



THE NEXT FIRST

IN CARDIOVASCULAR DISCOVERY

2018 Annual Report

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A LETTER FROM OUR BOARD CHAIRMAN OUR BIGGEST YEAR TO DATE



Since 1962, the Texas Heart Institute has been on a mission to reduce the devastating toll of cardiovascular disease through innovative and progressive programs in research, education, and improved patient care.

Today, the pursuit of that mission continues with the same pioneering spirit that has defined the Texas Heart Institute for over five decades. THI's research teams include renowned physicians, scientists, and engineers who are working tirelessly to unfold the origins of disease and identify the underlying causes of cardiovascular conditions to develop more effective and less invasive treatments.

This year, THI put new leadership and infrastructure in place to prepare for the future. The Board of Trustees appointed Emerson Perin, MD, PhD, a talented interventional cardiologist and physician-scientist, to serve as THI's medical director. THI also launched the Center for Clinical Research to rapidly move discoveries from the laboratories to clinical trials.

THI has expanded its education programs to provide global outreach through our newly launched website, which provides up-to-the-minute information about cardiovascular disease, associated risk factors, and healthful lifestyles. The website includes articles in English and Spanish and attracted over 5.9 million users from 93% of the world's countries in its first year.

THI's postdoctoral and fellowship training programs are at the forefront of our mission. THI provides one of the most respected

learning environments for training the next generation of cardiac specialty physicians. In 2018, THI mentored over 50 cardiology, cardiac subspecialty, and surgery fellows and provided postgraduate education to over 5,000 doctors through our continuing medical education programs.

The School of Perfusion Technology continues to train perfusionists in the use of the heart-lung machine, with over 900 graduates since it opened in 1971. It was the first accredited perfusion school established in the United States and remains one of only 17 programs of its kind in the country.

As we look ahead to another year of tremendous growth at THI, we continue to uphold the strong culture cultivated by Dr. Cooley. We are laying an even stronger foundation for a promising future for patients suffering from cardiovascular disease. We are deeply grateful for the decades of support from our local, national, and global community.

Yours truly,

A handwritten signature in blue ink, appearing to read "Eric D. Wade".

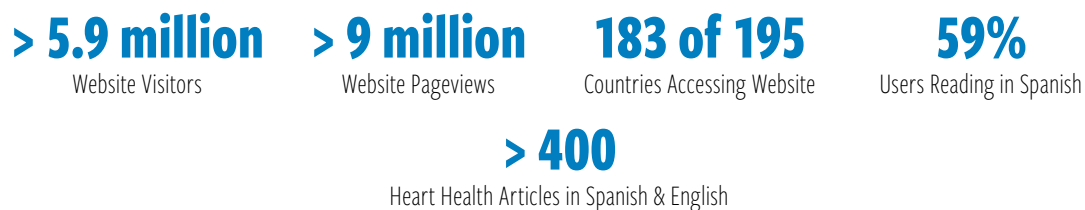
Eric D. Wade
Chairman, THI Board of Trustees

THE NUMBERS

A YEAR DEDICATED TO HEALTHY HEARTS

Texas Heart Institute (THI) remains focused on cardiovascular education and research to improve the lives of patients who struggle with heart and vascular disease. This past year, THI researchers, scientists and physicians touched the lives of millions who sought information from us through our publications, events, scientific lectures and website, texasheart.org. Physicians practicing throughout the world are also educated and mentored by leaders at THI. Although our home is the Texas Medical Center, our reach is global because cardiovascular disease knows no geographic boundaries.

GLOBAL OUTREACH



TEXAS HEART INSTITUTE JOURNAL



LEADING WITH THE HEART





A WORLD CLASS RESEARCH FACILITY

The Texas Heart Institute is recognized internationally for research programs in cardiology, cardiovascular surgery, regenerative medicine and pathology. Our physicians and scientists conduct research on topics ranging from gene therapy, stem cells and regenerative medicine, to wireless and battery-less pacemakers, ventricular assist devices (VADs) and artificial hearts.

RESEARCH BY THE NUMBERS

> 500

Scientific Publications

59

Active Scientific and
Clinical Research
Projects

34

New Federal, State,
Non-profit or Industry
Contracts

43

Principle Investigators

3 Years

Re-accreditation of the
THI Biorepository

20

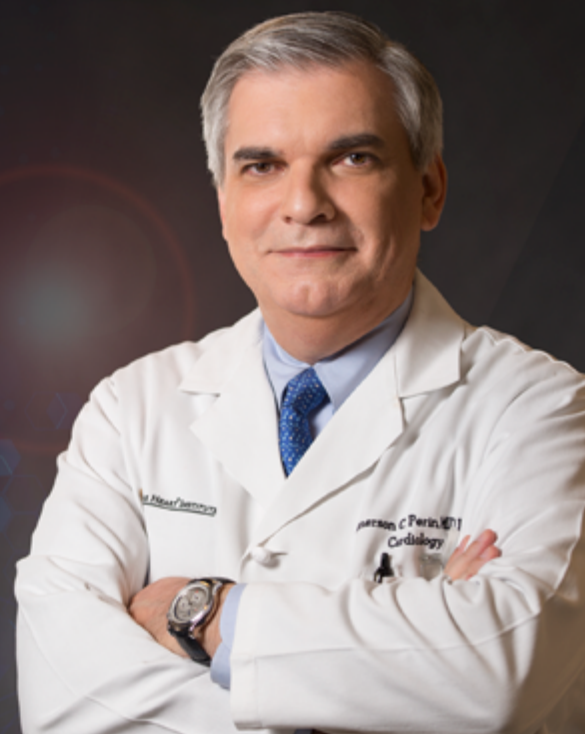
Fellows & International Students
Hosted by the Research Labs

MEDICAL DIRECTOR SPOTLIGHT

OUR SPIRIT AND DRIVE FOR DISCOVERY CONTINUE

“I have spent my entire practicing career supporting THI, learning from and practicing with pioneers in the cardiovascular discipline. I am honored to take on this new role and work with my peers to ensure that the THI spirit and drive for discovery continue.”

— Emerson Perin, MD, PhD,
Medical Director



In the spring of 2018, Dr. Emerson Perin was appointed by the THI Board of Trustees to serve as the new Medical Director and is already making tremendous progress toward positioning THI for unparalleled growth.

Dr. Perin has built an internationally recognized preclinical and clinical stem cell research program and has contributed to important discoveries and advancements in interventional cardiology.

As Medical Director, Dr. Perin will now govern THI's professional staff of researchers and provide counsel and guidance on all research and education initiatives to ensure continuity and alignment with THI's vision.

Dr. Perin joined the THI family 30 years ago as a clinical fellow in training and graduated as the Outstanding Cardiology Fellow of his class. Since then, Dr. Perin has provided interventional cardiology services in his private practice in the Texas Medical Center and contributed to THI's mission through both research and postgraduate teaching.

His passion for discovering new therapeutic solutions for patients suffering from heart disease has been the primary focus of his

research since 1998. His work has earned him multiple honors, including being named a McNair Scholar in 2013.

Dr. Perin has led clinical trials focused on improving the treatment of heart failure, heart attacks, refractory angina and peripheral arterial disease. He has also served as a Principal Investigator in the National Heart, Lung, and Blood Institute (NHLBI) Cardiovascular Cell Therapy Research Network, which is a national research consortium funded by the NHLBI.

In 2018, Dr. Perin founded the Center for Clinical Research (CCR) to support all areas of clinical cardiovascular research at THI. The CCR supports all areas of cardiovascular clinical research, from protocol development to trial facilitation, post-trial assessment, and reporting. ❤️

CENTER FOR CLINICAL RESEARCH THI OPENS CENTER FOR CLINICAL RESEARCH

“This was an incredibly productive year for our team with the launch of the new Center for Clinical Research, which centralizes and focuses our talented team in the most coordinated, compliant, and efficient way possible to move important clinical trials forward for the benefit of patients.”

– Emerson Perin, MD, PhD,
Medical Director



The clinical research underway at THI is vital to the fulfillment of THI's mission. Only through ethical clinical research, and with the help of the many patients who volunteer to participate in our studies, can we gain answers to important questions about the prevention, diagnosis, and treatment of medical conditions.

The launch of the new Center for Clinical Research (CCR) marks a major milestone for THI. This dynamic team of experts provides management support for clinical research activities for all THI departments and supports outsourced clinical research activities for private-practice and academic clinicians.

The CCR team has over 200 cumulative years of research experience and over 175 years of research experience specifically at THI. In 2018, the CCR employed 18 professionals: the Medical Director, two administrators, three managers, two research nurses, four research coordinators, two recruitment coordinators, one regulatory specialist, one clinical trial management specialist, a research fellow, and a research intern. Of the CCR employees, ten are research certified through the Association of Clinical Research Professionals (ACRP) or the Society of Clinical Research Associates (SOCRA).

A unique quality of the CCR is the inclusion of a dedicated Recruitment Division for clinical trials. The division provides centralized recruitment of participants for all clinical research studies at THI.

During 2018, the CCR participated in 13 clinical research trials funded by industry, the National Institutes of Health (NIH), or both.

With eight new trials scheduled to start in 2019, the CCR is advancing our knowledge of clinical science and generating discoveries that will lead to the development of new therapies for treating cardiovascular diseases.

