



Join Keystone Symposia  
for the 2016 conference on:

# Cardiac Development, Regeneration and Repair

April 3–7, 2016

Snowbird Resort | Snowbird, Utah | USA

Scientific Organizers:

Christine L. Mummery, Joseph C. Wu and Jonathan A. Epstein

*Joint with the conference on Heart Failure: Genetics, Genomics and Epigenetics*

*There is increasing evidence that developmental mechanisms regulating cardiac and vascular cell lineage differentiation and organogenesis contribute to cardiovascular disease in childhood and throughout life and could be leveraged to reduce cardiac damage and mediate repair or regeneration once damage has occurred. This meeting will emphasize shared molecular mechanisms in cardiovascular development, regeneration and disease and consider how patient-relevant pluripotent stem cell models can contribute to understanding human disease states. Specific aims are to: 1) Consider animal models for understanding cardiovascular cell lineage commitment, differentiation and proliferation; 2) Explore how this can be applied to creating new stem cell-based models that result in mature cardiovascular derivatives and assays for disease target discovery; and 3) Explore therapeutic potential for cardiovascular repair and regeneration mechanisms in clinical practice. It will bring together world-class speakers and researchers to facilitate new scientific directions and therapeutic approaches in the management and treatment of cardiovascular disease.*

*Session Topics:*

- Cardiac Lineage Commitment and Specification
- Cardiovascular Tissue Engineering and Organs on Chips (Joint)
- Cardiac Morphogenesis and Regeneration
- Differentiation and Characterization of Cardiomyocytes from Pluripotent Stem Cells
- Vascular Development and Disease

- Human Pluripotent Stem Cells as Models of Cardiovascular Disease
- Novel Therapeutic Approaches to Fix Broken Hearts (Joint)
- Cardiomyocyte Maturation, Proliferation and Cardiac Remodeling



Submitting an abstract is a great way of participating in the conference through poster presentation and possible selection for a short talk.

*Scholarship & Discounted Abstract Deadline: Dec 3, 2015*

*Abstract Deadline: Jan 7, 2016*

*Discounted Registration Deadline: Feb 4, 2016*

For additional details, visit [www.keystonesymposia.org/16Z2](http://www.keystonesymposia.org/16Z2).

**KEYSTONE SYMPOSIA™**  
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## Cardiac Development, Regeneration and Repair (Z2)

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## Heart Failure: Genetics, Genomics and Epigenetics (Z1)

Scientific Organizers: Stuart A. Cook, Christine E. Seidman and Yigal M. Pinto

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### SUNDAY, APRIL 3

#### Arrival and Registration

### MONDAY, APRIL 4

#### Welcome and Keynote Address (Z2)

**Peter W. Reddien**, Whitehead Institute, USA  
*The Role of Muscle Cells in Directing Regeneration in Planarians*

#### Welcome and Keynote Address (Z1)

**James A. Spudich**, Stanford University, USA  
*Mutations to Mechanisms to Therapies*

#### Cardiac Lineage Commitment and Specification (Z2)

\***Christine L. Mummery**, Leiden University Medical Center, Netherlands

**Vincent M. Christoffels**, Academic Medical Center, Netherlands  
*T-Box Transcription Factors in Conduction System Lineage Determination*

**Benoit G. Bruneau**, Gladstone Institute of Cardiovascular Disease, USA  
*Transcriptional Regulation of Heart Development and Chromatin Structure*

**Katherine E. Yutzey**, Cincinnati Children's Hospital Medical Center, USA  
*Epicardial-Derived Lineages in Heart Development and Disease*

**Alexandre R. Colas**, Sanford-Burnham Medical Research Institute, USA  
*Short Talk: Id1 Is an Evolutionarily Conserved Master Regulator of Cardiogenic Mesoderm Formation*

**Daniel M. DeLaughter**, Harvard Medical School, USA  
*Short Talk: Single Cell Transcriptional Atlas of Cardiac Development*

#### Heart Failure 2016: Syndromes, Mechanisms and Treatments (Z1)

\***Christine E. Seidman**, Harvard Medical School, USA

\***Hugh Watkins**, University of Oxford, UK

**Frank R. Heinzel**, Germany  
*What We Don't Know?*

**Denise Hilfiker-Kleiner**, Medizinische Hochschule Hannover, Germany  
*Molecular Mechanisms Underlying Peripartum Cardiomyopathy*

