Cardiac Physiome WORKSHOP

October 31 - November 2, 2012
Catamaran Resort Hotel in San Diego, California

www.nbcr.net/cardiacphysiome
**Tuesday, October 30**
5:30-7:00 p.m.  **WELCOME RECEPTION**  
**CATAMARAN RESORT PATIO**

**Wednesday, October 31**
7:30 a.m.  **CONTINENTAL BREAKFAST**  
**ROUSSEAU FOYER**

8:30 a.m.  **OPENING REMARKS**  
**ANDREW MCCULLOCH AND PETER ARZBERGER**

8:45 a.m.  **PLENARY LECTURE: MICHAEL REGNIER, Seattle**  
Combining Computational and Experimental Approaches to Study Myofilament Structure-Function in Normal and Diseased Cardiac Muscle  
**CHAIR: ANDREW MCCULLOCH, La Jolla**

9:30 a.m.  **COFFEE BREAK**  
**ROUSSEAU FOYER AND SUITE**

**CARDIAC ELECTROPHYSIOLOGY, CHAIR: DAVID PATERSON, Oxford**  
9:45 a.m.  **Sex, Drugs and Funky Rhythms In Silico**  
**COLLEEN CLANCY, Davis**

10:00 a.m.  **Markov Models of Use-dependence and Reverse Use-dependence During the Mouse Cardiac Action Potential**  
**RANDALL RASMUSSON, Buffalo**

10:15 a.m.  **Fine-Tuning of Cardiac Automaticity by Mitochondria Sodium-Calcium Exchange**  
**SATOSHI MATSUOKA, Kyoto**

10:30 a.m.  **Mathematical Models of the Action Potential in Human Ventricle in Relation to Safety Pharmacology**  
**WAYNE GILES, Calgary**

10:45 a.m.  **Discussion**

11:00 a.m.  **DISCUSSION OF JOURNAL OF PHYSIOLOGY SPECIAL ISSUE**  
**CHAIR: DAVID PATERSON, Oxford**

11:15 a.m.  **POSTER FLASH PRESENTATIONS, CHAIR: NICOLAS SMITH, London**

12:00 p.m.  **POSTERS AND BOXED LUNCH**  
**ROUSSEAU FOYER AND SUITE**

**MYOFILAMENTS, CHAIR: HENK TER KEURS, Calgary**  
1:45 p.m.  **Frank-Starling’s Law of the Heart: Myofilament length-Dependent Activation**  
**PIETER DE TOMBE, Chicago**

2:00 p.m.  **Phosphorylation of S-282 in Cardiac Myosin Binding Protein-C is Sufficient to Nearly DoubleMgADP Release Rate from Myosin Cross-Bridges in Mouse Myocardium**  
**BERT TANNER, Burlington**

2:15 p.m.  **ODE-Based Model of Myofilaments: Keeping up with Times**  
**JEREMY RICE, Yorktown Heights**

2:30 p.m.  **Models of Co-operative Sarcomere Dynamics for Multi-Scale Heart Simulation**  
**SEIRYO SUGIURA, Tokyo**

2:45 p.m.  **Cross-Bridge Kinetics in Intact Multicellular Cardiac Rat, Rabbit, and Human Muscles at Body Temperature**  
**PAUL JANSSSEN, Columbus**

3:00 p.m.  **Discussion**

3:15 p.m.  **COFFEE BREAK**  
**ROUSSEAU FOYER AND SUITE**

**EXCITATION-CONTRACTION COUPLING, CHAIR: DON BERS, Davis**  
3:45 p.m.  **Cell Membrane Microanatomy and L-Type Calcium Channel Distribution Modulate Calcium Dynamics in Ventricular Myocytes**  
**ANUSHKA MICHAIOLOVA, La Jolla**
4:00 p.m. Regulation of Cardiac Calcium Sparks: Insights Provided by Sensitivity Analysis of Stochastic Models  
ERIC SOBIE, New York

4:15 p.m. Compensation and Decompensation of Cardiomyocyte Calcium Homeostasis During Heart Failure Progression  
WILLIAM LOUCH, Oslo

4:30 p.m. How does Unstable Intracellular Calcium Cycling Induce Spatially Discordant Alternans of Action Potential Duration in Tissue?  
DAISUKE SATO, Davis