TRAINING THE NEXT GENERATION OF CLINICAL RESEARCHERS

The Nursing Skills Core Training Program at THI was designed to train nurses in the specialized field of research nursing, with a focus on effective planning, coordination, use of best practices, and proper compliance for clinical trials. The fourth trainee completed the program in September 2018.

Training efforts are led by the CCR administrative team, who continue to represent THI in leadership positions across the TMC. 

STEM CELL CENTER LEADING CELL THERAPY RESEARCH

“Cell therapies and regenerative medicine have immense potential and can offer hope to all patients, including those for whom surgery is not a viable option.”

— James T. Willerson, MD,
President Emeritus

The therapeutic potential of stem cells and cell therapy has captured the imagination of society and the medical community alike around the globe.

For two decades, physician-scientists at the Texas Heart Institute (THI) have been awarded funding and have committed significant internal resources to the study of regenerative medicine and cell therapy. These efforts are dedicated to improving treatment options and even reversing the devastating effects of heart and vascular disease.

At the helm of this groundbreaking work is world-renowned physician-scientist Emerson Perin, MD, PhD, who has been a leader in cardiovascular stem cell research for 20 years.

THI maintains its role as a founding clinical site in the prestigious Cardiovascular Cell Therapy Research Network (CCTRN), which is funded by the NIH. THI's Stem Cell Center, in conjunction with the CCTRN, completed enrollment of the first stem cell trial for cancer survivors with chemotherapy-induced heart failure in the fall of 2018. ♥

BY THE NUMBERS

> 20

Stem Cell Clinical Trials to Treat Cardiovascular Conditions

12

Trials for Heart Failure or Ischemic
Cardiomyopathy

4

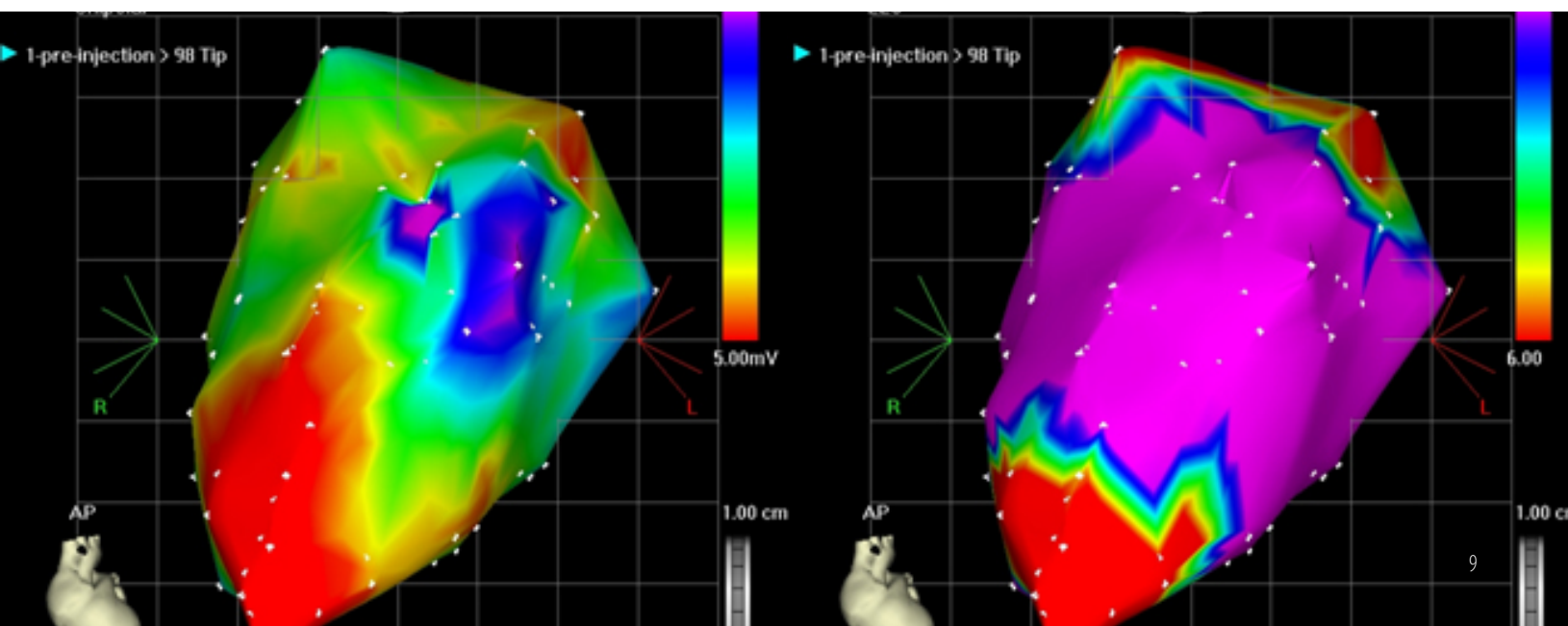
Trials for Peripheral Arterial
Disease, Critical Limb Ischemia, or
Diabetic Wounds

3

Trials for Acute
Myocardial Infarction

1st

Stem Cell Trial for Cancer Survivors
with Chemotherapy-Induced Heart
Failure



CENTER FOR WOMEN'S HEART & VASCULAR HEALTH HEART HEALTH & LONGEVITY FOR ALL WOMEN

Heart disease is the leading cause of death among women. For this reason, THI launched the Center for Women's Heart & Vascular Health nearly 10 years ago with the support of community leaders from across the city.



Photo © Cody Duty/Texas Medical Center

"Multi-stakeholder collaborations are the key to improving women's heart health. To decrease the devastating toll of heart and vascular disease in women, we must work together."

– Stephanie Coulter, MD,
Director, Center for Women's Heart & Vascular Health

Drs. Denton Cooley and James T. Willerson invited Dr. Stephanie Coulter, an outstanding cardiologist and world-class echocardiographer, to develop a unique program that would address significant gaps in the cardiovascular care of women. Launched in 2010, THI's Center for Women's Heart & Vascular Health was the first women's center of its kind in the Southwest, and it remains the only one in the Texas Medical Center.

Led by Dr. Stephanie Coulter, the Women's Center is addressing significant gaps in research and education to impact the care of women suffering from or at risk for developing heart and vascular disease. The Women's Center has three important goals: conduct clinical research in women, raise awareness about cardiovascular disease among women, and educate doctors and nurses so they can better recognize warning signs in their patients and choose the most appropriate treatments.

The Women's Center's team is highly collaborative and supports THI's research and educational missions in multiple ways.

OUTREACH

All Women's Center outreach programs strive to reach the community with life-saving information. In 2018, the Women's Center established new alliances and is investing in the technology to improve community outreach.

Through Houston HeartReach, more than 1,500 one-on-one heart-health screenings have been freely provided to women in the greater Houston area. As a result, the Women's Center has established unparalleled trust and strong relationships within the diverse Houston community and beyond.

EDUCATION FOR WOMEN

Physicians must be able to identify women's unique symptoms, choose effective diagnostic tests, develop targeted lifestyle-modification programs, and understand how disease progression may differ between men and women.

The Annual Women's Heart and Vascular Symposium is designed to provide physicians with the latest information about preventing, diagnosing, and treating heart disease in women. The information presented at the Symposium is subsequently published as a Special Section of the Texas Heart Institute Journal, which can be accessed at no cost.

This year, THI launched an online video library on its new website, which includes presentations by distinguished faculty who share insights into current research, guidelines, and treatment strategies specific to women.

The Women's Center also is training our next generation of professionals, including individuals pursuing administrative and communication careers in the healthcare, research, and medical education fields. We engage high school, college, and postgraduate students interested in our mission; this year, we mentored students from the University of Texas at Austin, UT Health, Lone Star College of Nursing, Baylor College of Medicine, the Houston Independent School District Emerge Scholar Program and its School for Law and Justice, Breakthrough Houston, Vanderbilt University, Texas Southern University Health Administration, and the University of Mississippi. In addition, using the Project Heart



Photo: Karla Campos, MD helps women understand their risk for heart and vascular disease at the Houston HeartReach women's healthy heart screening.

Curriculum and through hosting special events, we inspire young grade school girls to learn more about their heart and the importance of establishing heart-healthy lifestyles early in life.

OUR RESEARCH

The Women's Center has a highly collaborative research program that investigates the roles biology, psychology, and lifestyle play in putting women at risk for heart disease. New collaborations between THI teams and others in the Texas Medical Center are examining genetic factors that predispose women to heart disease.

In 2018, the Women's Center team dedicated substantial resources to strengthening its research network and developing new research protocols to facilitate collaborations with a comprehensive team of cardiovascular fellows, interventional heart disease physicians, advanced-imaging cardiac physicians, and cardiovascular surgeons. As a result, two new registries were launched in 2018: the Houston HeartReach Registry and the Percutaneous Valve Research Database.

HOUSTON HEARTREACH REGISTRY

From the time the Women's Center was launched in 2010, Dr. Coulter has remained focused on investigating racial, ethnic, and cultural disparities in the development of cardiovascular disease in women. To further this research, the THI Houston HeartReach Registry was established, which has over 1,500 participants today.

