherence Tomography Mona Garvin

Advisor:

# Naber, Kyle J.

Graduation Date: Degree: Thesis: Advisor:

#### Obadal, Jeffrey Ray

Graduation Date: Degree: Thesis: N/A Advisor:

Fall. 2017 MS (Non-Thesis) David Andersen

Spring, 2018

N/A

MS (Non-Thesis)

David Andersen

#### Snyder, Jacob

Graduation Date: Spring, 2018 Degree: MS (Non-Thesis) Thesis: N/A Advisor: David Andersen

#### Vasudeva, Naren

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	David Andersen

#### Venable, Abby Nicole

Spring, 2018
MS
N/A
Fatima Toor

#### Xiaoliu, Zhang

Spring, 2018
MS
N/A
Punam Saha

# Zdilar, Luka

Graduation Date:	Spring, 201
Degree:	MS

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Thesis:	Evaluating the Effect of Right Censored End-Point
	Transformation for Radiomic
	Feature Selection and Clustering
	of Oropharyngeal Cancer Patient
	Data
Advisor:	Guadalupe Canahuate

Advisor:

Tomography and In-Vivo Confocal Microscopy Images Mona Garvin

# **DOCTOR OF PHILOSOPHY**

# Agne, Jason C.

Fall, 2017
PhD
Automated Image-Based
Estimation of Severity and Cause
of Optic Disc Edema
Mona Garvin

# Bhattacharya, Ipshita

Graduation Date:	Spring, 2018
Degree:	PhD
Thesis:	Pushing the Limits of Magnetic
	Resonance Spectroscopic
	Imaging Using Novel
	Reconstruction Schemes
Advisor:	Mathews Jacob

# Chen, Cui

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	MRI Fat-Water Separation Using
	Graph Based Methods
Advisor:	Mathews Jacob

# Cho, Myung

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Convex and Non-Convex
	Optimizations for Recovering
	Structured Data: Algorithms and
	Analysis
Advisor:	Weiyu Xu

# **Robles**, Victor

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	Automated Image Analysis of Corneal Structures in Anterior- Segment Optical Coherence

# MECHANICAL & INDUSTRIAL ENGINEERING

# MASTER OF SCIENCE

# Ayres, Brennan Scott

Summer, 2017
MS
The Role of Teamwork in
Diagnosis: Team Diagnostic
Decision-Making in The Medica
Intensive Care Unit
Priyadarshini R. Pennathur

# Chen, Xiangkang

Graduation Date:	Fall, 2017
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Hiroyuki Sugiyama

# Heiderscheit, Timothy David

Graduation Date:	Fall, 2017
Degree:	MS
Thesis:	Comparative Study of Near-
	Infrared Pulsed Laser Machining
	of Carbon Fiber Reinforced
	Plastics
Advisor:	Hongtao Ding

# Janechek, Matthew James

Graduation Date:	Summer, 2017
Degree:	MS
Thesis:	Numerical Investigation of a
	Plunging Airfoil
Advisor:	James H.J. Buchholz

#### Jin, Xin

Graduation Date:	Spring, 2018
Degree:	MS (Non-Thesis)
Thesis:	N/A
Advisor:	Fatima Toor

# Pontarelli, Matthew Domenic

Summer, 2017
MS
Flow Regimes and Instabilities of
Propeller Crashback
Pablo M. Carrica

# Powell, Jaemin

Graduation Date: Degree:	Fall, 2017 MS	
Thesis:	Hardware Design for an Electro- Mechanical Bicycle Simulator in an Immersive Virtual Reality Environment	
Advisor:	Geb Thomas	
Wu, Yang		
Graduation Date:	Fall, 2017	
Degree:	MS	
Thesis:	Experimental and Numerical Study on Failure Strength of Aspirated Cell Membrane	
Advisor:	Jia Lu	
DOCTOR OF PHILOSOPHY		

# Attarian, Siamak

Graduation Date:	Spring, 2017
Degree:	PhD
Thesis:	
Advisor:	Shaoping Xiao

# Dogan, Timur

Spring, 2017
PhD
TBD
Frederick Stern

# Feldmeier, Christofer

Degree: PhD Thesis: TBD Advisor: Hiroyuki Sugiyam	Graduation Date:	Spring, 2017
Thesis: TBD Advisor: Hiroyuki Sugiyam	Degree:	PhD
Advisor: Hiroyuki Sugiyam	Thesis:	TBD
	Advisor:	Hiroyuki Sugiyama

# Gritsenko, Andrey

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	Bringing Interpretability and
	Visualization with Artificial Neural
	Networks
Advisor:	Amaury Lendasse

# He, Baosheng

Graduation Date: Degree:

Spring, 2017 PhD Thesis:

Advisor:

# He, Li

Graduation Date: Degree: Thesis: Advisor:

Spring, 2017 PhD TBD Xuan Song

Yong Chen

New Bayesian Methods for **Quality Control Applications** 

# Kim, Yagin

Graduation Date: Spring, 2017 Degree: PhD Thesis: TBD Advisor: Pablo M. Carrica

# Mofidi, Alireza

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	Ship Maneuvers with Discretized
	Propeller and Coupled Propeller
	Model/CFD
Advisor:	Pablo M. Carrica

# Mohaghegh, Fazlolah

Graduation Date:	Fall, 2017
Degree:	PhD
Thesis:	A Parallelized Diffuse Interface
	Solver with Applications to Meso
	Scale Simulation of Suspensions
Advisor:	H.S. Udaykumar

# Moon, Min-Yeong

Summer, 2017
PhD
Confidence-Based Model
Validation for Reliability
Assessment and Its Integration
with Reliability-Based Design
Optimization
Kyung K. Choi

# Rojas Murillo, Salvador

reas
cess
ents

# Sharma, Tejasvi

Graduation Date:	Spring, 2017
Degree:	PhD
Thesis:	TBD
Advisor:	Albert Ratne

# Shen, Ninggang

Graduation Date: Spring, 2017 Degree: PhD Thesis: TBD Advisor: Hongtao Ding

# Singh, Gurjap

Graduation Date:	Spring, 2017
Degree:	PhD
Thesis:	TBD
Advisor:	Albert Ratner

# Wang, Qinghua

Graduation Date:	Spring, 2017
Degree:	PhD
Thesis:	TBD
Advisor:	Hongtao Ding

# Zang, Guiyan

Graduation Date:	Spring, 2017
Degree:	PhD
Thesis:	TBD
Advisor:	Albert Ratner

# Zhang, Jianan

Graduation Date:	Summer, 2017
Degree:	PhD
Thesis:	An Experimental Study of the
	Global and Local Flame Features
	Created by Thermoacoustic
	Instability
Advisor:	Albert Ratner



Publications, Presentations & Awards

# **BIOMEDICAL ENGINEERING**

#### Ahamed, Hasan

#### Publications

Hassan A, Kim Y, Bravo E, and Richerson G. "Effect of Monoamine Reuptake Inhibitors on Seizures in DBA/1 Mice", *The FASEB Journal*, 1 Apr 2017.

#### Presentations

"Seizure Protection in DBA/1 Mice Using Selective Monoamine Reuptake Inhibitors", American Physician Scientist Association conference, Jan. 2018.

#### Austin, Brett

#### Presentations

Brett Austin, Timothy Chung and M.L. (Suresh) Raghavan, "Material Analysis: The Bubble Inflation Test (BIT)".

#### Awards

• Tau Beta Pi Engineering Honor Society Lyons No. 2 Scholarship

#### **Burand, Anthony**

#### Publications

Klingelhutz AJ, Gourronc FA, Chaly A, Wadkins DA, Burand AJ, Markan KR, Idiga SO, Wu M, Potthoff MJ, Ankrum JA. "Scaffold-Free Generation of Uniform Adipose Spheroids for Metabolism Research and Drug Discovery". *Sci Rep.* 2018 Jan 11;8(1):523. doi: 10.1038/s41598-017-19024-z. PubMed PMID: 29323267; PubMed Central PMCID: PMC5765134.

Boland L, Burand AJ, Brown AJ, Boyt D, Lira VA, Ankrum JA. "IFN-γ and TNF-α Pre-licensing Protects Mesenchymal Stromal Cells from the Pro-Inflammatory Effects of Palmitate". *Mol Ther.* 2017 Dec 19. pii: S1525-0016(17)30610-X. doi: 10.1016/j.ymthe.2017.12.013. [Epub ahead of print] PubMed PMID: 29352647.

Burand AJ Jr, Boland L, Brown AJ, Ankrum JA. "A Low-Cost Technique for Intraoperative Imaging of Cell Delivery and Retention in a Model of Delayed Wound Healing". *Adv Wound Care* (New Rochelle). 2017 Dec 1;6(12):413-424. doi: 10.1089/wound.2017.0751. PubMed PMID: 29279805; PubMed Central PMCID: PMC5734161.

Burand AJ, Gramlich OW, Brown AJ, Ankrum JA. "Function of Cryopreserved Mesenchymal Stromal Cells With and Without Interferon-γ Prelicensing is Context Dependent". *Stem Cells.* 2017 May;35(5):1437-1439. doi:10.1002/stem.2528. Epub 2016 Nov 10. PubMed PMID: 27758056; PubMed Central PMCID: PMC5397371.

Gramlich OW, Burand AJ, Brown AJ, Deutsch RJ, Kuehn MH, Ankrum JA. "Cryopreserved Mesenchymal Stromal Cells Maintain Potency in a Retinal Ischemia/Reperfusion Injury Model: Toward an Off-the-Shelf Therapy". *Sci Rep.* 2016 May 23;6:26463. doi: 10.1038/srep26463. PubMed PMID: 27212469; PubMed Central PMCID: PMC4876464.

#### Presentations

"Aggregation of MSCs Leads to a Shift in Secretome Due to Activation of an EP Receptor-PGE2 Pathway", FOEDRC Research Day, Iowa City, IA, February 2018.

"3D MSC Utilize the EP Receptor-PGE2 Pathway to Modulate Cell Phenotype", American Physician Scientists Association Midwest Regional Meeting in Iowa City, IA, January 2018.

# Cabel, Katie

#### Publications

Gelover E, Katherine C, Mart C, Sun W, Kim Y. "Patient's Specific Integration of OAR doses (D2 cc) from EBRT and 3D Image-Guided Brachytherapy for Cervical Cancer", *Journal of Applied Clinical Medical Physics*, Jan. 19, 2018.

# Chenoweth, James

#### Awards

• Creative Kick-Start Award

# Cooper, Sarah

#### Awards

• Creative Kick-Start Award

# Corrigan, Rae

#### Awards

• College of Engineering Dean's Graduate Engineering Fellowship

# Dahms, Kelsi

#### Awards

- Creative Kick-Start Funding Award, 2017- 2018
- Archie A. Alexander Memorial Scholarship

# El-Hattab, Mariam

#### Presentations

El-Hattab, M.Y. and Sander, E.A., 2017. "Visualizing and Quantifying Fibroblast Collagen Production in an In-Vitro Model of Wound Healing and Fibrosis," Podium Presentation, Biomedical Engineering Society (BMES), Phoenix, AZ.

El-Hattab, M.Y. and Sander, E.A., 2017. "Perturbation of Fibrin Gels Seeded with Fibroblast Cell Aggregates using a Servo-Controlled Needle," Poster Presentation, Engineering Research Open House, Iowa City, IA..

# Frick, Eric

# Awards

Graduate College Post-Comprehensive Research Award

# Garneau, Michael

#### Awards

- Creative Kick-Start Award
- Archie A. Alexander Memorial Scholarship

#### Gerard, Sarah

#### Publications

Bodduluri, S., Gerard, S. E., Reinhardt, J. M., Hoffman, E. A., Newell, J. D., Nath, H. P., Dransfield, M., Bhatt, S. P., "Silent Zones of Disease in Active Smokers," in, (abstract), *American Thoracic Society*, 2018.

Shao, W., Gerard, S. E., Pan, Y., Patton, T. J., Reinhardt, J. M., Durumeric, O. C., Bayouth, J. E., Christensen, G. E., "Sensitivity Analysis of Jacobian Determinant Used in Treatment Planning for Lung Cancer," in *Proc. SPIE Conf. Medical Imaging*, SPIE, 2018.

Patton, T., Gerard, S. E., Christensen, G. E., Reinhardt, J. M., Bayouth, J. E., "Removing Interpolation Artifacts in Respiratory-Gated 4DCT for Improved Ventilation Estimation," *Medical Physics*, 2017, (abstract).

Bayouth, J., Patton, T., Gerard, S., Christensen, G., Baschnagel, A., Reinhardt, J., "Clinical Application of Functional Planning Technique Designed to Improve Lung Toxicity," *Medical Physics*, 2017, (abstract).

Bayouth, J., Patton, T., Gerard, S., Christensen, G., Baschnagel, A., Reinhardt, J., "Reducing Patient Respiration Induced 4DCT Image Artifacts," *Medical Physics*, 2017, (abstract).

Kipritidis, J., Cazoulat, G., Tahir, B., Hofman, M., Siva, S., Callahan, J., Yamamoto, T., Christensen, G., Reinhardt, J., Kadoya, N., Patton, T., Gerard, S., Duarte, I., Archibald-Heeren, B., Byrne, M., Sims, R., Eslick, E., Hegi-Johnson, F., Woodruff, H., Ireland, R., Wild, J., Cai, J., Bayouth, J., Brock, K., Keall, P., "The VAMPIRE Challenge: Results of an International Multi-Institutional Validation Study to Evaluate CT Ventilation Imaging Algorithms," *Medical Physics*, 2017, (abstract).

Patton, T. J., Gerard, S. E., Christensen, G. E., Reinhardt, J. M., Bayouth, J. E., "Interim Analysis of Clinical Trial UW16037: Improving Pulmonary Function Following Radiation Therapy," *NCC AAPM Fall Meeting*, 2017.

