





## Our Newest HeRO: Josh Maxwell, PhD

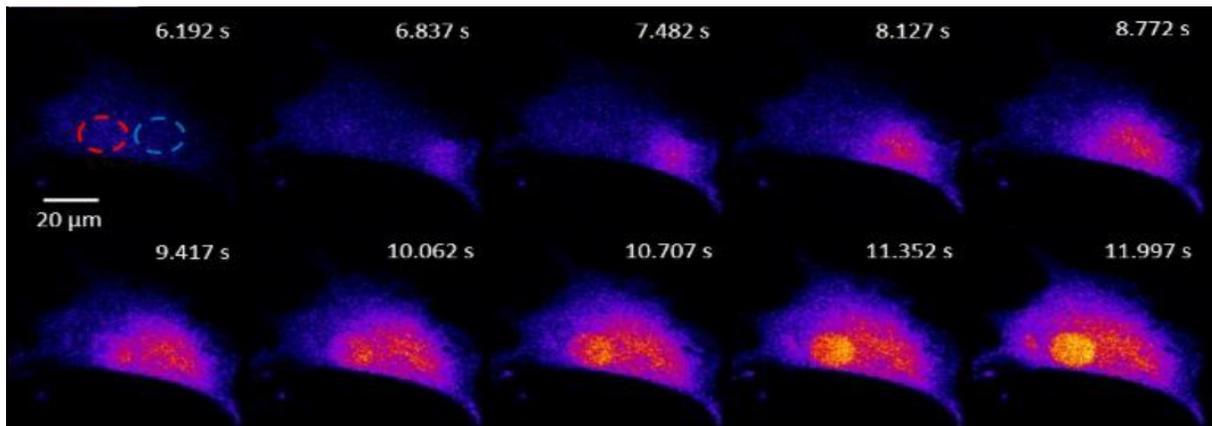
Dr. Maxwell received his PhD in Cell and Molecular Physiology from Loyola University Chicago in 2010, followed by a postdoctoral fellowship at Rush University Medical Center in Chicago. He completed a 2<sup>nd</sup> postdoc in the laboratory of Michael Davis in the Department of Biomedical Engineering at Emory and Georgia Tech before becoming an Instructor in the Department of Pediatrics and Heart Research and Outcomes (HeRO) Center.

His research focuses on developing stem cell-based therapies for heart failure in pediatric patients. Nearly 1% of babies born in the United States will be diagnosed with a congenital heart defect (CHD). CHDs are the leading cause of right-ventricular heart failure in the pediatric population,” says Maxwell. Stem cell based therapies have shown beneficial effects on several cardiovascular diseases in adults, however, stem cell therapy is relatively untested in the pediatric population. “It’s critical to develop novel methods of exploring the regenerative potential of these cells to improve therapeutic interventions in the pediatric population. Thus far, our work has uncovered a

novel response of pediatric stem cells to electrical stimulation that we believe can be used as a strategy for inducing cardiac differentiation of these cells and provide an innovative therapeutic strategy for pediatric heart failure.” Dr. Maxwell uses his experience with confocal calcium imaging and cardiac physiology not only in stem cells but also in adult myocytes to investigate the control of intracellular calcium and its role in the regulation of excitation-contraction and excitation-transcription coupling in primary atrial and ventricular myocytes.

In addition to running his laboratory, Dr. Maxwell serves as the Scientific Director of the Pediatric Research Alliance [Animal Physiology Core](#) in the Department of Pediatrics which provides pediatric researchers with the resources necessary to develop and characterize animal models critical to investigating pediatric diseases.

*Ca<sup>2+</sup> transients in electrically stimulated pediatric CPCs show spatial heterogeneity. Representative 2D high-speed confocal image montage of the activation of a Ca<sup>2+</sup> transient in a CPC loaded with fluo-4/AM. ROIs (red: nuclear, blue: cytosolic)*



## 2016 HeRO Pilot Awardees



**Changwon Park, PhD — PI**

“Myct1, a novel player for cardiovascular development”



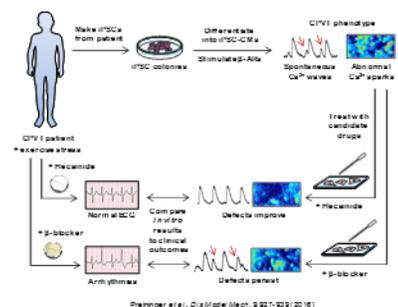
**Pamela D. Winterberg, MD—PI**

“Role of Dysregulated Arginine Metabolism in Uremic Cardiomyopathy”

## Xu Lab Highlight:

### Cardiac Disease Model in a Dish -Using Human Induced Pluripotent Stem Cells

Induced pluripotent stem cells (iPSCs) derived from patient’s somatic cells could present an auspicious platform for investigating precision medicine and drug discovery. In a study published in [Disease Models & Mechanisms](#), we demonstrated that clinically observed drug responses can be recapitulated in iPSC-cardiomyocytes derived from an individual with catecholaminergic polymorphic ventricular tachycardia.