PERCUTANEOUS VALVE RESEARCH

The valve registry was developed to collect and manage data on baseline characteristics, procedures, treatments, outcomes,

and follow-up of all patients receiving transcatheter aortic valve replacements (TAVR procedures). This includes data that are pertinent to the study of women's health, such as pregnancy complications, menopause status and treatment, osteoporosis history and treatment, pregnancy-induced complications, and cancer history and treatment.

The research findings derived from these registries will help physicians develop better prediction models to identify modifiable risk factors and implement the most successful treatment protocols for women. ♥

BY THE NUMBERS

>40

Straight Talk E-Newsletters
Published

30

Community Outreach Events for
Women

10

Online Videos for Medical
Professionals

>1,500

Heart-health Screenings for Women

>140 patches earned

K-6 THI Educational Programs for Young Girls

ELECTROPHYSIOLOGY CLINICAL RESEARCH & INNOVATIONS

DEVELOPING NEW WIRELESS, SHOCKLESS PACEMAKER TECHNOLOGY

THI doctors and engineers are committed to developing new pacing devices that will eliminate the need for batteries and wires and, more importantly, reduce the pain of the electrical shocks delivered by an implantable cardiac defibrillator.

Led by Mehdi Razavi, MD, Director of the Center for Electrophysiology Clinical Research & Innovations, the team is performing some of the most groundbreaking research currently underway for patients with cardiac arrhythmias. This work involves collaboration with institutions across the US, including Rice University, University of California, Los Angeles (UCLA), University of Texas at Austin, and Texas A&M University.

The team is focused on innovations that will improve patients' quality of life. The team's success stems from its specific focus on translational research that innovates devices and techniques used to detect, manage, and treat various cardiac conditions, particularly arrhythmias.

Under Dr. Razavi's leadership, THI's electrophysiology research continues to attract important grant funding and high-profile collaborations.

Both the Society for Biomaterials and the Heart Rhythm Society recognized the team for its important contributions and invited the team to present at annual meetings and share the ongoing and cutting-edge projects at THI.

PROGRESS TOWARD A WIRELESS PACEMAKER WITH SHOCKLESS DEFIBRILLATOR

Pacemakers in use today rely on electrical signals to prompt the heart to keep a steady beat. These devices are implanted under the skin, where surgeons can periodically replace their onboard batteries with minor surgery. Being located away from the heart, pacemakers transmit their electrical signals to it via wires called "leads." Some of the common problems with this arrangement are complications related to the leads, including bleeding and infection.

Dr. Razavi and team's new pacemaker reduces these risks by doing away with leads. Although some leadless pacemakers already exist, their designs limit them to pacing a single heart chamber; they cannot provide dual-chamber or biventricular pacing. In contrast, the team's pacemaker uses battery-less, leadless, wirelessly powered microchips that can be directly implanted to pace multiple points inside or outside the heart.


The small chips at the system's heart are less than four millimeters wide and are mounted on a circuit board that is a fraction of the size of a penny. In preclinical testing, the team demonstrated that the device could significantly tune the heart rate.

In 2018, the team reached critical milestones and completed wireless pacing studies featured on the cover of the November issue of the *Journal of Cardiovascular Electrophysiology*.

INNOVATING TO MAKE ICDS LESS PAINFUL

These little chips could soon improve implantable cardioverter defibrillators (ICDs).

"Often used to prevent sudden cardiac death in patients with life-threatening arrhythmias, ICDs are very effective, but they do have drawbacks. Most notably, the electric shock the device imparts to the heart when it falls out of rhythm can be very painful," says Dr. Razavi.

These chips could not only decrease the physical size of ICDs but could also provide much smaller shocks, returning the heart to its normal rhythm without the patient even noticing. 

“The ‘Triple Crown’ of treating both the most common and the most lethal cardiac arrhythmias is external powering, wireless pacing and—far and away most importantly—cardiac defibrillation that is not only painless but is actually imperceptible to the patient. Our technology brings into sharp focus the remarkable possibility of achieving this goal.”

– Mehdi Razavi, MD,
Director, Center for Electrophysiology Clinical Research & Innovations

DIRECTOR SPOTLIGHTS MEHDI RAZAVI, MD



Dr. Mehdi Razavi, Director of Electrophysiology Clinical Research and Innovations, is involved with numerous clinical trials assessing the efficacy of cutting edge technology in the field of cardiac electrophysiology. He is pioneering some of the most ground breaking cardiac arrhythmia research and management today in collaboration with institutions across the US. He has founded multiple medical device startups including: Saranas, a smart introducer sheath to detect internal bleeding complications, and Nanolinea, conductive nanotechnology for the treatment of arrhythmia. Additionally, Dr. Razavi has supervised the development of a number of technologies in collaboration with Rice University and Texas A&M and has over 20 patents to his name.

Photo: Aydin Babakhani, holds a computer chip that controls the wireless pacemaker developed in collaboration with THI.

© Cody Duty/Texas Medical Center

CENTER FOR PRECLINICAL SURGICAL AND INTERVENTIONAL RESEARCH A TREASURED TEXAS MEDICAL CENTER RESOURCE HONORS DR. COOLEY'S PASSION FOR INNOVATION

"The preclinical research laboratory at THI reflects the high standard of excellence established by Dr. Cooley and Dr. Frazier over the last five decades. Today, we have the resources necessary to imagine and execute translational studies that, in many cases, will lead to the next first advancement in cardiovascular care."

– Luiz Sampaio, MD,

Co-Director, Center for Preclinical Surgical and Interventional Research

The preclinical research labs at THI were launched in the 1970s with the development of the left ventricular assist device (LVAD), which is intrinsically linked to the work of Dr. O.H. Frazier, one of the most respected heart surgeons in the world.

Members of the Center authored 17 publications in peer-reviewed journals, including the *Annals of Biomedical Engineering*. The team also lectured at 12 regional, national, and international meetings and hosted several trainings for industry.

As we continue our 55+ years of innovation, we are committed to harnessing the expertise of our talented team and welcome collaboration in one of the most treasured resources in the Texas Medical Center.



THI AIMS TO RADICALLY IMPROVE DEVICES FOR HEART FAILURE PATIENTS

Texas Heart Institute is working on a project intended to radically improve blood-pumping devices for patients with heart failure. If successful, the device could be used to treat heart failure earlier in the course of the disease, perhaps preventing it from progressing to its critical stages. The device could even prevent the need for a heart transplant altogether.

THI EXPLORES ADVANCED 3D PRINTED SILICONE TECHNOLOGIES

THI is employing 3D printing technology that uses soft materials like silicone and hydrogel to create models for use in testing heart-assist devices during development.

In the past, the lab has used rigid plastic pipes to represent the body's circulatory system. With 3D technology, the team is able to create testing models that are more realistic because they use soft, 3D printed materials that are more similar to real human tissue.

The 3D printing technique can also be used to create realistic silicone models of human organs and anatomy for use in surgical and medical training workshops. ♥

"Researching implantable heart-assist devices by using rigid engineering materials has limitations that silicone models overcome."

– Alex Smith, PhD,

Research Engineer, Center for Preclinical Surgical and Interventional Research

Today, the Center for Preclinical Surgical and Interventional Research, under the direction of Dr. Luiz Sampaio and Dr. Frazier, is home to important internal and external research collaborations.

The state-of-the-art resource makes possible early discovery by our physician-scientists every day. In 2018, several internal collaborations were launched, including anti-arrhythmia and surgical device development projects with Dr. Mehdi Razavi, interventional and cell therapy studies with Dr. Emerson Perin, and regenerative medicine studies with Dr. Sampaio and Dr. Doris Taylor.

Medical device companies and agencies working on the design, development, and testing of a wide range of innovative projects partner with THI every year.

DIRECTOR SPOTLIGHTS

CO-DIRECTORS OF THE CENTER FOR PRECLINICAL SURGICAL AND INTERVENTIONAL RESEARCH.

O.H. FRAZIER, MD

For more than 30 years, Dr. Frazier has been a pioneer in the treatment of severe heart failure and in the fields of heart transplantation and artificial devices that may be used either to substitute for or to assist the pumping action of the human heart. As a result of his work, THI has one of the world's top transplantation and mechanical circulatory support programs. Dr. Frazier has performed over 1,300 heart transplants and implanted more than 1,000 left ventricular assist devices, more than any other surgeon in the world. Dr. Frazier's pioneering work in the field of circulatory support has resulted in more than 45,000 LVADs being implanted in patients worldwide as a life-saving effort, the design of most of these devices having been conceived or developed in Dr. Frazier's THI laboratory.

A friend of THI and beloved Texan author, Mimi Swartz, captured the essence of his lifelong journey in her book *Ticker*, the story of Dr. Frazier's quest to create an artificial heart.

In 2018, Dr. Frazier received two of the world's most prestigious lifetime achievement awards: the International Society of Heart and Lung Transplantation's 2018 Lifetime Achievement Award, and the American Association for Thoracic Surgery's 2018 Lifetime Achievement Award in Mechanical Circulatory Support.