Gerard, S. E., Patton, T. J., Christensen, G. E., Bayouth, J. E., Reinhardt, J. M., "FissureNet: A Deep Learning Approach for Fissure Detection in CT Images," *IEEE Trans. Medical Imaging*, 2018, In review.

Patton, T. J., Gerard, S. E., Shao, W., Christensen, G. E., Reinhardt, J. M., Bayouth, J. E., "Quantifying Ventilation Change Due to Radiation Therapy Using 4DCT Jacobian Calculations," *Medical Physics*, 2018, In review.

Bodduluri, S., Puliyakote, A., Gerard, S. E., Reinhardt, J. M., Hoffman, E. A., Newell, J. D., Nath, H. P., Han, M., Washko, G., Estepar, R., Dransfield, M., Bhatt, S. P., "Airway Fractal Dimension Predicts Respiratory Morbidity and Mortality in Chronic Obstructive Pulmonary Disease," *The Journal of Clinical Investigation*, 2018, In review.

#### Presentations

Sarah E. Gerard, "Introduction to Convolutional Neural Networks", Deep Learning Club, Iowa City, IA, 2017.

#### Awards

- Ballard and Seashore Dissertation Fellowship, 2017-18
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Images Lung Cancer, 2018

#### Goelz, Genevieve

#### Awards

- Creative Kick-Start Award
- Philip A. and Florence B. Temple Engineering Scholarship

# Goetz, Sawyer

#### Awards

- Josh and Marilyn McKercher Engineering Scholarship
- National Merit/Provost Scholarship
- Presidential Scholarship

# Graham, Gregory

#### Awards

Creative Kick-Start Award

# Guo, Zhihui

# Publications

Guo, Zhihui, et al. "Optical Coherence Tomography Analysis Based Prediction of Humphrey 24-2 Visual Field Thresholds in Patients with Glaucoma." *Investigative Ophthalmology & Visual Science* 58.10 (2017): 3975-3985.

#### Presentations

Guo, Zhihui, et al. "Optical Coherence Tomography Analysis Based Prediction of Humphrey 24-2 Visual Field Thresholds in Patients with Glaucoma." ARVO, Baltimore, MD, 2017.

#### Awards

• GSS Travel Fund Award, 2017

# Hajdarevic, Bakir

# Presentations

"Modeling the Frequency Response of a Proportional Solenoid Valve for Oscillatory Ventilation", Biomedical Engineering Society Annual Meeting, Phoenix, AZ, October 2017.

# Halberg, Spencer

# Awards

• Paul Scholz Memorial Scholarship 2017-2018

# Herrmann, Jacob

#### Publications

Herrmann J, Tawhai MH, Kaczka DW. "Parenchymal Strain Heterogeneity During Oscillatory Ventilation: Why Two Frequencies Are Better Than One", *Journal of Applied Physiology*, 124(3):653-663, 2018.

D'Antini D, Huhle R, Herrmann J, Sulemanji DS, Oto J, Raimondo P, Mirabella L, Hemmes SNT, Schultz MJ, Pelosi P, Kaczka DW, Vidal Melo MF, Gama de Abreu M, Cinnella G, PROtective VEntilation Network Investigators. "Respiratory System Mechanics During Low Versus High Positive End-Expiratory Pressure in Open Abdominal Surgery: A Sub-Study of PROVHILO Randomized Controlled Trial", *Anesthesia & Analgesia*, 126(1):143-149, 2018

Herrmann J, Hoffman EA, Kaczka DW. "Frequency-Selective Computed Tomography: Applications to Periodic Thoracic Motion", *IEEE Transactions on Medical Imaging*, 36(8):1722-1732, 2017
Huhle R, D'Antini D, Herrmann J, Raimondo P, Mirabella L, Hemmes SNT, Schultz MJ, Pelosi P, Kaczka DW, Cinnella G, Gama de Abreu M. "Intratidal Analysis of Intraoperative Respiratory System Mechanics: Keep It Simple", *Anesthesia & Analgesia*, 126(2):725-726, 2018.

Mondoñedo JR, Herrmann J, McNeil JS, Kaczka DW. "Comparison of Pneumotachography and Anemometry for Flow Measurement During Mechanical Ventilation with Volatile Anesthetics," *Journal of Clinical Monitoring and Computing*, 31(6):1263-1271, 2017.

#### Presentations

"What Can Frequency-Selective CT Show Us About Regional Lung Deformation?", Flow-Volume Underworld. Boston, MA. May 2017.

"Frequency-Selective CT Image Registration for Assessment of Regional Periodic Lung Deformation," Biomedical Engineering Society Annual Meeting. Phoenix, AZ. Oct 2017.

"Multi-Objective Optimization of Multi-Frequency Oscillatory Ventilation," Biomedical Engineering Society Annual Meeting. Phoenix, AZ. Oct 2017.

"Modeling the Frequency Response of a Proportional Solenoid Valve for Oscillatory Ventilation," Biomedical Engineering Society Annual Meeting. Phoenix, AZ. Oct 2017.

"Parenchymal Strain Versus Strain Rate During Multi-Frequency Oscillatory Ventilation," Annual Meeting of the American Society of Anesthesiologists. Boston, MA. Oct 2017.

"Temporally-Resolved Computed Tomography (CT) Imaging to Assess Regional Parenchymal Strain During Oscillatory Ventilation," American Thoracic Society International Conference. Washington, DC. May 2017.

"Stochastic Resonance Versus Deterministic Resonance During Variable Controlled Ventilation: A Numerical Investigation," American Thoracic Society International Conference. Washington, DC. May 2017.

"Minimizing Parenchymal Strain Heterogeneity During Oscillatory Ventilation," Association of University Anesthesiologists Annual Meeting. Washington, DC. May 2017.

"Temporally-Resolved Computed Tomographic (CT) Imaging to Assess High-Frequency Periodic Thoracic Motion," University of Iowa Health Sciences Research Week. Iowa City, IA. April 2017.

"Temporally-Resolved Computed Tomographic (CT) Imaging to Assess High-Frequency Periodic Deformation," International Workshop on Pulmonary Imaging. Philadelphia, PA. March 2017.

"Tuning the Frequencies of the Lung," Biomedical Engineering Graduate Seminar. University of Iowa, IA. Mar 2018. Seminar presentation.

#### Awards

- 2018 Associate Certificate, Center for the Integration of Research, Teaching, and Learning, University of Iowa
- 2017 Engineering Honor Society Inductee, Iowa Beta Chapter, Tau Beta Pi
- 2017 Early Career Professional Highlight, Respiratory Structure and Function Assembly, American Thoracic Society
- 2017 Poster Session Winner, Health Sciences Research Week, University of Iowa
- Trainee Travel Stipend, Functional and Medical Imaging Group, University of Pennsylvania, 2017.

# Koh, Jin-Young

# Publications

Michaelson J, Shin M, Koh J, Brueggeman L., Zhang A, Katzman A, McDaniel L, Fang M, Pufall M, Pieper A. "Neuronal PAS Domain Proteins 1 and 3 Are Master Regulators of Neuropsychiatric Risk Genes", *Biological Psychiatry*, April 2017.

# Kruse, Stephen

# Presentations

Spring Undergraduate Research Festival (SURF) 2017, "Noradrenergic Mechanisms in Seizure-Induced Respiratory Arrest," University of Iowa Old Capitol Mall, Iowa City, IA 52242

Healthcare Science Week 2017, "Noradrenergic Mechanisms in Seizure-Induced Respiratory Arrest," Medical Education Research Facility, Iowa City, IA 52252

Marshall Undergraduate Research Conference 2017, ""Norepinephrine: A Novel Approach to Seizure-Induced Respiratory Arrest," University of Iowa Old Capitol Mall, Iowa City IA, 52242

Society for Neuroscience (SFN) Annual Conference 2017, "Mechanisms of Norepinephrine and Serotonin in Prevention of Seizure-Induced Respiratory Arrest," Walter E. Lee Convention Center, Washington, D.C. 20001

Iowa Legislator University Tour 2017, "Mechanisms Involving Serotonin and Norepinephrine in Seizure-Induced Respiratory Arrest," Pappajohn Biomedical Discovery Building, Iowa City, IA 52246

# Awards

- Distinguished Poster Award SRUF 2017
- ICRU Travel Grant
- ICRU Summer 2018 Fellow
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Seeks to Understand Epilepsy, 2018

# Larraga Martinez, Maria Fernanda

# Awards

Creative Kick-Start Funding Program 2017-2018

# Malicki, Greg

# Awards

Creative Kick-Start Funding Program 2017-2018

# Martin, Russell

# Presentations

Russell Martin, Morgan Sturgeon, Alex Bassuk, Rob Cornell. "Using Zebrafish to Test Potential Drugs for Their Efficacy Against Epileptic Seizures," Spring Undergraduate Research Fair, Iowa City, IA, April 2017.

# Awards

- Rhodes Dunlap Honors Scholarship 2017-2019
- Dr. Royce E. and Shirley N Beckett Engineering Scholarship 2017
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Analyzes Potential Seizure Meds, 2018

# Minaghan, Ford

# Awards

• Creative Kick-Start Award

# Moghram, Waddah

# Presentations

"Integrated Traction Force Microscopy and Magnetic Tweezers to Study Blister Formation in Pemphigus Vulgaris and Bullous Pemphigoid", Biomedical Engineering Society 2017 Annual Meeting, Phoenix, AZ.

# Mueller, Marissa

# Awards

- Susan Moffatt Memorial Scholarship
- Pappy Burr Award

# Myer, Colton

# Awards

• Creative Kick-Start Award

# Nakagawa, Daichi

# Publications

Daichi Nakagawa MD PhD, Cushing Cameron MD, Yasunori Nagahama MD, Lauren Allan DO, David Hasan MD, "Quantitative Susceptibility Mapping as a Possible Tool to Radiographically Diagnose Sentinel Headache Associated with Intracranial Aneurysm: Case Report" *World Neurosurgery* 2017 Jul;103:954.e1-4

Yasunori Nagahama MD, Brian Dlouhy MD, Daichi Nakagawa MD PhD, Janina Kamm PsyD, David Hasan MD, Matthew Howard MD, Hiroto Kawasaki MD, "Bone Flap Elevation for Intracranial EEG Monitoring: Technical Note" *Journal of Neurosurgery* 2017 Sep 15:1-6

Yasunori Nagahama MD, Lauren Allan DO, Daichi Nakagawa MD PhD, Mario Zanaty MD, Robert M. Starke MD, Nohra Chalouhi MD, Pascal Jabbour MD, Robert D. Brown, Jr MD MPH, Colin P. Derdeyn MD, Joseph Broderick, Marc Chimowitz MD, R. Loch Macdonald, MD PhD, James C. Torner PhD, David Hasan MD, "Dual Anti-Platelet Therapy is Associated with Reduced Risk of Clinical Vasospasm and Delayed Cerebral Ischemia in Aneurysmal Subarachnoid Hemorrhage" *Journal of Neurosurgery*, 2017 Nov 3:1-9

Nohra Chalouhi, Pascal Jabbour, Mario Zanaty, James Torner, Daichi Nakagawa, David Hasan, "Sex Differential in 15-Hydroxyprostaglandin Dehydrogenase Levels in the Lumen of Human Intracranial Aneurysms" *JAHA* 2017 Oct 17;6(10)

Hudson JS, Nagahama Y, Nakagawa D, Starke RM, Dlouhy BJ, Torner JC, Jabbour P, Allan L, Derdeyn CP, Greenlee JDW, Hasan D., "Hemorrhage Associated with Ventriculoperitoneal Shunt Placement in Aneurysmal Subarachnoid Hemorrhage Patients on a Regimen of Dual Antiplatelet Therapy: A Retrospective Analysis." *J Neurosurg.* 2017 Nov 10:1-6.

# Presentations

Daichi Nakagawa MD PhD, Anna Schumacher PhD, Berkowits Benjamin PhD, Timothy Chung PhD, Seth Dillard PhD, David Hasan MD, M.L. Raghavan PhD "Tortuosity and Curvature of Cerebral Arteries in Posterior Fossa" SB3C2017 in Tucson Arizona June 21-24, 2017 (oral) .

Yasunori Nagahama MD, Brian Dlouhy MD, Daichi Nakagawa MD PhD, Janina Kamm PsyD, David Hasan MD, Matthew Howard MD, Hiroto Kawasaki MD PhD "Elevated Bone Flap Placement for Intracranial Electroencephalography" AANS2017 in Los Angeles April 22-26, 2017 (poster).

Daichi Nakagawa MD PhD, Yasunori Nagahama MD, Bruno Policeni MD, Raghavan Madhavan PhD, Anna Schumacher PhD, Srivats Sarathy BS, John Huston III MD, Harry Cloft MD, Max Wintermark MD, James

Torner PhD, Robert Brown MD, David Hasan MD "Accuracy of Detecting Enlargement of Aneurysms Using Different MRI Imaging Modalities and Measurement Protocols" ISC2018 in Los Angeles January 24-26th, 2018 (oral).

Yasunori Nagahama MD, Daichi Nakagawa MD, David Hasan MD "Dual Anti-Platelet Therapy is Associated With Reduced Risk of Clinical Vasospasm and Delayed Cerebral Ischemia in Aneurysmal Subarachnoid Hemorrhage" ISC2018 in Los Angeles January 24-26th, 2018 (poster).

Joseph Hudson, Benjamin Prout, Daichi Nakagawa MD, Yasunori Nagahama MD, David Hasan MD "Hemorrhage Associated With External Ventricle Drain Placement in Aneurysmal Sub Arachnoid Hemorrhage Patients on Dual Anti Platelet Therapy: A Retrospective Analysis" ISC2018 in Los Angeles January 24-26th, 2018 (poster).

