

2015 Cardiac Physiome Workshop

ANZ Viaduct Events Centre, Auckland, New Zealand
April 8-10, 2015

Wednesday 8th April

09:00 [Software Demonstrations and Publication of Computational Data](#)

Venue: Auckland Bioengineering Institute

17:00 Registration and opening reception
Room: Kawau 2

20:00 Cardiac Physiome Society meeting
Room: Kawau 2

Thursday 9th April (Room: Kawau 1)

08.00 Registration + tea/coffee

08:50 Opening Remarks

THEME 1 – CARDIAC MECHANICS

Chair: Alistair Young University of Auckland

09:00 **Plenary speaker:** **Andrew McCulloch** (University of California, San Diego)
Multi-Scale Modeling of Cardiac Mechanics in Murine Heart Failure

09:50 Break & Poster Viewing

10:20 **Nic Smith** (University of Auckland)

Multi-scale computational modelling of coronary blood flow

10:40 **Ki Moo Lim** (Kumoh Institute of Technology)

Computational prediction for effects of valvular regurgitation on IABP function using a 3D cardiac mechanics model

11:00 **Charles Taylor** (Heartflow Inc & Stanford University)

Non-invasive fractional flow reserve derived from coronary CT angiography: clinical data and scientific principles

11:20 **Michael Sacks** (University of Texas at Austin)

Estimation of fully three-dimensional properties of passive myocardium: a coupled inverse model-experimental study

11:40 Discussion

12:00 Poster teaser presentations

12:30 Lunch & Poster viewing

THEME 2 – DEVELOPMENT & TISSUE REMODELLING

Chair: David Paterson University of Oxford

13:30 **Plenary speaker:** **Sally Dunwoodie** (Victor Chang Cardiac Research Institute)
Exploring the genetic and environmental drivers of cardiogenesis and congenital heart disease

14:20 Break & Poster viewing

14:50 **Lauren Fovargue** (KCL)

Understanding cardiac resynchronisation therapy patient selection through modelling

15:20 **Christopher Villongco** (UCSD)

Cardiac resynchronization therapy reduces negative myocardial work in patient-specific models of dyssynchronous heart failure

15:40 **Vicky Wang** (University of Auckland)

Mechanical analysis of structural and functional remodelling in heart failure

16:00 **Tammo Delhaas** (Maastricht University)

Determinants of cardiac function in a biventricular finite element model: geometry versus myofiber orientation

16:20 Discussion

16:40 Poster session and social hour drinks

Friday 10th April (Room: Kawau 1)

08:30 Registration + tea/coffee

THEME 3 – CELL & MOLECULAR PROCESSES

Chair: Edmund Crampin University of Melbourne

09:00 **Plenary speaker:** **Carol Robinson** (University of Oxford)
A new view of membrane embedded complexes in cells

09:50 **Break & Poster viewing**

10:20 **Gary Mirams** (University of Oxford)
Experimental design and inference for ion channel model selection and calibration

10:40 **Vijay Rajagopal** (University of Melbourne)
Examination of the effects of heterogeneous organization of RyR clusters, myofibrils and mitochondria on Ca²⁺ + release patterns in cardiomyocytes

11:00 **Georges Christé** (Université Claude Bernard Lyon 1)
Role of the I_{Kr} current in potassium ions accumulation during an ischemia. Simulations in a human ventricular myocyte computer model

11:20 **Denis Loiselle & Andrew Taberner** (University of Auckland)
Measuring global cardiac mechano-energetics at the Auckland Bioengineering Institute

11:40 Discussion

12:00 **Lunch & Poster Viewing**

THEME 4 – CARDIAC ELECTROPHYSIOLOGY

Chair: Nic Smith University of Auckland

13:00 **Plenary speaker:** **Bruce Smaill** (University of Auckland)
Images of cardiac electrical activation

13:50 **Break**

14:20 **Sasha Panfilov** (University of Gent)
Role of small sized heterogeneities in the onset and perpetuation of cardiac arrhythmias

14:40 **Richard Walton** (Université de Bordeaux)
Uni-directional propagation at short coupling intervals through the muscular compartment of the right ventricular conduction network

15:00 **Peter Kohl** (Imperial College London)
Debunking mechanisms and determinants of mechanical induction of cardiac arrhythmias: experimental validation of modelling predictions made a decade ago.