Dr. Frazier received numerous honors before 2018, including the Living Legend Award from the World Society of Cardiothoracic Surgeons, the Gift to Mankind Award from the American Organ Transplant Association, the Distinguished Surgeon Award from the Houston Surgical Society, the Honored Physician Award from the American Heart Association Guild, the Ray C. Fish Award for Scientific Achievement in Cardiovascular Diseases from THI, the Denton A. Cooley Cardiovascular Surgical Society International Recognition Award, the Kauffman Heart Failure Award of Merit from the Cleveland Clinic Foundation, and the Dr. Barney Clark Award from the Medforte Research Foundation, in recognition of his pioneering efforts in the clinical advancement of cardiac transplantation and of mechanical circulatory support and replacement devices.

LUIZ SAMPAIO, MD

Dr. Sampaio has devoted his entire career to reducing the burden of cardiovascular disease, first as a practicing cardiovascular surgeon and now as a regenerative medicine researcher. As co-director of the Center for Preclinical Surgical and Interventional Research, he now applies his medical and surgical skills to developing new approaches to preventing, diagnosing, and treating heart disease. He provides medical and surgical expertise and training, organizational leadership, and business development and fiscal management experience to the Center; his contributions include overseeing research projects, gathering and analyzing data, co-authoring manuscripts to disseminate scientific findings, and coordinating the translation of scientific discoveries through clinical trials, FDA approvals, licensing, and business development protocols. He has co-authored several peer-reviewed publications, textbook chapters, and conference abstracts. ♥

Drs. Frazier (left) and Sampaio (right) in front of several circulatory support devices developed at THI.



REGENERATIVE MEDICINE RESEARCH

BUILDING THE FUTURE TODAY, FROM CELLS TO WHOLE HEARTS

Enthusiasm for the potential of regenerative medicine has resonated with patients and families around the world since the 1990s. To succeed requires awareness, tools, resources, and collaborations. Several years ago, THI committed a major part of its research resources to the field of regenerative medicine and cell therapy.

The Regenerative Medicine Research laboratories include the Biorepository and Sample Profiling Core Laboratory and the Organ Repair and Regeneration Research Laboratory.

THI BIOREPOSITORY IS FIRST AND ONLY CAP-ACCREDITED BIOREPOSITORY IN STATE

The THI Biorepository team provides biobanking and standardized processing, profiling, and storage of patient samples for academic and independent research institutions in the United States and Canada.

The THI Biorepository houses the Cardiothoracic Surgical Trials Network's Biorepository and Cell Profiling Core, both of which are funded by the National Heart, Lung, and Blood Institute of the National Institutes of Health. In its capacity serving the CCTRN, the THI Biorepository also conducts potency analyses on patients' samples as requested by CCTRN investigators.

This past year, the THI Biorepository received reaccreditation by the College of American Pathologists (CAP) and remains the only CAP-accredited biorepository in the State of Texas and one of only 24 in the entire nation.

Great progress was made this year in furthering the science of engineering bioartificial organs and tissues. Most notably, the team has overcome one of the basic challenges in regenerative medicine: producing sufficient numbers of human cells to develop new therapies and build tissue-based drug test beds and organs. This breakthrough was achieved by using new technologies that allowed the researchers to routinely produce the billions of human induced pluripotent stem cells (iPSCs) needed to engineer a whole heart.

Underscoring the progress made, the team presented nine abstracts at the 2018 American Heart Association annual scientific meeting in Chicago, including the team's research on induced blood vessel development in a pediatric-sized decellularized heart.

COLLABORATING TO ACCELERATE DISCOVERY

Several local, state, and national partnerships have made new discoveries possible. Local collaborations were established to study primary graft dysfunction with Dr. Gabriel Loor, director of lung transplantation at Baylor St. Luke's Medical Center. The team identified pre-transplant serum biomarkers that could predict the occurrence of primary graft dysfunction.

An important partnership with the State of Texas is the Center for Cell and Organ Biotechnology (CCOB), a collaboration between THI and Texas A&M University (TAMU). To date, this interinstitutional research collaborative supported 15 postdoctoral fellows at THI and TAMU and more than 30 undergraduate students at TAMU. We continue to have the best and the brightest students and staff, giving rise to new ideas and the next generation of scientists and clinicians. This year alone, two staff members were accepted into residencies, one lab member was accepted to medical school, and three were accepted to graduate school. In 2019, two CCOB-funded doctoral students will complete PhD degrees through TAMU's College of Veterinary Medicine and Biomedical Sciences. ♥

BY THE NUMBERS

9

AHA Scientific Sessions
Abstracts and Presentations

45

Postdoctoral Research Fellows
and Undergraduate Students

6

Lab Members Accepted to Graduate School, Medical School, or
Medical Residencies

“There is a critical need for new solutions for treating heart disease, and we aim to build custom human hearts using patients’ own cells. That way, each organ is built for each individual’s own body—eliminating the issue of organ rejection and giving us high hopes for eventually treating pediatric hearts.”

— Doris A. Taylor, PhD,
Director, Regenerative Medicine Research

DIRECTOR SPOTLIGHTS DORIS A. TAYLOR, PHD



Dr. Doris A. Taylor has served as Director of the Department of Regenerative Medicine Research since its founding in 2012. This year, Dr. Taylor was recognized as a Fellow of the European Society of Cardiology, an honorary title awarded by a jury of her peers in recognition of her international achievements and contributions to cardiology. She was also featured in the PBS *Nova* program “Transplanting Hope.” The program followed the journey of patients and their families awaiting life-saving organ donations and featured Dr. Taylor’s research efforts to grow artificial organs, a strategy that could reduce or eliminate patients’ dependency on donated organs.

Photo: A decellularized heart developed in Dr. Taylor’s Regenerative Medicine Research laboratory.

ELECTROPHYSIOLOGY BASIC RESEARCH UNRAVELING THE ORIGINS OF VENTRICULAR ARRHYTHMIAS

“We are unraveling the origins of ventricular arrhythmias and exploring the possibility of restoring electrical activity in chronic heart failure cases by using stem cell transplantation.”

–Jie Cheng, MD, PhD,
Director, Electrophysiology Basic Research

DIRECTOR SPOTLIGHTS JIE CHENG, MD, PHD



Jie (Jay) Cheng, MD, PhD, is a board-certified electrophysiologist and cardiologist, specializing in cardiovascular disease and cardiac electrophysiology. His work has been published in peer-reviewed journals around the world. Dr. Cheng earned his medical degree from Shanghai Medical University in Shanghai City, Shanghai, China. He received residency training in internal medicine and received a Ph.D. in biomedical engineering at Case Western Reserve University in Cleveland, Ohio. Dr. Cheng’s fellowship in cardiology was completed at the University of Chicago in Illinois and fellowship in electrophysiology was completed at the University of California in San Francisco.

In 2018, under the direction of Jie Cheng, MD, PhD, the Cardiac Electrophysiology Basic Research Lab focused its efforts on improving the way physicians detect heart rhythm abnormalities to guide treatment options for patients with life-threatening ventricular arrhythmias.

The implantable cardioverter-defibrillator (ICD) is the most effective treatment for rescuing patients suffering a ventricular arrhythmia. The ICD delivers an electrical shock to restore normal heart rhythm. Unfortunately, ICD shocks do not prevent arrhythmias from recurring.

The team is testing new methods to locate the exact origin of fatal ventricular arrhythmias that cause sudden cardiac death. Thus, doctors using an ICD to deliver shocks can avoid shocking areas unnecessarily.

The data will be used to develop methods and tools to guide minimally invasive ablation procedures commonly used to reduce arrhythmia recurrence.

In 2018, the team successfully completed the first testing of this procedure, and they are analyzing the data with plans to conduct the next phase of tests in 2019.

The team is also exploring the use of stem cell transplantation to restore electrical activity in patients with chronic heart failure. ♥

Photo on opposite page: Negative casting heart created by Jesse Jesus Rios.



MOLECULAR CARDIOLOGY RESEARCH

THE NEW FRONTIER OF MOLECULAR CARDIOVASCULAR MEDICINE

“We have discovered specific molecular targeting techniques that could have advantages over current noninvasive imaging approaches because these new techniques do not involve radiation exposure, can be used in MRI scanners that are widely available, and may be used to deliver therapeutic agents.”

– Darren Woodside, PhD,
Associate Director, Molecular Cardiology Research

The Molecular Cardiology Research team at THI continues to make progress in the quest to improve care through new discoveries in molecular biology. Led by esteemed scientists Dr. Richard Dixon, Director, and Drs. Peter Vanderslice, Ron Biediger, Mendel Chen, and Darren Woodside, the team has made significant discoveries in the use of small molecules for diagnostic and therapeutic medicine.

The research groups in the Molecular Cardiology Research Laboratories have produced more than ten new chemical entities that have entered human testing, one of which has led to an approved drug and two promising adhesion molecule antagonists.

This year, the group published eight original scientific publications and 12 symposium abstracts, and members of the team gave seven invited lectures and presentations at national and international meetings. In addition, the team has contributed significantly to the scientific community by serving on editorial boards, NIH Study Sections, and Scientific Advisory Boards and by reviewing submitted articles for scientific journals.

The team continues its licensing efforts with pharmaceutical partners to work toward completing preclinical studies for submitting Investigational New Drug Applications to the Food and Drug Administration. This milestone is an important and necessary step toward moving the small-molecule research and intellectual property developed here at THI into novel therapies for patients.

