Preface

Microfluidic techniques are becoming widely incorporated into medical diagnostic systems due to the inherent advantages of miniaturization. In particular, the application of microfluidics to point-of-care testing (POCT) devices and high-throughput screening is predicted to become increasingly important, and consequently, the interest in microfluidic diagnostics is rapidly growing. The inherent advantages of scaling down include increased speed, efficiency, a reduction in the demand for sample and reagents, and the potential for multiplexing and parallelization. Other often cited advantages, yet by no means universally achievable, include increased portability, lower device costs (through mass production), and more highly integrated and automated systems leading to powerful yet easy to use devices. Such potential has led to widespread predictions that such technologies will help revolutionize health care provision at a particularly timely moment. When faced with the multiple challenges of increased costs, an aging population, bringing health care to developing countries, and the need to shift the business models of pharmaceutical companies away from palliative care to more responsive and personalized therapeutics, it is easy to see that microfluidic diagnostics is well placed to take a centrally important role.

The sheer number of different methods and applications available has, however, led to a diffuse and fragmented field with little standardization. From a practical and commercial perspective, microfluidic diagnostics have not yet had as much of an impact in "real-world" applications as had been widely predicted although steady progress has been made. This may be partially attributed to the difficulty in translating academic research into practical solutions. In particular, the highly interdisciplinary nature of the field can be daunting to new researchers, especially those coming from more established and well-defined disciplines who seek to apply the benefits of microfluidics to their own work. Many challenges are faced in order to convert promising concepts from the lab bench through to practical and commercially viable devices. As well as technological challenges, regulatory hurdles and issues relating to intellectual property (IP) and other commercial concerns further complicate the routes for technology transfer.

This book seeks to partly address some of these problems by providing a set of protocols necessary for the development of a variety of microfluidic diagnostic technologies. It pulls together a range of methods from leading researchers in the field, covering subjects such as microfluidic device fabrication, on-chip sample preparation, diagnostic applications and detection methodologies. The protocols described range from cutting-edge developments to established techniques and basic demonstrations suitable for education and training; from basic fabrication methods to commercializing research.

What you need to know and how to do it: each protocol offers step-by-step instructions, including an introductory overview of the technique, a list of materials and reagents required, as well as helpful tips and troubleshooting advice. Insightful reviews along with advice on how to successfully develop and commercialize microfluidic diagnostic technologies makes this volume indispensable reading for scientists entering the field as well as providing a reference text for those already established. Due to the multidisciplinary nature of

the field, little background knowledge is assumed, providing an accessible text for scientists from a range of disciplines including biomedical researchers, engineers, biochemists, and clinicians.

This book is organized into three parts: "Microfluidic Diagnostics: From the Classroom to the Boardroom" contains a number of protocols suitable for the educational demonstration of microfluidic techniques, as well as chapters relating to commercialization issues, such as the microfluidic device market, patent filing, and regulatory affairs. In addition, the opening chapter provides an overview of present technology and future trends in point-of-care microfluidic diagnostics. "Fabrication and Manipulation Protocols" contains a number of protocol and review chapters detailing various microfluidic fabrication methods for the manipulation of fluidic samples on the microscale. "Application Protocols" contains protocols and reviews for various applications of microfluidic diagnostics and a range of detection methodologies.

In preparing this book we would first and foremost like to express our gratitude to all the authors whose hard work and excellent contributions will, we hope, form a useful and informative text for many other researchers in the field. We appreciate their time and especially their patience during a long and arduous review process. Dr Jenkins would like to express his thanks to his friends and colleagues at Imperial College London, in Nanjing, and at Xiamen University and also to the members of the European Consortium of Microfluidics (hosted by the Centre for Business Innovation) for many useful discussions during the preparation of this work. He would also like to acknowledge financial support from the UK Department for Business Innovation and Skills and from the State Key Laboratory of Physical Chemistry of Solid Surfaces at Xiamen University, China for the support of his UK-China Fellowship. Special thanks are due to his wife and newborn son whose support has been unending and indispensable throughout. Dr Mansfield would like to thank the series editor, John Walker, for inviting him to participate in this project, as well as for his guidance during preparation of the book. He would especially like to express gratitude to his wife, Fidji, and sons, James and Ryan, for their support and patience while he spent countless weekends and evenings away from them working on this book.

Jiangsu, China — *Gareth Jenkins*
Lyon, France — *Colin D. Mansfield*

http://www.springer.com/978-1-62703-133-2

Microfluidic Diagnostics
Methods and Protocols
Jenkins, G.; Mansfield, C.D. (Eds.)
2013, XIII, 525 p., Hardcover
ISBN: 978-1-62703-133-2
A product of Humana Press