Lab on a Chip

EDITORIAL

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Introduction to *Lab on a Chip* Reviews issue

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A few years ago, the *Lab on a Chip* Editorial Board was looking through a series of review articles that had recently been published in the journal, marvelling at how authoritative and informative they were. "Wouldn't it be great," the board-members mused, "if some of the most interesting and useful review articles in *Lab on a Chip* could be brought together into one easy-to-read themed issue?" Ideas like this take time, but it is with great pride that we announce today the delivery of this vision. Aided by the hard work of our select 2022 Commissioning Panel, (Table 1) we introduce the first *Lab on a Chip* Reviews issue.

In the years and months leading to this day, we expected an excellent collection, but even with this high expectation, we are awe-struck by the final product. In this issue, readers will find an incredible depth and breadth of informative content written by key opinion leaders in our community, ranging from medical diagnostics, to microphysiological models, from applications of nanoparticles to the power of multiplexing, and from microfluidic fundamentals to horizons for the future.

In the area of medical diagnostics, Kashaninejad and Nguyen (DOI: **https://doi.org/10.1039/D2LC00993E**) review the critical contributions that the microfluidics community is making in the growing area of wearable, skin-interfaced diagnostics. Klapperich and co-workers (DOI: **https://doi.org/10.1039/D2LC00552B**) teach us about next-generation electrode fabrication techniques for electroanalytical diagnostics that can be implemented in settings with limited resources. Meanwhile, Linnes and colleagues (DOI: **https://doi.org/10.1039/D2LC00554A**) discus the challenges and opportunities for paper-based nucleic acid amplification tests and Peeling and Sia (DOI: **https://doi.org/10.1039/D2LC00662F**) reveal what the COVID-19 pandemic has taught microfluidic diagnostic test-developers about the need to engage with governments, regulators, and policy makers to ensure equitable access. Avaro and Santiago (DOI: **https://doi.org/10.1039/D2LC00852A**) review the state of the art in CRISPR diagnostic assays, teaching us how microfluidic techniques can help overcome limitations imposed by kinetics. And Lu *et al.* (DOI: **https://doi.org/10.1039/D2LC00904H**) describe how microfluidic cell-sorting is improving blood analysis techniques. Finally, Plaxco and coworkers (DOI: **https://doi.org/10.1039/D2LC00716A**) teach us how microfluidics and conformational-shift sensors can be used to close the loop between diagnostic tests and treatment.

On the topic of microphysiological models, Wang *et al.* (DOI: **https://doi.org/10.1039/D2LC00493C**) review how microfluidic droplet compartmentalization is driving new applications in spheroid and organoid analysis. And Wu *et al.* (DOI: **https://doi.org/10.1039/D2LC00804A**) describe how organoids/organ-on-a-chip research is opening new horizons in gastrointestinal research. In parallel, Kang *et al.* (DOI: **https://doi.org/10.1039/D2LC00897A**) review the potential for microfluidic models of the brain to revolutionize central nervous system research. Moving to nanoparticles, Hettiarachchi *et al.* (DOI: **https://doi.org/10.1039/D2LC00793B**) describe the state-of-the-art in microfluidic processing of nanoparticles, while Fabozzi *et al.* (DOI: **https://doi.org/10.1039/D2LC00933A**) reviews how microfluidic systems are particularly well suited to tune nanoparticle properties for drug delivery applications.

On the subject of multiplexing, Duffy (DOI: **https://doi.org/10.1039/D2LC00783E**) teaches the principles of compartmentalization and digitization of chemical signals for ultrasensitive analyses, while Zhang *et al.* (DOI: **https://doi.org/10.1039/D2LC00667G**) discuss the application of microwell array chips to the single-cell analysis revolution. Also, Lin and colleagues (DOI: **https://doi.org/10.1039/D2LC00814A**) summarize recent techniques and applications of droplet digital PCR. Finally, Gu and co-authors (DOI: **https://doi.org/10.1039/D2LC00790H**) describe the state of the art uses of microneedle array chips for

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Table 1 Our 2022 *Lab on a Chip* commissioning panel

Member	Affiliation
Jean-Christophe Baret	University of Bordeaux, France
Aram Chung	Korea University, South Korea
Stéphanie Descroix	Institut Curie, France
David Issadore	University of Pennsylvania, USA
Wilbur Lam	Georgia Institute of Technology and Emory University, USA
Sindy Tang	Stanford University, USA
Yi-Chin Toh	Queensland University of Technology, Australia
Hongkai Wu	Hong Kong University of Science and Technology, China
Chaoyong James Yang	Xiamen University, China

drug delivery, sampling, and sensing. Moving to fundamentals, Yang and coworkers (DOI: https://doi.org/10.1039/D2LC00756H) teach the principles of digital microfluidics and review the litany of applications enabled by this technology. Likewise, Suwa, Tsukahara and Watarai (DOI: https://doi.org/10.1039/D2LC00702A) review the fundamentals of magnetic forces and how they are used in lab-on-a-chip systems. Meanwhile, Zhou and Zheng (DOI: https://doi.org/10.1039/D2LC00811D) highlight the importance of surface chemistry for microfluidic diagnostic immunoassays, and Tabrizian and co-workers (DOI: https://doi.org/10.1039/D2LC00439A) survey the many exciting applications that are made possible using acoustic forces in microfluidic systems. And rounding out the list, McAlpine and colleagues (DOI: https://doi.org/10.1039/D2LC01177H) review the myriad ways that 3D printing has transformed how we build and operate microfluidic devices.

Summing it up with a look to the future, Wu *et al.* (DOI: https://doi.org/10.1039/D2LC00946C) describe the emergent uses of microfluidic systems for energy harvesting, and Wang and Zhang and coworkers (DOI: https://doi.org/10.1039/D2LC00573E) highlight the role of lab-on-a-chip systems in the burgeoning field of microrobotics. Siu *et al.* (DOI: https://doi.org/10.1039/D2LC00813K) describe how the intersection of cutting-edge artificial intelligence and microscopic imaging modalities are shaping an exciting new future in microfluidics, and Li *et al.* (DOI: https://doi.org/10.1039/D2LC00876A) review the growing trend of microfluidic sample handling for nuclear magnetic resonance (NMR) spectroscopy. Monbaliu and Legros (DOI: https://doi.org/10.1039/D2LC00796G) imagine a future relying on micro- and mesofluidic flow reactors for chemical manufacturing, and Muñoz-Galán *et al.* (DOI: https://doi.org/10.1039/D2LC00873D) describe how microcantilever detection is being used for applications outside of biomedicine. And last but not least, Datta and Sinton and colleagues (DOI: https://doi.org/10.1039/D2LC00020B) outline how microfluidics and related techniques are poised to help society transition to a low-carbon way of life.

I think you will find that the 2023 (and first annual) *Lab on a Chip* Reviews issue is a rich "snapshot" of the amazing range of activities that the global microfluidics community is involved in today and where it envisions being involved in the future. The issue also contains a fantastic collaborative cover designed and illustrated by Shuailong Zhang with contributing images from Navid Kashaninejad and Nam-Trung Nguyen, Catherine M. Klapperich and Ariel L. Furst, Jacqueline Linnes, Kevin Tsia, Shuailong Zhang, Jean-Christophe M. Monbaliu and Julien Legros, David C. Duffy, Yu Wang and Qionglin Liang, Sujit Datta and David Sinton. Don't waste any more time reading this editorial – get on to reading these outstanding papers and begin thinking now about what you can contribute to next year's *Lab on a Chip* Reviews issue!

Aaron R. Wheeler, Editor-in-Chief

Philippa Ross, Executive Editor