Joseph S Hudson, Yasunori Nagahama, Daichi Nakagawa, Robert M Starke, Brian J Dlouhy, James Torner, Pascal Jabbour, Lauren Allan, Colin P Derdeyn, Jeremy Greenlee, David Hasan "Hemorrhage Associated with Ventriculoperitoneal Shunt Placement in Aneurysmal Subarachnoid Hemorrhage Patients on Dual Antiplatelet Therapy: A Retrospective Analysis" ISC2018 in Los Angeles January 24-26th, 2018 (poster).

Nohra Chalouhi, Pascal Jabbour, Robert M Starke, Mario Zanaty, James Torner, Daichi Nakagawa, David Hasan "Sex Differential in 15-hydroxyprostaglandin Dehydrogenase Levels in the Lumen of Human Intracranial Aneurysms" ISC2018 in Los Angeles January 24-26th, 2018 (poster).

# Niedert, Elizabeth

# Awards

• David R. Buchanan Scholarship

# Olvera, Angela

# Awards

- Edwin Dove Service Award
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Analyzes Mitochondrial Stress, 2018
- Clarence H. Clark Fund recipient

# Rashid, Tommy

# Awards

• Creative Kick-Start Award

# Remy, Matthew

# Publications

Voorhees, J. R., Remy, M. T., Cintrón-Pérez, C. J., Rassi, E. E., Khan, M. Z., Dutca, L. M., ... Pieper, A. A. (2017). "(–)-P7C3-S243 Protects a Rat Model of Alzheimer's Disease From Neuropsychiatric Deficits and Neurodegeneration Without Altering Amyloid Deposition or Reactive Glia," *Biological Psychiatry*. doi:10.1016/j.biopsych.2017.10.023.

# Presentations

Matthew T. Remy, "Incorporation of MicroRNA-200c and Collagen into 3D Printed Tricalcium Phosphate Scaffolds to Promote Bone Formation", Iowa Section of the American Association for Dental Research Research Day, Iowa City, IA, 2018.

# Rodriguez, Anna

# Awards

- Creative Kick-Start Award
- John and Marilyn McKercher Engineering Scholarship

# Rotti, Pavana Gururaj

# Publications

"Pancreatic and Islet Remodeling in Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) Knockout Ferrets", *The American Journal of Pathology*, Jan. 31, 2018.

"Infection is Not Required for Mucoinflammatory Lung Disease in CFTR-knockout Ferrets", *American Journal of Respiratory and Critical Care Medicine*, Jan. 12, 2018.

"Real-Time Monitoring of Insulin Using a Graphene Field-Effect Transistor Aptameric Nanosensor", *American Chemical Society Applied Materials & Interfaces,* Aug. 3, 2017.

# Presentations

"Cystic Fibrosis-Induced Pancreatic Remodeling", North American Conference for Cystic Fibrosis (NACFC), 2017.

"Real-Time Monitoring of Insulin Using a Graphene Aptameric Nano Sensor". IEEE Conference, 2017.

# Awards

• Finalist in the 'Junior Investigator Best Abstract in Basic Science'. Selected to present a 'chalk talk' at NACFC, 2017.

# Santhana, Velarchana

# Awards

- Creative Kick-Start Award
- Dwight & Elsie Johnston Scholarship

# Sherman, Ashten

# Awards

- Creative Kick-Start Award
- John M. Russ Memorial Fund

# Silva, Aaron

# Presentations

Aaron Silva, Daniel Kelly, and Fatima Toor, "The Impact of Silver Nanoparticle Plasmon Resonance on the Optical Properties of Nano- and Micro-Textured Silicon", 8th Annual Fall Undergraduate Research Festival (FURF), Iowa City, Iowa, 2017

Aaron Silva, Wenqi Duan, and Fatima Toor, "Impact of Silicon Nanowire Array Fill Fraction, Length, and Metal Nanoparticle Decoration on Surface Reflection" 12th Annual Summer Undergraduate Research Conference (SURC), Iowa City, Iowa, 2017.

- DAAD RISE Fellowship Summer 2018
- Bob and Molly Whitmore Engineering Scholarship 2017-2018

- Society of Hispanic Professional Engineers Scholarship 2017-2018
- Dean's List
- President's List.

# Schrodt, Michael

# Awards

• R.F. and H.W. Poston Scholarship

# Slater, Ethan

# Awards

• 2017 University of Iowa Homecoming Scholarship

# Song, Ino

# Publications

Dongrim Seol, Cheng Zhou, Marc J Brouillette, Ino Song, Yin Yu, Hyeong Hun Choe, Abigail D Lehman, Kee W Jang, Douglas C Fredericks, Barbara J Laughlin & James A Martin, "Characteristics of Meniscus Progenitor Cells Migrated from Injured Meniscus," *Journal of Orthopaedic Research*. 2017; 35(9) 1966-1972.

#### Presentations

Ino Song, "Finite Element Analysis Of Temporomandibular Joint For Mandibular Osteotomy", Iowa Section of the American Association for Dental Research, Iowa City, IA, 2018.

Ino Song, "Finite Element Analysis Of Temporomandibular Joint For Mandibular Osteotomy", American Association for Dental Research, Fort Lauderdale, FL, 2018.

# Tanner, Bryan

# Awards

- Creative Kick-Start Award
- William C. Blackburn Engineering Scholarship

# Thomas, Holly

# **Publications**

Townsend KC, Thomas-Aitken HD, Rudert MJ, Kern AM, Willey MC, Anderson DD, Goetz JE. "Discrete Element Analysis is a Valid Method for Computing Joint Contact Stress in the Hip Before and After Acetabular Fracture", *J Biomech*. 2018; 67:9-17. NIHMSID: 926259.

# Presentations

"Gait Effects on Joint Mechanics and Clinical Outcomes in Hip Dysplasia Patients." 41st Annual Meeting of the American Society of Biomechanics, August 8–11, 2017, Boulder, Colorado.

"Different Gait Patterns Affect Hip Joint Mechanics in Dysplasia Patients Following Periacetabular Osteotomy." 9th International Society for Hip Arthroscopy (ISHA) Annual Scientific Meeting, October 12-14, 2017, Santiago, Chile.

# Thompson, Jacob

# Awards

• Dr. Royce E. and Shirley N. Beckett Engineering Scholarship

# **Tollefson**, Mallory

# **Publications**

Tollefson, Mallory RaNae. "Accelerated Many-Body Protein Side-Chain Repacking Using GPUs: Application to Proteins Implicated in Hearing Loss." MS Thesis, University of Iowa, 2017.

# Presentations

"OtoProtein: Protein Optimization and Physics Based Analysis of Genetic Missense Variants Associated with Deafness", Association for Research in Otolaryngology.

"GPU Accelerated Protein Structure Optimization and Its Application to Proteins Associated with Hearing Loss", UI Biochemistry Retreat.

Mallory Tollefson, "OtoProtein: Toward a Tool for Automated Analysis of Genetic Variants Associated with Deafness", Association for Research in Otolaryngology Mid-Winter Conference, San Diego, CA, 2018.

# Awards

- Honors at Iowa Scholars Award, March 2017
- John and Marilyn McKercher Engineering Scholarship, 2017-2018

# Ulrich, Ethan

# Publications

Ulrich EJ, Sunderland JJ, Smith BJ, Mohiuddin I, Parkhurst J, Plichta KA, Buatti JM, Beichel RR. "Automated Model-Based Quantitative Analysis of Phantoms with Spherical Inserts in FDG PET Scans", *Medical Physics*. 2018; 45(1):258-76.

# Uthoff, Johanna

# Presentations

J. Uthoff, S. Dilger, J.C. Sieren, "Refinement of Quantitative Computed Tomography Imaging Feature Selection for Computer-Aided Pulmonary Nodule Assessment," Holden Comprehensive Cancer Center Research Retreat, Coralville, IA, USA, 2017

J. Uthoff, S. Dilger, J.C. Sieren, "Refinement of Quantitative Computed Tomography Imaging Feature Selection for Computer-Aided Pulmonary Nodule Assessment," American Thoracic Society Conference. Washington D.C., USA, 2017

J. Uthoff, F.A. De Stefano, K. Panzer, B.W. Darbro, D.E. Quelle, C.S. Rogers, D.K. Meyerholz, J.Weimer, J.C. Sieren, "Distinguishing Quantitative Features in Neurofibromatosis-1 Tumor Imaging: Towards Non-invasive Progression Risk Assessment," Holden Comprehensive Cancer Center Research Retreat, University of Iowa, IA, USA, 2017

J. Uthoff, S. Dilger, J.C. Sieren, "Refined Pipeline of Imaging Feature Selection for Lung Cancer Computer Aided Diagnosis," Engineering Research Open House, University of Iowa, IA, USA, 2017

- Third Place Award, Kellogg Biotech and Healthcare Competition, 2018
- First Place Paper in Math, Physical Science, and Engineering, Jakobsen Conference, 2017

- Graduate Poster Award, College of Engineering Research Open House, 2017
- Graduate Student Senate Travel Award, University of Iowa, 2017

# Wallace, Ellie

- Creative Kick-Start Award
- Gerorge L. & Gladys I. Petrik Memorial Scholarship

# CHEMICAL & BIOCHEMICAL ENGINEERING

# Alalwan, Hayder

#### Publications

Alalwan, H.A., David M. Cwiertny, and Vicki H. Grassiana, "Co3O4Nanoparticles as Oxygen Carriers for Chemical Looping Combustion: A Materials Characterization Approach to Understanding Oxygen Carrier Performance". *Chem. Eng. J.* 2017, 319, 279–287.

#### Presentations

AICHE poster presentation, Nov., 2017

#### Awards

- Digital Studio Summer Fellowship, 2017
- Ballard and Seashore Fellowship, Spring, 2018
- GPSG Travel Grant
- CGRER Travel Grant

# Aljaafari, Haydar

#### Publications

Erica Ricker, Haydar Aljaafari, Trigg Bader, Bruce Hundley, and Eric Nuxoll, "Thermal Shock Susceptibility and Regrowth of *Pseudomonas Aeruginosa* Biofilms", *International Journal of Hyperthermia*, DOI:10.1080/02656736.2017.1347964

#### Presentations

"Reincubation of Heat Shocked *Pseudomonas Aeruginosa* Biofilm," AICHE Annual Meeting, Minneapolis, MN, 2017.

Haydar Aljaafari, "Effect of Heat Shock on Growth Rate of *Pseudomonas Aeruginosa* Biofilm", 15th Annual College of Engineering Research Open House, University of Iowa, IA, 2017.

Haydar Aljaafari, "Effect of Thermal Shock on *Pseudomonas Aeruginosa* Biofilm", 26th Annual Center for Biocatalysis and Bioprocessing Conference, University of Iowa, IA, 2017.

Haydar Aljaafari, Comps exam presentation, "Development of Self-Sterilizing Implanted Device", University of Iowa, IA, 2018.

#### Awards

- Graduate & Professional Student Government (GPSG) Travel Grant, November, 2017
- Graduate Student Senate (GSS) Travel Grant, February, 2018

# Alsaedi, Sattar

#### Presentations

Abdulsattar H., Ghanim, S. Mubeen, "3-D Flow Through Electrodes for Rapid and Current Efficient Electrodialysis." Poster session presented at: The Electrochemical Society (ECS), 2017 22nd ECS Meeting, Oct. 1-5; National Harbor

Abdulsattar H., Ghanim, Jonathan Koonce, S. Mubeen, "Optimizing Pt Loading on Three-Dimensional Carbon Foam for HER." Poster session presented at: American Institute of Chemical Engineers (AICHE) Conference, 2017 Annual Meeting, Oct. 29-Nov. 3; Minneapolis. Abdulsattar H. Ghanim, Jonathan G. Koonce, Bjorn Hasa, Alan M. Rassoolkhani, Wei Cheng, David W. Peate, Joun Lee, and Syed Mubeen, "Optimizing Pt Loading on 3D Carbon Foam Support for Hydrogen Production by Water Electrolysis." Poster session presented at: The Nanoscience and Nanotechnology Institute at University of Iowa, Winter 2018 NNI Symposium. March 2, 2018. Iowa City, IA.

Abdulsattar H. Ghanim, S. Mubeen, "3-D Flow Through Electrodes for Rapid and Current Efficient Electrodialysis. Poster session presented at: The Nanoscience and Nanotechnology Institute at University of Iowa, Winter 2018 NNI Symposium. March 2, 2018. Iowa City, IA. ".

# Awards

- Graduate and Professional Student Government (GPSG) Travel Grant
- Graduate Student Senate (GSS) Travel Grant

# Chou, Hsien

# Presentations

Hsien Chou, "Aggregation and Charge of Protein-Coated Gold Nanoparticles at Varying pH", University of Iowa Summer Undergraduate Research Conference, Iowa City, IA, 2017.

# Christiansen, Megan

# Presentations

Megan Christiansen, "Overview of Lake Michigan Ozone Study (LMOS 2017)", American Association for Aerosol Research, Raleigh, NC, 2017.

Megan Christiansen, "Nitrogen Oxide Emissions Perturbation and its Effects on the WRF-Chem Forecast", American Association for Aerosol Research, Raleigh, NC, 2017.

