UAB SCHOOL OF ENGINEERING

UAB SCHOOL OF MEDICINE

Knowledge that will change your world

Summer 2018 UAB BME Newsletter

Message from the Vice Chair for Research

Gangjian 'GQ' Qin, MD, FAHA
Vice Chair of Research & Professor
UAB Department of BME

Dear Colleagues, Alumni, Students, Staff, and Friends:

It is my great pleasure to update you on our research program in Biomedical Engineering. As you may be aware, our department has been ranked 4th in research funding among the NIH-funded joint BME departments (joint within the School of Medicine and School of Engineering) for the past two years in a row. The variety of funding sources obtained reflects the strength and uniqueness of our program. The convergence of life sciences and bioengineering brings about integration of stem cell biology, tissue engineering, and cardiovascular science. The interdisciplinary nature of our program affords a tremendous opportunity to bring forth advances in new scientific discoveries and technological development to foster improved quality of life. Led by national leaders and dedicated faculty members, our research is on the cutting-edge of translating regenerative medicine to health care practice.

Science is about an open mind and free exchange of ideas. In the BME Department, we currently offer a series of three seminars. The *Frontiers in Cardiovascular Science and Engineering Seminars* bring in top scientists and engineers to speak on campus. Our weekly Friday BME Seminars provide a forum for faculty and outside scientists to introduce their research and new discoveries to the entirety of our departmental researchers and students. Finally, we co-host the tri-departmental BME/Pathology/Surgery Joint Seminar Series featuring leading national and international scientists and research administrators. In addition to the seminars, this year on March 1-2, our department also organized the 4th Annual Cardiovascular Bioengineering (CVBE) Symposium. This NIH-sponsored event featured leading international scientists and top journal editors as invited speakers, with over 200 focused attendees, in a broad conversation on the current state of regenerative medicine,

pluripotent stem cells, cardiovascular sciences, tissue engineering, and pathways to translation. The event was tremendously successful in our collective efforts to help move the field forward.

Collaborations are vital to scientific research. In partnership with the Department of Surgery, we have launched the BME-Surgery Collaborative Pilot Grant Award, aimed to encourage interdepartmental collaborations and test new and bold scientific ideas to help compete and prepare for large national grants. Although the impact of the initial awards is yet to be evaluated, the preliminary results as indicated by publications and awards of new research funding are encouraging. We will soon begin planning award administration for the next academic year. We hope these collective efforts will make a meaningful contribution to the overall success of the research enterprise of the Schools of Medicine and Engineering at UAB.

The next generation of leaders and innovators will shape the technological and economic landscapes of tomorrow. We make every effort to build an enriched research environment that fosters the growth of junior faculty and young scientists. Our weekly Research Update provides a forum for trainees to communicate their ideas and obtain feedback to improve their science. We encourage the exposure of our undergraduate and Science & Technology Honors Program students to laboratory research. We are proud of the hard work and dedication of our young scientists and students, and congratulate those who won career development grants, postdoctoral and predoctoral fellowships, prizes in national scientific meetings, and awards for most-cited research article of the year.

I invite you to read about our progress and future plans in this issue of the UAB BME Newsletter, and I welcome you to visit our BME laboratories to offer your constructive ideas and support.

With best wishes,

Gangjian 'GQ' Qin, MD, FAHA
Vice Chair of Research, Department of Biomedical Engineering
Professor, Medicine and Biomedical Engineering
Director, Molecular Cardiology Program

