Preliminary Program

Transport Phenomena in Micro and Nanodevices

October 17-21, 2004
Kona, Hawaii

Conference Chair

Mohamed Gad-el-Hak
Caudill Eminent Professor and Chair of Mechanical Engineering
Virginia Commonwealth University, USA

Conference Co-Chairs

Nobuhide Kasagi
Department of Mechanical Engineering
University of Tokyo, Japan

Steffen Hardt
Institute of Microtechnology Mainz (IMM), Germany

ECI

Engineering Conferences International
6 MetroTech Center
Brooklyn, NY 11201
info@eci.poly.edu - www.engconfintl.org
Sunday, October 17, 2004

6:00 - 7:00 pm  Registration

7:00 - 8:00 pm  Reception
### Monday, October 18, 2004

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<tr>
<td>8:15</td>
<td>Opening Remarks                                                                     Mohamed Gad-el-Hak</td>
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<td>8:30</td>
<td><strong>SESSION I: Quantum and Nano Transport</strong></td>
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<td>Chair: Karen Jacobs</td>
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<td>8:30</td>
<td>Slippage of Liquids at the Nanoscale                                                      K. Jacobs, R. Konrad, H. Mantz, D. Podzimek</td>
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<td>8:50</td>
<td>Transport and Noise in Quantum Shuttles                                                    A. P. Jauho</td>
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<td>9:10</td>
<td>Theoretical Approach for Transport Properties of Molecular Electronics Based on Binuclear Phthalocyanine H. Mizuseki, H. Baba, R.V. Belosludov, A. A. Farajian, Y. Kawazoe</td>
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<td>9:30</td>
<td>Molecular Number Flux Detection Using Oxygen Sensitive Luminophore                        T. Niimi, H. Mori, M. Hirako, H. Uenishi</td>
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<td>9:50</td>
<td>Quantum and Discrete Impurity Effects in Nanoscale Devices                                D. Vasileska</td>
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<td>10:30</td>
<td>Coffee Break</td>
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<tr>
<td>10:30</td>
<td>Ballistic Quantum Transport Simulations in Nano-Devices Using the Contact Block Reduction Method D. Mamaluy, M. Sabathil, D. Vasileska, P. Vogl</td>
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<td>10:50</td>
<td>Stochastic MD Simulations of Complex Fluids in Microdomains                             V. Symeonidis, B. Caswell, G. E. Karniadakis</td>
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<td>11:10</td>
<td>Simulation of ION Population Dynamics Dominated by Discrete Collisions Events in Rarified Gases in the Presence of Electromagnetic Fields A. Hieke</td>
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<td>11:50</td>
<td>Spin Transport in Quantum Wires                                                           S. Bandyopadhyay, M. Cahay, S. Pramanik</td>
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<td>12:10</td>
<td>Lunch Break</td>
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9/20/04
SESSION II: Flow Manipulation/Actuation
Chair: Peter Ehrhard

1:30 - 1:50
Electric Field-Driven Phenomena for Manipulating Particles in Micro- and Nano-Devices
B. Khusid, A. Acrivos

1:50 - 2:10
Generation of Nanofluidic Layers as a Means for Enhancing Mass Transport Coefficients in Protein- Surface Reactions
H. P. Jennissen

2:10 - 2:30
Analytical Results for Small-Scale, Shear-Driven Oscillatory Gaseous Flows
N. Hadjiconstantinou

2:30 - 2:50
Model and Validation of Electrokinetic Flow and Transport in a Micro Electrophoresis Device
P. Ehrhard, D. P. J. Barz

2:50 - 3:10
Lagrangian Chaos in a Microserpentine Mixer of Immuno- Magnetic Cell Sorting
K. Fukagata, N. Kasagi, C. Chakranond

Coffee Break

3:30 - 3:50
Simulation, Fabrication, and Experimentation of Electrowetting Actuation in a Microchannel
K. Mohseni, A. Dolatabadi

3:50 - 4:10
Application of Micro Wall Jets for Enhanced Biosensor Fluid Mixing
T. Mautner

4:10 - 4:30
Fabrication and Transport of Metallic Nano Particles via Electrostatic Atomization
K. A. Sallam, S. M. Bogadi, R. Sankarakrishnan

4:30 - 4:50
The Study of Microscale Effects in an Experimental Setup with a Continuously Decreasing Characteristic Length
H. Herwig, O. Hausner

4:50 - 5:10
Electroosmotic Flow in Nanochannels: Fundamentals and Simulations
R. Qiao, A. Chatterjee, S. Joseph, N. R. Aluru

9/20/04
Tuesday, October 19, 2004

SESSION III: Modeling
Chair: Steffen Hardt

8:30-8:50 am  Recent Developments in Modeling Small-Scale Gaseous Hydrodynamics Beyond Navier-Stokes: The Transition and Free-Molecular-Flow Regimes
N. Hadjiconstantinou