4:45 p.m. Cardiac Deformation in the Normal Cycle and Electrical Responses to Point Stimulation  
PETER KOHL, London

5:00 p.m. Discussion  

5:15 p.m. POSTERS AND REFRESHMENTS  
ROUSSEAU FOYER AND SUITE

6:30 p.m. Dinner on your own

Thursday, November 1

7:30 a.m. CONTINENTAL BREAKFAST  
ROUSSEAU FOYER

8:45 a.m. PLENARY LECTURE: NATALIA TRAYANOVA, Baltimore  
Modeling Cardiac Rhythm Disorders  
CHAIR: JAMES BASSINGTHWAIGHTE, Seattle

9:30 a.m. COFFEE BREAK  
ROUSSEAU FOYER AND SUITE

9:45 a.m. Mechanisms of Early Afterdepolarizations Prior to Heart Failure in the CaMKIIδc Transgenic Mouse  
ANDY EDWARDS, La Jolla

10:00 a.m. Arrhythmogenic Responses Triggered by Dynamic Changes in Autonomic Tone  
ROBERT HARVEY, Reno

10:15 a.m. Cooperativity in PKA Activation and cAMP Diffusion in Localized Microdomains of Adult Cardiomyocytes  
BRITTON BORAS, La Jolla

10:30 a.m. Control of Energy Metabolism and Substrate Utilization in Cardiac and Skeletal Muscle in Health and Disease  
DAN BEARD, Milwaukee

10:45 a.m. Network Reconstruction and Systems Analysis of Cardiac Myocyte Hypertrophy Signaling  
JEFFREY SAUCERMAN, Charlottesville

11:00 a.m. Discussion  

11:15 a.m. POSTER FLASH PRESENTATIONS, CHAIR: PETER HUNTER, Auckland  
KON TIKI BALLROOM

12:00 p.m. POSTERS AND BOXED LUNCH  
ROUSSEAU FOYER AND SUITE

1:45 p.m. Localized Sources for Cardiac Fibrillation  
SANJIV NARAYAN, La Jolla

2:00 p.m. Study of the Effect of Rapid Pacing from the Septum Area on Atrial Fibrillation  
NATHALIE VIRAG, Lausanne

2:15 p.m. Insights into the Mechanisms of Ventricular Fibrillation in the Human Heart: Experiments and Models  
RICHARD CLAYTON, Sheffield

2:30 p.m. Beyond Channel Blocking: Anti-Arrhythmic Strategies from Bifurcation Theory  
ALAN GARFINKEL, Los Angeles

2:45 p.m. Towards Modeling Arrhythmogenic Cardiomyopathy - Can Simulation Shed Light on a Complex Disease Process?  
MOLLY MALECKAR, Oslo

3:00 p.m. Discussion
3:15 p.m. **COFFEE BREAK**

**VENTRICULAR ELECTROMECHANICS, CHAIR: PETER HUNTER, Auckland**

3:45 p.m. Computational Analysis of 15-Lead ECG System Using an Electromechanical Model of the Heart  
**EUN BO SHIM, Chuncheon**

4:00 p.m. Structural Imaging and Modelling the Mechanics of Heart Failure  
**MARTYN NASH, Auckland**

4:15 p.m. Towards Patient-Specific Simulations of Strongly Coupled Cardiac Electro-Mechanics  
**JOAKIM SUNDNES, Oslo**

4:30 p.m. Integrating Patient-Specific Models with Growth and Remodeling  
**ROY KERCKHOFFS, La Jolla**

4:45 p.m. Applying Personalised Computational Modelling to Clinical Cardiology  
**STEVE NIEDERER, London**

5:00 p.m. Discussion

5:15 p.m. **POSTERS**

7:00 p.m. **COCKTAILS**

7:00 p.m. **CONFERENCE DINNER**

**FRIDAY, NOVEMBER 2**

7:30 a.m. **CONTINENTAL BREAKFAST**

8:45 a.m. **PLENARY LECTURE: NICOLAS SMITH, London**  
Of Mice and Men and Multi-scale Cardiac Modelling  
**KON TIKI BALLROOM**  
**CHAIR: PETER HUNTER, Auckland**

9:30 a.m. **COFFEE BREAK**

**CLINICAL IMAGE-BASED MODELING, CHAIR: ROY KERCKHOFFS, La Jolla**

9:45 a.m. The Cardiac Atlas Project: Data Sharing for Population Modeling  
**ALISTAIR YOUNG, Auckland**