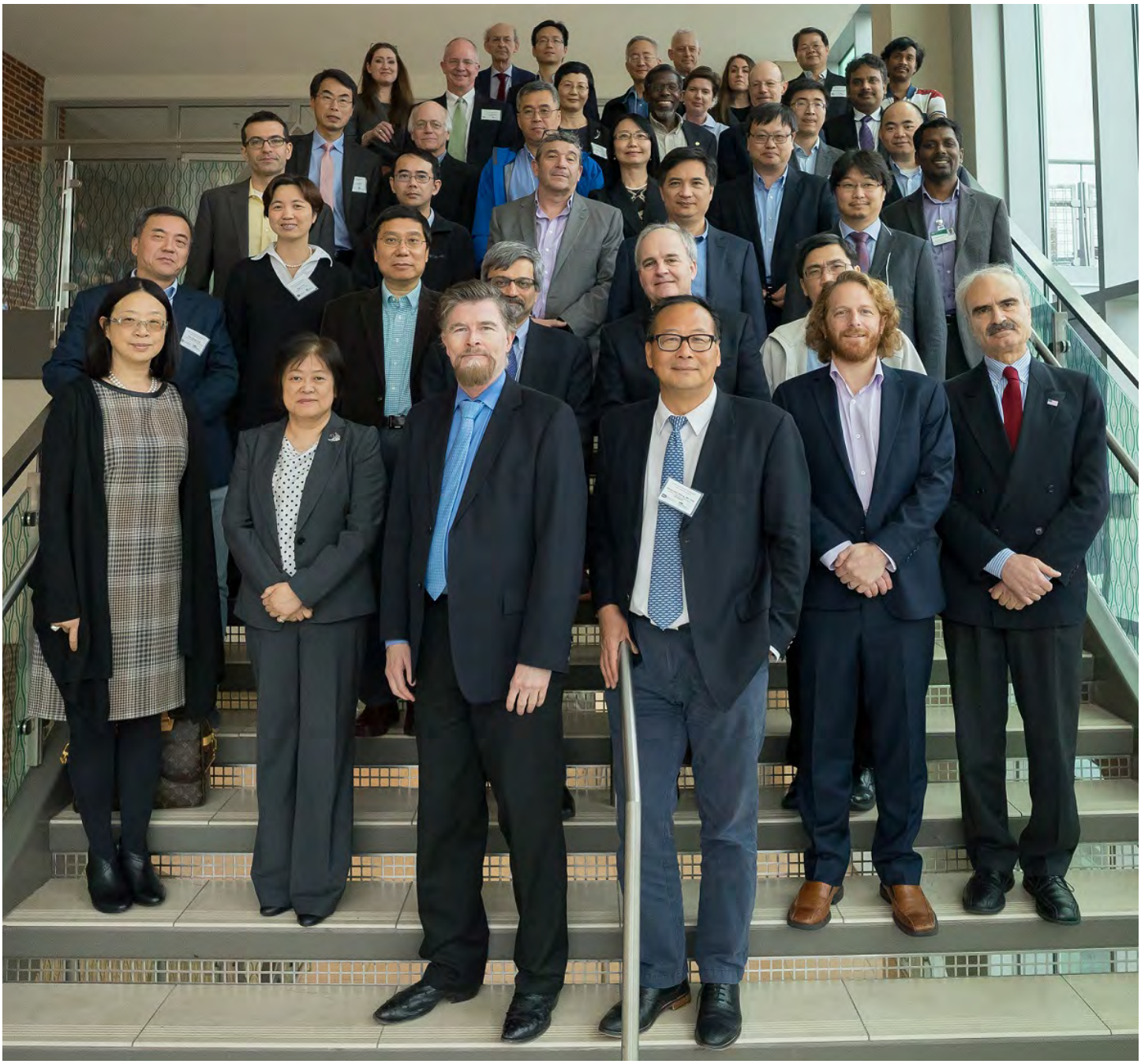
2018 Cardiovascular Bioengineering Symposium a Success!

The 4th annual NIH Cardiovascular Bioengineering (CVBE) Symposium was held on the campus of The University of Alabama at Birmingham (UAB) on March 1-2, 2018. The symposium, held over 1.5 days, continues to be unique in the world, featuring a combination of top researchers in cardiovascular bioengineering with trainees in the field while maintaining the intimacy of UAB's cardiovascular bioengineering community and Southern hospitality of Birmingham.

The symposium also provided a forum for trainees and junior investigators to present their work in the areas of gene editing, induced pluripotent stem cells, and cardiac stem cells in the context of heart failure as well as general topics in cardiovascular bioengineering. Additional topics included vascular tissue engineering, cardiac development, exosomes, microRNAs, and mitochondria. Cardiac gene and cardiac cell therapy were center stage. Nearly 200 people attended the conference, which was supported by speakers from North America, Europe, and Asia's cardiovascular bioengineering communities.

Planning is already in motion for the 2019 CVBE!

Dr. Jay Zhang *hosted the kick-off of the 2018 Cardiovascular Bioengineering Symposium*



Featured speakers of the CVBE Symposium on March 1, 2018 at the Hill Center on the campus of UAB.

