The heart is the first organ to form in the embryo, and its development and function is essential for life. Defects in heart formation result in congenital heart disease, which affects at least 1% of live births. The lessons learned from heart development are also critical for the development of strategies aimed at regenerating diseased adult hearts. This meeting will address advances in our understanding of cellular and molecular mechanisms of heart development, with a view toward congenital heart disease and cardiac regeneration. It will bring together developmental biologists, cardiologists, geneticists and basic scientists from many disciplines to discuss current findings and to promote multi-disciplinary collaborations. The pairing with the Keystone Symposia meeting on “RNA-Based Approaches in Cardiovascular Disease” presents an opportunity to bridge exciting fields in cardiovascular biology.

Session Topics:
• Common RNA-Based Mechanisms in Cardiovascular Development and Pathology (Joint)
• Workshop 1: Gene Regulatory Mechanisms
• Cardiac Lineages
• Epicardium and Coronaries
• Gene Regulatory Mechanisms
• Congenital Heart Disease: Genes and Pathways
• Mechanisms of Cardiac Growth and Morphogenesis
• Mechanisms of Cardiovascular Regeneration (Joint)
• Workshop 2: Cardiovascular Repair Mechanisms
• Modeling Human Heart Development

Scholarship Application & Discounted Abstract Deadline: November 30, 2016
Abstract Deadline: December 11, 2016
Discounted Registration Deadline: January 26, 2017
SUNDAY, MARCH 26
Arrival and Registration

MONDAY, MARCH 27
Welcome and Keynote Address (Joint)
* Benoit G. Bruneau, Gladstone Institute of Cardiovascular Disease, USA
* Thomas Thum, Medical School Hannover, Germany
Eric N. Olson, University of Texas Southwestern Medical Center, USA
Following the Heart

Common RNA-Based Mechanisms in Cardiovascular Development and Pathology (Joint)
* Benoit G. Bruneau, Gladstone Institute of Cardiovascular Disease, USA
* Thomas Thum, Medical School Hannover, Germany
Stefanie Dimmeler, University of Frankfurt, Germany
Non-coding RNAs in Cardiovascular Repair and Aging
William C. Sessa, Yale University School of Medicine, USA
Vascular Therapeutics Approaches using miRNAs
Laurie A. Boyer, Massachusetts Institute of Technology, USA
Long Noncoding RNAs in Heart Development and Differentiation
Tilman Ziegler, Klinikum rechts der Isar der TU München, Germany
Short Talk: LNA Mediated Inhibition of miR-132 Prevents Hypertrophy Induced Cardiomyopathy in Pigs

Workshop 1: Gene Regulatory Mechanisms (X7)
* Eric Small, University of Rochester, USA
Nicole Schlußler, Goethe University Frankfurt, Germany
A LncRNA Locus in the Genomic Region of Hand2 is Essential for Cardiogenic Lateral Plate Mesoderm
Alexandre R. Colas, Sanford-Burnham Medical Research Institute, USA
Id Genes Are Essential For Early Heart Formation
Sunil K. Verma, University of Texas Medical Branch, USA
Role of the RNA Binding Protein Rbfox2 in Hypoplastic Left Heart Syndrome
Christian Mosimann, University of Zürich, Switzerland
An Ancient Regulatory Program Controls the Emergence of Cardiogenic Lateral Plate Mesoderm
Li Qian, University of North Carolina at Chapel Hill, USA
Single Cell Transcriptomics Reveals a Deterministic Trajectory of Cell Fate Conversion during Direct Cardiac Reprogramming
Min Zhang, Shanghai Children's Medical Center, China
Atrial Fibrillation-Associated Functional Element Regulates Ptx2 Expression via CTCF-Mediated Long-Range Interaction

Workshop 1: Basic and Novel Tools for RNA Research (X8)
* Carlos Fernandez-Hernando, Yale School of Medicine, USA
* Leon Johannes De Windt, Maastricht University, Netherlands
Esther E. Creemers, Academic Medical Center, Netherlands
Circular RNA Profiling and Implications for Cardiac Disease
Mark Mercola, Stanford University, USA
High Throughput Screening as a Massive Omics Approach to Understand the Heart
Lior Zangi, Icahn School of Medicine at Mount Sinai, USA
Gene Therapy Approach for Cardiac Regeneration using Modified mRNA
Cristina Espinosa-Diez, Oregon Health and Science University, USA
A MicroRNA Regulated Incoherent Feedforward Loop Drives Vascular Senescence

Cardiac Lineages (X7)
* Kristy Red-Horse, Stanford University, USA
Margaret E. Buckingham, Institut Pasteur, France
Cardiac Cell Lineages and the Second Heart Field
Lionel Christiaen, New York University, USA
Regulation of Cardiopharyngeal Multipotency and Early Fate Specification in a Simple Chordate
Caroline E. Burns, Harvard Medical School, Massachusetts General Hospital, USA
Development of the Cardiopharyngeal Lineage in Zebrafish
Nicole Dubois, Icahn School of Medicine at Mount Sinai, USA
Short Talk: Foxa2 Marks a Ventricular Progenitor Population during Heart Development

