THE
MICROFLOW CYTOMETER

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Preface

While there are numerous current volumes and journal articles on applications of flow cytometry, we could find few recent compendia focused on advances in flow cytometers. Clearly, flow cytometers are becoming smaller and more geared toward special-purpose applications and less sophisticated operators. Yet as potential system developers, we had to scan the literature in microfluidics, optics, electronics, and nanotechnology to assemble information on the state-of-the-art. The dissatisfaction and frustration resulting from our search for a digest of progress in flow cytometry produced the concept for this book. Our search for the leaders in each of the relevant sub-areas produced the selection of chapter authors who have kindly contributed their perspectives on the future challenges and opportunities for realization of microflow cytometers.

For the scientists and engineers interested in the future of flow cytometers, the following chapters describe the continuing development of inexpensive, portable flow cytometers through incorporation of microfluidic technologies and small optical components. The underlying microscale theories essential for microflow cytometry are discussed, as well as advances that are representative of the current state-of-the-art. Innovative component technologies and integration of the components into functional prototype devices are reviewed with a goal of automated analysis and manipulation of particles and cells. Currently available commercial “personal cytometers” are examined to highlight both strengths and areas for necessary improvement.

Chapters included are from prominent scientists and engineers, including Howard Shapiro — a keystone in flow cytometry from the start of the technology, Michael Ladisch — past chair of the Bioengineering Section of the US National Academy of Engineering, Wayne Roth and Colin Rich — corporate leaders in industrial development and manufacture of benchtop flow cytometers, and John Dzenitis — project leader for the BioWatch version 2 biosurveillance system. Other chapters by leading scientists focus on technical breakthroughs critical for next-generation systems.

We hope you enjoy the compilation of the technologies that we think will spur future development, as well as the lessons learned from current developers of flow cytometry instrumentation. Perhaps you will discover a “missing link” after reading this book that will revolutionize future microflow cytometers. If that is the case, we wish you a satisfying and fruitful future in flow cytometry.

With best regards to our readers.

Jason Kim and Fran Ligler
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