Preface

Microfluidics, or the control of fluids at the micron scale, refers to a recent set of techniques that grew rapidly in the 1990s out of engineering and physical science laboratories and were almost immediately applied to biology, in particular cell biology. This rapid adoption by cell biologists is primarily due to the availability of biocompatible materials that can be microfabricated to enable work with live cells and biomolecules. Remarkably, culturing cells in such devices has been straightforward, with some hard-to-culture cells like neurons appearing to grow better in microfluidic devices than regular Petri dishes. The second reason for the rapid success of microfluidics in biology is the possibility to quantitatively and temporally control the environment of live cells and multicellular assemblies or organisms, and to perform miniaturized analytic procedures thanks to simple implementation of single-cell sorting and encapsulation. These developments have led to the general concepts of controlled cell microenvironment, lab-on-a-chip, and organ-on-a-chip devices, with a very wide range of applications, including some that have become industrial products. In these volumes of *Methods in Cell Biology*, we focus on applications of microfluidics to cell biology. Part A (Volume 146) deals with model multicellular assemblies (monolayers and spheroids), organs on chip, and model organisms; Part B (Volume 147) deals with single cells, including application to microorganisms, cell migration, and cell mechanics; and finally, Part C (Volume 148) deals with applications for cell analysis including cell culture and sorting, droplet-based microfluidics, and single-cell analysis. These volumes cover a broad range of application of microfluidics to cell biology, with detailed methods for specific cases.

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