3rd International Conference on Computational & Mathematical Biomedical Engineering (CMBE13)

City University of Hong-Kong
Tat Chee Avenue, Kowloon, Hong Kong SAR
16^{th}-18^{th} December 2013

Conference Programme*†

15 December 2013

16.00 - 21.00 **Conference Registration** City Top Restaurant Floor 9

18.00 - 21.00 **Conference Reception**

16 December 2013

07.30 **Conference Registration** AC1 (outside LT15 & LT16)

08.30 - 08.50 **Conference Welcome & Opening Plenary** LT1 (AC1)

Arthur B Ellis, Provost, City University of Hong Kong HK

Perumal Nithiarasu, Conference Co-Chair, Swansea University UK

08.50 - 09.30 **Invited Lecture** LT1 (AC1) **Chair** Perumal Nithiarasu (Swansea University UK)

Frans van de Vosse, TU/e The Netherlands

Model predictive clinical decision support in cardiovascular intervention

09.30 - 09.50 **Refreshments** AC1 (outside LT15 & LT16)

09.50 - 12.00 **Session A**

A1 Heart valve modelling P4701 (AC1)

Chairs Raoul van Loon (Swansea University UK), Xiaoyu Luo (University of Glasgow UK)

A1.1 *Subject-specific acquisition of normal aortic valve geometry from 3D+t TEE images* Bahareh Momenan, University of Ottawa Canada

A1.2 *Fluid-structure interaction simulations of tissue heart valves with a calcified leaflet using immersed boundary-finite element method* Iman Borazjani, UB State University of New York USA

A2 Multiphysics & multiscale models for simulating total heart function LT16 (AC1)

Chairs Toni Lassila (EPFL Switzerland), Martin Weiser (ZIB Germany)

A2.1 *Integrated Heart-Coupling multiscale and multiphysics models for simulation of total heart function* Toni Lassila, EPFL Switzerland

A2.2 *An effective algorithm for the generation of patient-specific Purkinje networks in computational electrocardiology* Simone Palamara, MOX Polytechnic of Milan Italy

*Only presenting authors are indicated. All venues are located on Floor 4 Academic Building 1 (AC1). Users should always proceed to the University Concourse (Floor 4) for other areas. Catering outlets (City Top and Chinese Restaurant) are located in the Amenities Building (AM), and are accessible through lifts L19 & L20.

†Time allocated for each oral presentation in sessions A,B,C,D and E is 20 minutes including questions. Each session is allocated a time for discussion, at the discretion of the session chair.

A1.3 *Image-based immersed boundary/finite element model of the human mitral valve* Nan Qi, University of Glasgow UK

A1.4 (CANCELLED) *Simulating the effects of inter-subject variability in aortic root compliance by the immersed boundary method* Boyce E. Griffith, New York University USA

A1.5 *Parameter estimation of heart, valve and vasculature* Raoul van Loon, Swansea University UK

A1.6 *Effects of local architectural mapping and material model on modeling the mitral valve* Michael S. Sacks, The University of Texas at Austin USA

A1.7 *Discussion*

A2.3 *Parallel multilevel solvers for cardiac electromechanical models* Luca F. Pavarino, Milan University Italy

A2.4 *Adaptive simulation of electro-mechanical coupling in cardiac simulation with spectral deferred correction methods* Martin Weiser, ZIB Germany

A2.5 *Towards a scalable numerical framework for multiscale-multiphysics models of cardiac function* Gernot Plank, Medical University of Graz Austria

A2.6 *Complex modeling and estimation of cardiac tissue anisotropy* Cristobal Bertoglio, TUM Germany

A2.7 *Discussion*

A3 Segmentation and registration for biomedical applications P4704 (AC1)

Chair Xianghua Xie (Swansea University UK)

A3.1 *Tracing vocal-fold vibrations using level-set segmentation method* Yuling Yan, Santa Clara University USA

A3.2 *Interactive segmentation of media-adventitia border in OCT* Xianghua Xie, Swansea University UK