8:50-9:10 am  Liquids: The Holy Grail of Microfluidics Modeling
M. Gad-el-Hak

9:10-9:30 am  The Constitutive Relations and Boundary Conditions for Gas Microflow Modeling
D. Lockerby, J. Reese, D. Emerson, R. Barber

9:30-9:50 am  An Extended VOF Method for Microflow With Short-Range Interactions Between Fluid Interfaces
S. Hardt

9:50-10:10 am  Recent Results of Rarefied Gas Dynamics and Their Applications in Microfluidics
F. Sharipov

Coffee Break

10:30-10:50 am  Rarefield Gas Flow and Its Relation to Damping in Inertial Microsensors
F. Petri, C. Doering, R. Neul, R. Laur

10:50-11:10 am  Numerical Simulation of Flow in Micropump by Vorticity-Stream Function and Vorticity-Vector Potential Method
H. Tokunaga, A. Fujiwara, M. Matsumoto

11:10-11:30 am  Flow of Gaseous Mixtures Through Rectangular Microchannels Driven by Pressure, Temperature and Concentration Gradients
S. Naris, D. Valougeorgis, D. Kalempa, F. Sharipov

11:30-11:50 am  Design of Micro Synthetic Jet Actuator for Flow Control
O. Baysal, M. Koklu, N. Erbas

11:50-12:10 pm  Heat Transfer in Thermal AFM Systems
W. Ye, N. Masters, W. King

Lunch Break

SESSION IV: Emerging Applications
Chair: Hiroshi Mizuseki

1:30-1:50 pm  The Fabrication of Nanofluidic Devices and the Study of Fluid Transport Through Them
H. H. Bau
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<tr>
<td>1:50–2:10 pm</td>
<td><strong>Comparison of Slip and Transitional Microchannel Flows Using Direct Simulation Monte Carlo</strong>&lt;br&gt;<strong>J. Sung, J. Y. Yoo</strong></td>
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<td>2:10–2:30 pm</td>
<td><strong>Confined Complex Fluid Dynamics</strong>&lt;br&gt;<strong>S. Herminghaus</strong></td>
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<td>2:30–2:50 pm</td>
<td><strong>Langmuir's Slip Model and EU's Generalized Hydrodynamics for Microfluidic Transport</strong>&lt;br&gt;<strong>R. J. Myong</strong></td>
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<td>2:50–3:10 pm</td>
<td><strong>Enhancement of Short-Strand DNA Renaturation by an Active Micromixer</strong>&lt;br&gt;<strong>T. John, I. Mezic</strong></td>
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<td><strong>Coffee Break</strong></td>
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<td>3:30–3:50 pm</td>
<td><strong>Coherent Nonlinear Chromatography</strong>&lt;br&gt;<strong>E. B. Cummings</strong></td>
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<td>3:50–4:10 pm</td>
<td><strong>Simplified Model of a Buoyancy-Driven Polymerase Chain Reaction (PCR) Device</strong>&lt;br&gt;<strong>K. Ness, E. K. Wheeler, B. Benett, J. Ortega, K. E. Goodson</strong></td>
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<td>4:10–4:30 pm</td>
<td><strong>Wetting Morphologies on Topographically Structured Substrates: A Possible New Way to Open Microfluidics</strong>&lt;br&gt;<strong>R. Seemann, K. Krishnacharya, S. Herminghaus</strong></td>
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<td>4:30–4:50 pm</td>
<td><strong>Rheological Behavior and Spreading Properties of Silicone Oils on Glass in Various Geometries</strong>&lt;br&gt;<strong>P. Woehl, A. Carre</strong></td>
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<td>4:50–5:10 pm</td>
<td><strong>ION Transport Through Nanoslits Investigated by Impedance Spectroscopy</strong>&lt;br&gt;<strong>R. Schoch, H. V. Lintel, P. Renaud</strong></td>
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<td>7:00 pm</td>
<td><strong>Conference Banquet</strong></td>
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Wednesday, October 20, 2004

SESSION V: Experiments
Chair: Nobuhide Kasagi

8:30–8:50 am  Micro Visualization of Ferromagnetic Nanoparticles in Microcapillary Flow
J. Matsushita, H. Kikura, M. Aritomi, Y. Kobayashi

8:50–9:10 am  Cavitation of Microparticles
P. F. Dunn, M. Davis

9:10–9:30 am  High-Speed Micro-PIV Measurement of Micro Counter-Current Flow
K. Shinohara, Y. Sugii, A. Aota, A. Hidaka, T. Kitamori

9:30–9:50 am  Study on Heat Transfer Characteristics of Compact Heat Exchangers
M. Mori, F. Kawashima, M. Fukagawa, K. Hasezaki

9:50–10:10 am  Experimental Study of Viscous Dissipation in Liquid Flow Through a Micro-Device
H. El-Sadi

Coffee Break

10:30–10:50 am  X-Ray Micro-PIV Measurements of Flows in Opaque Conduits
S. J. Lee