They also discovered new links between imprinted gene networks and cardiac dysfunction by using genetic network interaction analyses. Another exciting research focus is the use of microRNA as a potential treatment strategy for cardiac hypertrophy in pulmonary arterial hypertension.


In support of THI’s educational mission, the research team has developed and implemented an educational/training program that has successfully hosted four international students to date.

NEW METHODS FOR EARLIER IDENTIFICATION OF PATIENTS AT HIGH RISK OF HEART ATTACK OR STROKE DUE TO INFLAMED ARTERIAL PLAQUE

Treating risk factors for atherosclerosis, such as high blood pressure and cholesterol levels, has reduced mortality rates. However, these same risk factors are poor indicators of sudden, serious, and recurrent cardiovascular events.

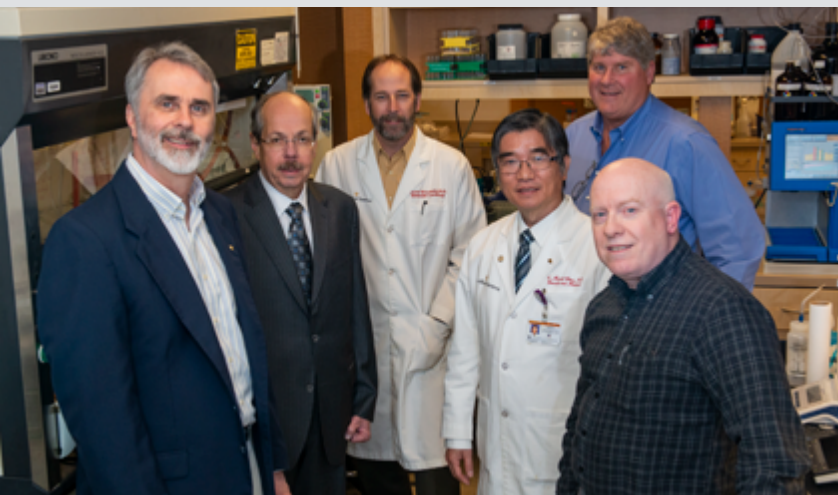
Coronary artery disease develops when plaque accumulates in a coronary artery, leading to hardening of the artery (atherosclerosis). This accumulation prevents blood flow to the heart, causing coronary artery disease. Inflammatory cells contribute to plaque formation and may be important indicators of acute events like heart attack and stroke.

There are currently no noninvasive imaging tools readily available for clinical use to identify patients at high risk of having an acute event due to inflamed atherosclerotic plaque. A technique that can clearly identify inflamed plaques could allow physicians to more accurately characterize patient risk.

More than two decades ago, Dr. James T. Willerson, THI President Emeritus, and colleagues at THI identified a receptor on vascular cells that directs inflammatory cells to atherosclerotic plaques. Building on this research, Dr. Willerson and his team of scientists then collaborated to design a targeted imaging contrast agent that binds to this receptor to identify inflamed atherosclerotic plaque. 

DIRECTOR SPOTLIGHTS

THE DIRECTORS IN MOLECULAR CARDIOLOGY RESEARCH



From left to right: Peter Vanderslice, PhD; Richard Dixon, PhD; Darren Woodside, PhD; Mendel Chen, MD, PhD; Ron Biediger, PhD (back); and Robert V. Market (front)

RICHARD DIXON, PHD | DIRECTOR

Dr. Dixon is the Director of the Wafic Said Molecular Cardiology Research Laboratories at THI. Over his long career, he has been involved in many aspects of pharmaceutical and biotechnology research and development. Formerly, he was a founder, Director, and Chief Science Officer of Encysive Pharmaceuticals. Before that, Dr. Dixon held various management positions, including head of the molecular biology department at Merck and Co. Dr. Dixon's basic research efforts focus on the molecular biology and pharmacology of intracellular signaling and cell trafficking. He and his group were the first to clone and characterize a G-protein-coupled receptor, the beta2 adrenergic receptor, which resulted in the awarding of the 2012 Nobel Prize in Chemistry to his colleagues.

PETER VANDERSLICE, PHD | DIRECTOR

Dr. Vanderslice is the Director of Biology in the Molecular Cardiology Research Laboratories. He has spent his professional career leading teams focused on developing small-molecule compounds that target cell adhesion—a key step in the progression of inflammatory diseases, including atherosclerosis. Joining THI in 2008 from the pharmaceutical industry, Dr. Vanderslice has experience with each stage of the drug development pipeline, from discovery to progression into clinical trials. At THI, he has spearheaded a program developing a compound discovered here to enhance

stem cell therapy, as well as for use as an immunotherapeutic for cancer. The program is at the stage of preparing an Investigational New Drug Application for the FDA, the first step in the path to drug approval.

MENDEL CHEN, MD, PHD | DIRECTOR

Mendel Chen, MD, PhD, is the Director of Vascular and Medicinal Research in the Molecular Cardiology Research Laboratories. Dr. Chen's research centers on the harmful effects of low-density lipoproteins and the mechanisms of their action in cardiovascular disease. He and his group have identified a subfraction of lipoprotein, termed L₅, that is particularly atherogenic. He has authored over 150 manuscripts and is internationally recognized in this field.

RON BIEDIGER, PHD | ASSOCIATE DIRECTOR

Dr. Biediger is currently Associate Director of Chemistry in the Molecular Cardiology Research Laboratories. Previously, Dr. Biediger was the Senior Director of Medicinal Chemistry at Encysive Pharmaceuticals. There, he directed numerous drug discovery and development projects that resulted in four new chemical entities that have entered human clinical testing, including one cell adhesion molecule antagonist that has successfully completed phase I clinical trials. He was part of the team that completed the first total synthesis of Taxol. At THI, Dr. Biediger and his team have invented numerous small-molecule drugs, some of which have been outlicensed and are now poised to enter phase I clinical testing.

DARREN WOODSIDE, PHD | ASSOCIATE DIRECTOR

Dr. Woodside is an Associate Director of the Molecular Cardiology Research Laboratories at THI. His previous positions include Associate Director of Drug Discovery at Encysive Pharmaceuticals. Dr. Woodside's research centers around the role that cell adhesion molecules play in cardiovascular and autoimmune diseases and the development of novel means to identify and treat these diseases. He has authored numerous publications and has served on editorial review boards, and he currently chairs the NIH Innovative Immunology Study Section. ♥

CARDIOMYOCYTE RENEWAL LABORATORY

NEW HOPE FOR HEART REPAIR AFTER HEART FAILURE

“We are on the cusp of a major clinical breakthrough that could lead to a treatment to reverse heart failure and effectively cure the number one cause of death in America.”

– James Martin, MD, PhD,
Director, Cardiomyocyte Renewal Laboratory

Dr. Jim Martin leads important regenerative medicine research that is helping us understand how signaling pathways are related to heart development and tissue regeneration. The ultimate goal of his work is to develop ways to treat congenital diseases and also to regenerate hearts damaged by conditions such as heart attacks, heart failure, and atrial fibrillation.

The team discovered that the heart has the capacity to heal, challenging the long-held scientific belief that the heart cannot regenerate itself after injury. Their work shows that damage can be reversed by simply turning off a specific inhibitory signaling pathway that is important for heart growth and renewal.

Using this innovative approach to reversing heart failure, the team’s initial studies in mice have yielded promising results, giving hope to the 6.5 million Americans living with heart failure, which is the leading cause of death from cardiovascular disease.


In his early studies, Dr. Martin observed increased activity in a specific signaling pathway, called the Hippo pathway, in patients with heart failure. The Hippo pathway acts as a built-in “stop signal” that slows or prevents the proliferation of heart muscle cells (cardiomyocytes) as a way to control the growth rate and size of the heart. After making this discovery, Dr. Martin’s team set out to investigate what would happen if they turned that inhibitory pathway off completely.

In their latest study, with funding support from the National Institutes of Health, they compared hearts with Hippo pathway turned on and turned off after a heart attack.

The results were remarkable and were accepted for publication in *Nature*, one of the most prestigious scientific journals in the world.

When Dr. Martin turned off the Hippo pathway, he noted new heart cells, recovery of heart pumping function, less heart tissue scarring, improved blood flow to the heart, and the formation of new small blood vessels. In addition, despite Hippo being turned off, these hearts appeared to stop growing once the heart reached an appropriate size. Because of the groundbreaking results of this study, we are one step closer to finding new options for heart regeneration and renewal.

Today, Dr. Martin and his team continue to study the molecular interactions of the Hippo pathway and how best to control it.

Dr. Martin’s findings could lead to potential treatments for other critical health conditions that have no cure, such as Duchenne muscular dystrophy, a progressive disease that weakens the muscles and reduces their flexibility over time. Dr. Martin hopes these findings can be modified to help treat and improve the outcomes of children with this disease. 

