Program

Computational Fluid Dynamics (CFD) in Medicine and Biology II

August 30-September 4, 2015
Albufeira, Portugal

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Prof. Josué Sznitman
Israel Institute of Technology
Israel

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Previous conference in this series:

**Computational Fluid Dynamics (CFD) in Medicine and Biology**
in conjunction with the
**Seventh International Biofluid Mechanics Symposium**

March 25 – 30, 2012
Crowne Plaza Dead Sea, Ein Bokek, Dead Sea, Israel

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Sunday, August 30, 2015

16:00 - 18:00  Conference check-in

**Plenary I:**

18:00 - 19:00  Integrated computational biomechanics of the flow phenomena in the living body
   Takami Yamaguchi, Tohoku University, Japan

19:00 - 20:00  Welcome Reception

20:00 - 22:00  Dinner

**NOTES**

- Technical Sessions will be held in Sala Grande Real.
- Poster Sessions will be held in Grande Real Foyer.
- Most meals will be in the Restaurante do Real. Changes will be announced.
- The conference banquet on Thursday will be held in the Restaurante Santa Eulalia.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your cellular telephones to vibrate or off during technical sessions.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
- Please do not smoke at any conference functions.
- Please write your name in the front of this program booklet so it can be returned if misplaced.
**Monday, August 31, 2015**

07:30 - 09:00  Breakfast

09:00 - 09:15  **Opening Remarks**  
Josué Sznitman, Israel Institute of Technology, Israel  
Beth Junker, ECI Liaison, USA

**Session 1: Aneurysms**  
**Session Chair:** David Steinman, University of Toronto, Canada

09:15 - 09:35  Identifying effective metrics to quantify CFD simulations of blood flow in intracranial aneurysms  
Madhavan L. Raghavan, University of Iowa, USA

09:35 - 09:55  Intracranial aneurysm vulnerability index by simulation and medical imaging  
Franck Nicoud, University of Montpellier, France

09:55 - 10:15  On the assumption of laminar flow in the cerebrovasculature: Implications for CFD insights into aneurysm initiation and rupture  
Kristian Valen-Sendstad, Simula, Norway

10:15 - 10:35  A semi-automated method for computational modeling of intracranial aneurysm hemodynamics  
Jung-Hee Seo, Johns Hopkins University, USA

10:35 - 11:05  Coffee break and networking

11:05 - 11:25  Clinical application of CFD simulations in treatment of cerebral aneurysms  
Kenichi Kono, Showa University Fujigaoka Hospital, Japan

11:25 - 11:45  Evaluation of hemodynamic changes after virtual flow diverter treatment with a dedicated prototype system  
Christof Karmonik, Houston Methodist Research Institute, USA

11:45 - 12:05  The 2015 Aneurysm CFD challenge, preliminary results: Is CFD ready for clinical use?  
Kenichi Kono, Showa University Fujigaoka Hospital, Japan  
Kristian Valen-Sendstad, Simula, Norway
Monday, August 31, 2015 (continued)

Session 2: Respiratory I
Session Chair: Josué Sznitman, Israel Institute of Technology

12:05 - 12:25 The mechanics of surfactant replacement therapy in newborns and adults
Marcel Filoche, Ecole Polytechnique, France

12:25 - 12:45 Advanced CFD Studies of aerosol deposition in the human airways
Stavros Kassinos, University of Cyprus, Cyprus

12:45 - 13:05 Aerosol therapeutic delivery through the lung: Deposition predictions with multi-domain in silico models
Jessica Oakes, University of California Berkeley, USA

13:05 - 14:45 Lunch

Session 2: Respiratory I (continued)
Session Chair: Josué Sznitman, Israel Institute of Technology

15:00 - 15:20 Acoustic probing of the lung in acute lung injury
Noam Gavriely, Technion, Israel

15:20 - 15:40 Mechanisms of ultrasound quantification of pulmonary edema
Joseph L. Bull, University of Michigan, USA

15:40 - 16:00 A fully resolved volumetrically constrained fluid-structure interaction model of the human respiratory system
Christian J. Roth, Institute for Computational Mechanics, Technical University of Munich, Germany

16:00 - 16:30 Coffee break and networking

Session 3: Fluid-Structure Interactions and Multiphysics
Session Chair: Rajat Mittal, Johns Hopkins University

16:30 - 16:50 Continuum modeling of rheology and aggregation of red blood cells
Daegeun Yoon, POSTECH, South Korea

16:50 - 17:10 Progress toward experimentally validated immersed boundary models for cardiovascular device design applications
Boyce E. Griffith, University of North Carolina at Chapel Hill, USA