**Robert N. Willette**, GlaxoSmithKline, USA  
*Challenges and Opportunities in Heart Failure Drug Discovery: An Industry Perspective*

**Leanne Elizabeth Felkin**, Imperial College London, UK  
*Short Talk: Recovery of Cardiac Function in Cardiomyopathy due to Titin Truncation*

**Pu Qin**, GlaxoSmithKline, USA

*Short Talk: Activation of the Amino Acid Response Pathway Blunts the Effects of Cardiac Stress and Improves Survival*

#### Workshop and Panel 1: Molecular Etiology of Heart Failure (Z1)

\***Norbert Hubner**, Germany

\***Denise Hilfiker-Kleiner**, Medizinische Hochschule Hannover, Germany

**Daniel I. Swerdlow**, University College London, UK  
*Heart FailuRe Molecular Epidemiology for Therapeutic Targets (HERMES) Consortium: Design of a Collaborative Genetic Meta-Analysis Investigating Causal Pathways in Heart Failure*

**J. Gustav Smith**, Lund University, Sweden  
*Discovery and Initial Characterization of Genetic Variation on Chromosome 5q22 Associated with Mortality in Heart Failure*

**Lek Wen Tan**, Genome Institute of Singapore, Singapore  
*Circular RNA Landscape in Human and Mouse Heart*

**Anthony Cammarato**, Johns Hopkins University, USA  
*Influence of Actin Pseudo-Acetylation on in vivo and in vitro Cardiac Performance*

**Yasmine Aguib**, Aswan Heart Centre, MYF, Egypt  
*Defining the Genetic Architecture of Cardiomyopathy within the Egyptian Population*

**Saptarsi M. Haldar**, Gladstone Institutes and University of California, San Francisco, USA  
*Therapeutic Targeting of Chromatin-Dependent Signaling in Heart Failure*

**Selvi Celik**, Lund University, Sweden  
*Atrial Natriuretic Peptide Expression is Negatively Regulated by a Long Noncoding Antisense RNA Transcript (NPPA-AS1) in Human Cardiomyocytes*

**Rudolf J. Wiesner**, University of Cologne, Germany  
*Mosaic Mitochondrial Respiratory Chain Deficiency Causes Cardiac Arrhythmia during Aging*

#### Cardiovascular Tissue and Organs on Chips (Joint)

\***Karl Tryggvason**, Karolinska Institutet, Sweden

**Thomas Eschenhagen**, University Medical Center Hamburg-Eppendorf, Germany  
*Dissecting Gene Variant Effects with Tissue Models*

**Christopher S. Chen**, Boston University, USA  
*Mechanoregulation of Form and Function: A Story of Cell Adhesion and the Cytoskeleton*

**Eric N. Olson**, University of Texas Southwestern Medical Center, USA  
*Myoediting: Correction of DMD by CRISPR/Cas9 Gene Editing*

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**Kevin Beussman**, University of Washington, USA  
*Short Talk: Intracellular Assessment of the Maturation of Excitation-Contraction Coupling in Human Stem Cell-Derived Cardiomyocytes*

### Poster Session 1

#### TUESDAY, APRIL 5

##### Cardiac Morphogenesis and Regeneration (Z2)

\***Benoit G. Bruneau**, Gladstone Institute of Cardiovascular Disease, USA

**Jonathan A. Epstein**, University of Pennsylvania, USA  
*Nuclear Architecture and Cardiac Development*

**Eldad Tzahor**, Weizmann Institute of Science, Israel  
*Novel Insights into Cardiac Regeneration*

**Kristy Red-Horse**, Stanford University, USA  
*Growth and Patterning of Coronary Arteries*

**Neil C. Chi**, University of California, San Diego, USA  
*Cellular and Genetic Dissection of Cardiovascular Development and Regeneration*

**Ignacio Flores**, Centro Nacional de Investigaciones Cardiovasculares, Spain  
*Short Talk: Telomerase is Essential for Zebrafish Heart Regeneration*

**Tilde Eskildsen**, Odense University Hospital, Denmark  
*Short Talk: Defining the Earliest Step of Cardiovascular Development Using CRISPR Genome Editing Technology*

##### Sarcomere Genetics: So What's New? (Z1)

\***Norbert Hubner**, , Germany

\***Carolyn Ho**, Brigham and Women's Hospital, USA

**Stuart A. Cook**, Duke-NUS Graduate Medical School Singapore, Enleofen, Singapore  
*Disease Mechanisms in Titin Cardiomyopathy*