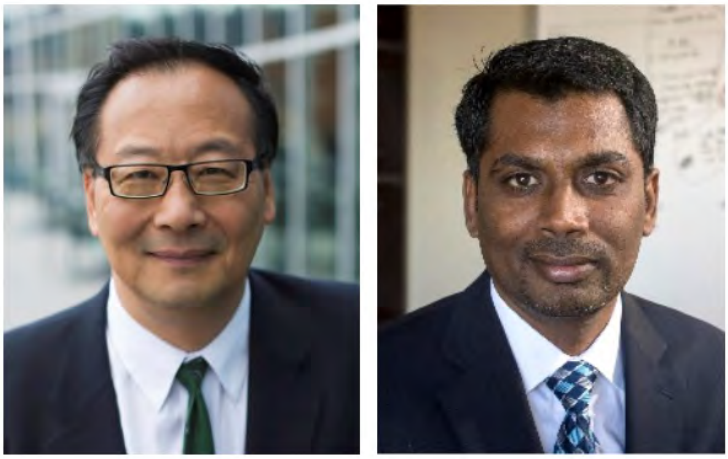
Following the presentations on March 1st, symposium faculty and participants adjourned to the Rogue Tavern in downtown Birmingham for an evening of fellowship, music, and fun.

On the evening of March 1, 2018, symposium participants unwound by joining The Unnamed Band (T.U.B.) for a few sets of live music at Rogue Tavern in downtown Birmingham. Featuring drummer and Professor of BME, ***Dr. Alan Eberhardt****, and Associate Professor* ***Dr. Joel Berry*** *on guitar, T.U.B. kept the crowd dancing.*

New Grants Boost BME Research

Congratulations to **Drs. Jianyi (Jay) Zhang** and **Prasanna Krishnamurthy** on their newly awarded NIH multiple-PI R01 grant!

The project aims to study how diabetes influences resolution of inflammation in an injured heart. Cardiac injury leads to myocardial cell death, which is associated with inflammation, microvascular abnormalities and fibrosis resulting in altered heart function. To resolve inflammation and maintain tissue homeostasis, the dead cells have to be removed by phagocytes by an evolutionarily conserved biological process called phagocytosis or efferocytosis. However, under certain pathological conditions, the imbalance of cell death and their removal could lead to adverse tissue remodeling. Dr. Krishnamurthy's lab has previously shown that diabetes-induced microRNA dysregulation impairs clearance of apoptotic cardiomyocytes, thus leading to impairment in resolution of inflammation.



Jay Zhang, MD, PhD*, Professor and Chair of BME (left) and* ***Prasanna Krishnamurthy, DVM, PhD****, Associate Professor of BME (right).*

The new grant will fund studies involving use of mesenchymal stem cells to modulate the process and therefore achieve efficient cardiac repair.

UAB BME #4 in NIH Research funding for Second Year!

The UAB Department of Biomedical Engineering took another big step forward in 2017, ranking in the top five BME departments nationally in the amount of funding it receives from the National Institutes of Health (NIH). The other joint BME departments ahead of UAB are Stanford, Johns Hopkins, and Oregon Health & Sciences University. This high ranking is based on BME departments that are joint with schools of medicine at their respective institutions and is a significant indicator of the quality of the research enterprise.

BME Welcomes New Faculty Member, Dr. Philippe Menasché

It is our pleasure to announce the faculty appointment of **Philippe Menasché, MD, PhD**, as a Visiting Professor in the Department of Biomedical Engineering. Dr. Menasché's appointment at UAB is in conjunction with a NIH-funded grant (U01 HL134764-01, PI: J Zhang), titled "Integrated Cellular and Tissue Engineering for Ischemic Heart Disease". The project is expected to continue until June 2023, which is when the 7-year U01 grant ends. Dr. Menasché has outstanding abilities and a stellar international reputation. After earning his MD, he went on to earn his PhD in Natural Sciences in 1987 from the Université de Paris XI (Center of Orsay). Dr. Menasché then embarked on a remarkable career of discovery and advances in cell therapy and cardiac surgery that quickly catapulted him to the top of the field. Since 1988, he has served as Professor of Cardiovascular Surgery at the Public Assistance Hospitals of Paris, University Paris Descartes, as an expert in stem cell therapy and tissue engineering in cardiology and cardiac surgery. He also currently serves as the senior staff surgeon in the Department of Cardiovascular Surgery of the European Hospital Georges Pompidou in Paris, France. Dr. Menasché is the lead or co-author on over 325 articles cited over 13,500 times in leading international publications in the field, including *European Journal of Cardiothoracic Surgery*, *Cell Transplant*, *Journal of Thoracic Cardiovascular Surgery*, *Canadian Journal of Cardiology*, and *American Journal of Transplantation.* Welcome, Dr. Menasché!