15:20 **Axel Lowe** (Karlsruhe Institute of Technology)
In silico assessment of the dynamic effects of amiodarone and dronedarone on human atrial patho-electrophysiology

15:40 Discussion

16:00 Closing Remarks

16.30-
18.00 At own leisure

18.00- **Conference Dinner**

Saturday 11th April

All day

[Cardiac electrophysiology satellite meeting](#)
Room: Kawau 2

Poster Listing

Theme 1 – Cardiac Mechanics

- 1 Bianca Freytag UoA Field-Based Parameterisation Of Left Ventricular Microstructure From Diffusion Tensor Magnetic Resonance Images
- 2 Anton Koshelev Ural Federal University Mathematical model of the basal and apical regions of the left ventricle of the heart
- 3 Renee Miller UoA Determining Anisotropic Myocardial Stiffness from Simulated Magnetic Resonance Elastography with Gaussian Noise
- 4 Luigi Perotti UCLA Identification of Unique Material Properties for Passive Myocardium
- 5 Aditya Ponnaluri UCLA Material Point Validation for an Electromechanical Viscoactive Myocardium Constitutive Model
- ~~6 Michael Sacks U Texas at Austin Myofiber-Collagen fiber mechanical interactions in normal and hypertrophied right ventricle free wall myocardium~~
- 7 Shimayoshi Takao Kyoto University Influence of Cellular Level Transmural Heterogeneity on Left Ventricular Energetic Efficiency: A Theoretical Study
- 8 Sugiura Seiryō The University of Tokyo Multi-scale, multi-physics simulations of congenital heart disease and its surgical repair
- 9 Zhinuo (Jenny) Wang UoA Estimation of myocardial contractile stress transients using subject-specific MR imaging and haemodynamic data
- 10 Vladimir Zverev Ural Federal University Extension of a one-dimensional model of the heart muscle strand to the simple three-dimensional domain
- 11 Kim Mellor UoA Normotensive cardiac hypertrophy is associated with reduced contractile performance but increased efficiency in isolated cardiac trabeculae

Theme 2 – Development & Tissue Remodelling

- 12 Nazanin Ebrahimi UoA Towards a Multi-scale Systems Biology Model of the Developing Heart
- 13 Jagir Hussan UoA Modelling intracellular mechanical events using geometric metamorphosis
- 14 Alex Wilson UoA Structural and functional relationships in cardiac remodelling
- 15 Jaeboum Youm College of Medicine, Inje University Spontaneous oscillation of Na⁺/Ca²⁺ exchanger currents reflects the role of Ca²⁺ clock-dependent pacemaker mechanism in human embryonic stem cell derived cardiomyocytes
- 16 Brian Carlson University of Michigan Quantitative Assessment of the Coupling of Theoretical Fibroblast and Cardiomyocyte Models

Theme 3 – Cell & Molecular Processes

17	A.J. Bakermans	Academic Medical Center	Localized 31P-MRS of the human heart - towards dynamic assessments of myocardial energy metabolism at multiple cardiac work rates
18	Karen Cardona Urrego/Oscar Camara	Universitat Pompeu Fabra	In-silico Analysis of influence of fibroblasts in the generation of late potentials in conducting channels
19	Ming Cheuk	UoA	OCT imaging of isolated cardiac trabeculae: adding a new dimension to the study of contracting cardiac muscle preparations
20	Georges Christé	Université Lyon 1	Contributions of multiple tetrameric arrangements of HCN1 and HCN4 subunits to the generation of If during a cardiac cycle in a model of single sino-atrial node cell
21	Richard Clayton	University of Sheffield	Uncertainty and sensitivity analysis of cardiac cell models using statistical emulators
22	Martin Falcke/Stephen Gilbert	Max Delbrück Center for Molecular Medicine	A model of the rabbit ventricular cardiomyocyte with spatially resolved calcium cycling
23	Garcia Cañadilla, Patricia	Universitat Pompeu Fabra	Two-dimensional mechanical model of a cardiomyocyte to assess the local inhomogeneities within the cell
24	June-Chiew Han	UoA	Mechanical efficiency of the diabetic heart at organ and tissue levels
25	Prashanna Khwaounjoo	UoA	Fibrosis and sudden cardiac death
26	Ki Moo Lim	Kumoh National Institute of Technology	Computational Prediction of Effect of V241F Mutation on Human Ventricular Fibrillation under Fibrotic Condition
27	Denis Loiselle	UoA	Does AV Hill's 'Shortening Heat' exist in Cardiac Muscle?
28	Toan Pham	UoA	Interventricular Comparison of force-frequency and heat-frequency relationships at 37°C in isolated rat ventricular trabeculae
29	Jaeboum Youm	College of Medicine, Inje University	Neuronal nitric oxide synthase modulation of L-type Ca ²⁺ channel activity in cardiac myocytes from normal and hypertensive rat
30	John Gennari	University of Washington	Legacy Computational Model Annotation, Visualization and Merging with SemGen