# Contreras, Marisol

# Awards

College of Engineering Dean's Graduate Engineering Diversity Fellowship for Broadening Participation

# Delcau, Michael

# Publications

M. Delcau, V. Henry, E. Pattee, T. Peeples. "Effect of Mode of Growth and Temperature on Expression of Atrazine-Degrading Genes in *Pseudomonas sp.* Strain ADP Biofilms". Submission in progress 2018. (Journal Article)

M. Delcau, B. Aðalbjörnsson, R. Jónsdóttir. "Effect of Thermal Treatment and pH on Stability of Polyphenols from *Fucus Vesiculosis* Seaweed Extract". Submission in progress 2018. (Journal Article)

# Presentations

M. Delcau, T. Peeples. "*Pseudomonas sp.* ADP Biofilms: Differentiation of Expression in Atrazine-Degrading Genes and Fluorescent Lectin Binding Analysis," American Institute of Chemical Engineering Annual Meeting. 2017. Minneapolis. (Oral Presentation)

M. Delcau, T. Peeples. "Temporal and Temperature-Dependence on Expression of Atrazine-Degrading Genes in *Pseudomonas sp.* ADP Biofilms". American Chemical Society National Meeting and Exposition. San Francisco. 2017. (Poster Presentation)

- Ballard and Seashore Fellowship, Spring, 2018
- Graduate College Summer Research Fellowship, Summer, 2017
- GPSG Travel Grant 2018
- GSS Travel Grant 2018

# Do, Anh-Vu

### Publications

Do A.-V., Geary S. M., Seol D., Tobias P., Carlsen D., Leelakanok N., . . . Salem A. K. (2018). "Combining Ultrasound and Intratumoral Administration of Doxorubicin-Loaded Microspheres to Enhance Tumor Cell Killing<" *Int J Pharm.* doi:10.1016/j.ijpharm.2018.01.028

Ebeid K., Meng X., Thiel K. W., Do A.-V., Geary S. M., Morris A. S., . . . Salem A. K. (2018). "Synthetically Lethal Nanoparticles for Treatment of Endometrial Cancer," *Nat Nanotechnol*, 13(1), 72-81. doi:10.1038/s41565-017-0009-7

Khorsand B., Nicholson N., Do A.-V., Femino J. E., Martin J. A., Petersen E., . . . Salem A. K. (2017). "Regeneration of Bone Using Nanoplex Delivery of FGF-2 and BMP-2 Genes in Diaphyseal Long Bone Radial Defects in a Diabetic Rabbit Model." *Journal of Control Release* 248, 53-59. doi:10.1016/j.jconrel.2017.01.008"

#### Presentations

"Controlled Delivery of Fluorophores from 3D Two-Photon Photolithographic Printed Poly(Ethylene Glycol) Methacrylate Scaffolds." Anh-Vu Do and Kristan Worthington, Budd Tucker, Aliasger K. Salem. American Association of Pharmaceutical Scientists, San Diego, California 2017.

"Combining Ultrasound and Intratumoral Administration of Doxorubicin-Loaded Microspheres to Enhance Tumor Cell Killing." Do A.-V., Geary S. M., Seol D., Tobias P., Carlsen D., Leelakanok N., Martin J., Salem A. American Association of Pharmaceutical Scientists, San Diego, California 2017."

#### Awards

- NASA Iowa Space Grant Consortium (ISGC) NASA Fellowship
- Thesis in Focus, Fall 2017
- Finalist of 3 Minute Thesis, Fall 2017
- The University of Iowa 2016 Inventor Award, Spring 2017
- Future Scientist Scholarship, Summer 2017
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Engineers Tissues, 2018

# El-Hattab, Sara

#### Awards

• Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Fights Muscular Dystrophy, 2018

# Givens, Brittany

# Publications

Givens, Brittany E., Diklich, Nina D., Fiegel, Jennifer, Grassian, Vicki H., "Adsorption of Bovine Serum Albumin on Silicon Dioxide Nanoparticles: Impact of pH on Nanoparticle-Protein Interactions" 2017. *Biointerphases*. 12 (1), DOI: 10.1116/1.4982598.

Givens, Brittany E., Geary, Sean M., Salem, Aliasger K., "Nanoparticle-Based CpG-ODN Therapy for Treating Allergic Asthma" 2018. *Immunotherapy*. Accepted January 2018.

# Presentations

Oral Presentation: Givens, Brittany E.; Areecheewakul, Sudartip; Wang, Yifang; Steines, Benjamin R.; Dodd, Andrea A.; Altmaier, Ralph; O'Shaughnessy, Patrick T.; Salem, Aliasger K., Thorne, Peter S., "Characterizing Toxicity for Industrial Engineered Nanomaterials" University of Iowa Jakobsen Conference, University of Iowa, Iowa City, IA, USA. March 24, 2018.

Poster: Givens, Brittany E.; Areecheewakul, Sudartip; Wang, Yifang; Steines, Benjamin R.; Dodd, Andrea A.; Altmaier, Ralph; O'Shaughnessy, Patrick T.; Salem, Aliasger K., Thorne, Peter S., "Characterizing Toxicity for Industrial Engineered Nanomaterials" University of Iowa Jakobsen Conference, University of Iowa, Iowa City, IA, USA. March 24, 2018.

Poster: Givens, Brittany E.; Areecheewakul, Sudartip; Wang, Yifang; Steines, Benjamin R.; Dodd, Andrea A.; Altmaier, Ralph; O'Shaughnessy, Patrick T.; Salem, Aliasger K., Thorne, Peter S., "Characterizing Toxicity for Industrial Engineered Nanomaterials" Nanoscience Winter Symposium, University of Iowa, Iowa City, IA, USA. March 2, 2018.

#### Awards

- Osburn Teaching Award, 2017
- Luther H. Smith Honorable Service Award (Ethnic Inclusion Effort for Iowa Engineering)
- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Edits Cancer DNA, 2018

# Green, Brian

#### Publications

Jennings, James, Green, Brian, Baguenard, Celine, Guymon, C. Allan, Mahanthappa, Mahesh, "Controlling Crosslinking Polymerizations within Gemini Surfactant Lyotropic Templates" 2017, *Chemistry of Materials*, 2018, 30 (1), pp 185-196

# Presentations

Green, Brian; Worthington, Kristan; Thompson, Jessica; Tucker, Budd; Guymon, C. Allan; "Effect of Molecular Weight and Functionality on Degradation, Biocompatibility, and Two-Photon Polymerization of Acrylated Poly(Caprolactone)" 2017 AIChE Annual Meeting, Minneapolis, MN, Nov 2017.

Green, Brian; McLeod, Robert; Guymon, C. Allan; "Effect of Post Cure on 3D Photocured Systems" 2017 Photopolymerization Center IUCRC Annual Meeting, PPG, Pittsburgh, PA, May 2017

#### Awards

• Graduate College Summer Research Fellowship, 2017

# Hasa, Erion

#### Presentations

Photopolymerization Center IUCRC Annual Meeting: "Light-Controlled Phase Separation Using Different Monomer Compositions of a Radical/Cationic System", Johnson & Johnson Vision Care, Jacksonville, FL, January 2018

AICHE national meeting: "Light-Controlled Phase Separation Using Different Monomer Compositions of a Radical/Cationic System", Minneapolis, MN, November 2017

Photopolymerization Fundamentals: "Light-Controlled Phase Separation Using Different Monomer Compositions of a Radical/Cationic System", Boulder, CO, September 2017

Photopolymerization Center IUCRC Annual Meeting: "Nano/Microstructured Materials Obtained Using Photopolymerization-Induced Phase Separation", PPG, Pittsburgh, PA, May 2017 "

# Awards

• Post Comprehensive Research Award, Spring, 2018.

# Janechek, Nathan

# Publications

Janechek, N. J., Hansen, K. M., and Stanier, C. O., "Comprehensive Atmospheric Modeling of Reactive Cyclic Siloxanes and Their Oxidation Products," *Atmos. Chem. Phys.*, 17, 8357-8370, doi:10.5194/acp-17-8357-2017, 2017.

# Presentations

"Experimental Characterization and Hygroscopicity Determination of Secondary Aerosol from D5 Cyclic Siloxane Oxidation", AGU Conference, New Orleans, LA, Dec 2017, (Poster).

"Comprehensive Atmospheric Modeling of Gas-phase Cyclic Volatile Methyl Siloxanes and Their Oxidation Products", AAAR Conference, Raleigh, NC, Oct 2017, (Poster).

"Experimental Characterization and Lung Cytotoxicity of Secondary Aerosol from D5 Cyclic Siloxane Oxidation", AAAR Conference, Raleigh, NC, Oct 2017, (Poster).

"Expanding the Modeling of Semivolatile Aerosols within the CMAQ Framework: Development and Application to Oxidized Cyclic Siloxanes and Polychlorinated Biphenyl Compounds", AAAR Conference, Raleigh, NC, Oct 2017, (Poster).

"Experimental Characterization of Secondary Aerosol from D5 Cyclic Siloxane Oxidation", 15th Annual College of Engineering Research Open House, Iowa City, IA, Apr 2017, (Poster).

# Awards

- Karl Kammermeyer Award for Excellence in Research, 2017
- Ballard and Seashore Fellowship, Spring, 2017

# Kaalberg, Sara

# Awards

• Ballard and Seashore Fellowship, Fall, 2017

# King, Benjamin

# Presentations

Oral Presentation: Benjamin King, Sachin Gharse, & Jennifer Fiegel. "CuO Nanoparticles Induce Toxicity and Enhanced Receptor Expression in Lung Epithelial Cells" ISAM Congress, Santa Fe, NM, 2017

Poster: Benjamin King and Jennifer Fiegel. "Zwitterionic Polymer Coatings to Limit Protein Adsorption to Nanocarrier Surfaces" ISAM Congress, Santa Fe, NM, 2017

Poster: Benjamin King and Jennifer Fiegel. "Zwitterionic Polymer Coatings to Limit Protein Adsorption to Nanocarrier Surfaces" AIChE Conference, Minneapolis, MN, 2017.

- Vetter Service Award, 2017
- International Society for Aerosols in Medicine, 3<sup>rd</sup> Place Student Research Award
- Graduate College Summer Research Fellowship, Summer, 2017
- Graduate Student Senate Travel Grant
- Graduate and Professional Student Government Travel Grant

# Kloepfer, Nicole

# Presentations

Kurpius, R., Kloepfer, N., Jessop, J.L.P., "Curing Dose Rate Effects: Predicting Polymer Properties in Electron-Beam Polymerization," AIChE Mid-American Conference, University of Tulsa, Tulsa, OK, 4/1/17 \*Presentation received 3rd place honors\*

Kloepfer, N., Jessop, J.L.P., "A Recipe for Success: Correlation Monomer Chemistry to Dose Rate Effects in Electron-Beam Polymerization," Spring 2017 IUCRC conference, PPG, Pittsburg, PA, 5/16/17.

### Awards

- Post Comprehensive Research Award, Spring, 2018
- Dr. Eunice Beam WISE Travel Grant

# Koonce, Jonathan

# Presentations

J. Koonce. "Low Noble Metal Content Oxygen Evolution Reaction Catalyst for Solar Water Splitting." Poster session presented at: 2017 ECS Annual Meeting. 2017 October 1-5; Oxon Hill, MD

# Kurpius, Renae

# Presentations

Renae Kurpius, Nicole Kloepfer, Dr. Julie Jessop, "Curing Dose Rate Effects: Predicting Polymer Properties in Electron-Beam Polymerization", AIChE Regional Conference, Tulsa, OK, 2017.

# Leigh, Braden

# Publications

Leigh, Braden, Cheng, Elise, Andresen, Corinne, Hansen, Marlan, and Guymon, C. Allan, "Photopolymerizable Zwitterionic Polymer Patterns Control Cell Adhesion and Guide Neural Growth," *Biomacromolecules*, 2017 18 (8), 2389-2401.

Leigh, Braden, Truong Kristy, Bartholomew, Reid, Ramirez, Mark, Hansen, Marlan, and Guymon, C. Allan, "Tuning Surface Properties of Acrylate Photopolymers to Investigate Competitive Guidance of Spiral Ganglion Neurons," *ACS Applied Materials and Interfaces* 2017, 9, 31488–31496.

Tuft, Bradley, Xu, Linjing, Leigh, Braden, Lee, Daniel, Guymon, C. Allan and Hansen, Marlan, "Photopolymerized Micropatterns with High Feature Frequencies Overcome Chemorepulsive Borders to Direct Neurite Growth," *The Journal of Tissue Engineering and Regenerative Medicine* 2017 Jul 28.

Xu, Linjing, Seline, Alison E., Leigh, Braden, Ramirez, Mark, Guymon, C. Allan, and Hansen, Marlan R., "Photopolymerized Microfeatures Guide Adult Spiral Ganglion and Dorsal Root Ganglion Neurite Growth," *Otology & Neurotology*, 2018 Jan;39(1):119-126.

#### Presentations

"Engineering Zwitterionic Polymers that Control Cell Adhesion and Direct Neurite Growth to Improve Cochlear Implants," AIChE 2017.

- Osburn Teaching Award, 2017
- ACS Excellence in Graduate Research Award, 2017
- AIChE Excellence in Graduate Polymer Research Award

# Lennartson, Elizabeth

# Publications

Sharma, A., J. Wang, and E. M. Lennartson, "Inter-Comparison of MODIS and VIIRS Fire Products in Khanty-Mansiysk Russia: Implications for Characterizing Gas Flaring from Space," *Atmosphere*, 8, 95, doi:10.3390/atmos8060095, 2017.

#### Presentations

"Diurnal Variation of Aerosol Optical Depth in Korea: A synthesis from AERONET, Satellite, KORUS-AQ Observation, and WRF-Chem Model" at the APOLO 2017 Meeting in Hefei, China

"Diurnal Variation of Aerosol Optical Depth in Korea: A synthesis from AERONET, Satellite, KORUS-AQ Observation, and WRF-Chem Model" at the 2017 AGU Fall Meeting in New Orleans, LA

#### Awards

• Vetter Service Award, 2017

# Leyden, Michael

# Awards

- Bob and Molly Whitmore Engineering Scholarship
- William Lichtenberger Scholarship

# McKee, Austin

#### Presentations

Austin McKee et al., "Plasmonics Mediated Carbon Dioxide Reduction Patchways", NNI Symposium, Iowa City, IA, 2018

#### Awards

• Honors in Engineering, University of Iowa University Honors

# McLaughlin, Jacob

#### Awards

• Graduate College Summer Research Fellowship, Summer, 2017

# Pattee, Emily

# Presentations

Emily Pattee, "The Effect of Cyanuric Acid on Atrazine Degrading Genes in Pseudomonas sp.ADP", University of Iowa Research Open House Poster Session

# Pradhan, Ojas

#### Presentations

Ojas Pradhan, "Creating Antibiotic-Loaded Dry Powders for Treating Lung Infections", Marshall Undergraduate Research Conference, Iowa City, IA, 2017.