Philippe Menasché, MD, PhD

Noteworthy Papers

Dr. Wuqiang 'Wuk' Zhu, Assistant Professor of Biomedical Engineering *(laboratory of J Zhang)* on his paper published in the journal ***Circulation Research***, entitled "CCND2 Overexpression Enhances the Regenerative Potency of Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes (CM): Remuscularization of Injured Ventricle". Myocardium lost due to ischemic injury is replaced by an infarct scar of fibrous tissue. The size of the infarct is linearly related to the severity of LV dysfunction and dilatation, which eventually leads to heart failure. Therefore, the reduction of infarct size saves lives. The effectiveness of cell-based therapies for myocardial repair is limited by an extremely low engraftment rate. In this recent paper by Dr. Zhu and associates (Zhu, et al. CCND2 Overexpression Enhances the Regenerative Potency of Human Induced Pluripotent Stem

Wuqiang 'Wuk' Zhu, MD, PhD

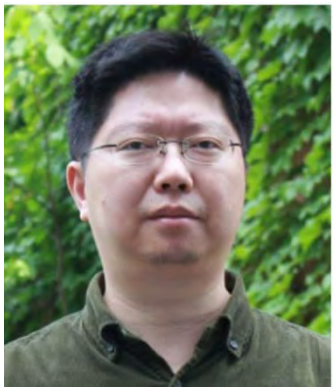
Cell-Derived Cardiomyocytes (CM): Remuscularization of Injured Ventricle. *Circulation Research*. 2018;122(1):88-96) the authors engineered a new human iPS cell line and demonstrated that overexpression of a cell cycle protein, CCND2, promotes sustained cell cycle activity in MHC driven hiPSC-CMs. The grafted iPSC-CMs exhibit the capacity to undergo CCND2 mediated and enhanced myocytes proliferation which, in turn, results in a significantly reduced infarction size and improved cardiac function. Future preclinical studies are planned using large animal models to examine if myocyte proliferation mediated remuscularization can ultimately replace the LV scar. In addition, new hiPSC lines are needed to fabricate the larger and thicker myocardial tissue equivalent with reduced arrhythmogenicity.

Shiyue Xu, MD, PhD

Congratulations to **Dr. Shiyue Xu** *(laboratory of Gangjian 'GQ' Qin, MD)* for acceptance of his paper to ***Circulation Research***. The manuscript, entitled "E2F1 Suppresses Oxidative Metabolism and Endothelial Differentiation of Bone Marrow Progenitor Cells". Bone marrow progenitor cell (BM PC)-based cell therapy has emerged as a promising strategy to improve the prognosis of ischemic heart disease. However, the clinical outcome of this therapy is still unsatisfactory, in large part, due to the limited number of BM PCs that actually become vascular endothelial cells and incorporate into the vessels. In a recent study accepted for publication in *Circulation Research*, Dr. Shiyue Xu et al found that cellular metabolic state critically determines the fate of BM PCs. Genetic deletion of the E2F1 transcription factor in BM PCs can lead to a metabolic switch from anaerobic glycolysis to oxidative metabolism, which enhances the endothelial differentiation of BM PCs and consequently improves the repair of cardiac ischemic injury. The findings provide a new perspective for the field of BM PC research and may lead to a novel basis for development of more effective cell therapy for ischemic heart disease. Dr Xu is currently a Postdoctoral Fellow in Dr. Gangjian 'GQ' Qin's laboratory in the Department of Biomedical Engineering. Dr. Xu earned his MD and PhD from Sun Yat-sen University in China. His PhD thesis work was completed in Dr. Qin's lab, where he was a Visiting Scholar. During his time in Qin Lab, Dr. Xu was awarded an AHA Predoctoral Fellowship for his study on the role of SDF-1/CXCR4 axis in stem cell calcium signaling and cell trafficking. After he completed his PhD training, Dr. Xu returned to China to complete his Internal Medicine Residency. In 2017, he rejoined Dr. Qin's lab for postdoctoral training. Dr. Xu's long-term research interests are in stem cell biology and regenerative medicine.

Yasin Oduk, PhD

Congratulations to **Dr. Yasin Oduk** *(laboratory of J Zhang)* on his paper published in the ***American Journal of Physiology – Heart and Circulatory Physiology***, entitled "VEGF Nanoparticles Repair Heart after Myocardial Infarction" (full reference below). Vascular endothelial growth factor (VEGF) is a well-characterized proangiogenic cytokine but has a short half-life and a rapid clearance rate. When encapsulated in nanoparticles, VEGF was released for 31 days and improved left ventricular function in infarcted mouse hearts. In a murine myocardial infarction model, VEGF nanoparticle administration was associated with significantly greater vascular density in the peri-infarct region, reductions in infarct size, and improvements in left ventricular contractile function four weeks after treatment. Thus, the study provides proof of principle that nanoparticle-mediated delivery increases the angiogenic and therapeutic potency of VEGF for the treatment of ischemic heart disease. Dr. Oduk has also conveyed this work through local presentations (UAB Departments of Electrical & Computer Engineering, Cardiovascular Disease/Vascular Biology & Hypertension Program, Department of Materials Engineering, and Department of Medicine/Division of Nephrology) and national meetings (2017 BMES, Phoenix, AZ, and 2017 PCTC/Breakout Sessions, Cincinnati, OH).