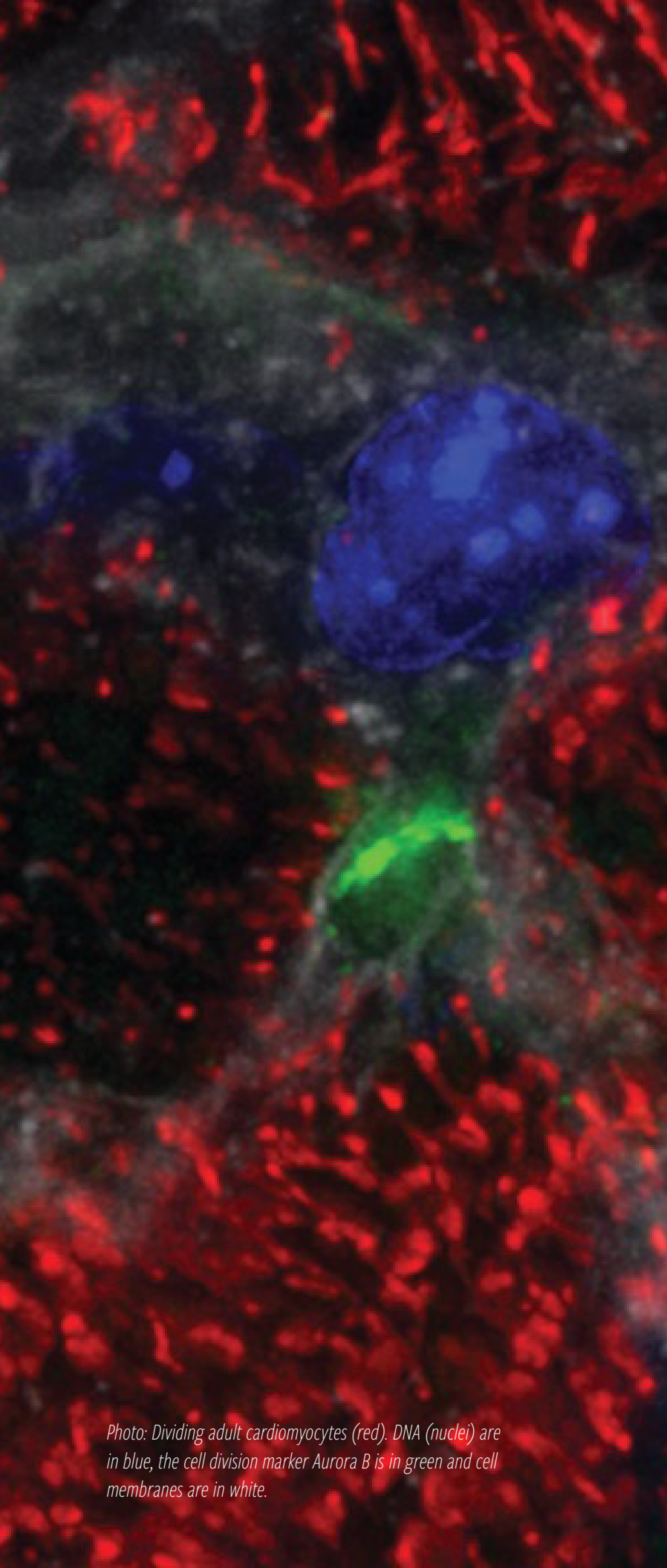


Photo: Dividing adult cardiomyocytes (red). DNA (nuclei) are in blue, the cell division marker Aurora B is in green and cell membranes are in white.

DIRECTOR SPOTLIGHTS

JAMES MARTIN, MD, PHD



James Martin, MD, PhD, is an internationally recognized developmental and regenerative biologist who has made fundamental contributions to our understanding of heart development, disease, and regeneration. He has authored more than 135 peer-reviewed papers published in top-tier journals such as *Nature*, *Science*, *Cell*, *Developmental Cell*, *PLOS Genetics*, *Development*, and *PNAS* (*Proceedings of the National Academy of Sciences*).

CHANGING HEART HEALTH EDUCATION

Texas Heart Institute's commitment to education sets it apart from other major cardiovascular centers. The Institute's educational activities include postdoctoral and allied training programs, seminars, symposia, grand rounds, scientific publications and public education outreach.



EDUCATION BY THE NUMBERS

> 50

Cardiology, Anesthesiology, and Surgery Fellows
Trained at THI

~5,000

CME Program
Attendees

22

New Online Videos for
Health Professionals

> 1 million

THI Journal Readers

> 5.9 million

Website Users

> 900

School of Perfusion Technology
Graduates since 1976

OUR GLOBAL INFLUENCE DEVELOPED LOCALLY & TRUSTED GLOBALLY

THI is recognized internationally for its expertise in cardiovascular research and education, and the THI website has attracted tens of millions of people around the world since its launch.

THI LAUNCHES NEW WEBSITE

In 2018, THI launched an entirely new website and, by year end, attracted nearly 6 million users (resulting in over 9 million page views) from 183 of 195 countries around the world and 242 countries, territories, and dependencies combined. This new global resource was built by the THI Visual Communications and Library and Learning Resources Center teams, attracting new visitors every day.

The Heart Information Center remains the most visited section of the website and covers over 200 topics in both Spanish and English.

THI's web-based features like "Frequently Asked Patient Questions" and "Straight Talk by Dr. Stephanie" are meeting a huge, previously unfilled demand for reliable information about cardiovascular disease, delivered in a way many people prefer to learn.

TEXAS HEART INSTITUTE JOURNAL

The *Texas Heart Institute Journal* (ISSN 1526-6702) is a peer-reviewed journal published by THI as part of its medical education program. The purpose of the *Journal* is to educate, with emphasis on disseminating information to physicians in practice.

The *Journal* invites the submission of clinical and laboratory research papers, reviews, techniques papers, history of medicine pieces, case reports and series, images papers, guest editorials, and letters to the editor. Last year, the *Journal* accepted manuscripts from authors in 32 different countries.

In 2018, the *Texas Heart Institute Journal* attracted over 1.1 million unique visitors, resulting in over 1.7 million journal page views. Dr. James T. Willerson serves as the Editor-in-Chief, and the *Journal*'s dedicated editorial staff includes talented production editors and consultants.

JOURNAL HISTORY

The *Journal* was published under the name *Cardiovascular Diseases* from 1974 through 1981 (ISSN 0093-3546). The name was changed to *Texas Heart Institute Journal* in 1982, and the *Journal* was published in print through 2013 (ISSN 0730-2347). It is indexed by Index Medicus/MEDLINE and by other indexing and abstracting services worldwide.



"Since 1974, the Texas Heart Institute Journal has served as a valuable educational tool and resource for physician-scientists and clinical investigators around the world."

— James T. Willerson, MD,
President Emeritus, Texas Heart Institute
Editor-in-Chief, *THI Journal*

DEPARTMENT OF SCIENTIFIC PUBLICATIONS

The Scientific Publications team helps THI's physicians and researchers publish their findings by editing and formatting journal articles, book chapters, conference abstracts, presentations, and grants. The team comprises five scientific editor/writers, one grant editor/writer, and one editorial assistant. Most of the editors have advanced degrees in the sciences, and all are capable of editing papers at every level, from ensuring that research methods and results are reported properly to correcting grammar and punctuation.

During 2018, the Scientific Publications Department edited 304 manuscripts for submission to peer-reviewed medical and scientific journals. By the end of the year, 206 manuscripts were published, and another 50 were accepted and pending publication. These publications document the important basic science and clinical research being done at THI. ♥

FELLOWSHIPS AND RESIDENCIES TRAINING THE NEXT GENERATION OF CARDIOLOGISTS AND CARDIAC SPECIALISTS

“Our fellowship has a rich history of stalwart clinician-educators, such as Dr. Robert Leachman, Dr. Robert Hall, Texas Heart Institute President Emeritus Dr. James T. Willerson, and many others, who take tremendous pride in training our fellows.”

– Stephanie Coulter, MD,
Director, Cardiovascular Disease Fellowship Program

The Texas Heart Institute Cardiovascular Disease Fellowship at Baylor St. Luke’s Medical Center began in 1965 and honors the legacy of Dr. Denton A. Cooley by supporting both the education and research missions of THI.

THI’s teaching faculty consists of more than 70 clinical cardiologists and cardiac specialists. In this diverse group of clinicians, every practice model is represented, including single- and multi-subspecialty cardiologists who practice in private, academic, or hybrid settings. This provides a unique training opportunity

for the fellows in the program and is a large part of what makes THI’s cardiology and subspecialty programs outstanding.

Under the leadership of Program Director Dr. Stephanie Coulter and Associate Program Director Dr. George Younis, the cardiology and cardiovascular subspecialty fellowship programs have attracted some of the best and brightest clinical physicians from top-tier medical training programs around the country. In 2018, more than 28 fellows were trained throughout the course of the year. Across the five cardiology and cardiology subspecialty programs, we graduated 13 fellows.

DENTON A. COOLEY FELLOWSHIP

THI was proud to host the inaugural recipient of the Denton A. Cooley Fellowship in the spring of 2018. The fellowship, which is funded and administered by the American Association for Thoracic Surgery Foundation, provides an educational experience for North American cardiothoracic surgeons who are in their final year of residency or have recently completed it.