A3.3 *Computational biomechanics of the brain brings real benefits in the operating theatre* Karol Miller, University of Western Australia Australia

A3.4 *Modification of the GPF method for efficient segmentation of high dimensional medical scans* Igor Sazonov, Swansea University UK

A3.5 *Bone segmentation by clustering* Nicolas Moreno, KAUST Saudi Arabia

A3.6 *Discussion*

A4 Multiphysics modelling & applications of the CV system I P4703 (AC1)

Chairs Luca Formaggia (MOX, Polytechnic of Milan Italy), Alberto Figueroa (King's College London UK)

A4.1 *A continuum model for platelet plug formation and growth under flow* Francesca Storti, TU/e The Netherlands

A4.2 *Intra-cardiac turbulence in a realistic human left heart* Franck Nicoud, University Montpellier France

A4.3 *Numerical modeling of blood flow in right coronary arteries* Ming-Jyh Chern, National Taiwan University of Science and Technology Taiwan

A4.4 *Aortic hemodynamics post Thoracic Endovascular Repair (TEVAR): a focus on birdbeak drawback* Michele Conti, Pavia University Italy

A4.5 *Numerical simulation of blood flow in the vascular network with pathologies or implants* Tatiana K. Dobroserdova, Lomonosov Moscow State University Russia

A4.6 (MOVED FROM B2.5) *Biomechanical analyses of the thoracic aorta: Could wall stress and 3D geometry help identify patients at risk of acute aortic dissection?* Barry J. Doyle, University of Western Australia Australia, University of Edinburgh UK

A4.7 *Discussion*

12.00 - 13.30 **Lunch** City Top Restaurant Floor 9

13.30 - 14.10 **Invited Lecture** LT1 (AC1)

Chair Marek Behr (RWTH Aachen University Germany)

Xiaoyu Luo, University of Glasgow UK

Soft tissue mechanics and fluid-structure interaction

14.20 - 16.30 **Session B**

B1 Aneurysm modelling: from basic science to clinical translation I P4701 (AC1)

Chair Paul Watton (Sheffield University UK)

B2 Numerical simulation of CV devices & procedures LT16 (AC1)

Chairs Michele Conti, Simone Morganti (University of Pavia Italy)

B1.1 *Clinical relevance of mechano-biological transduction in intracranial aneurysms: the mediating role of thrombus formation and inflammatory response expressing as aneurysm shape* Sven Hirsch, Zurich University of Applied Sciences Switzerland

B1.2 *A novel chemo-mechano-biological mathematical model of intracranial aneurysm evolution* Emilie C. Dickinson, University of Oxford UK

B1.3 *A novel mathematical model for the microstructural adaption of the collagen fabric during aneurysm evolution* Haoyu Chen, University of Oxford UK

B1.4 *A computational model of arterial wall degeneration: Coupling signalling pathways to vascular mechanobiology* Pedro Aparício, University of Oxford UK

B1.5 *Volumetric growth and remodelling of a fibre composite* Thomas S.E. Eriksson, University of Oxford UK

B1.6 *Modeling rupture of growing aneurysms* Konstantin Volokh, Technion-I.I.T Ben-Gurion University of the Negev Israel

B1.7 *Discussion*

B2.1 *Fluid-dynamics in ascending aorta in presence of a bicuspid aortic valve* Christian Vergara, Bergamo University Italy

B2.2 *Patient-specific finite element analysis of TAVI: evaluation of paravalvular leakage and prosthesis post-operative configuration* Simone Morganti, Pavia University Italy

B2.3 *Patient specific application of a structural beam model for biomechanical analysis of transcatheter aortic valve implantation* Michael Gessat, University of Zurich Switzerland

B2.4 *Image-based computational simulations for patient-specific surgery planning in congenital heart defects* Ajit P. Yoganathan, GIT Emory University USA, presentation given by Alessandro Veneziani (Emory University USA)

B2.5 (MOVED TO A4.6) *Biomechanical analyses of the thoracic aorta: Could wall stress and 3D geometry help identify patients at risk of acute aortic dissection?* Barry J. Doyle, University of Western Australia Australia, University of Edinburgh UK