Fundamentals in RNA Diagnostics and Paracrine Effects (X8)
* Manuel Mayr, King's College, University of London, UK
* Susmita Sahoo, Icahn School of Medicine at Mount Sinai, USA
Carlos Fernandez-Hernando, Yale School of Medicine, USA
Noncoding RNAs as Paracrine Players in Vascular Inflammation and Lipid Metabolism
Denise Hilfiker-Kleiner, Medizinische Hochschule Hannover, Germany
Pathophysiology of Peripartum Cardiomyopathy Links Prolactin to the PAI-1/uPAR System: Modulation of NF-κB Signaling and miR146a as Therapeutic Options
Paula da Costa Martins, Maastricht University, Netherlands
Short Talk: Cardiomyocyte-Derived Exosomes Mediate Pathological Cardiac Microvascular Remodeling
Yuri D'Alessandra, Centro Cardiologico Monzino, Italy
Short Talk: Circulating MicroRNAs as Biomarkers of Long-Term Doxorubicin-Induced Cardiotoxicity
**KEYSTONE SYMPOSIA**

**on Molecular and Cellular Biology**

**Molecular Mechanisms of Heart Development (X7)**  
Scientific Organizers: Benoit G. Bruneau, Brian L. Black and Margaret E. Buckingham  
Supported by the Directors' Fund

**RNA-Based Approaches in Cardiovascular Disease (X8)**  
Scientific Organizers: Thomas Thum and Roger J. Hajjar

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**Epicardium and Coronaries (X7)**

*Stefanie Novakowski*, University of British Columbia, Canada  
Short Talk: *Noncoding RNA Therapeutics: What Have We Learned?*

*Christa L. Trexler*, University of Colorado Boulder, USA  
Short Talk: *Cardiomycyte Function and Gene Expression are Influenced by Biological Sex*

**Posters Session 1**

**TUESDAY, MARCH 28**

**Keynote Address (X8)**

*Roger J. Hajjar*, Mount Sinai School of Medicine, USA  
*Gerald W. Dorn, II*, Washington University School of Medicine, USA  
*Manuel Mayr*, King’s College, University of London, UK  
A Systems Biology Approach: Circulating Noncoding RNAs as Innovative and Prognostic Markers of Cardiovascular Disease

**Epicardium and Coronaries (X7)**

*Kelly Smith*, University of Queensland, Australia  
*Kristy Red-Horse*, Stanford University, USA  
*Kenneth D. Poss*, Duke University Medical Center, USA  
*Bin Zhou*, Albert Einstein College of Medicine, USA  
*Paul R. Riley*, University of Oxford, UK  
*Michael A. Trembley*, University of Rochester Medical Center, USA  
Cell Fate Decisions during Coronary Artery Development  
Developmental Mechanisms of Coronary Artery Formation  
Developmental Programming of the Cardiac Lymphatics  
Novel Mechanisms of Epicardial-Derived Cell Mobilization

**Noncoding RNA Therapeutics: What Have We Learned? (X8)**

*Roger J. Hajjar*, Mount Sinai School of Medicine, USA  
*Gerald W. Dorn, II*, Washington University School of Medicine, USA  
*Susmita Sahoo*, Icahn School of Medicine at Mount Sinai, USA  
Exosomes as a Diagnostic and Therapeutic Tool in Cardiovascular Disease

**Posters Session 2**

**WEDNESDAY, MARCH 29**

**Congenital Heart Disease: Genes and Pathways (X7)**

*Vincent M. Christoffels*, Academic Medical Center, Netherlands  
*Christine Seidman*, Harvard Medical School, USA  
*Christian Kupatt*, Technical University Munich, Germany  
Steps and Missteps in Building the Heart

**Novel Approaches in RNA Detection and Networks (X8)**

*Gianluigi Condorelli*, Humanitas University, Italy  
*Christian Kupatt*, Technical University Munich, Germany  
*Prabhu Mathiyalagan*, Icahn School of Medicine at Mount Sinai, USA  
Short Talk: Dynamic Regulation of m6A RNA methylation is a Novel Remodeling Mechanism of the Ischemic Heart

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*Session Chair † Invited but not yet accepted  Program current as of September 3, 2019. Program subject to change. Meal formats are based on meeting venue.  For the most up-to-date details, visit [www.keystonesymposia.org/17X7](http://www.keystonesymposia.org/17X7) and [www.keystonesymposia.org/17X8](http://www.keystonesymposia.org/17X8).*
**Mechanisms of Cardiac Growth and Morphogenesis (X7)**

*Caroline E. Burns*, Harvard Medical School, Massachusetts General Hospital, USA  
*Anthony B. Firulli*, Wells Center for Pediatrics Research, USA  
*Katherine E. Yutzey*, Cincinnati Children's Hospital Medical Center, USA