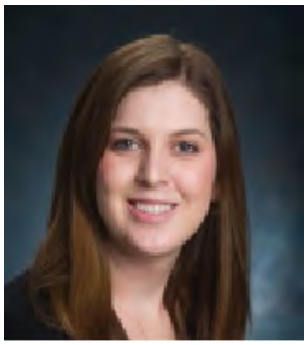


Ling Gao, MD, PhD

Dr. Ling Gao *(laboratory of J Zhang)* recently reported in ***Circulation*** on the fabrication of large cardiac-muscle patches engineered from human induced-pluripotent stem-cell–derived cardiac cells. The article, entitled "Large Cardiac Muscle Patches Engineered from Human Induced Pluripotent Stem Cell-Derived Cardiac Cells Improve Recovery from Myocardial Infarction in Swine", describes human cardiac muscle patches (hCMPs) of clinically relevant dimensions (4cm × 2cm × 1.25mm) generated by suspending cardiomyocytes, smooth-muscle cells, and endothelial cells that had been differentiated from human induced-pluripotent stem cells (hiPSCs) in a fibrin matrix and culturing the construct on a dynamic (rocking) platform. The results from *in vitro* assessments of calcium transients, action potential propagation, and force generation, as well as the presence of intercalated disk-like structures, suggest that cardiomyocytes mature in the hCMP during the 7-day dynamic culture period, presenting hCMPs of large dimensions. After fabrication and culture on a dynamic rocking platform, the electrophysiological and contractile properties of the hCMPs resembled those of native myocardial tissue. When two of the hCMPs were transplanted onto infarcted swine hearts, the measurements of cardiac function, infarct size, and wall stress improved significantly with no increase in the occurrence of arrhythmogenic complications. Changes in the expression profile of myocardial proteins indicated that hCMP transplantation partially reversed abnormalities in sarcomeric protein phosphorylation. Collectively, these observations indicate that hCMPs of clinically relevant dimensions can be successfully generated and may improve recovery from ischemic myocardial injury.

Article: http://circ.ahajournals.org/content/137/16/1712.full?ijkey=8cDwncpVSWAJfa3&keytype=ref

Defenses



Kristin Lottman

Kristin Lottman (*Adrienne Lahti, PhD, advisor)* will defend her dissertation, entitled "Multimodal Imaging in Schizophrenia", this summer. Due to the heterogeneity of the schizophrenia, critical gaps in knowledge about the disorder persist as the underlying neural mechanisms and etiology remain poorly understood. Hence, in order to fill this gap in knowledge, identification of an imaging biomarker characteristic of schizophrenia's pathophysiology is critical to not only further understanding of the disorder, but also improve patient prognosis and outcome. For her dissertation, Lottman utilizes multivariate approaches to assess the contribution of these issues to heterogeneous results. The goal of this research is to provide greater insight into the underlying neural mechanisms of the disorder that cannot be achieved using univariate, single modality approaches. These studies will advance the field toward the identification of an imaging biomarker that will impact patient prognosis and disorder outcomes through improved diagnostic and therapeutic predictors.

Ningning Xu *(X. Margaret Liu, PhD, advisor)* defended her dissertation, entitled "Novel Anti-cancer Therapy Development using Omics Guided Rational Cell Process Engineering", this spring. Cancer is one of the leading causes of mortality across the globe. Multiple anti-cancer therapies have been developed and applied over last few decades; antibody-based cancer therapies have been one of the most exciting and promising of these therapeutic strategies. Monoclonal antibodies (mAbs) can control the progression of cancers via targeted binding to the specific antigen of tumors to trigger an immune response to target and block the signaling pathway involved in cancer progression, or deliver cytotoxic agents into tumors. Dr. Xu's *in vitro* studies, e.g. binding affinity of antibody to cancer cells, were performed to evaluate the bio-function of the antibody produced in stirred-tank bioreactor. In addition, advanced Omics technologies, e.g. proteomics, were used to identify novel surface markers, enrich the knowledge of cellular metabolism and physiology, and guide cell engineering and bioprocess optimization. The antibody production platform and the deep understating of antibody expression regulation can also benefit the development of other promising antibody-based therapies, such as antibody-drug conjugate and antibody-based cell therapy, in the future.