B2.6 *Discussion*

B3 Standard session I P4703 (AC1)

Chair Elisa Budyn (École National Supérieure de Cachan France)

B3.1 *Computational study of bone tissue cryofreezing incorporating nanoparticles* Kian J. Chua, National Unversity of Singapore, Singapore

B3.2 *Thermal microenvironment of keratinocytes and fibroblasts during cauterisation by laser devices* Elisa Budyn, École National Supérieure de Cachan France

B3.3 *Structural modelling of the annulus fibrosus - an anisotropic hyperelastic model approach at the lamellar level* Marlene Mengoni, University of Leeds UK

B3.4 *A non-linear heterogeneous finite element model of vertebral trabecular bone using greyscale-based material properties* Daniel J. Rollins, University of Leeds UK

B3.5 *Stochastic modeling of cortical bone: Application to ultrasound axial transmission measurements* Vu-Hieu Nguyen, MSME France

B3.6 (CANCELLED) *Inverse dynamics simulation in patients with developmental dysplasia of the hip and effect biomechanical of hip with use abduction splint* Carlos A. Pérez A., Manuela Beltran University Colombia

B3.7 *Discussion*

B4 Standard session II P4704 (AC1)

Chair to be confirmed

B4.1 *Computational fluid dynamics analysis of thoracic aortic dissection* Desmond Dillon-Murphy, King's College London UK

B4.2 *Fluid flow patterns within porous scaffolds: influence of porosity and permeability* Junuthula N. Reddy, Texas A&M University USA

B4.3 *Blood flow simulations in the cerebral venous network* Stéphanie Salmon, University of Reims France

B4.4 *A computational fluid dynamics approach to magnetic drug targeting* Ann Lee, University of New South Wales Australia

B4.5 *Physical modeling of the heart with the atrioventricular plane as a piston unit* Elira Maksuti, KTH Sweden

B4.6 (CANCELLED) *On human gut and gut microbial ecosystem: in vitro study and mathematical modelling* Chenfeng Li, Swansea University UK

B4.7 *Discussion*

16.30 - 16.50 **Refreshments** AC1 (outside LT15 & LT16)

16.50 - 18.00 **Poster Session**‡ AC1 (outside LT15 & LT16)

18.00 - 18.40 **Invited Lecture** LT1 (AC1) **Chair** Luca Formaggia (MOX Polytechnic of Milan Italy)

Alessandro Veneziani, Emory University USA

From simulations to assimilations: challenges and perspective of bringing CV mathematics to the bedside

17 December 2013

08.00 - 08.40 **Invited Lecture** LT1 (AC1)

Chair C.W. Lim (City University of Hong Kong HK)

Xi-Qiao Feng, Tsinghua University China

Surface wrinkling of soft biological tissues

08.50 - 11.00 **Session C**

C1 Standard session III P4701 (AC1)

Chairs Xianghua Xie, Igor Sazonov (Swansea University UK)

C1.1 *Detection and localisation of prostate abnormalities* Andrik Rampun, Aberystwyth University UK

C1.2 *Sensitivity analysis of heamodynamics to pre-processing medical images: reducing the geometry definition uncertainty* Ana J. João, Portugal

C1.3 *Shape descriptors to predict diabetic foot deformity: a feasibility study* Moi Hoon Yap, Manchester Metropolitan University UK

C1.4 *Integral approach to atlas-based whole-body segmentation with application to small-animal PET-CT* Fabian Gigengack, University of Münster Germany

C1.5 *High resolution human body computational model for bioelectrical impedance analysis* Alexander Danilov, Russian Academy of Sciences Russia

C1.6 *Continuum elasticity with atomic rigidity* Guo-Wei Wei, Michigan State University USA

C1.7 *Discussion*

C2 Aneurysm modelling: from basic science to clinical translation II P4703 (AC1)

Chair Paul Watton (Sheffield University UK)

C2.1 *A method for automated flow analysis in intracranial aneurysms* Jingfeng Jiang, Michigan Tech University USA