17:10 - 17:25 Short break

17:25 - 17:45 A coupled chemo-fluidic model for the prediction of left ventricle thrombus risk
Rajat Mittal, Johns Hopkins University, USA
Monday, August 31, 2015 (continued)

17:45 - 18:05  Windkessel optimization in STAR-CCM+ using the SHERPA algorithm
               Alistair Brown, CD-Adapco, United Kingdom

18:05 - 18:25  Fluid-structure interaction models of aortic coarctation and repair:
               Lessons to be learned for hemodynamic analysis
               Patrick Segers, Ghent University, Belgium

19:00 - 20:30  Dinner

20:30 - 21:30  Poster Session and Social Hour
Tuesday, September 1, 2015

07:30 - 09:00  Breakfast

**Plenary II:**

09:00 - 10:00  Brain transport phenomena, the glymphatic system and multicompartamental poroelasticity
Yiannis Ventikos, University College London, United Kingdom

**Session 4: Respiratory II**
Session Chair: Stavros Kassinos, University of Cyprus

10:00 - 10:20  Flow characteristics of the upper human lung airways
Katrin Bauer, TU-Bergakademie Freiberg, Germany

10:20 - 10:40  Unsteady diffusional screening in 3D pulmonary acinar structures
Philipp Hofemeier, Technion - Israel Institute of Technology, Israel

10:40 - 11:00  Validation of mono-disperse glycerin-based aerosol deposition simulation in a realistic cast of human respiratory tract
Markus Nordlund, Philip Morris International R&D, Switzerland

11:00 - 11:30  Coffee break and networking

11:30 - 11:50  Multi-scale model of liquid obstruction formation and clearance in the lung
Jason Ryans, Tulane University, USA

11:50 - 12:10  Gas flows in micro channels: A study inspired by insect respiratory systems
Annie Staples, Virginia Tech, USA

12:10 - 12:30  Airflow dynamics in tracheas with compressive goitres
Alister J. Bates, Imperial College London, United Kingdom

12:30  Box Lunch - Optional Tour

19:00  Dinner on own
Wednesday, September 2, 2015

07:30 - 09:00  Breakfast

**Session 5: Cardiovascular Devices**  
**Session Chair:** Alison Marsden, University of California San Diego, USA

09:20 - 09:40  **In silico and in vitro simulations of a novel surgical approach for first-stage single ventricle heart palliation**  
Richard Figliola, Clemson University, USA

09:40 - 10:00  **Patient-specific computational fluid dynamic simulation of intraventricular hemodynamics: introducing mitral valve motion as prescribed boundary condition**  
Alessandra Maria Bavo, Ghent University, Belgium

10:00 - 10:20  **Patient-specific virtual stenting in coronary bifurcations: From medical images to fluid dynamics**  
Francesco Migliavacca, Laboratory of Biological Structure Mechanics, Politecnico di Milano, Italy

10:20 - 10:50  Coffee break and networking

10:50 - 11:10  **Hemodynamic characterization of aneurysmal geometry effects on endovascular treatment outcomes**  
Priya Nair, Arizona State University, USA

11:10 - 11:30  **A clinical method to quantify blood stasis in the left ventricle**  
Pablo Martinez-Legazpi, UCSD, USA

11:30 - 11:50  **Influence of distal angle and side branch stenosis on the fractional flow reserve in coronary artery bifurcations: a computational fluid dynamics study**  
Jolanda J. Wentzel, ErasmusMC, Netherlands

**Session 6: Multiscale Modeling**  
**Session Chair:** Alison Marsden, University of California San Diego, USA

11:50 - 12:10  **Strategies for cardiovascular and respiratory multiscale modeling parametrization**  
Irene E. Vignon-Clementel, INRIA, France

12:30 - 14:30  Lunch
Wednesday, September 2, 2015 (continued)

**Session 7: Multiscale Modeling (continued)**
Session Chair: Alison Marsden, University of California San Diego, USA

14:30 - 14:50
**Multi-scale modeling of deformable platelets and fibrin networks**
Mark Alber, University of Notre Dame, USA

14:50 - 15:10
**A patient-specific multi-scale surgical planning framework to assess exercise physiology of fontan patients**
Zhenglun Wei, Georgia Institute of Technology, USA

15:10 - 15:30
**On pressure-flow condensation in cardiovascular modeling**
Daniele E. Schiavazzi, University of California, San Diego, USA

15:30 - 16:00
Coffee break

**Session 8: Microfluidic Applications in Cell Mechanics and Mechanobiology**
Session Chair: C.T. Lim, National University of Singapore, Singapore

16:00 - 16:20
**Separation of motile bacteria using drift force near a wall**
Takuji Ishikawa, Tohoku University, Japan