Ningning Xu

Grant Alexander *(Ho-Wook Jun, PhD, advisor)* defended his dissertation, entitled "Prohealing Multifunctional Endothelium Nanomatrix Coated Stents", this spring semester. His project aimed to develop a novel prohealing multifunctional endothelium nanomatrix coating for stents, which can minimize the risks of late stent thrombosis, restenosis, inflammatory responses, and incomplete endothelialization, and can restore the healthy endothelium on the surface of stents. Alexander evaluated the effect of the novel prohealing multifunctional endothelium nanomatrix coating for stents on inflammation *in vitro* under both static and physiological flow conditions. The prohealing multifunctional endothelium nanomatrix coating for stents can promote endothelial healing while limiting restenosis, thrombosis, and inflammation in order to enhance the efficacy of stents and address the clinical concerns of currently available cardiovascular stents.

Grant Alexander

Also, congratulations to Grant on his selection as the School of Engineering's Outstanding Graduate Student Engineer and as the Department of Biomedical Engineering's Outstanding Graduate Student Engineer!

Thomas Haglund *(Palaniappan Sethu, PhD, advisor)* defended his Master's thesis, entitled "Role of Diminished Pulsatility from Continuous Flow Ventricular Assist Devices on Small Vessel Endothelial Dysfunction", in spring 2018. Continuous-flow VADs (CF-VADs) support results in non-physiological diminished arterial pressure and flow pulsatility. It has been hypothesized that arterial endothelial dysfunction contributes to adverse events in patients including hemorrhagic strokes, arteriovenous malformations (AVMs), compromised end-organ function, and gastrointestinal (GI) bleeding. However, clinical complications due to CF-VAD usage, such as GI bleeding and AVMs, primarily occur in small vessels. Haglund's thesis evaluated production of soluble factors from large vessel endothelial cells and began investigations to determine if endothelial dysfunction in small vessels is a consequence of hemodynamics or a soluble factor signaling from large vessel endothelial cells upstream as result of the flow created by CF-VADs.

Thomas Haglund

Honors/Awards

Emma Lathum

Emma Latham, a BME undergraduate student, has been selected as the School of Engineering's *Outstanding Undergraduate Student Engineer* for the 2017-2018 academic year. This recognition carries a scholarship award of $500 in addition to the $500 for being chosen *Outstanding Undergraduate Student Engineer* by the department. As an Outstanding Student Engineer of the Year for the School of Engineering, Emma was recognized at the 2018 Annual ECOB Awards Banquet at The Harbert Center. Congratulations, Emma!

Jervaughn Hunter

Jervaughn DeAnthony Hunter, a Post-Baccalaureate Research Education Program (PREP) Scholar in the **Jay Zhang Lab**, has accepted an offer of admission from UC San Diego's Bioengineering PhD program. In addition to his admission, the UCSD BME department has also awarded Jervaughn the Sloan Scholar Fellowship at $40,000 for 4 years. This award is made possible by a generous grant from the Alfred P. Sloan Foundation, which designated UC San Diego as a University Center of Exemplary Mentoring (UCEM). Jervaughn plans to focus on cardiovascular tissue regeneration under Dr. Karen Christman. Jervaughn received his BS in BME from UAB Spring 2017. Afterwards, Jervaughn joined the Zhang Lab, where he has investigated maturation of human induced pluripotent stem cell derived cardiomyocytes via electrical stimulation. Congratulations, Jervaughn!

Patrick Ernst

Patrick Ernst, BME Graduate Student, has been awarded a 2-year American Heart Association (AHA) Pre-doctoral Fellowship. His research project, co-mentored by **Dr. Lufang Zhou** and **Dr. Jay Zhang**, will focus on the mechanism of cell death in hiPSC-CM using mitochondrial optogenetics approach. Congratulations, Patrick!

Eric Zhang

Eric Zhang, a BME Graduate Student in the laboratory of **Dr. Gangjian 'GQ' Qin,** has been awarded a 2-year American Heart Association (AHA) Pre-doctoral Fellowship. The research he proposed, entitled "*Role of SDF-1/CXCR4 Signaling in Recruitment of C-kit+ Bone Marrow Progenitor Cells to the Ischemic Myocardium"*, begins on July 1st and focuses on stem cell trafficking in the cardiovascular system. Eric's fellowship application submission received a ranking of 1.04 percentile in the competition. Congratulations, Eric!