C2.2 *CFD assessment of small-sized cerebral aneurysm rupture risk: case-control study* Rafik Ouared, University of Geneva and Olivier Brina, Geneva University Hospital Switzerland

C2.3 *In vivo validation of CFD simulations* Christian Doenitz, University Medical Center Regensburg Germany

C2.4 *Hemodynamic and clinical study of Y-stents for treatment of cerebral aneurysms* Kenichi Kono, Wakayama Rosai Hospital Japan

C2.5 *Hemodynamic comparison for a giant cerebral aneurysm treated by coils embolization and flow diverter implantation* Shengzhang Wang, Fudan University China

C2.6 *Stagnant blood flow in intracranial aneurysms: A possible association with atherosclerosis* Akira Takahashi, Tohoku University Japan

C2.7 *Discussion*

C3 Modelling of pulse wave propagation in the arterial tree I LT16 (AC1)

Chairs Frans van de Vosse (TU/e The Netherlands), Nikos Stergiopulos (EPFL Switzerland)

C3.1 *A comprehensive one-dimensional model of the cardiovascular system* Jonathan P. Mynard, University of Melbourne Australia

C3.2 *An extended pulse wave propagation model to predict (patho-)physiological coronary pressure and flow patterns* Frans N. van de Vosse, TU/e The Netherlands

C3.3 *On the coupling between 3D-FSI and 1D models* Luca Formaggia, MOX Polytechnic of Milan Italy

C3.4 *Coupling of a pulse wave propagation model to a lumped parameter regulation model based on physiological mechanisms* Wouter P. Donders, Maastricht University The Netherlands

C3.5 *Impact of elastic and viscoelastic wall models on wave-propagation in large arteries* Mette S. Olufsen, NC State University USA

C3.6 *On generic and patient specific 1-D models of the systemic arterial tree* Nikos Stergiopoulos, EPFL Switzerland

C3.7 *Discussion*

[‡]See at the end of the programme for titles and presenting authors.

11.00 - 11.20 **Refreshments** AC1 (outside LT15 & LT16)

11.20 - 12.00 **Invited Lecture** LT1 (AC1) **Chair** Wolfgang A. Wall (TUM Germany)

Yiannis Ventikos, University College London UK

Evaluation of device efficacy for cerebral aneurysm treatment: From deployment to clot development

12.00 - 13.30 **Lunch** City Chinese Restaurant Floor 8

13.30 - 14.10 **Invited Lecture** LT1 (AC1) **Chair** Alberto Figueroa (King's College London UK)

Marie Oshima, University of Tokyo Japan

Numerical investigation of cerebrovascular circulation after carotid artery stenting

14.20 - 16.50 **Session D**

D1 Inverse problems in CV mathematics P4704 (AC1)

Chair Alessandro Veneziani (Emory University USA)

D1.1 *Variational estimation of cardiac conductivities* Huanhuan Yang, Emory University USA

D1.2 *Sequential estimation in fluid-structure interaction and identification of arterial wall stiffness: in-vitro validation and in-vivo results* Cristobal Bertoglio, INRIA Paris-Rocquencourt France, TUM Germany

D1.3 *Finding cardiac conductivity values: An inverse problem approach* Peter R. Johnston, Griffith University Australia

D1.4 *Effects of time-varying feedback signals on pressure field in ultrasonic-measurement-integrated simulation of pulsatile blood flow* Kenichi Funamoto, Tohoku University Japan

D1.5 *Closed loop baroreflex regulation of blood flow in the cardiovascular system* Mette S. Olufsen, NC State University USA

D1.6 *Boundary control of bidomain equations with state dependent switching source functions in ionic model* Nagaiah Chamakuri, Radon Institute for Computational and Applied Mathematics Austria

D1.7 *Parameters estimation in Holzapfel-Ogden law of the human left ventricle using clinical in-vivo images* Hao Gao, University of Glasgow UK

D1.8 *Discussion*

D2 Numerical techniques for computational surgery P4703 (AC1)

Chairs Elias Cueto (University of Zaragoza Spain), Francisco Chinesta (Central School of Nantes France)