16:20 - 16:40
**Single circulating tumor cell protease activity assay through jetting microfluidics**
Chia-Hung Chen, National University of Singapore, Singapore

16:40 - 17:00
**Microfluidic devices for mechanical characterization of circulating cells**
Jaap den Toonder, Eindhoven University of Technology, Netherlands

17:00 - 17:15
Short break

17:15 - 17:35
**Real-time deformability cytometry: On-the fly mechanical phenotyping for label-free functional cell assays**
Oliver Otto, Technical University of Dresden, Germany

17:35 - 17:55
**Two-dimensional transient model for prediction of NO/O\textsubscript{2} diffusion in an arteriole: Aggregation effect**
Sangho Kim, National University of Singapore, Singapore

17:55 - 18:15
**Cell mechanics based microfluidics for cancer diagnosis**
Chwee Teck Lim, National University of Singapore, Singapore

18:15 - 18:35
**A CFD-enhanced nonlinear theoretical model for the capturing of circulating tumor cells in microfiltration chips**
Yi-Kuen Lee, Hong Kong University of Science and Technology, Hong Kong
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<td>20:30 - 21:30</td>
<td>Poster Session and Social Hour</td>
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Thursday, September 3, 2015

07:30 - 09:00 Breakfast

**Session 9: Atherosclerosis**
*Session Chair:* Frank Gijsen, Erasmus University Medical Center

10:00 - 10:20 *Functional and anatomical measures for outflow boundary conditions in atherosclerotic coronary bifurcations*  
Frank Gijsen, Erasmus University Medical Center, Netherlands

10:20 - 10:40 *Image-based non- and minimally-invasive physiological and haemodynamic characterization for diagnosis and follow up*  
David R. Hose, University of Sheffield, United Kingdom

10:40 - 11:10 Coffee break and networking

11:10 - 11:30 *Hemodynamic assessment of the carotid bifurcation in an atherosclerotic mouse model using FSI simulations*  
David De Wilde, Ghent University, Belgium

11:30 - 11:50 *Phenotypic differences in human coronary artery disease progression and dependence on a focal oscillatory hemodynamic environment*  
Lucas H. Timmins, Georgia Institute of Technology, USA

11:50 - 12:10 *A novel method to study permeability of endothelium chronically exposed to different shear stresses in vitro*  
Peter D. Weinberg, Imperial College London, United Kingdom

12:10 - 13:40 Lunch

**Session 10: Micro- and Macro-Locomotion**
*Session Chair:* Takuji Ishikawa, Tohoku University, Japan

13:40 - 14:00 *Trypanosomes complex cell design and deadly swim*  
Davod Alizadehrad, Institute of Theoretical Physics, Technical University of Berlin, Germany

14:00 - 14:20 *Simulations of a swimming microorganism near an fluid-air or an fluid-solid interface*  
Junichi Manabe, Tohoku University, Japan

14:20 - 14:40 *Modeling mechanical behavior of precession of bacterial flagella*  
Yuji Shimogonya, Tohoku University, Japan

14:40 - 15:00 *Computational haemodynamics of small vessels using a stabilized implicit formulation of the moving particle semi-implicit (MPS) method*  
Alberto Gambaruto, Barcelona Supercomputing Center, Spain

15:00 - 15:30 Coffee break and networking
Thursday, September 3, 2015 (continued)

15:30 - 15:50  A simulation study of hydrodynamic sperm rheotaxis  
Kenta Ishimoto, Kyoto University, Japan

16:00 – 16:10  Simulating the hydrodynamics of bacterial swimming in confined geometries  
Eamonn Andrew Gaffney, University of Oxford, United Kingdom

16:10 - 16:30  Swimming of a spermatozoon in shear flow near non-slip boundary  
Toshihiro Omori, Tohoku University, Japan

16:30 - 16:50  Microscale blood flow visualization in biomedical microdevices: From blood cells to microbubbles  
Alberto Gambaruto, Minho University, Portugal

16:50 - 17:05  Short break

Session 11: Reproductive Flows  
Session Chair: Megan Leftwich, The George Washington University

17:05 - 17:25  Investigations of spermatozoan flagellum structural mechanics and energetics  
Eamonn A. Gaffney, Mathematical Institute, University of Oxford, UK and Centre for Human Reproductive Science, University of Birmingham, UK

17:25 - 17:45  Sperm progression - biochemical signals and fluid flow  
Sarah D. Olson, Worcester Polytechnic Institute, USA

17:45 - 18:05  Simplified fluid dynamic models for human birth  
Megan Leftwich, The George Washington University, USA