This fellow spends up to four weeks studying at THI, learning from our team of world-renowned physicians and researchers, including Drs. Jennifer Cozart, O.H. Frazier, Charles Hallman, James Livesay, and Joseph Coselli. These pioneers take tremendous pride in sharing decades of knowledge with our next generation of cardiac specialists. This experience is invaluable to a young surgeon. We continue to embrace the spirit of this fellowship and honor these great mentors. ♥



“...for those of us who didn’t train in the Texas Medical Center, you know about the history of Dr. Cooley and other cardiac pioneers, but the gravity of it can be lost on you. When you are touring the various locations and really observing the history, you see just how far we’ve come. It makes you realize, the people that came before us, we owe them a huge debt of gratitude because their work has enabled us to do operations that were just a fantasy 50 years ago.”

— Adam Protos, MD,
Inaugural Recipient of the Denton A. Cooley Fellowship

SCHOOL OF PERFUSION TECHNOLOGY

A LEADER IN PERFUSION TECHNOLOGY EDUCATION

“Between academic classes and clinical observation rotations, our students are entrenched in an unparalleled learning environment that exposes them to a broad range of complicated cardiovascular procedures.”

– Terry Crane,
Director, THI School of Perfusion

Denton A. Cooley, MD, recognized that the quality of patient care could be augmented by highly trained and competent perfusion technologists, and he started the Texas Heart Institute School of Perfusion Technology on December 1, 1971. Today, the school continues to attract bright college graduates interested in an exhilarating career in the medical field.

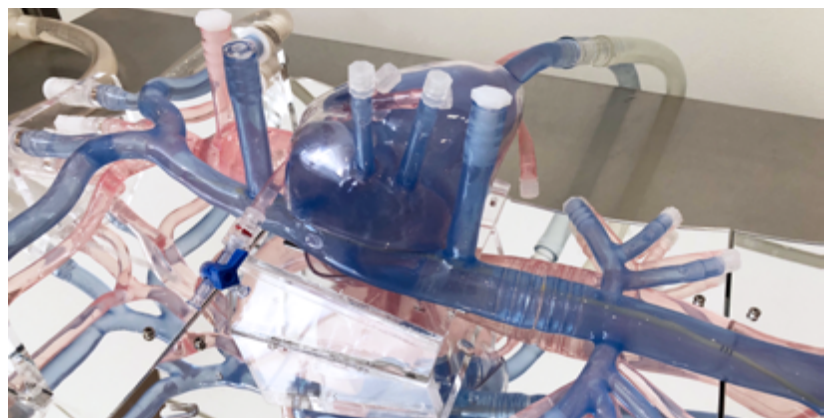
The program became the first perfusion school to be accredited by the American Board of Cardiovascular Perfusion in 1976. The school was also awarded accreditation by the Council on Allied Health Education and American Medical Association in 1982, and the Commission on Accreditation of Allied Health Education Programs granted continuing accreditation of the program in 2002.

The School of Perfusion Technology continues to maintain its accreditation status and to provide high-quality education for perfusion graduates. Through a nationally recognized 12-month course of intensive study, the program offers a post-baccalaureate certificate in perfusion technology. New classes begin every January and July.

Over 1,000 perfusionists have been trained at the School since its inception and have gone on to work in hospitals and medical facilities around the U.S. and the world.

ANNUAL THI PERFUSION CONFERENCE

The School hosts the Annual THI Perfusion Conference every summer at the Institute. The meeting, which contributes to THI's education mission, attracts participants from around the country who earn CAT I Continuing Education credits from the American Board of Cardiovascular Perfusion. Attendees at the conference discuss important case reviews and the latest trends in the techniques and technology used by perfusionists and physicians. Funds raised at these conferences are used to purchase additional training equipment and material to support the School in training the next generation of perfusionists.



“By using anatomically correct training models, the students gain a better understanding of how the roles of the surgeon and perfusionist interface in the operating room.”

– Alex Smith, PhD,
Research Engineer, Center for Preclinical Surgical and
Interventional Research

3D PRINTING ENHANCES PERFUSION TRAINING SURGICAL BOOTCAMPS

During their training, perfusion students are taught how to operate a cardiopulmonary bypass machine and other ancillary equipment used in cardiac surgery. This type of training requires a perfusion circuit that simulates blood flow in the body. In 2018, through a partnership with an international company, the THI School of Perfusion Technology acquired an anatomic training model made of 3-dimensional-printed silicone. The model simulates the human cardiovascular system more accurately, allowing more realistic surgical training boot camps. ❤

CONTINUING MEDICAL EDUCATION OUR RELENTLESS EFFORT TO IMPROVE CONTINUING MEDICAL EDUCATION

“THI plays a vital role in providing continuing education to cardiovascular physicians and other specialists around the world.”

– Elaine Allbritton,
Director, Continuing Medical Education



“Our CME Program was awarded Accreditation with Commendation by the Accreditation Council for Continuing Medical Education. This award recognizes medical education providers who not only demonstrate compliance with core accreditation criteria, but who aim for even higher levels of achievement—a testament to the team’s relentless effort to improve continuing medical education.”

– James T. Willerson, MD,
President Emeritus

For more than 35 years, THI’s Office of Continuing Medical Education (CME) has been recognized as an accredited provider of relevant, effective, and practice-based CME activities that support the improvement of health care quality in the United States.

The mission of THI’s CME program is to provide physicians and medical professionals with comprehensive and innovative CME activities that are designed to increase medical knowledge and skills and, ultimately, to change practice behavior to improve patient care. These goals are accomplished by recruiting program directors and speakers for a series of high-quality symposia.

In 2018, we saw the continued success of this critical program. In 2018 alone, the CME team accredited 17 live CME symposia, 19 regularly scheduled series, and five journal CME activities. A total of 721 physicians and 1,114 non-physicians attended THI’s CME-accredited live activities. For all of the CME activities combined, the total attendance was almost 5,000 individuals. Although most attendees reside in the United States, international participants also attend. The success of THI’s CME program illustrates the Institute’s extensive reach within the medical community at the local, national, and international levels.

THI’s Office of CME continues to partner with St. Luke’s and the Catholic Health Initiatives Health System in accrediting their CME offerings across the country. The CME Office also works with physicians at Baylor College of Medicine in accrediting and planning of several of their educational offerings. This alliance strengthens and expands the Office of CME’s scope beyond cardiology to many other subspecialties.

Looking toward the future, THI’s CME program will continue to expand the meaningful impact it has on the local and global medical community, supporting the Institute’s overall mission to reduce the devastating toll of cardiovascular disease through medical education programs. ♥

JAMES T. WILLERSON, MD, CARDIOVASCULAR SCIENCES SEMINAR SERIES A THI EDUCATION COLLABORATION HONORS OUR PRESIDENT EMERITUS

THI remains dedicated to improving the standard of care through education and research, and the James T. Willerson, MD, Cardiovascular Sciences Seminar Series is a treasured tradition that upholds this commitment.

Led by Dr. A. J. Marian, this educational program is organized by the Texas Heart Institute and The University of Texas Health Science Center at Houston. The series is attended by investigators, colleagues, and trainees from clinical and teaching institutions across the Texas Medical Center, including Baylor College of Medicine, Rice University, Baylor St. Luke's Medical Center, Houston Methodist Hospital, Texas Children's Hospital, and MD Anderson Cancer Center, as well as visitors and members of the Texas Medical Center.

The seminar series is named after THI's President Emeritus, Dr. James T. Willerson. Dr. Cooley invited Dr. Willerson to succeed him as President of the Texas Heart Institute in 2004, and today he serves as the President Emeritus of THI and editor of the Texas Heart Institute Journal. With Dr. Emerson Perin, Dr. Willerson has been directly involved in seminal research in the use of stem cells to repair hearts and blood vessels injured by heart attacks. He also maintains a busy practice and cares for several thousand patients annually.

Dr. Willerson has served as the Chairman of the National American Heart Association (AHA) Research Committee, as Chairman of the National Heart, Lung, and Blood Research Study Section, as a member of the National AHA Board of Directors and of the AHA National Steering Committee, and as the President of the AHA's Houston Chapter. Dr. Willerson is also a member of the University of Texas System Chancellor Executive Council.

He served as the Chairman of Internal Medicine at the UT Houston Medical School and was later named President of the University of Texas Health Science Center in Houston, which includes Schools of Medicine, Nursing, Dentistry, Public Health, and Graduate Medical Education. While at the UT Houston Medical School, he founded the Institute of Molecular Medicine for the Prevention of Human Disease.

In his career, Dr. Willerson has authored more than 1000 scientific articles in respected medical journals, assembled 28 textbooks of cardiovascular medicine, and served for 11 years as the editor of *Circulation*, the premier AHA journal of cardiovascular medicine. He also holds 15 patents. Dr. Willerson is a member of the National Academy of Medicine and is an honorary member of 10 foreign

cardiovascular societies. He is a Distinguished Alumnus of Baylor College of Medicine, a Professor of Medicine at the University of Texas MD Anderson Cancer Center, and an Adjunct Professor of Medicine at Baylor College of Medicine and the University of Texas Medical School. ♥

DIRECTOR SPOTLIGHTS ALI J. MARIAN, MD



Dr. Marian, Professor and Director of the IMM Center for Cardiovascular Genetic Research (CCGR) at the Texas Heart Institute, is recognized nationally and internationally for his research achievements and expertise in the genetics of cardiomyopathies. Dr. Marian has co-authored over 100 articles in peer-reviewed journals. His expertise is recognized and evidenced by lectureships at major national and international meetings, editorials in major journals, review articles, and book chapters. With his team, Dr. Marian is exploring the molecular genetics of cardiovascular diseases in humans and how this influences disease progression.