D2.1 *PGD-based efficient thermography inverse analysis* Francisco Chinesta, Central School of Nantes France

D2.2 *Haptic surgery simulation based on PGD techniques* Elias Cueto, University of Saragossa Spain

D2.3 *Real-time numerical simulation of soft tissues* David Gonzàlez, University of Saragossa Spain

D2.4 *An implementation of stabilized nearly-incompressible hyperelastic model in interactive speed* Masato Ogata, Mitsubishi Precision Co. Japan

D2.5 *Computational model for the focused ultrasound ablation of liver tumour in a patient specific geometry* Maxim A. Solovchuk and Tony W. H. Sheu, National Taiwan University Taiwan

D2.6 *Cardiovascular variability and intra-surgical monitoring of autonomic control* Federico Aletti, Polytechnic of Milan Italy

D2.7 *Computational study of CO2 balance during laparoscopic procedures* Sergey S. Simakov, Moscow Institute of Physics and Technology Russia

D2.8 *Discussion*

D3 Multiphysics modelling & applications of the CV system II P4701 (AC1)

Chairs Marek Behr (RWTH Aachen University Germany), Christian Vergara (Bergamo University Italy)

D4 Towards clinically relevant computational vascular mechanics LT16 (AC1)

Chairs Christian Gasser (KTH Royal Institute of Technology Sweden), Michael Gee (TUM Germany)

D3.1 *Parameter estimation for a 3D Navier-Stokes-0D coupled system: application to patient-specific haemodynamics* Benoit Fabrèges, INRIA Paris-Rocquencourt France

D3.2 *Complex flow in branching geometries: a modular multiscale coupling that handles backflow* Irène E. Vignon-Clementel, INRIA University P. and M. Curie France

D3.3 *A combined feedforward and feedback system for simulating neural and local control of coronary resistance and compliance* Christopher J. Arthurs, King's College London UK

D3.4 *Numerical investigation of the effects of the cerebrovascular and neck circulations on multi-scale simulation* Marie Oshima, University of Tokyo Japan

D3.5 *Transport processes & chemical reactions in large arteries* Etienne Boileau, Swansea University UK

D3.6 *A viscoelastic fluid-structure interaction model for carotid arteries under pulsatile flow* Zhongjie Wang, Imperial College London UK

D3.7 *Discussion*

D4.1 *Patient-specific simulation of stent-graft deployment within an abdominal aortic aneurysm* Pierre Badel, EMSE France

D4.2 *Acoustic localisation of coronary artery stenosis: wave propagation in soft tissue mimicking gels* Malcolm J Birch, Barts Health NHS Trust UK

D4.3 *Numerical simulation of coronary bioresorbable vascular scaffolds* Boyi Yang, Emory University USA

D4.4 *Efficient uncertainty quantification in patient specific vascular material models* Michael W. Gee, TUM Germany

D4.5 *Identification of material parameters for nonlinear elasticity: Toward solution of the inverse elasticity problem based on image similarity* Sebastian Kehl, TUM Germany

D4.6 *Shear-induced migration of red blood cells in the abdominal aorta and the carotid bifurcation: considerations on oxygen transport* Jacopo Biasetti, KTH Sweden

D4.7 *Physical and numerical aspects of vascular remolding with application to abdominal aortic aneurysms* T. Christian Gasser, KTH Royal Institute of Technology Sweden

D4.8 *Discussion*

16.50 - 17.10 **Refreshments** AC1 (outside LT15 & LT16)

17.10 - 17.50 **Invited Lecture** LT1 (AC1) **Chair** Guo-Wei Wei (Michigan State University USA)

Zhongcan Ouyang, Chinese Academy of Sciences

Elastic theory of fluid membranes of Helfrich model and its application in other soft matters

19.00 - 22.00 * bus at 18.00 **Conference Banquet** Star Seafood Floating Restaurant

18 December 2013

08.30 - 09.10 **Invited Lecture** LT1 (AC1) **Chair** Yiannis Ventikos (University College London UK)