19:00 - 21:30  Banquet
**Friday, September 4, 2015**

07:30 - 09:00  Breakfast

**Session 12: Interstitial Flows**

*Session Chair: Yiannis Ventikos, University College London, United Kingdom*

09:00 - 09:20  Direct numerical simulations unfold fluctuations in the cerebrospinal fluid hydrodynamics in Chiari I malformation  
Kartik Jain, University of Siegen, Germany

09:20 - 09:40  Brain water transport and astrocyte networks  
Vartan Kurtcuoglu, University of Zurich, Switzerland

10:00 - 10:20  Computational analysis of lymphatic valves  
Raoul van Loon, Swansea University, United Kingdom

10:20 - 11:00  Coffee Break and networking

11:00  Final discussion / Next conference

12:00  Lunch and departures
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| **1.** Numerical modeling of flow-diverter stents in cerebral aneurysms  
Augusto Fava Sanches, University of Heidelberg, Germany |
| **2.** Large-eddy simulation of three-dimensional vortex structures and micro-particle transport and deposition in an idealized mouth-throat model  
Ali Farnoud, University of Heidelberg, Germany |
| **3.** Transport and deposition of anisotropic aerosols in pulmonary acinar shear flows  
Yan Ostrovski, Technion - Israel Institute of Technology, Israel |
| **4.** Enhancing pulmonary acinar deposition using magnetic particles: Insight from CFD simulations  
Yan Ostrovski, Technion - Israel Institute of Technology, Israel |
| **5.** A macroscopic model to study mucociliary clearance in complex geometries: Predicting optimal ciliary forcing patterns  
Michail Manolidis, University of Michigan, USA |
| **6.** Aerosols in healthy and emphysematous in silico acinar models  
Jessica Oakes, University of California Berkeley, USA |
| **7.** Respiratory therapies of the developing lungs: Inhaled aerosols delivery during early childhood  
Janna Tenenbaum-Katan, Technion - Israel Institute of Technology, Israel |
| **8.** Wave propagation-based cardiovascular monitoring and assessment  
Nikos Stergiopulos. EPFL, Switzerland |
| **9.** Morphometry and hemodynamics of porcine coronary venous tree  
Hao Wu, Peking University, China |
| **10.** Hemodynamic analysis of patient-specific internal mammary artery bypass grafts  
Tingting Fan, Peking University, China |
| **11.** Hemodynamic analysis of patient-specific vertebro-basilar junction and basilar bifurcations  
Yundi Feng, Peking University, China |
| **12.** Hemodynamics at different stages of patient-specific stenotic carotid artery bifurcation  
Yunlong Huo, Peking University, China |
| **13.** Biomedical microfluidic devices by using low cost fabrication techniques: A review  
Alberto Gambaruto, Minho University, United Kingdom |
| **14.** Uncertainty quantification of boundary conditions for CFD simulations of a rabbit aorta  
Michael McElroy, Manchester Metropolitan University, United Kingdom |
15. The parametric study of a spiral-inducing bypass graft using computational fluid dynamics
   Michael McElroy, Manchester Metropolitan University, United Kingdom

16. A numerical model for inert gas transport in the lung based on a fractal airway morphology
   David Hasler, University of Bern, ARTORG Center, Switzerland

17. Interventional planning and outcome prediction for arteriovenous malformation therapy
   Sabrina Frey, University of Bern, Switzerland

18. On transitional flow in intracranial aneurysms - critical Re, cyclic variations, vasculature and aneurysm morphology
   Kartik Jain, University of Siegen, Germany

19. On the data assimilation problem in blood flow simulations
   Telma Guerra Santos, CEMAT, IST- University Lisbon, Portugal

20. An assessment of 3D ultra-sound derived geometry versus computerized tomography techniques for abdominal aortic aneurysms
   Benjamin Owen, The University of Manchester, United Kingdom

21. Assessment of the mixing performance of a biomimetic micromixer using the lattice Boltzmann-immersed boundary method
   Joseph M. O'Connor, University of Manchester, United Kingdom

22. Automated microfluidic optimization to reduce blood cell activation
   Giulia Mazza, Danube University Krems, Austria

23. Blood perfusion in microfluidic models of pulmonary capillary networks
   Hagit Stauber, Technion-Israel Institute of Technology, Israel

24. Patient-specific planning for cerebral aneurysm treatment using CFD with finite element endovascular device models
   Priya Nair, Arizona State University, USA

25. Process of cell-free layer formation after arteriolar bifurcation and its effect on NO/O2 diffusion
   Yan Cheng Ng, National University of Singapore, Singapore

26. Particle-based simulation study of red blood cell flow in capillary bifurcations using open inflow/outflow boundary conditions
   Kirill Lykov, University of Lugano, Switzerland

27. 4D phase contrast MRI derived hemodynamics of the rabbit aortic arch
   Lucas Timmins, Georgia Institute of Technology, USA