Theme 4 – Cardiac Electrophysiology

31	Jesse Ashton	UoA	Impulse conduction in the right atrium during baroreflex induced bradycardia
32	Bryan J. Caldwell	SUNY Upstate Medical University, Syracuse, NY, USA	Cardiac response to weak electrical shocks challenges the functional syncytium paradigm
33	Judit Chamorro Servent	UoA	Reconstructing atrial fibrillation: New inverse method for intracardiac electro-anatomic mapping
34	Andrew Crozier	Medical Uni of Graz	High Resolution Personalised Modelling of Cardiac Electromechanics
35	Thomas Fastl	KCL	Towards a Modeling Pipeline for Atrial Electromechanics

36	Guardiola Garcia, Marta	Universitat Pompeu Fabra	Computational electrophysiology for prediction of the outflow tract origin in idiopathic ventricular tachycardia
37	Kristen McLeod		Fast Sweeping Vs. Fast Marching for Eikonal Methods of Electrophysiology – A Potential for Significantly More Efficient Computation?
38	Jun-ichi Okada	The University of Tokyo	Cardiac safety assessment of drug effects based on combining automated patch clamp and three dimensional excitation propagation analyses
39	Sasha Panfilov	U Gent	Global alternans instability and its effect on wave propagation: dynamical Wenckebach block and self terminating spiral waves
40	Luigi Perotti	UCLA	The Electrophysiology of Heart Failure: Computational Modeling, Validation, and Evaluation of Ventricular Fibrillation
41	Aditya Ponnaluri	UCLA	Modeling Cardiac Electrophysiology: The Electrocardiogram and Interventional Therapies for Ventricular Fibrillation
42	Indana Zulfa/Ki Moo Lim	Kumoh National Institute of Technology	Simulation Study of the Effect of G229D on KCNQ1 Mutation in the Occurrences of Atrial Fibrillation
43	Tammo Delhaas	Maastricht University	TBA

******LATE BREAKING POSTERS ******

44	Kalyan Vinnakota	University of Michigan	Feedback regulation and time hierarchy of oxidative phosphorylation in cardiac mitochondria
45	Daniel Beard	University of Michigan	Modular Multi-Scale Modeling of Cardiovascular Function to Probe the Etiology of Complex Cardiovascular Disease
46	Susann Beier	University of Auckland	Coronary Bifurcation 3D Flow accessed with dimensionally scaled ex vivo PC-MRI and CFD - A Comparison for Idealized, Stented and Patient Specific Geometries
47	Hashem Yousefi	University of Auckland	Preliminary Steps for Large Scale Modelling of Heart Development
48	Belvin Thomas	University of Auckland	Computational investigation of the role of structural remodelling in atrial fibrillation
49	Girish Singh Ramlugun	University of Auckland	Three dimensional reconstruction of atrial myocyte architecture: How does tissue remodelling contribute to the substrate for atrial fibrillation?
50	Shu Meng	University of Auckland	Accurate Endocardial Activation Representation of Atria with Noncontact Mapping
51	Liam Kampshof	University of Auckland	Modeling Cardiac Electrophysiology: The Electrocardiogram and Interventional Therapies for Ventricular Fibrillation