10:50–11:10 am  Evaporation Dynamics of Liquid Sessile Micro Droplets on Solid Substrates of Different Wettability
K. Graf, G. Li, J. Viertel, A. Fortig, R. Jordan

11:10–11:30 am  Characterization of Surface Roughness Effects on Pressure Drop in Single-Phase Flow in Mini/Micro Channels
S. G. Kandikar, D. Schmitt, A. Carrano, J. Taylor

11:30–11:50 am  The Melting Temperature of Polymer Thin Films and Surfaces
S. Herminghaus, R. Seemann, K. Landfester

11:50–12:10 pm  Negative Pressure and Electroviscous Effect in Nanochannels
A. van den Berg, N. Tas

Lunch Break

SESSION VI: Two-Phase Flow/Mixing
Chair: Duncan Lockerby

1:30–1:50 pm  Visualization of Droplet Formation and Ejection from a Micromachined Ultrasonic Droplet Generator
J. M. Meacham, E. L. Degertekin, A. G. Fedorov
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<tr>
<td>1:50–2:10 pm</td>
<td>Boiling Propagation Phenomena on a Solid Surface in Highly Superheated Liquid and Its Application to a Novel Micropump</td>
<td>K. Okuyama, T. Kino, J. H. Kim, Y. Iida</td>
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<td>2:10–2:30 pm</td>
<td>Dynamics of Microbubble Agents for Medical Ultrasound and Targeted Drug Delivery</td>
<td>K. Sarkar, D. Chatterjee, P. Jain</td>
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<td>2:30–2:50 pm</td>
<td>Mathematical Modelling of Mixing</td>
<td>J. Gleeson</td>
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<td>2:50–3:10 pm</td>
<td>An Engineering Model for the Evaporation of Solute Droplets on Polymer Substrates</td>
<td>W. Wiechert, T. Haschke, C. Stupperich Sequeira, K. -H. Graf</td>
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<td>Coffee Break</td>
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<td>3:30–3:50 pm</td>
<td>Efficiency of Mixing in the Shear Superposition Micromixer</td>
<td>F. Bottausci, C. Cardonne, C. Meinhart, I. Mezic</td>
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<td>3:50–4:10 pm</td>
<td>Thermal-Hydraulics Characterization of a Microreactor</td>
<td>C. Boyer, P. Font</td>
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<td>4:10–4:30 pm</td>
<td>Optimal Binary Fluid Mixing in Heated Microchannels</td>
<td>T. Mautner, J. Allen</td>
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<td>4:30–4:50 pm</td>
<td>Prediction Model for Droplet Generation in a Microchannel Network</td>
<td>M. M. Mielnik, G. J. Pedersen, L. R. Saetran</td>
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<td>4:50–5:10 pm</td>
<td>An Experimental Investigation of Flow Boiling in a Microchannel</td>
<td>C. Huh, M. H. Kim</td>
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Thursday, October 21, 2004

SESSION VII: Wetting and Other Micro Phenomena  
Chair: Stephan Herminghaus

8:30-8:50 am  
**Microdetonics: The Science and Engineering of Microscale Explosive Technology**  
R. J. Adrian, D. S. Stewart

8:50-9:10 am  
**Three-Phase Line Patterns of Spreading Liquid on a Solid Surface**  
N. Zhang, D. F. Chao, J. M. Sankovic

9:10-9:30 am  
**Spreading Behavior of an Impacting Drop on a Structured Rough Surface**  
D. Sivakumar, K. Katagiri, T. Sato, H. Nishiyama

9:30-9:50 am  
**Paramagnetic Particles Self-Assembly Within Microgeometries**  
D. Liu, M. Maxey, G. Karniadakis

9:50-10:10 am  
**Foamy Emulsions Confined in Channels: Digital Microfluidics**  
R. Seemann, M. Ulmeanu, F. Wen, D. Melenevsey, S. Herminghaus  
Coffee Break

10:30-10:50 am  
**Passive Thermally Actuated Biochemical Reactions and Transport in Convective Flows**  
V. Ugaz, N. Agrawal

10:50-11:10 am  
**Numerical Simulation on a Micropump Driven by Marangoni Effect Taking Interface Deformation into Account**  
H. Yoshida, Y. Suzuki, M. Saito

11:10-11:30 am  
**Enhanced Microfluidic Mixing in Planar Asymmetric Curved Channel Geometries**  
V. M. Ugaz, A. P. Sudarsan

11:30-11:50 am  
**Applications of MEMS Sensors in Thermal Engineering**  
O. Nakabeppu

11:50-12:10 pm  
**Characteristic of Electrostatically Activated Resonant Fan Micromixer**  
C. W. Tsao, K. Mohsnei

12:10-12:30 pm  
**Closing Remarks**  
M. Gad-el-Hak, N. Kasagi, S. Hardt

Lunch and Departure