**Enduring Hearts**  
HEALTHY KIDS • STRONGER HEARTS • LONGER LIVES

## Enduring Hearts Funds Generous Grant Focused on Extending Lives of Heart Transplant Patients

Children's Healthcare of Atlanta received a generous grant of \$1,000,000 from the Enduring Hearts Foundation to fund cardiac research to enhance the lives of children needing heart transplantation. Some of the research funded will be that of Michael Davis, Ph.D., Director of the Emory-Children's Heart Research and Outcomes (HeRO) Center at Children's Healthcare of Atlanta and Emory University School of Medicine. His research focuses on bioengineering and stem cell approaches to treating pediatric and adult heart disease, with the goal of strengthening hearts to avoid transplantation and improving post-transplantation outcomes.

**"We are extremely grateful for this grant from an amazing foundation like Enduring Hearts,** whose important funding will enable us to research the next generation of therapies for children with congenital heart defects. If we can prevent children from needing to be on the transplant list or find a way to extend the life of existing transplants, it will have a tremendous positive effect on the lives of these patients, many of whom spend months in the hospital waiting for their first or second hearts. Building stronger relationships with local philanthropic organizations like Enduring Hearts is critical to funding the research that will give children with heart disease, and their families, a better quality of life," says Davis.

Children's cardiothoracic surgeons have performed more than 325 heart transplants since the transplant program's inception in 1988.

Each year in the US approximately 400 children are placed on a waitlist for heart transplantation. Many more have heart failure that requires medical treatment. Children's cardiothoracic surgeons have performed more than 325 heart transplants since the transplant program's inception in 1988, "While the outcomes following pediatric heart transplantation have gradually improved over the last 40 years, the rate of change has been too slow. This funding can catalyze the types of discoveries in heart transplantation that dramatically advance the field and improve the lives of the thousands of children needing heart transplants," says William Mahle, M.D., Chief of Children's Sibley Heart Center, Director of Sibley Heart Center Cardiology, Medical Director of the Children's Heart Transplant Program, Medical Director of Cardiac Clinical Research, and associate professor of pediatrics at Emory.

"There is much work to be done in the research areas of cardiac transplant prevention and post-transplant longevity, and this grant will make real progress toward solving the various challenges facing pediatric transplant candidates and recipients," says Ankur Chatterjee, President & Executive Direc-

tor of Enduring Hearts. "We are excited to support this esteemed organization, and wish Dr. Davis and his team continued success with their valuable research."

### Enduring Hearts Foundation

Atlanta-based Enduring Hearts' mission since 2013, has been to fund research that both increases the longevity of pediatric heart transplants and improves the quality of life for transplant recipients. The results of funded research projects contribute to the clinical and scientific knowledge about many important aspects of organ transplantation, e.g. the mechanisms of long-term organ deterioration, the consequences of tissue injury, and opportunities to intervene, postpone, and eliminate these rejection processes. Enduring Hearts also has a research co-funding alignment with the American Heart Association, and was ranked as a 2015 Top Rated Charity by Great Non-profits.

To learn more about Enduring Hearts, visit: <http://www.enduringhearts.org>

Check out page 4 for heartwarming patient transplant stories.



**Ankur Chatterjee, President & Executive Director**

"Enduring Hearts is rapidly making a significant impact in the scope and quality of research oriented toward pediatric transplantation and solid organ graft longevity. The momentum this organization has demonstrated in a few short years—by way of fundraising, grant making and establishing critical partnerships with leading institutions in the transplantation community—is indicative of the long-term success we intend to achieve. I am inspired by the mission at hand, and excited about helping attain our goals!"

## Before and After: Photos Show Kids Thriving Thanks to Heart Transplants

Children's blog "[Dedicated to All Better](#)" recently documented several heart transplant success stories. The framed photos show each recipient in the days and weeks leading up to their surgery date. HeRO is dedicated to ensuring that transplant success stories, such as these, become the norm.

### **Silas** (middle left photo)

At just a few months old, Silas was diagnosed with dilated cardiomyopathy, a condition in which the heart becomes weakened and cannot pump blood. Silas had been in the hospital for 101 days when his family received news that a heart was on the way. Today, the 3-year-old can be found playing with his toy trains or being loved on by his two adoring big sisters.