10:00 a.m. Shape Determines Non-Uniformity in Intramural Myocardial Mechanics In the Left Ventricle and Atrium  
**PIET CLAUS, Leuven**

10:15 a.m. Simulations for Improved Risk Stratification in Patients With Kawasaki Disease  
**ALISON MARSDEN, La Jolla**

10:30 a.m. Image Based Modeling of Atrial Arrhythmias  
**ROB MACLEOD, Salt Lake City**

10:45 a.m. Towards Personalized Clinical In-Silico Modeling of Atrial Anatomy and Electrophysiology  
**GUNNAR SEEMANN, Karlsruhe**

11:00 a.m. Discussion

11:15 a.m. **DISCUSSION ABOUT PAPERS AND FUTURE MEETINGS**

11:55 a.m. **CLOSING REMARKS**  
**ANDREW MCCULLOCH**

12:00 p.m. **POSTERS AND BOXED LUNCH**

1:00 p.m. **MEETING CONCLUDES**
1. HERMENEGILD AREVALO, Johns Hopkins University
   MRI-Based Models Of Patient-Specific Hearts With Ischemic Disease Can Predict SCD Risk

2. JASON BAYER, Johns Hopkins University Schools of Medicine
   Spatially Discordant Alternans In Action Potential Voltage Increase Arrhythmia Vulnerability In Human Heart Failure

3. LAURA BEAR, Auckland Bioengineering Institute
   Inverse Analysis of Body Surface Potentials with Simultaneous Epicardial and Endocardial Mapping

4. CHIARA BELLINI, University of Calgary and Universite Bordeaux
   Computational Models of the Left Atrium for the Study of Atrial Fibrillation

5. BOJAN BLAZEVIC, King’s College London and Medical University of Graz
   Can We Routinely Build Patient-Specific Models of CRT from Clinical Data?

6. PATRICK BOYLE, Johns Hopkins University
   A Computational Framework for Simulating Cardiac Optogenetics

7. MASHID BOZORGIZADEH, University of Sheffield
   How is Dynamic Electrical Activity in the Heart Influenced by Tissue Structure?

8. SCOTT BUGENHAGEN, Medical College of Wisconsin
   A Minimal Model of the Cardiac Ca2+/Calmodulin-Dependent Protein Kinase II holoenzyme

9. ALFONSO BUENO OROVIO, University of Oxford
   Fraction Diffusion Models of Electrical Propagation In Cardiac Tissue: Electrotonic Effects And Modulated Dispersion Of Repolarization

10. STUART CAMPBELL, Yale University
    Aging Alters Ventricular Torsion and the Transmural Distribution of Myocyte Contractile Properties

11. LEAH CANNON, Sanford Burnham Medical Research Institute
    Odd-skipped up-regulation compensates for aging-related changes in the Drosophila heart

12. RADOMIR CHABINIOK, King’s College London
    Myocardial Perfusion Modeling From Clinical Data

13. KELLY CHANG, Johns Hopkins University
    Reduced Inactivation of Ryanodine Receptors in Atrial Fibrillation Drives Alternans at Slow Rates

14. ANDREW CROZIER, King’s College London and University of Oxford
    Determining Indicators of CRT Response Through Computation Modelling

15. BERNARDO DE OLIVEIRA, Simula Research Laboratory
    Multiple Mechanoelectrical Feedback Mechanisms Affect Conduction Velocity

16. TAMMO DELHAAS, Maastricht University
    CircAdapt: a User-Friendly Learning Environment for Cardiovascular (Patho)physiology

17. SUKRITI DEWAN, UC San Diego and Loyola University Chicago
    Altered Cross-Bridge Relaxation Kinetics and Myofilament Phosphoproteome in Guinea Pig Heart Failure

18. THOMAS FRITZ, Karlsruhe Institute of Technology
    Finite Element Analysis of the Contraction of the Heart within the Pericardium: A Frictionless Contact Problem

19. ZHUOHUI GAN, UC San Diego and Gladstone Institute, UC San Francisco
    MAAMD: A Workflow to Standardize Meta-Analyses of Affymetrix Microarray Data