**Christine E. Seidman**, Harvard Medical School, USA  
*Genetic (and Other) Antidotes for Cardiomyopathy*

**Richard L. Moss**, University of Wisconsin, Madison, USA  
*Modulation of Sarcomeres via MYBPC3*

**Leslie A. Leinwand**, University of Colorado Boulder, USA  
*Myosin Myopathies: Pathogenesis and Potential Therapeutics*

**Hugh Watkins**, University of Oxford, UK  
*Sequencing Sarcomeric (and Other Genes) in Cardiomyopathy*

##### Differentiation and Characterization of Cardiomyocytes from Pluripotent Stem Cells (Z2)

\***Martina Brueckner**, Yale University School of Medicine, USA

**David A. Elliott**, Murdoch Childrens Research Institute, Australia  
*Generating Cellular Diversity during Human Cardiovascular Development*

**Bernd K. Fleischmann**, Bonn University, Germany  
*Assessing Plasticity of Cardiomyocytes Using Pluripotent ES-Cell and Mouse Models*

**Godfrey Smith**, University of Glasgow, UK  
*The Pharmacology of iPS-Derived Cardiomyocytes*

**Sanjay Sinha**, University of Cambridge, UK  
*Short Talk: Human Pluripotent Stem Cell-Derived Epicardium Promotes Cardiomyocyte Maturation and Contraction in Tissue-Engineered Cardiac Constructs*

##### Systems Dissection of Cardiac Failure (Z1)

\***Yigal M. Pinto**, University of Amsterdam, Netherlands

**Norbert Hubner**, , Germany  
*Dissecting the Genetic Basis of Translational Regulation in Heart Failure*

**Andrew R. Marks**, Columbia University College of Physicians and Surgeons, USA  
*Towards a Structural Basis of Complex Disorders of the Heart: Calcium Leak and Mitochondria*

### Poster Session 2

#### WEDNESDAY, APRIL 6

##### Human Pluripotent Stem Cells as Models of Cardiovascular Disease (Z2)

\***Stacey L. Rentschler**, Washington University School of Medicine, USA

**Joseph C. Wu**, Stanford University School of Medicine, USA  
*Cardiac iPSCs for Disease Modeling and Drug Discovery*

**Lior Gepstein**, Technion-Israel Institute of Technology, Israel  
*iPS Modeling of Cardiac Disease: Arrhythmias and Heart Failure*

**Christine L. Mummery**, Leiden University Medical Center, Netherlands  
*Human iPS Cell Models of Heart and Blood Vessel Disease*

**Kiran Musunuru**, University of Pennsylvania, USA  
*Genome Editing of Human Pluripotent Stem Cells to Generate Human Cellular Disease Models*

**Zhen Ma**, University of California, Berkeley, USA  
*Short Talk: Biomaterial-Guided Isogenic iPS Disease Modeling of Hypertrophic Cardiomyopathy*

**Yuta Yamamoto**, Kyoto University, Japan  
*Short Talk: Modeling of Long-QT Syndrome Associated with a Calmodulin Mutation using Human Induced Pluripotent Stem Cells*

##### Aging Hearts (Z1)

\***Leslie A. Leinwand**, University of Colorado Boulder, USA

\***Gerald W. Dorn, II**, Washington University School of Medicine, USA  
**Jeffrey Robbins**, Cincinnati Children's Hospital Medical Center, USA  
*Interplay of Proteotoxicity, Heart Failure and Autophagy*

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**Richard T. Lee**, Harvard University, USA  
*Systemic Factors and Cardiac Aging*

**Jeffery D. Molkentin**, Cincinnati Children's Hospital Medical Center, USA  
*Genetic Lineage Tracing Defines Myofibroblast Origin and Function in the Injured Heart*

**Joseph A. Hill**, University of Texas Southwestern Medical Center, USA  
*Autophagy and Heart Disease*

**Rolf Bodmer**, Sanford-Burnham Medical Research Institute, USA  
*Short Talk: Preserving Heart Function despite Obesity, Aging and Parental Diet*

**Eleonora Adami**, Max Delbrück Center for Molecular Medicine, MDC, Germany  
*Short Talk: Ribo-Seq Provides a Genome-Wide View of Translational Control in the Diseased Human and Rat Heart*

