

Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices

By Brian J. Kirby

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This text focuses on the physics of fluid transport in micro- and nanofabricated liquid-phase systems, with consideration of gas bubbles, solid particles, and macromolecules. This text was designed with the goal of bringing together several areas that are often taught separately - namely, fluid mechanics, electrodynamics, and interfacial chemistry and electrochemistry - with a focused goal of preparing the modern microfluidics researcher to analyze and model continuum fluid mechanical systems encountered when working with micro- and nanofabricated devices. This text is not a summary of current research in the field, and it omits any discussion of microfabrication techniques or any attempt to summarize the technological state of the art. This text serves as a useful reference for practicing researchers but is designed primarily for classroom instruction. Worked sample problems are inserted throughout to assist the student, and exercises are included at the end of each chapter to facilitate use in classes.

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Editorial Review

About the Author
Brian J. Kirby currently directs the Micro/Nanofluidics Laboratory in the Sibley School of Mechanical and Aerospace Engineering at Cornell University. He joined the school in August 2004. Previous to that, he was a Senior Member of the Technical Staff in the Microfluidics Department at Sandia National Laboratories in Livermore, California, where he worked from 2001 to 2004 on microfluidic systems, with applications primarily to counterbioterrorism. Professor Kirby received a 2002 R&D Top 100 Invention Award for work on microvalves for high-pressure fluid control, a 2004 JD Watson Investigator Award for microdevices for protein production and analysis, and a 2006 Presidential Early Career Award for Scientists and Engineers (PECASE) for nanoscale electrokinetics and bioagent detection. He teaches both macroscale and microscale fluid mechanics, and received the 2008 Mr and Mrs Robert F. Tucker Excellence in Teaching Award at Cornell University.

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