20. SARA GATTONI, King’s College London
    Modelling Calcium Dynamics in the Rat Cardiac Myocyte

21. NAMIT GAUR, Simula Research Laboratory and UC San Diego
    Multiscale Modeling of Ca Cycling in Ventricular Myocytes: Whole-Cell Effects of Dyadic Properties
22. STEPHEN GILBERT, University of Leeds  
Myocardial 3D Structural Measurement: Comparison of DTMRI and Structure Tensor of High Resolution MR

23. MATTHEW GONZALES, UC San Diego  
Rotor Dynamics in Patient-Specific Biventricular Finite Element Models

24. MYRIANTHI HADJIRCHARALAMBOUS, King’s College London  
Weak Penalization Method - A Novel Approach to Incompressibility in Cardiac Mechanics

25. JOHAN HAKE, Simula Research Laboratory  
Altered Configurations of Ca2+ Release Units Cause Slowed Ca2+ Sparks in Failing Cardiomyocytes

26. YUKIKO HIMENO, Ritsumeikan University and Advanced Scientific Technology & Management Research Institute of Kyoto  
Development of an ANS-Regulated Cardiovascular Model Based on Cellular & Molecular Mechanisms

27. DEL RAY JACKSON, University of Nevada School of Medicine  
Simple Models of Muscle Regulation & Contraction

28. PETER KEKENES HUSKEY, UC San Diego  
Calcium Dynamics in Rabbit Ventricular Myocytes

29. SHANKARJEE KRISHNAMOORTHI, UC Los Angeles  
Numerical Quadrature and Operator Splitting for Cardiac Electromechanics

30. ADARSH KRISHNAMURTHY, UC San Diego  
Multi-Scale Constitutive Model Of Active Myocardial Mechanics

31. ADARSH KRISHNAMURTHY, UC San Diego  
Acute CRT Response Correlates With Regional Variation In Work Density From Patient-Specific Ventricular Models

32. GEOFFREY KUNG, UC Los Angeles  
Microstructural Border Zone Remodeling in the Post-Infarct Porcine Heart Measured by DT- and LGE-MRI

33. SANDER LAND, University of Oxford  
Beta-Adrenergic Stimulation Maintains Cardiac Function in Sereca2 Knockout Mice

34. JACK LEE, King’s College London  
Coronary Flow and Perfusion-Contraction Coupling in the Left Ventricle

35. PAN LI, UC San Diego  
A Model of Cardiac Thin Filament Activation with PKA and CaMKII Regulation

36. JUSTIN LICHTER, University of Utah  
Cytoskeletal Remodeling of Cardiac Ventricular Myocytes During Heart Failure

37. JOOST LUMENS, Maastricht University Medical Center  
Left Ventricle Versus Biventricular Pacing in the Failing Heart with Left Bundle-Branch Block

38. XIAOYU LUO, University of Glasgow, Xian Jiaotong University and New York University  
Finite Strain Modeling of Human Left Ventricle

39. STEPHANIE MARCHESSEAU, INRIA  
Cardiac Mechanical Model Calibration Based on the Unscented Transform

40. GARY MIRAMS, University of Oxford  
Evaluation of an In-Silico Pro-Arrhythmic Safety Assay

41. MICHAEL MOULTON, University of Nebraska Medical Center  
A Low Order Dynamical Model of the Left Ventricle for Clinical Applications

42. LUIGI PEROTTI, UC Los Angeles  
Computational Modeling Requirements to Produce an Accurate ECG

43. EMILY PFEIFFER, UC San Diego  
Stretch Modulation of Cardiomyocyte Conduction

44. SARAH PILOTO, Sanford Burnham Medical  
Roles for Hif1α/sima and Small Heat Shock Protein 23 (Hsp23) in Ischemia/Reperfusion-Induced Cardiac Injury in Drosophila

45. JOSE PUGLISI, UC Davis  
Feed Forward Modelling, Fixing the Force-Frequency Relationship
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It is our pleasure to welcome you to the 2012 Cardiac Physiome Workshop in San Diego! We are excited by the high quality of presentations, continued from previous years, and the participation of so many graduate students and postdocs. We look forward to vibrant scientific interactions and fruitful discussions that will continue to promote new collaborations and advance our growing field. Last but not least, we are grateful to the NBCR staff who helped with the organization and the financial support of all of our sponsors for helping to make this year’s workshop possible.