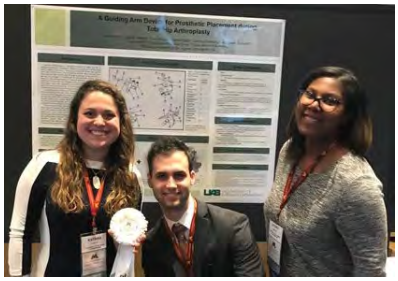
Nick Pensa

Nick Pensa, a BME graduate student in laboratory of **Dr. Susan Bellis**, has just been awarded a NIH Kirschstein-NRSA Predoctoral Fellowship (F31) for his project, entitled "*Tunable Co-delivery of VEGF and BMP2 Mimetic Peptides to Enhance Bone Regeneration*." Nick's proposed research will introduce a novel method of delivering/releasing bone promoting factors, BMP-2 and VEGF on implanted commercial bone grafts within the injury site to enhance bone regeneration. Congratulations, Nick!

Dr. Shiyue Xu in the laboratory of **Dr. Jay Zhang** has been awarded an American Heart Association (AHA) Post-doctoral Fellowship with a near-perfect priority score of 1.01. Shiyue's proposal is based on his recent publication in *Circulation Research* (https://www.ncbi.nlm.nih.gov/pubmed/29358228). The award will provide $114,000 for 2 years to study the relationship between stem cell metabolism and differentiation. Congratulations, Shiyue!

BME Senior Design Team Places in Design Competition

Congratulations to our UAB BME Senior Design team, who took 3rd place in the 2018 *Design of Medical Devices Conference* in Minneapolis, MN. BME students Sydney Watkins, Dave Monaco, Katrina Hatch, and Dania Mallah entered their project and won 3rd place for UAB. Rice University and Johns Hopkins received 1st and 2nd place, respectively. The UAB group's design helps orthopedic surgeons to properly align a revision hip stem in total hip arthroplasty.



From left to right: Katrina Hatch, Dave Monaco, Sydney Watkins.

BME Undergrad Senior Design Teams Sweep UAB Expo Day!

BME had three winners at this year's *UAB Undergraduate Expo*, all from the BME 499 Senior Capstone Design class. Congratulations to these BME seniors!

- 1st place Engineering: Revision Hip Alignment Tool –
  Katrina Hatch, Sydney Watkins, Dave Monaco, Dania Mallah
- 2nd place Engineering: Wheelchair Exercise Kit –
  Jack Kim, Matt Strachan, Alex Williams
- 2nd place Service Learning: Hematoma Simulator –
  Nick Sibley, Yiyang Guo, Tianyi Liu, Sarah Owens

Third place was a 3-way tie in the Engineering category:

- 3rd place Engineering: Wheelchair Rain Shelter –
  Jessica Pieczynski, Gerardo Hernandez-Moreno, Tess Vessels, Seth Patterson
- 3rd place Engineering: Pressure Reducing Backboard for Emergency Transfer –
  Shambi Anshumali, Jayci Hamrick, Rachana Kotapalli, Archit Patel, Baley West
- 3rd place Engineering: Prosthetic Leg for Animals with Complete Limb Loss –
  Abbey Leibold, Vaishali Nijampatnam, Pooja Wagle, Jonah Sharkins, Seoul Hee Kim

BME Student will spend summer at CMU Robotics Program

We are proud to announce that that BME undergraduate student **Maggie Collier** was accepted into the summer robotics program at Carnegie Mellon University (CMU). Carnegie Mellon is the #1 robotics program in the nation, and many alumni from the program have gone on to grad school at CMU. Maggie is double-majoring in Biomedical Engineering and Electrical Engineering. In her own words "*I got accepted to the Robotics Institute Summer Scholars (RISS) program, an 11-week summer robotics research experience at Carnegie Mellon University. According to their website, 'RISS is among the best and most comprehensive robotics research programs for undergraduates in the world.' I have been selected to work under the mentorship of Henny Admoni, an Assistant Professor at CMU who leads the Human and Robot Partners Lab. Since my first robotics research experience last summer, I have been interested in human-robot interaction research. Therefore, I'm excited to have the opportunity to work in this specific field of robotics again and at a university so highly regarded for its robotics research*." Congratulations, Maggie!

Maggie Collier

BMES *(Biomedical Engineering Society)* News

The UAB chapter of the Undergraduate *Biomedical Engineering Society* (**BMES**) has announced its officers for the 2018-2019 academic year:

- President **Nicholas Dietschweiler**
- Vice President **Hannah Lacy**
- Secretary **Camille Goldman**
- Treasurer **Emmanuel Dean**
- Social Media Chair **Aliyah McCain**
- Peer-Mentoring Co-Chairs **Karly Casey & Aakansha Gosain**
- Academic Resources Chair **Zena Banker**