Ojas Pradhan, Benjamin King, Sachin Gharse, Jennifer Fiegel, "Formulation of Novel Dry Powder Antibacterial Aerosols Using Central Composite Design of Experiments", American Institute of Chemical Engineers National Conference, Minneapolis, MN, 2017 Ojas Pradhan, Benjamin King, Sachin Gharse,

Jennifer Fiegel, "Formulation of spray dried antimicrobial powders using design of experiments", UI Summer Undergraduate Research Conference, Iowa City, IA, 2017

# Awards

- Iowa Center for Research by Undergraduates Fellowship, Summer 2017
- Goldwater Scholarship Campus Nominee, 2017-2018
- Koch Undergraduate Teaching Fellowship, Fall 2017
- Caterpillar Scholarship, Fall 2017

# Qian, Jiajie

# Awards

- Ballard and Seashore Fellowship, Fall, 2017
- Graduate College Summer Research Fellowship, Summer, 2017

# Rassoolkhani, Alan

# Awards

• Post Comprehensive Research Award, Spring, 2018

# Sobhani, Negin

# Awards

• 1<sup>st</sup> Place Student Oral Presentation for third Symposium on Higher Performance Computing for Weather, Water, and Climate

# Tang, Beiming

- College of Engineering Dean's Graduate Engineering Fellowship
- Kammermeyer Fellowship

# CIVIL & ENVIRONMENTAL ENGINEERING

# Bittle, Maeve

# Awards

- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Samples of Iowa Air Quality, 2018
- Kenneth Mosher Scholarship Fund

# Black, Ellen

# Awards

• Ballard and Seashore Dissertation Fellowship, Spring 2018

# Drake, Chad

# Awards

• Ballard and Seashore Dissertation Fellowship, Spring 2018

# Grant, Amina

# Awards

- College of Engineering Dean's Graduate Engineering Diversity Fellowship
- National Science Foundation Research Traineeship (NRT) Fellowship 2017-2021
- Underrepresented Minority Pre-Comprehensive Mentored Summer Research Fellowship 2017

# Herkert, Nicholas

# Publications

Herkert, Nicholas J., Scott N. Spak, Austen Smith, Jasmin K. Schuster, Tom Harner, Andres Martinez and Keri C. Hornbuckle, "Calibration and Evaluation of PUF-PAS Sampling Rates Across the Global Atmospheric Passive Sampling (GAPS) Network," *Environmental Science: Processes & Impacts*, 2018, 20, 210-219.

# Presentations

Herkert, Nicholas J., Andrew M. Awad, Keri C. Hornbuckle, "Atmospheric OH-PCBs in the Metropolitan Chicago Area" SETAC North America 38th Annual Meeting, Minneapolis, MN. (Nov. 2017).

Herkert, Nicholas J., Scott N. Spak, Austen Smith, Jasmin K. Schuster, Tom Harner, Andres Martinez and Keri C. Hornbuckle, "Evaluation of PUF-PAS Sampling Rates in Any Environment" SETAC North America 38th Annual Meeting, Minneapolis, MN. (Nov. 2017).

# Awards

• Graduate College Post-Comprehensive Research Award, Spring 2018

# Jadidoleslam, Navid

# Awards

• Certificate of Outstanding Contribution in Reviewing from Renewable Energy, 2017

# Jahnke, Jacob

# Presentations

Poster: Jacob C. Jahnke and Keri C. Hornbuckle, "Toxins Going Off the Wall: PCBs found in Indoor Air Due to Pigments: Quantification, Modelling, and Prediction," 15th Annual College of Engineering Research Open House, University of Iowa, April 6, 2017

Poster: Jacob C. Jahnke and Keri C. Hornbuckle, "Toxins Going Off the Wall: A Framework for Describing PCB Emissions from Paint," Iowa Superfund External Advisory Committee Meeting, University of Iowa, October 3, 2017

Presentation: Jacob C. Jahnke, "Toxins Going Off the Wall: A Framework for Describing PCB Emissions from Paint," SETAC, Minneapolis, MN, November 15, 2017

Poster: Jacob C. Jahnke and Keri C. Hornbuckle, "Toxins Going Off the Wall: A Framework for Describing PCB Emissions from Paint," SRP Annual Meeting, Philadelphia, PA, December 6, 2017

# Awards

- Iowa CGRER Travel Award 2017
- SETAC Travel Award 2017
- SRP Travel Award 2017

# Klarich, Kathryn

# Awards

• 2017 Best Paper Award, Environmental Science and technology Letters, March 2018

# Morrison, Alex

# Awards

• College of Engineering Dean's Graduate Engineering Fellowship

# Notini de Andrade, Luiza

# Awards

- DAAD Research Grant, German American Exchange Service, March 2018
- T. Anne Cleary International Dissertation Research Fellowship, February 2018
- CGRER Travel Award, 2018
- College of Engineering Graduate Incentive Fellowship, November 2017
- Graduate College Fellowship Incentive Program, November 2017

# Perez Mesa, Gabriel

# Awards

- Fall 2017 Outstanding TA Award, Civil & Environmental Engineering
- Graduate College Post-Comprehensive Research Fellowship, Spring 2018

# Preuschi, Jacob

# Awards

• Fall 2017 Outstanding TA Award, Civil & Environmental Engineering

# **Razmand**, Maral

# Awards

• Paul C. and Sarah Jane Benedict Fellowship for the Study of Alluvial River Processes

# Saktrakulkla, Panithi

### Presentations

Panithi Saktrakulkla, "Development of a MRM Method to Detect OH-PCBs in Environment Samples", Central States - Society of Toxicology (CS-SOT) annual meeting, Ames, IA, 2017.

Panithi Saktrakulkla, "Development of a MRM Method to Detect OH-PCBs in Environment Samples", Central States - Iowa Superfund Research Program (isrp) advisory board meeting, Iowa City, IA, 2017.

# Yildirim, Enes

# Publications

Demir, I., Yildirim, Enes, Sermet, Y., Sit, M.A., 'FLOODSS: Iowa Flood Information System as a Generalized Flood Cyberinfrastructure', *The International Journal of River Basin Management*, 2017.

Yildirim, Enes 'HAZUS-MH Flood Loss Estimation on a Web-Based System,", Master of Science Thesis, 2017.

#### Presentations

Yildirim, Enes, Sermet, Y., Demir, I., 'Web-Based Flood Damage Estimation and Emergency Management', 2017 CUAHSI Conference on Hydroinformatics, July 25-27, 2017, Tuscaloosa, AL, USA.

Hornbuckle, B., Eichinger, B., Wallace, V., Walker, W., Yildirim, Enes, "Soil Surface Roughness Observed During SMAPVEX16–IA and its Potential Consequences for SMOS and SMAP," July 23-28, 2017, Fort Worth, TX, USA.

Yildirim, Enes, Demir, I., 'Flood Emergency Decision Support System and Loss Estimation on the Web Using HAZUS' The 15th Annual College of Engineering Research Open House, April 6, 2017, Iowa City, IA, USA.

Yildirim, Enes, Sermet, Y., Demir, I., 'Flood Loss Estimation and Decision Support Framework on the Web' 19th Annual James F. Jakobsen Memorial Graduate Conference, March 25, 2017, Iowa City, IA, USA.

Yildirim, Enes, Demir, I., 'Web-based Flood Hazard Estimation and Emergency Management', Iowa Water Conference, March 22-23, 2017, Ames, IA, USA.

# Xu, Haowen

# Publications

Muste, M., Xu, H. and Mocanu, M. (2017). "Community Engagement in Water Resources Planning Using Serious Gaming," *IEEE 13th international Conference on Intelligent Computer Communication and Processing*, September 7-9, 2017, Cluj-Napoca, Romania.

Xu, H., Hameed, H., Windsor, M., Muste, M., Demir, I., Smith, J., Hunemuller, T., Stevenson, M. B. (2017). Decision-support System for Underpinning Collaborative Planning for Multi-Hazard Mitigation," *Proceedings of the 37th IAHR World Congress*, August 13-18, 2017; Kuala Lumpur, Malaysia.

Xu, H., Hameed, H., Windsor, Smith, J., Hunemuller, T., M., Muste, M., Demir, I., Stevenson, M. B. (2017). "An Iowa Prototype for a Generic Watershed Decision Support System," *11th Annual Iowa Water Conference*, March 22-23, 2017, Ames, IA.

Muste, M. Xu, H., Goetz, V., Claman, D., Abu-Hawash, A. (2017)."Sedimentation Mitigation at Multi-box Culverts," 96th Annual Meeting, Transportation Research Board, January 8-12, 2017; Washington D.C..

# Awards

- Graduate College Post-Comprehensive Research Fellowship 2018
- NSF UCGIS Summer Travel Award

# Zhou, Zhe

- AECOM Student Scholarship Award, June 2017
- ACS Geochemistry Best Student Paper Award, March 2018
- GPSG Travel Grant
- CGREG Graduate Travel Grant
- Graduate College Post-Comprehensive Research Fellowship, Spring 2018

# ELECTRICAL & COMPUTER ENGINEERING

# Aggarwal, Hemant Kumar

#### Publications

S. Biswas, H.K. Aggarwal, S. Poddar, and M. Jacob, "Model-Based Free-Breathing Cardiac MRI Reconstruction Using Deep Learned & STORM Priors: MoDL-STORM," accepted in *ICASSP* 2018.

H.K. Aggarwal, M. Mani, and M. Jacob, "Model Based Image Reconstruction Using Deep Learned Priors (MoDL)," Accepted in *ISBI* 2018.

H.K. Aggarwal, M. Mani, and M. Jacob, "MoDL: Model Based Deep Learning Architecture for Image Recovery with Prior Information," *ISMRM* 2018

# Anderson, Kyle

#### Awards

• Leonard G. Parks Memorial Engineering Scholarship

# Asgharzadeh, Amir

#### Publications

Amir Asgharzadeh, Bill Marion, Chris Deline, Clifford Hansen, Joshua Stein, Fatima Toor, "A Sensitivity Study of the Impact of Installation Parameters and System Configuration on the Performance of Bifacial PV Arrays", *IEEE Journal of Photovoltaics* (submitted)

Amir Asgharzadeh, Tomas Lubenow, Joseph Sink, Bill Marion, Chris Deline, Clifford Hansen, Joshua Stein, Fatima Toor, "Analysis of the Impact of Installation Parameters and System Size on Bifacial Gain and Energy Yield of PV Systems", in 2017 IEEE 44th Photovoltaic Specialists Conference (PVSC), 2017.

Bill Marion, Sara MacAlpine, Chris Deline, Amir Asgharzadeh, Fatima Toor, Daniel Riley, Joshua Stein, Clifford Hansen, "A Practical Irradiance Model for Bifacial PV Modules", in 2017 IEEE 44th Photovoltaic Specialists Conference (PVSC), 2017.

Clifford W Hansen, Renee Gooding, Nathan Guay, Daniel M Riley, Johnson Kallickal, Donald Ellibee, Amir Asgharzadeh, Bill Marion, Fatima Toor, Joshua S Stein, "A Detailed Model of Rear-Side Irradiance for Bifacial PV Modules", in 2017 IEEE 44th Photovoltaic Specialists Conference (PVSC), 2017.

#### Presentations

Amir Asgharzadeh, Bill Marion, Chris Deline, Clifford Hansen, Joshua Stein, Fatima Toor, "A Sensitivity Study of the Impact of Installation Parameters and System Configuration on the Performance of Bifacial PV Arrays", ECE Department Graduate Seminar, University of Iowa, Iowa City, IA, October 2017.

Amir Asgharzadeh, Tomas Lubenow, Joseph Sink, Bill Marion, Chris Deline, Clifford Hansen, Joshua Stein, Fatima Toor, "Analysis of the Impact of Installation Parameters and System Size on Bifacial Gain and Energy Yield of PV Systems", 44th IEEE Photovoltaic Specialists Conference (PVSC), Washington, DC, June 2017.

Amir Asgharzadeh, and Fatima Toor, "Ray Tracing Models for Bifacial PV Performance ", 8th PV Performance Modeling and Monitoring Workshop, Albuquerque, NM, May 2017.

Amir Asgharzadeh, Tomas Lubenow, Joseph Sink, Bill Marion, Chris Deline, Clifford Hansen, Joshua Stein, Fatima Toor, "The Effect of Photovoltaic System Size and Installation Parameters on the Performance of Bifacial Module Arrays", College of Engineering Research Open House, University of Iowa, Iowa City, IA, April 2017.

 University of Iowa Graduate Student Senate (GSS) travel award to present an oral presentation at the 44th IEEE Photovoltaic Specialists Conference (PVSC), June 2017

### Balachandrasekaran, Arvind

#### Publications

A. Balachandrasekaran, V. Magnotta, M. Jacob, "Recovery of Damped Exponentials Using Structured Low Rank Matrix Completion," *IEEE Transactions on Medical Imaging*, (TMI), 36(10):2087-2098, 2017.

A. Balachandrasekaran, M. Jacob, "Novel Annihilation Filter Framework for Accelerated Parameter Mapping," *Proc. ISMRM 2017*, Honolulu, Hawaii.

A. Balachandrasekaran, G. Ongie and M. Jacob, "Continuous Domain Compressed Sensing (CD-CS): Application to Accelerated Dynamic MRI," *ISMRM 2017*, Honolulu, Hawaii.