REAL STORIES OF HEART

The Texas Heart Institute is recognized internationally for research programs in cardiology, cardiovascular surgery, regenerative medicine and pathology. Our physicians and scientists conduct research ranging from gene therapy, stem cells and regenerative medicine, to miniature pacemakers, ventricular assist devices (VADs) and artificial hearts.



H. Frazier, M.D.
Vascular Su

DR. O. H. FRAZIER INTERNATIONAL RECOGNITION FOR A LIFETIME OF WORK

In his more than 40 years at the Texas Medical Center, Dr. O. H. Frazier has led the Texas Heart Institute (THI) to become a world leader in the field of mechanical circulatory support innovation. Through global partnerships with his esteemed colleagues and an unwavering dedication to developing solutions to improve the lives of suffering patients, he has extended the life of people around the world with heart failure and other serious cardiovascular conditions for nearly half a century.



Dr. Frazier first became interested in mechanical circulatory support in 1963 as a first-year medical student at Baylor College of Medicine, when he wrote a research paper about the experimental total artificial heart. After finishing medical school and a surgical internship, and then serving for 2 years in Vietnam as a combat flight surgeon, he completed his general surgery residency under Dr. Michael E. DeBakey. Dr. Frazier then did his cardiac training at THI under its founder, Dr. Denton A. Cooley, so that he could continue pursuing heart-assist device research.

Although the heart transplantation program at THI was revolutionary, many of the patients were too weak to wait for a viable heart transplant. In an effort to help patients survive until heart transplantation was an option, through the 1970s and 1980s, Dr. Frazier explored developing an implantable left ventricular assist device (LVAD) to aid the failing heart. In 1980, he implanted the first LVAD, and in 1988, he implanted the first continuous-flow LVAD, called the Hemopump. In 2000, Dr. Frazier implanted the first Jarvik continuous-flow LVAD, and in 2003, he implanted the first HeartMate II, a device that has since become the most widely used implantable LVAD in the world.

Conventional approaches to the development of an artificial heart attempted to mimic the beating of a normal human heart. But these designs were too large for many patients, and their mechanical components were subjected to substantial wear and tear. In 2011, Dr. Frazier implanted two second-generation HeartMate II LVADs to totally replace a patient's failing heart. This dual-pump device was the first successful continuous-flow total artificial heart—a heart without a heartbeat.

Now, as a professor of surgery at Baylor College of Medicine, Director of the Cullen Cardiovascular Research Laboratory and Co-Director of the Center for Preclinical Surgical and Interventional Research at THI, Dr. Frazier continues to pursue new innovations in mechanical circulatory support and patient care.

THI is honored to have such a successful, world-renowned medical professional and leader as a part of the team working to unveil the next first in cardiovascular discovery.

“There is no one more deserving of recognition for their global contributions to alleviating patient suffering than Dr. O. H. Frazier. For half a century, he has extended the life of patients around the world with heart failure and other serious cardiovascular conditions, and we are very proud of his accomplishments.”

– James T. Willerson, MD,
President Emeritus

In April, Dr. O. H. Frazier was honored as the 2018 recipient of the International Society for Heart and Lung Transplantation (ISHLT) Lifetime Achievement Award at the society's 38th Annual Meeting and Scientific Sessions in Nice, France. This award is reserved for those whose lifetime body of work has contributed significantly to improving the care of patients with advanced heart or lung disease, and Dr. Frazier is one of only seven recipients of this highly prestigious award in the ISHLT's 38-year history.

Dr. Frazier is widely regarded as a pioneer in the treatment of severe heart failure, and in the fields of heart transplantation and the development of mechanical heart-assist devices. With a career spanning more than four decades, he has performed over 1,300 heart transplants and implanted more than 1,000 left ventricular assist devices—more than any other surgeon in the world.

A HISTORY OF FIRSTS IN MECHANICAL CIRCULATORY SUPPORT

- 1974** Dr. O.H. Frazier arrives at St. Luke's Episcopal Hospital
- 1976** First-in-world intra-abdominal left ventricular assist device (LVAD) | Drs. Jack Norman and Frazier
- 1978** First heart-kidney transplant | Drs. Denton A. Cooley, Frazier & Barry Kahan
- 1978** First-in-world bridge to transplant with LVAD | Drs. Cooley & Frazier
- 1978** First-in-world heart-kidney transplant | Drs. Cooley, Frazier & Kahan
- 1982** First heart transplant with cyclosporine | Stanford, Columbia, Pittsburgh, and Texas Heart Institute
- 1985** Development of the AbioCor artificial heart | Dr. Frazier
- 1985** NHLBI funds proposed project to develop permanent artificial heart | Dr. Frazier
- 1986** First implantation of pneumatic Thermo Cardiosystems Inc. (TCI) LVAD (first LVAD approved by FDA) | Dr. Frazier
- 1986** First-in-world implantation of pneumatic TCI LVAD (first approved by FDA) | Dr. Frazier
- 1986** Development with Dr. Robert Jarvik of blood-washed (non-lubricated) bearing for long-term, implantable continuous-flow (pulseless) LVAD; basis for development of entire field of continuous-flow LVADs (over 30,000 implanted worldwide) | Dr. Frazier
- 1988** First implantation of intracorporeal continuous-flow LVAD | Dr. Frazier
- 1991** First-in-world implantation of electrically powered LVAD (also TCI) | Dr. Frazier
- 1993** First patient to be discharged from hospital with LVAD | Dr. Frazier
- 1994** First centrifugal LVAD developed (now known as the HeartWare HVAD) | Dr. Frazier
- 2000** First ever continuous-flow pump (Jarvik 2000) implanted in a human being | Dr. Frazier
- 2000** First-in-world implantation of continuous-flow LVAD (Jarvik) as destination therapy (in Oxford, England) | Drs. Stephen Westaby, Frazier, Igor Gregoric
- 2001** Implantation of AbioCor artificial heart | Dr. Frazier
- 2003** First device approved as destination therapy
- 2003** First-in-world implantation of HeartMate II LVAD (also developed in THI research lab). Now the world's most widely used device | Dr. Frazier
- 2005** Demonstration, in large preclinical model, of feasibility of total heart replacement with continuous-flow LVAD | Dr. Frazier
- 2006** Six million-dollar NIH grant for development of implantable continuous-flow LVAD for total heart replacement; Dr. Frazier served as Principal investigator | Dr. Frazier
- 2011** First-in-world implantation of total heart replacement with two continuous-flow LVADs in a human being | Dr. Frazier
- 2014** Implantation of single continuous-flow LVAD as total heart replacement in large preclinical model | Drs. William Cohn and Frazier

THE NEXT FIRST IN CARDIOVASCULAR DISCOVERY

Dr. Frazier believes that the first meaningful total heart replacement with a continuous-flow device in a human being is in sight. The LVAD that appears to be most promising for adaptation to a total artificial heart has now supported some patients for more than 9 years, and durability testing suggests that this device could continue to operate for up to 20 years.

In addition, Dr. Frazier is deep into the development and testing of a new, minimally invasive LVAD that can be placed in a patient in the cath lab, eliminating the need for open heart surgery. The hope is to ultimately develop a device that slows the progression of heart failure and thus reduces the number of patients who need a heart transplant. ❤

MAKE-A-WISH AN ASPIRING CARDIOTHORACIC SURGEON'S WISH COMES TRUE



"They really went overboard. I was able to do and see a lot more than I thought was possible. They gave me a lab coat and scrubs and many surprises that I was not expecting. My time here at the Texas Heart Institute was invaluable and changed my life forever."

—Micaela

Make-A-Wish recipient

When THI was approached by the Make-A-Wish Foundation of New Jersey about helping to make a young woman's wish come true, our team never dreamed the experience could have such an exciting and profound impact on the Institute and our partners. Micaela's dream to become a cardiothoracic surgeon drove the THI team to put together a wish experience possible only in the Texas Medical Center.

Partnering with Baylor St. Luke's Medical Center and THI Thoracic Surgery Residency teaching staff member Dr. Ourania Preventza, THI orchestrated an almost week-long wish experience for Micaela this fall. The experience exposed Micaela to the many facets of cardiothoracic surgery: patient care, cutting-edge research, continuing medical education, and much more.

Micaela's experience was filled with tours and the many daily activities of a resident in training, including completing new-resident paperwork and attending orientation for her badge processing.

She attended several education conferences with the trainees and met with Dr. Preventza during her office hours. She toured the surgical units, ICU, operating rooms, clinics, and laboratories and interacted with executive administrators, nurses, doctors, surgeons, technicians, researchers, and support staff across the institution. Among the highlights of her experience were observing surgery, rounding with Dr. Preventza, and attending THI's Friday Cardiology Grand Rounds with all of the faculty, staff, and trainees. At the conclusion of her three-day visit, the Visual Communications team interviewed her in the studio for a heartwarming wrap-up video produced by the team for the Make-A-Wish Foundation of New Jersey and the Texas Heart Institute website, texasheart.org/micaelas-wish. ❤