BEDrock at the 2018 World Congress of Biomechanics

The world's most famous biomedical engineering band, ***BEDrock***, will be performing this summer at the 2018 *World Congress of Biomechanics* in Dublin, Ireland on July 10. This will be *BEDrock*'s first international show. Formed in 2003 as a gathering of bioengineers with rock'n roll in their blood and bones, the core band has major UAB roots with **Dr. Alan Eberhardt** on percussion and drums and **Dr. Joel Berry** on guitar and vocals. Other core members include **Dr. Clark Hung** (Columbia), **Dr. Mike Moreno** (Texas A&M), and **Dr. James Moore** (Imperial College). A series of other faculty and students from the nation and the world have cycled through the band over the years, along with semi-professional and professional musicians. They have provided rousing entertainment primarily for the annual *SB^3C (biomechanics, bioengineering, and biotransport) Conference* for their colleagues and at various BMES conferences, including a memorable show at the House of Blues during the 2014 World Congress in Boston.

Graduate Program

Graduate Enrollment and Graduation (Ph.D., Masters, Masters + Certificate)

- Total enrollment for Spring 2018 = 39 students
- Graduates for 2017-2018 = 1 Ph.D.; 9 MS students

Congratulations, graduates!

BME Summer Scholars

This summer, UAB Biomedical Engineering is offering an exciting hands-on Biomedical Engineering Summer Scholars program led by **Dr. Abi Yildirim** for junior high and high school students interested in building Biomedical Devices!

The camp offers not only measuring various bio-signals of the human body but also building and controlling bionic hands, devices for measuring heart pulses, body temperatures, devices for hearing tests, and work on many other exciting projects, including the basics of the embedded computers that are present almost all smart devices and portable medical devices. Understanding of intro level computer programming and the basic understanding of electronics are required. The 16 summer scholars will spend five days learning about embedded systems and programming biomedical devices and sensors, with lunch and snacks provided, during the week of June 25-29, 2018.

The BME Summer Scholars camp will cover:

1. Basics of electrophysiology, communication of neurons, action potential, etc.
2. Basic bioinstrumentation and measurement techniques, skin resistance, electrodes, measuring galvanic skin response/resistors, etc.
3. Measuring biopotential, EEG/ EMG/ECG, etc.
4. Building optical instrument to measure heart pulse rate, body stress sensor (lie detector) etc. with LCD display and acoustic outputs.
5. Advanced projects, such as a bionic hand using a 3D printer, Arduino controller, and servo motor.

Fellowship Opportunities

Pre-doctoral Fellowship:

• **National Institutes of Health (NIH)** provides several predoctoral fellowships in specified health and health-related areas. For eligibility and application, go to https://researchtraining.nih.gov/programs/fellowships

• **National Science Foundation (NSF)** graduate research program supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited United States institutions. https://www.nsfgrfp.org

• **American Heart Association (AHA)** provides multiple pre-doctoral fellowships to help students initiate careers in cardiovascular and stroke research. https://professional.heart.org/professional/ResearchPrograms

Postdoctoral Fellowship:

• **National Institutes of Health (NIH**) provides several fellowships in postdoctoral research training to individuals to broaden their scientific background and extend their potential for research in specified health-related areas. For eligibility and application, go to https://www.nimh.nih.gov/funding/training/funding-opportunities-for-postdoctoral-fellows.shtml

• **National Science Foundation (NSF)** provides several postdoctoral research fellowships. For details, go to https://www.nsf.gov/funding/education

• **American Heart Association (AHA)** provides multiple postdoctoral fellowships to empower postdoctoral trainees who are not yet independent with assistance and training from a mentor to initiate careers in cardiovascular and stroke research. https://professional.heart.org/professional/ResearchPrograms

Featured Publications

1. Yang L, Gao L, Nickel T, Yang J, Gilbertsen A, Geng Z, Johnson C, Young B, Henke C, Gourley GR, Zhang J. Lactate Promotes Synthetic Phenotype in Vascular Smooth Muscle Cells. ***Circulation Research***. 2018;121(11):1251-1262. PMID: 29021296. PMCID: PMC5681426

2. Zhu W, Zhao M, Mattapally S, Chen S, Zhang J. CCND2 Overexpression Enhances the Regenerative Potency of Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes: Remuscularization of Injured Ventricle. ***Circulation Research***. 2018;122(1):88-96. PMID: 29018036. PMCID: PMC5756126

3. Chen Z, Zhu W, Bender I, Gong W, Kwak IY, Yellamilli A, Hodges TJ, Nemoto N, Zhang J, Garry DJ, Van Berlo JH. Pathologic Stimulus Determines Lineage Commitment of Cardiac C-kit^{+} Cells. ***Circulation.*** 2018;136(24):2359-2372. PMID: 29021323

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