A. Balachandrasekaran, M. Jacob, "Novel Structured Low-Rank Algorithm to Recover Spatially Smooth Exponential Image Time Series," *IEEE ISBI*, Melbourne, Australia, 2017.

Wenna Duan, H. Michael Gach, Arvind Balachandrasekaran, Parshant Sehrawat, Ashish B. Bhumkar, Paresh B. Boraste, James T. Becker, Oscar L. Lopez, and Weiying Dai. "Cross-Sectional and Longitudinal Cerebral Blood Flow Changes in the Progression from Normal Cognition to Alzheimer's Disease Measured with Continuous Arterial Spin Labeling (CASL)," *ISMRM 2017*, Honolulu, Hawaii.

#### Awards

- GSS travel award for attending ISMRM 2017
- Graduate College Summer Fellowship 2017

#### Battacharya, Ipshita

#### Publications

I. Bhattacharya, J. Humston, C. Cheatum, M. Jacob, "Accelerating Two-Dimensional Infrared Spectroscopy While Preserving Lineshapes Using GIRAF," *Optics Letters*, in press.

I. Bhattacharya, M. Jacob, "Compartmentalized Low-Rank Recovery for High Resolution Lipid Unsuppressed MRSI," *Magnetic Resonance in Medicine*, in press.

J. Humston, I. Bhattacharya, M. Jacob, C. Cheatum, "Compressively Sampled Two-Dimensional Infrared Spectroscopy That Preserves Lineshape Information," *Journal of Physical Chemistry A*, 2017, 121 (16), pp 3088–3093.

I. Bhattacharya, M. Jacob, "Denoising and Deinterleaving of EPSI Data Using Structured Low-Rank Matrix Recovery," Accepted in *ISBI* 2018

I. Bhattacharya, R. Noeske, B. Yang, R. Schulte, M. Jacob, "High Resolution MRSI Using Compartmental Low Rank Algorithm: Demonstration Using Undersampled EPSI," *Proc. ISMRM 2017*, Honolulu, USA.

C. Cushing, I. Bhattacharya, R. Noeske, W. Kearney, B. Yang, M. Jacob, V. Magnotta, "Comparison of Undersampling Schemes for In-Vivo COSY and j-Resolved Spectroscopy at 7T," *58th Experimental Nuclear Magnetic Resonance Conference*, Asilomar Conference Grounds, Pacific Grove, California.

#### Biswas, Sampurna

#### Publications

G. Ongie, S. Biswas, M. Jacob, "Convex Recovery of Continuous Domain Piecewise Constant Images from Non-Uniform Fourier Samples," *IEEE Transactions on Signal Processing*, in press.

S. Biswas, H.K. Aggarwal, S. Poddar, and M. Jacob, "Model-Based Free-Breathing Cardiac MRI Reconstruction Using Deep Learned & STORM Priors: MoDL-STORM," accepted in *ICASSP* 2018.

# Presentations

"Model-Based Free-Breathing Cardiac MRI Reconstruction Using Deep Learned & STORM Priors: MoDL-STORM," in ISMRM Machine learning workshop 2018

### Awards

Graduate College Post-Comprehensive Research Award, Fall 2017

# Blicharski, Kevin

Awards

- Wilbur and Helen Kime Memorial Electrical Engineering Undergraduate Scholarship
- UI Old Gold Scholarship
- Iowa Center for Research by Undergraduates Award
- Academic Success Scholarship
- Rhodes Dunlap Second Year Scholarship
- Electrical and Computer Engineering Undergraduate Scholarship

# Bruflodt, Rachel

# **Publications**

Rachel Bruflodt, Ananya Sen Gupta, et al, "Fingerprinting the Refugio Oil Spill Using Topographic Signal Processing of Two-Dimensional Gas Chromatographic Images", *Proceedings of IEEE Oceans Conference*, Anchorage, September 18-21, 2017.

# Awards

- Campus-Wide Student Employee of the Year, UI Student Employment
- Campus-Wide Student Employee of the Year in Science/Health and Engineering, UI Student Employment
- Electrical and Computer Engineering Undergraduate Scholarship
- Accenture Scholarship

# Butler, Sy

Awards

- Creative Kick-Start Funding Award
- Bob and Molly Whitmore Engineering Scholarship
- National Merit/Provost Scholarship

# Chen, Cui

# Publications

C. Chen, A. Shah, X. Wu, M. Jacob, "A Rapid 3D Fat-Water Decomposition Method Using GlObally Optimal Surface Estimation (R-GOOSE), *Magnetic Resonance in Medicine*, in press.

C. Cui, A. Shah, X. Wu, M. Jacob, "A Novel Method for Rapid 3D Fat and Water Decomposition Using a GlObally Optimal Multi-Surface Estimation (R-GOOSE), *ISMRM 2017*, Honolulu, USA.

# Deutsch, Joshua

- University of Iowa President's List, Spring and Fall, 2017
- College of Engineering Dean's List, Spring and Fall, 2017
- Rockwell Collins Spring Leadership Retreat (Selected), Spring, 2018

# Duan, Wenqi

# Publications

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar Cells", in preparation.

Rasheid Smith, Wenqi Duan, Juliana Quaterman, Angie Morris, Ceryce Collie, Marcie Black, Fatima Toor, Aliasger K. Salem, "Surface Modifying Doped Silicon Nanowire Based Solar Cells for Applications in Biosensing", in preparation.

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar Cells", *45th IEEE PVSC Proceedings*, 2018 (submitted).

K A S M Ehteshamul Haque, Wenqi Duan and Fatima Toor, "Extremely Low Reflectivity Nanoporous Black Silicon by Copper Catalyzed Etching for Efficient Solar Cells," *44th IEEE PVSC Proceedings*, 2017

# Awards

• 2017 NSF Graduate Research Fellowship Program Honorable Mention

# Elmaleh, Ahmed

# Awards

- Sudhakar and Bharathi Reddy Scholarship
- Electrical and Computer Engineering Undergraduate Scholarship

# Freund, Harrison

# Awards

- University Engineering Grand Challenges Scholarship 2017-18
- Dale Irwin Hayes Scholarship 2017-18
- Electrical and Computer Engineering Undergraduate Scholarship

# Gao, Bingtao

# Publications

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar cClls", in preparation.

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar Cells", 45th IEEE PVSC Proceedings, 2018 (submitted).

# Awards

• College of Engineering Dean's Graduate Engineering Fellowship

# Haque, K. A. S. M. Ehteshamul

# Publications

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar Cells", in preparation.

Wenqi Duan, Bingtao Gao, K A S M Ehteshamul Haque, and Fatima Toor, "Performance Optimization Techniques for the Front and Back of Nanostructured 'Black Silicon' Solar Cells", 45th IEEE PVSC Proceedings, 2018 (submitted).

K A S M Ehteshamul Haque, Wenqi Duan and Fatima Toor, "Extremely Low Reflectivity Nanoporous Black Silicon by Copper Catalyzed Etching for Efficient Solar Cells," *44th IEEE PVSC Proceedings*, 2017

# Hawkins, Shea

# Awards

• Sudhakar and Bharathi Reddy Scholarship

# Hoehne, Justin

# Awards

• Creative Kick-Start Awards (2)

# Howk, Robin

# Publications

Ananya Sen Gupta, Craig Kletzing, Robin Howk, William Kurth, and Morgan Matheny, "Automated Identification and Shape Analysis of Chorus Elements in the Van Allen Radiation Belts," *Journal of Geophysical Research: Space Physics*; 2017 122(12). 12,353-12,369.

# Awards

• Iowa Space Grant Consortium Scholarship, 2017-2018

# Kapo, Mirela

# Awards

- Iowa Space Grant Consortium Award
- Electrical and Computer Engineering Undergraduate Scholarship

# Kelly, Daniel

# Presentations

Aaron Silva, Daniel Kelly, and Fatima Toor, "The Impact of Silver Nanoparticle Plasmon Resonance on the Optical Properties of Nano- and Micro-Textured Silicon", 8th Annual Fall Undergraduate Research Festival (FURF), Iowa City, Iowa, 2017

# Awards

- Electrical and Computer Engineering Undergraduate Scholarship
- National Merit/Provost Scholarship

# Levitt, Daniel

# Awards

• Creative Kick-Start Award

# Liyanage, Ganegama Suran

# Awards

- College of Engineering Dean's List
- University of Iowa Honors List Spring 2017.

# Mallaro, Sophia

# Awards

- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Innovates in Virtual Reality 2018
- Electrical and Computer Engineering Undergraduate Scholarship
- C.P. McGrath Memorial Scholarship
- Plumly Tuition Scholarship

# Marting, Caleb

# Awards

• College of Engineering Creative Kick-Start Grant Award

# McCarthy, Ryan

# Presentations

Ryan McCarthy, Ananya Sen Gupta, Andrew Awad, Keri Hornbuckle, "Analysis of Target and Non-Target PCBs in Air Sample Data Set", Iowa Superfund Research Program External Advisory Committee (EAC) meeting, October 3, 2017, Iowa City, IA.

Ryan McCarthy, Ananya Sen Gupta, Andrew Awad, Keri Hornbuckle, "Analyzing Key PCBs and Hidden Contaminants in Air Sample Data", NIEHS 2017 Superfund Research Program Annual Meeting, December 6th-8th, Philadelphia, PA 2017.

# Awards

• Peter L. Bernsten Graduate Scholarship

# **McCormick**, Emily

# Awards

- Joanne and Robert M. Chusiano Engineering Scholarship
- Electrical and Computer Engineering Undergraduate Scholarship

# Mohsin, Yasir

# Publications

Y. Mohsin, S. Poddar, B. Thattayilath, D. Ansah, and M. Jacob, "Navigator-Less Manifold Recovery of Cardiac Data Using Iterative STORM," *ISMRM-ESMRMB Conference*, Paris, France 2018.

Yasir Mohsin, Sunrita Poddar, Bijoy Thattaliyath, Ansah Diedra, Xiaoming B, Dingxin Wang and Mathews Jacob, "Calibration-Free Manifold Recovery for Free Breathing & Ungated Cardiac MR Imaging, *ISMRM Workshop 2017*, New York City, NY, USA.

# Nadeem, Syed Ahmed

#### Publications

Nadeem, Syed Ahmed, Eric A. Hoffman, and Punam K. Saha. "Path-Gradient–A Theory of Computing Full Intensity-Transition Between Two Points." *Iberoamerican Congress on Pattern Recognition*. Springer, Cham, 2017.

Nadeem, Syed Ahmed, Dakai Jin, Eric A. Hoffman, and Punam K. Saha. "A Fully Automated Airway Segmentation Algorithm From Chest CT Images At Total Lung Capacity." *Am J Respir Crit Care Med* 195 (2017): A4875.

#### Presentations

Syed Ahmed Nadeem, "Novel Theory and Algorithms of Path-Gradient and Their Application to Image Segmentation", Ninth International Conference on Advances in Pattern Recognition, Indian Statistical Institute (ISI), Bengaluru, India, Dec 30, 2017.

Syed Ahmed Nadeem, "Topological Leakage Detection and Freeze-and-Grow Propagation for improved CTbased airway segmentaiton", SPIE Medical Imaging Conference, Houston, TX, Feb. 13, 2018.

# Pan, Yue

# Publications

W Shao, SE Gerard, Y Pan, TJ Patton, JM Reinhardt, OC Durumeric, JE Bayouth, GE Christensen, "Sensitivity Analysis of Jacobian Determinant Used in Treatment Planning for Lung Cancer," *Medical Imaging* 2018: *Proc. SPIE*, vol 10574, Feb 2018.

# Permesawaran, Yashila

# Awards

• Peter L. Bernsten Graduate Scholarship

# Poddar, Sunrita

# Publications

Y. Mohsin, S. Poddar, B. Thattayilath, D. Ansah, and M. Jacob, "Navigator-Less Manifold Recovery of Cardiac Data Using Iterative STORM," *ISMRM-ESMRMB Conference*, Paris, France 2018.

S. Poddar, M.Jacob, "Recovery of Noisy Points on Band-Limited Surfaces: Kernel Methods Re-Explained," Accepted in *ICASSP* 2018

S. Poddar, M. Jacob, "Clustering of Data with Missing Entries," Accepted in *ICASSP* 2018.

S. Poddar, M. Jacob, "Recovery of Point Clouds on Surfaces: Application to Image Reconstruction," Accepted in *ISBI* 2018.

Yasir Mohsin, Sunrita Poddar, Bijoy Thattaliyath , Ansah Diedra, Xiaoming B, Dingxin Wang and Mathews Jacob, "Calibration-Free Manifold Recovery for Free Breathing & Ungated Cardiac MR Imaging, *ISMRM Workshop 2017*, New York City, NY, USA.

A. Parekh, S. Poddar, X. Bi, D. Wang, M. Jacob, "Free-Breathing and Ungated Cine MRI Using Joint Smoothness Regularization on Image and Patch Manifolds," *ISMRM 2017*, Honolulu, USA.

M. Mani , S. Poddar , V. Magnotta, M. Jacob, "Trajectory Correction of Radial Data Using MUSSELS," *Proc. ISMRM*, 2017, Honolulu, US

S. Poddar, X. Bi, D. Wang, M. Jacob, "A Calibration-Less Approach to Free-Breathing Ungated Cardiac MRI," *Proc. ISMRM 2017*, Honolulu, US.

S. Biswas, H.K. Aggarwal, S. Poddar, and M. Jacob, "Model-Based Free-Breathing Cardiac MRI Reconstruction Using Deep Learned & STORM Priors: MoDL-STORM," accepted in *ICASSP* 2018.