Wolfgang A. Wall, TUM Germany

A comprehensive computational model to obtain clinically relevant insight into the human respiratory system

09.20 - 10.30 **Session E**

E1 Modelling of pulse wave propagation in the arterial tree II P4701 (AC1)

Chairs Frans van de Vosse (TU/e The Netherlands), Nikos Stergiopulos (EPFL Switzerland)

E1.1 *Including gravitational stress in a blood pressure wave propagation model for cardiovascular space physiology* Carole Leguy, DLR Germany, Simon Fraser University Canada

E1.2 *Assessment of statistical variability in material parameters for 1D wave propagation in arterial networks* Leif R. Hellevik, NTNU Norway

E2 Standard session IV P4703 (AC1)

Chair Michael Gee (TUM Germany)

E2.1 *Large scale simulations in an extensive human upper respiratory tract* Alberto M. Gambaruto, CASE-BSC Spain

E2.2 *An immersed boundary method for patient-specific modelling of flow and aerosol deposition in the respiratory airways* Laura Nicolaou, Imperial College London UK

E1.3 *Numerical analysis of blood flow in the dysplastic Circle of Willis using one-dimensional patient-specific model* Ying He, University of Science and Technology of China China

E1.4 *Discussion*

E2.3 *Flow pattern comparison between LES Simulation and Reynolds-Average Navier-Stokes modeling for flow in realistic upper airway models with obstructive sleep apnea* Mingzhen Lu, The Hong Kong Polytechnic University HK SAR

E2.4 *Discussion*

10.30 - 11.00 Refreshments

11.00 Conference Closing

Poster Presentations[§]

P.1 *Efficient reconstruction of coronary vessels from 2D angiography* Xianghua Xie, Swansea University UK

P.2 *Non-singular method of fundamental solutions for biomedical Stokes flow problems* Eva Sincich, University of Nova Gorica Slovenia

P.3 *Simulation of arterial hypertension and progressive arteriosclerosis with a 0-D multipurpose cardiovascular model* Michael Broomé, KTH, Karolinska Institute and University Hospital Sweden

P.4 *Prediction of the Optimal Timing of LVAD Therapy in terms of Ventricular Unloading: Simulation Study* Ki Moo Lim, Kumoh National Institute of Technology Korea

P.5 *Influence of the side branch diameter on the endovascular treatment of intracranial aneurysms located near a bifurcation* Abraham Y. S. Tang, The University of Hong Kong HK SAR

P.6 *Comparisons of image-based computational flow dynamics in giant and small intracrenial aneurysms* Chubin Ou, Hong Kong University of Science and Technology HK SAR

P.7 *Changes in residual strain and residual stress of rat's abdominal aorta in response to danshen extract* Wei Huang and David C.C. Lam, Hong Kong University of Science and Technology HK SAR

P.8 *Hemodynamic investigation of flow diverter angle at the aneurysm neck* Kaavya Karunanithi, Macquarie University Australia

P.9 *Image-based hair counting for hair care diagnosis system* Huang-Chia Shih, Yuan Ze University Taiwan

P.10 *Biomechanisms of impact-resistance in woodpeckers ocular* Lizhen Wang and Yubo Fan, Beihang University, International Joint Research Center of Aerospace Biotechnology and Medical Engineering China

P.11 *The mechanical competition between teeth of black carp and mollusk shells* H.M. Yao Hong Kong Polytechnic University HK SAR

P.12 *A quasi-analytical method for calculating junction pressure losses in 1D vascular network models: Validation with high-resolution CFD* Kristian Valen-Sendstad, University of Toronto, Canada

P.13 *Noninvasive quantification of fractional flow reserve: an approach based on one-dimensional pressure-flow analysis* Etienne Boileau, Swansea University UK

P.14 *Fracture behaviour of multilayer biological shell composites using finite element discretized symplectic method* Z.H. Zhou, Dalian University of Technology, C.W. Lim, City University of Hong Kong

[§]Posters will be on display for the whole duration of the conference. There will be a dedicated poster session on 16^{th} December.