

Preface to Special Topic: Papers from the 2009 Conference on Advances in Microfluidics and Nanofluidics, The Hong Kong University of Science & Technology, Hong Kong, 2009

Leslie Y. Yeo

*Department of Mechanical & Aerospace Engineering, Monash University,
Clayton VIC 3800, Australia*

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The inaugural conference on **Advances in Microfluidics and Nanofluidics** was held at the Hong Kong University of Science and Technology on 5–7 January 2009 and brought together leading researchers from across a wide variety of disciplines from North America, Europe, Asia, and Oceania. This Special Topic section forms the second of the two issues dedicated to original contributions covering both fundamental physicochemical aspects of microfluidics and nanofluidics as well as their applications to the miniaturization of chemical and biological systems that were presented at the conference. [DOI: [10.1063/1.3167278](https://doi.org/10.1063/1.3167278)]

In the last five years, we have observed rapid growth in the microfluidics and nanofluidics community in Asia, owing largely to the substantial strategic investments by both government and industry in the region to promote the microfabrication and nanotechnology sectors.¹ The organization of a regular meeting focusing on activities in the Asia-Pacific rim region was, therefore, timely, particularly to enhance dissemination of research of the highest quality within the region and to promote collaboration between researchers in the Asian community with their counterparts from Europe and the USA.

Biomicrofluidics is, therefore, proud to be closely involved with the organization of the first of such conferences, **Advances in Microfluidics and Nanofluidics 2009**, which was kindly hosted by the Hong Kong University of Science and Technology (HKUST). As reported in the preface to the first of the two issues dedicated to invited reviews and original contributions associated with the conference,² the meeting, which took place over three days in the breathtaking HKUST campus overlooking Clearwater Bay in Hong Kong, was a tremendous success. Together with our colleagues, the *Biomicrofluidics* editors are busy putting in place arrangements for a follow-up meeting in January 2011. Given the overwhelming response and positive feedback we've had to date, we believe that **Advances in Microfluidics and Nanofluidics** will form a regular event in the calendar of the Asian microfluidics and nanofluidics community in the future.

It was particularly pleasing to observe the translation of fundamental and theoretical work into advanced applied chip-based platforms for a variety of practical chemical and biological applications in the talks presented at the conference. The collection of articles in this second part, in fact, provides a gist of the flavor of the multidisciplinary research spanning the entire fundamental to applied research spectrum, which is exactly the scope which the journal intends to cover.

Electrokinetics continues to be a dominant theme in this issue and within the microfluidics and nanofluidics community. The article by Ng *et al.*³ provides experimental evidence that might put to rest a longstanding area of debate within the electrokinetics community on the role of Faradaic charging in driving electro-osmotic flow, first proposed by Ben and Chang.⁴ In other electrokinetics papers, the role of interfaces is explored, for example, electrowetting on the superhydrophobic nanostructured surfaces of a lotus leaf⁵ and droplet manipulation in an immiscible dielectric liquid continuum under an electric field.⁶

In addition, the characterization of the surface charge density of the nanopores etched in organic foils is reported by Xue *et al.*,⁷ which provides a deeper understanding of the mechanisms by which ions are transported in nanochannels, whereas Wei and Hsiao⁸ present a stochastic simulation to model the condensation of linear polyelectrolyte molecules under electric fields, in which they show the marked increase in the mobility of the polyelectrolyte chain during its unfolding in free-solution electrophoresis.

Continuing along the theme of numerical simulations, particulate transport in converging-diverging microchannels was studied using a Lagrangian-Eulerian finite-element model,⁹ and slip arising in Couette flows over superhydrophobic surfaces was studied using a hybrid multiscale simulation that interfaces molecular dynamics simulations in the near-wall region with the continuum fluid model in the bulk.¹⁰ In other numerical studies, drop coalescence¹¹ and nanotube transport¹² were studied.

Complementing these fundamental studies is the use of multiphase flows in microfluidic channels to engineer scaffolds for tissue engineering in which the bubbles trapped in liquid droplets transported in microchannels were employed to produce the pores of the scaffold.¹³ Other practical microfluidics applications, such as chip-based enhancement of DNA hybridization through a genetic-bead-based protocol¹⁴ and an automated ELISA chip for chemical-biological analysis with an enhancement in the detection range and time,¹⁵ also constitute papers in this Special Topic section.

We hope you enjoy reading the papers in this Special Topic section and that it provides you with a feel for the broad multidisciplinary spectrum across fundamental and applied microfluidic and nanofluidic research that the conference, as well as the journal, intends to span. Do watch out for the conference announcement for the next Advances in Microfluidics and Nanofluidics meeting in 2011 on the Biomicrofluidics website (<http://bmf.aip.org>)—hope to see you there!

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