#### Awards

- University of Iowa Graduate College Summer Fellowship
- ISMRM Trainee Educational Stipend 2017
- Graduate Student Senate Travel Grant 2017
- Graduate and Professional Student Government Travel Grant 2017
- Graduate and Professional Student Government Travel Grant 2018

#### Sermet, Yusuf

# Publications

Demir, I., Yildirim, E., Sermet, Yusuf, Sit, M.A., "FLOODSS: Iowa Flood Information System as a Generalized Flood Cyberinfrastructure," *The International Journal of River Basin Management*, 2017.

#### Awards

- Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Deploys Artificial Intelligence 2018
- Runner-Up Award, 'AGU Data Visualization and Storytelling Competition', NASA and AGU 2017
- Research Grant, 'Al for Earth', Microsoft 2nd Place
- 'Flood Action VR', Samsung and IBM 2017

#### Shao, Wei

#### Publications

W Shao, SE Gerard, Y Pan, TJ Patton, JM Reinhardt, OC Durumeric, JE Bayouth, GE Christensen, "Sensitivity Analysis of Jacobian Determinant Used in Treatment Planning for Lung Cancer," *Proc. SPIE 10574, Medical Imaging 2018: Image Processing,* 1057418 (2 March 2018); doi: 10.1117/12.2293920; <u>https://doi.org/10.1117/12.2293920</u>

### Presentations

Wei Shao, Sarah E. Gerard, Yue Pan, Taylor J. Patton, Joseph M. Reinhardt, Oguz C. Durumeric, John E. Bayouth, Gary E. Christensen, "Sensitivity Analysis of Jacobian Determinant Used in Treatment Planning for Lung Cancer", SPIE Medical Imaging Conference, Houston, TX, 2018.

#### Silva, Aaron

#### Presentations

8th Annual Fall Undergraduate Research Festival (FURF) - Aaron Silva, Daniel Kelly, and Fatima Toor, "The Impact of Silver Nanoparticle Plasmon Resonance on the Optical Properties of Nano- and Micro-Textured Silicon"

12th Annual Summer Undergraduate Research Conference (SURC) - Aaron Silva, Wenqi Duan, and Fatima Toor, "Impact of Silicon Nanowire Array Fill Fraction, Length, and Metal Nanoparticle Decoration on Surface Reflection"

- Bob and Molly Whitmore Engineering Scholarship
- Society of Hispanic Professional Engineers Scholarship

- Dean's List
- President's List
- 2018 DAAD Rise Fellowship

# Swanson, Zachary

# Awards

• Gannon Samek Memorial Scholarship

# Thompson, Conrad

# Awards

• Peter L. Bernsten Graduate Scholarship

# Tosado, Joel

# Presentations

"Identifying Sub-Groups of Oropharyngeal Head and Neck Cancer Patients for Right-Censored Outcomes" ECE Graduate Seminar Fall 2017

# Awards

• GAANN Fellowship to Aug 2017

# Trautsch, Shane

# Awards

- Creative Kick-Start Award
- Electrical and Computer Engineering Undergraduate Scholarship

# Weller, Titus

# Awards

• L.A. Ware Scholarship

# Williams, Bram

# Awards

• Creative Kick-Start Award

# Xie, Hui

# Awards

• Tom and Ruth Dimond Fellowship

# MECHANICAL & INDUSTRIAL ENGINEERING

# Attarian, Siamak

# Awards

• Rajyalakshmi & Shankar N. Planjery Memorial Graduate Award

# Berdon, Randall

# Presentations

Kevin Wabick, Randall Berdon, Kyle Johnson, Brian Thurow & James Buchholz. "Characterization of Vorticity Transport in the Leading-Edge Vortex of a Rolling Wing using Plenoptic PIV", AIAA Sci-Tech Conference, Orlando, FL, 2018.

APS Denver, 2017

# Boesen, Dana

# Awards

• Featured in "Dare to Discover" Banner Series in Downtown Iowa City. Headline: Measures Indoor Air Toxins, 2018

# Di Napoli, Isaac Miguel

# Awards

• College of Engineering Dean's Graduate Engineering Fellowship

# Dogan, Timur

# Awards

Venkatachlam Memorial Graduate Award in Mechanical Engineering

# Dooley, Gregory

# Publications

Buchholz, J., Martin, J., Krebill, A. F., Dooley, G. M., & Carrica, P. (2018), "Structure of a Ship Airwake at Model and Full Scale," In *2018 AIAA Aerospace Sciences Meeting* (p. 1263).

Dooley, G., Krebill, A., Martin, J. E., Buchholz, J., & Carrica, P. (2017), "Aerodynamics of the Superstructure of a Moving Ship in a Turbulent Boundary Layer," *Bulletin of the American Physical Society*, 62.

# Fei, Fan

# Awards

College of Engineering Dean's Graduate Engineering Fellowship

# Feldmeier, Christofer

# Publications

Feldmeier, C., Li, H., Yamazaki, Y., Kato, T., Fujimoto, T., Kondo, O. and Sugiyama, H., 2017, "Prediction of Wheel Profile Wear Using Railroad Vehicle Dynamics Simulation: Comparison of Simulation and Test Results", *IMechE Journal of Multi-Body Dynamics*, DOI: 10.1177/1464419317721434.

### Awards

• Ray L. amd Edna P. Sweigert Memorial Graduate Fellowship, 2017-2018

# He, Li

# Publications

He, L. and Song, X., 2017. "Supportability of a High-Yield-Stress Slurry in a New Stereolithography-Based Ceramic Fabrication Process". *JOM*, pp.1-6.

Song, X., He, L., Yang, W., Wang, Z., Chen, L. "Co-Continuous Piezocomposites With Triply Periodic Phase Interfaces For Enhanced Mechanical Flexibility and Piezoelectricity". *The 13th Manufacturing Science and Engineering Conference of ASME* (MSEC2018). Accepted.

# Presentations

He, L., Song, X.. "Supportability of A Highly Viscous Slurry in a New Stereolithography-based Ceramic Fabrication Process". 28th Annual International Solid Freeform Fabrication Symposium. August 7-9, Austin, Texas, 2017.

# Heiderscheit, Timothy David

# Publications

Heiderscheit, T., Shen, N., Wang, Q., Samanta, A., Wu, B., and Ding, H., 2018, "Keyhole Laser Cutting of Carbon Fiber Reinforced Polymer Using a Long-Duration Nanosecond Pulse Laser," *ASME Journal of Manufacturing Science and Engineering*, under review.

# Hsiao, Nicholas

# Awards

Creative Kick-Start Award

# Hu, Renjie

# Publications

Hu, R., Roshdibenam, V., Johnson, H., Eirola, E., Akusok, A., Miche, Y., Björk, K.-M., Lendasse, A., (2018, under review). "ELM-SOM: A Continuous Self-Organizing Map for Visualization," *IEEE WCCI 2018*, Rio de Janeiro, Brazil.

Gritsenko, A., Sun, Z., Baek, S., Miche, Y., Hu, R., Lendasse, A., (2017), "Deformable Surface Registration with Extreme Learning Machines," In *International Conference on Extreme Learning Machines* (ELM 2017). Yantai, China.

# Presentations

"Deformable Surface Registration with Extreme Learning Machines," International Conference on Extreme Learning Machines, Yantai, China, 2017.

# Awards

• Best Paper Award, 2017 International Conference on Extreme Learning Machines

# Jian, Teng

# Awards

• Charles Day One World Peace Scholarship

# Kim, Dongyoung

# Publications

Kim, D., Kim, S., Han, J., Kim, S., Paik, K. (2017), "A Study on the Sensitivity Analysis of the Hydrodynamic Derivatives on the Maneuverability of KVLCC2 in Shallow Water," *Brodogradnja: Teorija i praksa brodogradnje i pomorske tehnike*, 68(4). doi:10.21278/brod68401

# Presentations

Kim, D., Kim, H., Yang, J., Song, S., Kim, I., Han, J., Kim, S. (2017). "A Study on the Maneuverability Analysis of KVLCC2 in Irregular Waves," Proceedings of Spring Joint Conference, KAOSTS, Busan, pp. 90-96.

Song, S., Kim, S., Kim H., Kim, I., Kim, D. (2017), "A Numerical Study for Evaluation of Linear and Non-Linear Roll Damping of Ships in Frequency Domain," Proceedings of Spring Joint Conference, KAOSTS, Busan, pp. 97-106.

Park, J., Lee, Y., Kim, S., Kim, D., Kang, U., Yang, I., Lee, S. (2017), "A Numerical Study on the Added Resistance Characteristics Analysis and the Hydrodynamic Derivatives Estimation of Ship in Waves," Proceedings of Spring Joint Conference, KAOSTS, Busan, pp. 583-592.

Han, J., Kim, S., Chae, S., Kim, D., Kim, I. (2017), "A Study on the PMM Test and the Estimation of the Hydrodynamic Derivatives Using Small Model Ship," Spring Joint Workshop of KTTC (Korea Towing Tank Conference), Incheon.

Han, J., Kim, S., Kim, H., Kim, D., Yang, J. (2017), "A Study on the Hydrodynamic Derivatives Estimation of Ship Using the PMM Carriage for a Small Towing Tank," Proceedings of the Annual Autumn Conference, SNAK, Yeosu, pp. 232-237.

Kim, I., Kim, S., Kim, H., Kim, D., Yang, J. (2017), "A Study on for Improving the Estimation Accuracy of Maneuverability in Shallow Water Using the Virtual Captive Model Test Results," Proceedings of the Annual Autumn Conference, SNAK, Yeosu, pp. 260-264.

# Awards

• Inha Vision Scholarship 2017 (Graduate College, Inha University, Korea)

# Kim, Yagin

# Awards

• Dr. Richard B. Stewart Thermal-Fluids Graduate Scholarship

# Krebill, Austin

# Publications

Buchholz, J., Martin, J., Krebill, A. F., Dooley, G. M., & Carrica, P. (2018), "Structure of a Ship Airwake at Model and Full Scale," In *2018 AIAA Aerospace Sciences Meeting* (p. 1263).

Dooley, G., Krebill, A., Martin, J. E., Buchholz, J., & Carrica, P. (2017), "Aerodynamics of the Superstructure of a Moving Ship in a Turbulent Boundary Layer," *Bulletin of the American Physical Society*, 62.

# Madalinski, Patrick

# Awards

• Creative Kick-Start Award

# Marting, Caleb

# Awards

• Creative Kick-Start Award

# Ponomar, Dylan

# Awards

- Creative Kick-Start Award
- ASHRAE Cedar Valley Engineering Scholarship

# Samanta, Avik

# Publications

Avik Samanta, Ninggang Shen, Heipeng Ji, Weiming Wang, Jingjing Li & Hongtao Ding, "Cellular Automaton Simulation of Microstructure Evolution for Friction Stir Blind Riveting," *Transactions of the ASME, Journal of Manufacturing Science and Engineering*. 2018; 140(3) 031016-031025

Ze Liu, Benxin Wu, Avik Samanta, Ninggang Shen, Hongtao Ding & Yung Shin, "Manufacturing of Hourglass-Shaped Through Holes with Varying Diameters at Different Depths by Dual-Pulse Laser Drilling and Laser-Induced Plasma-Hole Interaction," *Manufacturing Letters*. 2018; 16 18-22.

Ninggang Shen, Avik Samanta, Qinghua Wang, & Hongtao Ding, "Selective Laser Melting of Fiber-Reinforced Glass Composites," *Manufacturing Letters*. 2017; 14 6-9.

# Shen, Ninggang

# Publications

Samanta, A., Shen, N., Ji, H., Wang, W., Li, J., and Ding, H., 2018, "Cellular Automaton Simulation of Microstructure Evolution for Friction Stir Blind Riveting," *ASME Journal of Manufacturing Science and Engineering*, 140(3), p. 31016.

Liu, Z., Wu, B., Samanta, A., Shen, N., Ding, H., and Shin, Y. C., 2018, "Manufacturing of Hourglass-Shaped Through Holes with Varying Diameters at Different Depths by Dual-Pulse Laser Drilling and Laser-Induced Plasma-Hole Interaction," *Manufacturing Letters*, article in press.

Heiderscheit, T., Shen, N., Wang, Q., Samanta, A., Wu, B., and Ding, H., 2018, "Keyhole Laser Cutting of Carbon Fiber Reinforced Polymer Using a Long-Duration Nanosecond Pulse Laser," *ASME Journal of Manufacturing Science and Engineering*, under review.

Shen, N., Ding, H., Pu, Z., Jawahir, I. S., and Jia, T., 2017, "Enhanced Surface Integrity from Cryogenic Machining of AZ31B Mg Alloy: A Physics-Based Analysis with Microstructure Prediction," *ASME Journal of Manufacturing Science and Engineering*, 139(6), p. 61012.

Samanta, A., Shen, N., Ji, H., Wang, W., Ding, H., and Li, J., 2017, "Simulations of Microstructure Evolution During Friction Stir Blind Riveting Using a Cellular Automaton Method," *Volume 1: Processes, ASME*, p. V001T02A007.

Shen, N., Samanta, A., Wang, Q., and Ding, H., 2017, "Selective Laser Melting of Fiber-Reinforced Glass Composites," *SME Manufacturing Letters*, 14, pp. 6–9.

Wang, Y., Shen, N., Befekadu, G. K., and Pasiliao, C. L., 2017, "Modeling Pulsed Laser Ablation of Aluminum with Finite Element Analysis Considering Material Moving Front," *International Journal of Heat and Mass Transfer*, accepted, 113, pp. 1246–1253.

#### Awards

 Aug 2017, NSF 17-091 Dear Colleague Letter: Non-Academic Research Internships for Graduate Students (INTERN), NSF (NOTE: NSF sponsored non-academic research internship, at General Motors Global R&D Center at Warren, Michigan)

# Sharma, Tejasvi

#### Publications

Zang, G., Sharma, T., Ratner, A., and Silva Lora, E. E., "A Comparative Study of Biomass Integrated Gasification Combined Cycle Power Systems: Performance Analysis," *Bioresource Technology*, in press, 2018.