### Vascular Development and Disease (Z2)

**Anne C. Eichmann**, Yale University School of Medicine, USA  
*Signalling in Vascular Development and Function*

**Zoltan P. Arany**, University of Pennsylvania, USA  
*Vascular Metabolism and Disease*

**Stefanie Dimmeler**, University of Frankfurt, Germany  
*Non-Coding RNAs in Cardiovascular Repair*

**Alexandria Afonso**, McMaster University, Canada  
*Short Talk: Modeling Genetic Determinants of Early-Onset Coronary Artery Disease using Patient-Derived Induced Pluripotent Stem Cells*

**Naoko Koyano-Nakagawa**, University of Minnesota, USA  
*Short Talk: Feedback Mechanisms Regulate Ets variant 2 (Etv2) Gene Expression and Hematoendothelial Lineages*

### Molecular Aspects of Muscle Cell Contractility and Relaxation (Z1)

\***Jeffrey Robbins**, Cincinnati Children's Hospital Medical Center, USA

\***Stefan Engelhardt**, Technical University of Munich, Germany

**Wolfgang A. Linke**, University of Munster, Germany  
*Titin Elasticity Impacts Diastolic and Systolic Function*

**David Warshaw**, University of Vermont, USA  
*Molecular Mechanics of MYBPC3*

**Gerald W. Dorn, II**, Washington University School of Medicine, USA  
*Mitochondrial Triage: Dynamism Determines Quality Control*

**Nina de Groot**, University of Amsterdam, Netherlands  
*Short Talk: Rbm24 Influences the force-Ca<sup>2+</sup> Relation in Heart Muscle*

**Ryan L. Boudreau**, University of Iowa, USA  
*Short Talk: The Cardiac microRNA-target Interactome Reveals a Novel miR-24:SCN5A:SNP Interaction Associating with Non-Arrhythmic Death in Heart Failure*

### Poster Session 3

#### THURSDAY, APRIL 7

#### Novel Therapeutic Approaches to Fix Broken Hearts (Joint)

\***Joseph C. Wu**, Stanford University School of Medicine, USA

**Paul R. Riley**, University of Oxford, UK  
*Developmental Programming of the Cardiac Lymphatics towards Heart Repair*

**Kenneth D. Poss**, Duke University Medical Center, USA  
*Endogenous Heart Regeneration Programs*

**Charles E. Murry**, University of Washington, USA  
*Cardiogenesis with Human Pluripotent Stem Cells*

**Karl Tryggvason**, Karolinska Institutet, Sweden  
*Using Laminins to Generate Therapeutic Cardiomyocytes from hES Cells*

**Anna Blice-Baum**, Johns Hopkins University, USA  
*Short Talk: Titered FOXO Overexpression Maintains Cardiac Proteostasis and Ameliorates Age-Associated Functional Decline*

**Palmer Yu**, Gladstone Institutes, USA  
*Short Talk: Regeneration of Cardiomyocytes in vivo Using Human Cardiac Reprogramming Factors in a Pig Model*

#### Cardiomyocyte Maturation, Proliferation and Cardiac Remodeling (Z2)

\***Bernd K. Fleischmann**, Bonn University, Germany

**Anthony J. Muslin**, Sanofi Global Research & Development, USA  
*Signal Transduction Pathways Related to Cardiac Hypertrophy*

**Jose Luis de la Pompa**, Centro Nacional de Investigaciones Cardiovasculares, Spain  
*Notch Signaling in Ventricular Chamber Development and Disease*

**Thomas Braun**, , Germany  
*The Role of Dedifferentiated Cardiomyocytes in the Diseased Myocardium*

#### Epigenetics and miRNAs: Muscle Failure and Arrhythmia Predisposition (Z1)

\***Esther E. Creemers**, Academic Medical Center, Netherlands

\***Joseph A. Hill**, University of Texas Southwestern Medical Center, USA

**Stefan Engelhardt**, Technical University of Munich, Germany  
*MiRNAs from Non-Muscle Cells*

**Roger Foo**, Genome Institute of Singapore, Singapore  
*What Single Cell Genomics Can Tell Us About Heart Failure*

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**Yigal M. Pinto**, University of Amsterdam, Netherlands  
*Role of Cardiac Specific RNA Binding Proteins in Regulating miRNA Function*

**Meeting Wrap-Up: Outcomes and Future Directions (Organizers)**  
(Z2)

**Meeting Wrap-Up: Outcomes and Future Directions (Organizers)**  
(Z1)

**FRIDAY, APRIL 8**

**Departure**