Lab on a Chip



EDITORIAL



Introduction to Lab on a Chip Reviews issue

Cite this: Lab Chip, 2023, 23, 816

Aaron R. Wheeler ¹ and Philippa Ross^b

DOI: 10.1039/d3lc90019c

rsc.li/loc

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 from microphysiological models, 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

^a University of Toronto, Canada.

E-mail: aaron.wheeler@utoronto.ca

microfluidies community is making in the growing area of wearable, skininterfaced diagnostics. Klapperich and (DOI: co-workers 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 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 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, Fabozzi et al. (DOI: https://doi.org/ 10.1039/D2LC00933A) reviews how microfluidic systems are particularly suited to tune nanoparticle drug delivery properties for applications.

On the subject of multiplexing, Duffy https://doi.org/10.1039/ (DOI: 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 https://doi.org/10.1039/ (DOI: D2LC00790H) describe the state of the art uses of microneedle array chips for

^b Royal Society of Chemistry, Cambridge, UK

Lab on a Chip **Editorial**

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 https://doi.org/10.1039/ (DOI: 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 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 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. 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 chemical manufacturing, Muñoz-Galán et al. (DOI: https://doi.org/ 10.1039/D2LC00873D) describe 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 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