Zang, G., Sharma, T., and Ratner, A., "Biomass Gasification Study Applied to Biomass Integrated Gasification Combined Cycle," *10th National US Combustion Meeting*, Paper # 1E16, College Park, MD, April 23-26, 2017.

Sharma, T., Yepes, D., Shi, Y., Nascimento, R., Shi, Y., Zang, G., Ratner, A., and Silva Lora, E.E., "Miscanthus Gasification in a Downdraft Gasifier," *10th National US Combustion Meeting*, Paper # 2D06, College Park, MD, April 23-26, 2017.

### Singh, Gurjap

#### Awards

Sharada Devi Planjery Memorial Graduate Award in Mechanical Engineering

# Sun, Zhiyu

#### Publications

Sun, Z., Harik, R., Baek, S. (2017), "Mesh Segmentation via Geodesic Curvature Flow," Computer-Aided Design and Applications

#### Presentations

Sun, Z., Baek, S., Harik, R., (2017), "Mesh Segmentation via Geodesic Curvature Flow," 14th Annual International CAD Conference, Okayama, Japan.

# Wabick, Kevin

#### Presentations

Kevin Wabick, Randall Berdon, Kyle Johnson, Brian Thurow & James Buchholz. "Characterization of Vorticity Transport in the Leading-Edge Vortex of a Rolling Wing using Plenoptic PIV", AIAA Sci-Tech Conference, Orlando, FL, 2018.

# Wang, Qinghua

#### Publications

Ninggang Shen, Avik Samanta, Qinghua Wang, Hongtao Ding. "Selective Laser Melting of Fiber-Reinforced Glass Composites," *Manufacturing Letters*, 2017, 14: 6-9.

# Presentations

Qinghua Wang, Avik Samanta, and Ninggang Shen, and Hongtao Ding, "Fast Laser Processing for Nanostructured Surfaces and Measurements", 2017 University of Iowa College of Engineering Research Open House

# Awards

• Sharada Devi Planjery Memorial Graduate Award in Mechanical Engineering, 2017

# Zang, Guiyan

# **Publications**

Zang, G., Sharma, T., Ratner, A., and Silva Lora, E. E., "A Comparative Study of Biomass Integrated Gasification Combined Cycle Power Systems: Performance Analysis," *Bioresource Technology*, in press, 2018.

Zang, G., Sharma, T., and Ratner, A., "Biomass Gasification Study Applied to Biomass Integrated Gasification Combined Cycle," *10th National US Combustion Meeting*, Paper # 1E16, College Park, MD, April 23-26, 2017.

# Zhang, Jianan

# Publications

Zhang, J. and Ratner, A., "Experimental Study of the Effects of Hydrogen Addition on the Self-excited Thermoacoustic Instability," *10th National US Combustion Meeting*, Paper # 2E13, College Park, MD, April 23-26, 2017.

Zhang, J. and Ratner, A., "Effect of Pressure Variation on Acoustically Perturbed Swirling Flames," *Proceedings of the Combustion Institute*, Vol. 36, No. 3, pp 3881–3888, 2017.

Zhang, J. and Ratner, A., "Experimental Study of the Global and Local Flame Responses to Acoustic Perturbation," *Journal of Propulsion and Power*, Vol. 33, No. 2, March-April, 2017.

# LIST OF SCHOLARSHIP & FELLOWSHIP RECIPIENTS 2017 – 2018

<u>Name</u>	<u>Department</u>	Scholarship/Fellowship
Alalwan, Hayder	Chemical & Biochemical Engineering	Ballard and Seashore Fellowship Digital Studio Summer Fellowship
Anderson, Kyle	Electrical & Computer Engineering	Leonard G. Parks Memorial Engineering Scholarship
Attarian, Siamak	Mechanical & Industrial Engineering	Rajyalakshmi & Shankar N. Planjery Memorial Graduate Award
Austin, Brett	Biomedical Engineering	Tau Beta Pi Engineering Honor Society Lyons No. 2 Scholarship
Balachandrasekaran, Arvind	Electrical & Computer Engineering	Graduate College Summer Fellowship 2017
Bittle, Maeve	Civil & Environmental Engineering	Kenneth Mosher Scholarship Fund
Black, Ellen	Civil & Environmental Engineering	Ballard and Seashore Dissertation Fellowship, Spring 2018
Blicharski, Kevin	Electrical & Computer Engineering	Wilbur and Helen Kime Memorial Electrical Engineering Undergraduate Scholarship UI Old Gold Scholarship Academic Success Scholarship Rhodes Dunlap Second Year Scholarship Electrical and Computer Engineering Undergraduate Scholarship
Bruflodt, Rachel	Electrical & Computer Engineering	Electrical and Computer Engineering Undergraduate Scholarship Accenture Scholarship
Butler, Sy	Electrical & Computer Engineering	Bob and Molly Whitmore Engineering Scholarship National Merit/Provost Scholarship
Contreras, Marisol	Chemical & Biochemical Engineering	College of Engineering Dean's Graduate Diversity Fellowship
Corrigan, Rae	Biomedical Engineering	College of Engineering Dean's Graduate Fellowship
Das, Pratik	Civil & Environmental Engineering	S.K. Nanda Engineering Scholarship
Dahms, Kelsi	Biomedical Engineering	Archie A. Alexander Memorial Scholarship
Dietz, Clarissa	Physics	University of Iowa Presidential Scholarship National Merit/Provost Scholarship 2018 Myrtle K. Maier Scholarhsip
Di Napoli, Isaac Miguel	Mechanical & Industrial Engineering	College of Engineering Dean's Graduate Fellowship
Delcau, Michael	Chemical & Biochemical Engineering	Ballard and Seashore Fellowship

(List of Scholarships/Fellowships for ROH 2018 Presenters & Participants)
		Graduate College Summer Research Fellowship
Do, Anh-Vu	Chemical & Biochemical Engineering	NASA Iowa Space Grant Consortium (ISGC) Fellowship
		Varlatashlara Manazish Qardasta Augustia
Dogan, Timur	Mechanical & Industrial Engineering	Venkatachiam Memorial Graduate Award in Mechanical Engineering
Drake, Chad	Civil & Environmental Engineering	Ballard and Seashore Dissertation Fellowship, Spring 2018
Elmaleh, Ahmed	Electrical & Computer Engineering	Sudhakar and Bharathi Reddy Scholarship Electrical and Computer Engineering Undergraduate Scholarship
Fei, Fan	Mechanical & Industrial Engineering	College of Engineering Dean's Graduate Fellowship
Feldmeier, Chistofer	Mechanical & Industrial Engineering	Mechanical & Industrial Engineering Sweigert Graduate Fellowship
Freund, Harrison	Electrical & Computer Engineering	Engineering Grand Challenges Scholarship
		2017-18 Dale Irwin Hayes Scholarship 2017-18 Electrical and Computer Engineering Undergraduate Scholarship
Gao, Bingtao	Electrical & Computer Engineering	College of Engineering Dean's Graduate Fellowship
Garneau, Michael	Biomedical Engineering	Archie A. Alexander Memorial Scholarship
Gerard, Sarah	Biomedical Engineering	Ballard and Seashore Dissertation Fellowship, 2017-2018
Goelz, Genevieve	Biomedical Engineering	Philip A. and Florence B. Temple Engineering Scholarship
Goetz, Sawyer	Biomedical Engineering	John and Marilyn McKercher Engineering Scholarship National Merit/Provost Scholarship Presidential Scholarship
Grant, Amina	Civil & Environmental Engineering	College of Engineering Dean's Graduate Diversity Fellowship National Science Foundation Research Traineeship (NRT) Fellowship 2017-2021 Underrepresented Minority Pre-Comprehensive Mentored Summer Research Fellowship 2017
Green, Brian	Chemical & Biochemical Engineering	Graduate College Summer Research Fellowship
Halberg, Spencer	Biomedical Engineering	Paul Scholz Memorial Scholarship 2017-2018
Hawkins, Shea	Electrical & Computer Engineering	Sudhakar and Bharathi Reddy Scholarship

Howk, Robin	Electrical & Computer Engineering	Iowa Space Grant Consortium Scholarship 2017-2018
Janechek, Nathan	Chemical & Biochemical Engineering	Ballard and Seashore Fellowship
Jian, Teng	Mechanical & Industrial Engineering	Charles Day One World Peace Scholarship
Kaalberg, Sara	Chemical & Biochemical Engineering	Ballard and Seashore Fellowship
Kapo, Mirela	Electrical & Computer Engineering	Electrical and Computer Engineering Undergraduate Scholarship
Kelly, Daniel	Electrical & Computer Engineering	Electrical and Computer Engineering Undergraduate Scholarship National Merit/Provost Scholarship
Kim, Dongyoung	Mechanical & Industrial Engineering	Inha Vision Scholarship 2017 (Graduate College, Inha University, Korea)
Kim, Yagin	Mechanical & Industrial Engineering	Dr. Richard B. Stewart Thermal-Fluids Graduate Scholarship
King, Benjamin	Chemical & Biochemical Engineering	Graduate College Summer Research Fellowship
Leyden, Michael	Chemical & Biochemical Engineering	Bob and Molly Whitmore Engineering Scholarship William Lichtenberger Scholarship
Mallaro, Sophia	Electrical & Computer Engineering	Electrical and Computer Engineering Undergraduate Scholarship C.P. McGrath Memorial Scholarship Plumly Tuition Scholarship
Martin, Russell	Biomedical Engineering	Rhodes Dunlap Honors Scholarship 2017-19 Dr. Royce E. and Shirley N. Beckett Engineering Scholarship 2017
McCarthy, Ryan	Electrical & Computer Engineering	Peter L. Bernsten Graduate Scholarship
McCormick, Emily	Electrical & Computer Engineering	Joanne and Robert M. Chuisano Engineering Scholarship Electrical and Computer Engineering Undergraduate Scholarship
McLaughlin, Jacob	Chemical & Biochemical Engineering	Graduate College Summer Research Fellowship
Morrison, Alex	Civil & Environmental Engineering	College of Engineering Dean's Graduate Fellowship
Mueller, Marissa	Biomedical Engineering	Susan Moffatt Memorial Scholarship
Niedert, Elizabeth	Biomedical Engineering	David R. Buchanan Scholarship
Notini de Andrade, Luiza	Civil & Environmental Engineering	T. Anne Cleary International Dissertation Research Fellowship, February 2018 College of Engineering Graduate Incentive Fellowship, November 2017 Graduate College Fellowship Incentive Program, November 2017
Olvera, Angela	Biomedical Engineering	Clarence H. Clark Fund

Perez Mesa, Gabriel	Civil & Environmental Engineering	Graduate College Post-Comprehensive Research Fellowship, Spring 2018
Permesawaran, Yashila	Electrical & Computer Engineering	Peter L. Bernsten Graduate Scholarship
Ponomar, Dylan	Mechanical & Industrial Engineering	ASHRAE – Cedar Valley Engineering Scholarship
Pradhan, Ojas	Chemical & Biochemical Engineering	Koch Undergraduate Teaching Fellowship, Fall 2017 Caterpillar Scholarship, Fall 2017
Qian, Jiajie	Chemical & Biochemical Engineering	Ballard and Seashore Fellowship Graduate College Summer Research Fellowship
Razmand, Maral	Civil & Environmental Engineering	Paul C. and Sarah Jane Benedict Fellowship for the Study of Alluvial River Processes
Rodriguez, Anna	Biomedical Engineering	John and Marilyn McKercher Engineering Scholarship
Santhana, Velarchana	Biomedical Engineering	Dwight & Elsie Johnston Scholarship
Schrodt, Michael	Biomedical Engineering	R.F. and H.W. Poston Scholarship
Sherman, Ashten	Biomedical Engineering	John M. Russ Memorial Fund
Silva, Aaron	Biomedical Engineering	DAAD RISE Fellowship Summer 2018 Bob and Molly Whitmore Engineering Scholarship 2017-2018 Society of Hispanic Professional Engineers Scholarship 2017-2018
Singh, Gurjap	Mechanical & Industrial Engineering	Sharada Devi Planjery Memorial Graduate Award in Mechanical Engineering
Slater, Ethan	Biomedical Engineering	University of Iowa Homecoming Scholarship 2017
Swanson, Zachary	Electrical & Computer Engineering	Gannon Samek Memorial Scholarship
Tang, Beiming	Chemical & Biochemical Engineering	College of Engineering Dean's Graduate Fellowship Kammermeyer Fellowship
Tanner, Bryan	Biomedical Engineering	William C. Blackburn Engineering Scholarship
Thompson, Conrad	Electrical & Computer Engineering	Peter L. Bernsten Graduate Scholarship
Thompson, Jacob	Biomedical Engineering	Dr. Royce E. and Shirley N. Beckett Engineering Scholarship
Tollefson, Mallory	Biomedical Engineering	John and Marilyn McKercher Engineering Scholarship, 2017-2018
Tosado, Joel	Electrical & Computer Engineering	GAANN Fellowship
Trautsch, Shane	Electrical & Computer Engineering	Electrical and Computer Engineering Undergraduate Scholarship
Wallace, Ellie	Biomedical Engineering	George L. & Cladys I. Petrik Memorial Scholarship

Wang, Qinghua	Mechanical & Industrial Engineering	Sharada Devi Planjery Memorial Graduate Award in Mechanical Engineering
Weller, Titus	Electrical & Computer Engineering	L.A. Ware Scholarship
Xie, Hui	Electrical & Computer Engineering	Tom and Ruth Dimond Fellowship
Xu, Haowen	Civil & Environmental Engineering	Graduate College Post-Comprehensive Research Fellowship 2018
Zhou, Zhe	Civil & Environmental Engineering	AECOM Student Scholarship Award, June 2017 Graduate College Post-Comprehensive Research Fellowship, Spring 2018



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