**Non-Coding RNAs Going Looooong…. (X8)**

*Stefan Engelhardt*, Technical University of Munich, Germany  
*Gerald W. Dorn, II*, Washington University School of Medicine, USA  
*Yibin Wang*, University of California, Los Angeles, David Geffen School of Medicine, USA  
*Thomas Thum*, Medical School Hannover, Germany  
*Venkata Naga Srikanth Garikipati*, Temple University, USA  
*Da-Zhi Wang*, Children's Hospital Boston, USA  
*Samir Ounzain*, University of California, Los Angeles, David Geffen School of Medicine, USA

**Mechanisms of Cardiovascular Regeneration (Joint)**

*Mauro Giacca*, International Center for Genetic Engineering, Italy  
*Deepak Srivastava*, Gladstone Institute of Cardiovascular Disease and University of California, San Francisco, USA  
*Nadia Mercader*, Institut of Anatomy, University of Bern, Switzerland  
*Leon Johannes De Windt*, Maastricht University, The Netherlands  
*Andrew H. Baker*, University of Edinburgh, UK

**Posters**

**Poster Session 3**

**THURSDAY, MARCH 30**

**Mechanisms of Cardiovascular Regeneration (Joint)**

*Masaki Ieda*, Keio University School of Medicine, Japan  
*Eva van Rooij*, Hubrecht Institute, Netherlands  
*Monika M. Gladka*, Hubrecht Institute, Netherlands

**Preclinical Approaches Using RNA Therapeutics (X8)**

*Yibin Wang*, University of California, Los Angeles, David Geffen School of Medicine, USA  
*Patrick Most*, University of Heidelberg, Germany  
*Rusty Montgomery*, miRagen Therapeutics, Inc., USA  
*Christian Kupatt*, Technical University Munich, Germany  
*Rabea Hinkel*, Klinikum rechts der Isar, TUM, Germany

**Workshop 2: Cardiovascular Repair Mechanisms (Joint)**

*Zeb2 Protects the Heart from Ischemic Damage*

*Eva van Rooij*, Hubrecht Institute, Netherlands

For the most up-to-date details, visit [www.keystonesymposia.org/17X7](http://www.keystonesymposia.org/17X7) and [www.keystonesymposia.org/17X8](http://www.keystonesymposia.org/17X8).
Molecular Mechanisms of Heart Development (X7)
Scientific Organizers: Benoit G. Bruneau, Brian L. Black and Margaret E. Buckingham

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Scientific Organizers: Thomas Thum and Roger J. Hajjar

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FRIDAY, MARCH 31

Departure

Ajit Magadum, Icahn School of Medicine, Mount Sinai Hospital, USA
Cardiomyocyte-Specific Expression of Cell Cycle Inducer modRNA Induces Cardiac Regeneration

Shin Watanabe, Icahn School of Medicine at Mount Sinai, USA
miR-146a Regulates Cardiac Function by Targeting SUMO1/SERCA2a Pathway

Lina A. Shehadeh, University of Miami Miller School of Medicine, USA
Osteopontin RNA Aptamer Can Prevent and Reverse Pressure Overload-Induced Heart Failure

C. Geoffrey Burns, Harvard Medical School, Massachusetts General Hospital, USA
Cardiomyocyte Polyploidization Creates a Barrier to Heart Regeneration in Zebrafish

Honghai Liu, Children's Hospital of Pittsburgh of UPMC, USA
Repression of Epithelial Cell Transforming 2 (Ect2) Induces Binucleation of Cardiomyocytes

Thomas J. Cahill, University of Oxford, UK
Macrophages Activate Distinct Programs of Regeneration and Scar Formation to Direct Repair following Myocardial Infarction

Hamid el Azzouzi, Maastricht University, Netherlands
Targeted Deletion of ADAR1 in the Adult Heart Causes Severe Cardiac Dysfunction and Increased Lethality

Modeling Human Heart Development (X7)

Benoit G. Bruneau, Gladstone Institute of Cardiovascular Disease, USA
Developmental Patterning of Human Pluripotent Stem Cells: From Beating Cardiomyocytes to Heart Disease Models

Charles E. Murry, University of Washington, USA
Networks Underlying Human Cardiovascular Differentiation

Gordon M. Keller, University Health Network, MaRS Centre, Canada
Modeling Cardiovascular Development with Human Pluripotent Stem Cells

RNA Therapeutics in Clinical Translation (X8)

Wolfram H. Zimmermann, University Medical Center Göttingen, Germany
Gene Therapy and Genome Editing for Heart Failure

Patrick Most, University of Heidelberg, Germany
Development of Nucleic-Acid Therapeutics for Cardiac and Vascular Disorder Treatment

Mauro Giacca, International Center for Genetic Engineering, Italy
Small RNA Therapy for Cardiac Regeneration

Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (X7)

Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (X8)