### **Mallory** (middle right photo)

When Mallory was just 10 days old, a mysterious virus attacked her heart. Her tiny, damaged heart held on for nearly two years before it could no longer keep up with her. Mallory spent two months in the hospital in critical condition before her new heart arrived. Less than a week after transplant, Mallory returned home to a neighborhood-wide celebration. Later this month, Mallory will celebrate her fourth birthday.



### **Kaleb** (center photo)

What began as a dry cough during a beach vacation led to a cardiomyopathy diagnosis for Kaleb. Kaleb then spent 96 days in the hospital in heart failure. Shortly after he turned 6 months old, Kaleb's family got the call that a match had been found for him. Three months later, Kaleb is now happy, healthy and gearing up for a big first birthday celebration.





## HeRO Pilot Awardees Receive NIH Extramural Funding



Drs. David Archer and W. Robert Taylor, recipients of a 2014 HeRO Pilot Grant, recently received RO1 funding for their project “Impaired Collateral Vessel Formation in Sickle Cell Disease.”

Sickle cell disease is characterized in part by repeated bouts of tissue ischemia due to vascular occlusion. Most of the complications of sickle cell disease including stroke, pain crises, renal failure, etc. can be attributed to these episodes of vascular insufficiency. A normal adaptive response of the human body to vascular occlusion is the development of collateral blood vessels to allow perfusion of the vascular bed distal to the site of obstruction. In other diseases such as coronary artery disease and peripheral vascular disease, dysfunctional collateral blood flow is associated with increased morbidity and mortality. We have hypothesized that in sickle cell disease, formation of dysfunctional collateral blood vessels is directly related to many aspects of the ultimate pathology of the disease. The studies proposed in this application are based on exciting preliminary data generated by the co-PI’s that show that in a murine model of sickle cell disease, collateral vessel formation is dramatically impaired and that a hallmark of the pathology is a maladaptive response to ischemia that results in excessive inflammation and overproduction of reactive oxygen species. We will attempt to gain a greater understanding of dysfunctional collateral vessel formation in sickle cell disease and more importantly, obtain insights into the underlying pathological mechanisms in order to lay the groundwork for novel therapeutic strategies. Our overall hypothesis is that collateral vessel formation in sickle cell disease is impaired as the result of a disproportionate inflammatory response driven by the excessive production of reactive oxygen species.

## Cardiac Units Receive Beacon Award for Excellence

The [Cardiac Step-down Unit \(CSU\)](#) at Egleston received the [Gold-level Beacon Award for Excellence](#), a national award given by the American Association of Critical-Care Nurses. Children’s is currently the only pediatric CSU in the country that has been awarded a Gold-Level Beacon Award. The awards, which are active for a three-year period, commend hospital units that employ evidence-based practices to improve patient and family outcomes. Recipients of a Gold-Level Beacon Award demonstrate excellence in sustained unit performance and patient outcomes. This was the first time the Children’s CSU applied for the award. It is now one of eight active gold-level cardiac step-down units in the country. To read more, [click here](#).

## Lab and Research Pages

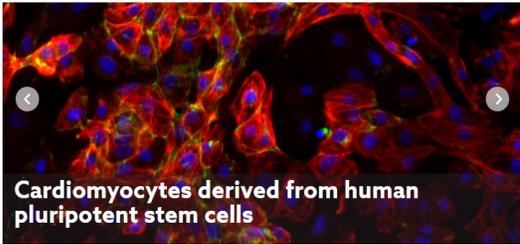
Faculty are encouraged to take advantage of the lab/research pages available on [pedsresearch.org](#). Highlight your research interests, publications, lab members, media coverage!

Interested in creating your lab page? Contact Kristen Herzegh [kcoshau@emory.edu](mailto:kcoshau@emory.edu)

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**Cardiomyocytes derived from human pluripotent stem cells**

Cardiomyocyte Stem Cell Laboratory

Our research is focused on human cardiomyocytes derived from human pluripotent stem cells, which hold promise for cardiac cell therapy, disease modeling, drug discovery, and the study of developmental biology. We are also collaborating with investigators at Georgia Tech, Emory University, and Children’s Healthcare of Atlanta, exploring the application of nanotechnology and tissue engineering in stem cell research.

[RESEARCH](#) [GROUP MEMBERS](#) [PUBLICATIONS](#) [NEWS](#) [OPEN POSITIONS](#)

Highlights of Recent Research

## Future HeRO—Cora McGuire Yunker

Congratulations to Dr. Erin Buckley and her husband, Dr. Peter Yunker, on the birth of their daughter. Cora made her debut on 11/5/16 weighing 7lbs 3oz. We’re happy to report that Cora has already gained 2lbs and continues to be incredibly adorable.

