

Introduction To Microfluidics

The second edition of Introduction to Microfluidics captures all the new exciting developments in the field of microfluidics over the last twenty years. The book describes the applications, the market, and attempts to envision the future of microfluidics. It covers the physics of miniaturization, the hydrodynamics of microfluidics in channels and with droplets, transport phenomena in microsystems, electrokinetic phenomena, and an introduction to microfabrication. Many examples are provided and discussed simply, most often from a physical perspective, and the book includes 415 figures and 600 references. The basic principles are explored in depth and with rigor, and their main applications are clearly presented. While maintaining the same clear structure, and accessible explanations of the basic theory, this new edition is a complete revision of the first edition and makes use of the considerable data collected in the field over the last two decades. Offering a cross-disciplinary view of the field embracing biological, chemical, physical and engineering perspectives, this book is an ideal resource for students and researchers at any level 2ea601111f

The manipulation of cells and microparticles within microfluidic systems using external forces is valuable for many microscale analytical and bioanalytical applications. The book also provides information on the design and characterization of ultrasonic particle manipulation devices as well as applications in acoustic trapping and immunoassays. It has gained much interest because it allows for the simple label-free separation of microparticles based on their mechanical properties without affecting the microparticles themselves. Acoustofluidics is the ultrasound-based external forcing of microparticles with microfluidic systems. Microscale Acoustofluidics provides an introduction to the field providing the background to the fundamental physics including chapters on governing equations in microfluidics and perturbation theory and ultrasound resonances, acoustic radiation force on small particles, continuum mechanics for ultrasonic particle manipulation, and piezoelectricity and application to the excitation of acoustic fields for ultrasonic particle manipulation. Written by leading experts in the field, the book will appeal to postgraduate students and researchers interested in microfluidics and lab-on-a-chip applications 2ea601111f

Microfluidics for Advanced Functional Polymeric Materials 2ea601111f

Additionally, the interdisciplinary approach to the science of nano- and microfluidics enables readers from a range of different academic disciplines to broaden their understanding. This practical approach is ideally suited to researchers and R&D staff in industry. Provides a practical guide to the successful design and implementation of nano- and microfluidic processes (e. Microfluidics: Modeling, Mechanics and Mathematics, Second Edition provides a practical, lab-based approach to nano- and microfluidics, including a wealth of practical techniques, protocols and experiments ready to be put into practice in both research and industrial settings. Alongside traditional fluid/transport topics, the book contains a wealth of coverage of materials and manufacturing techniques, chemical modification/surface functionalization, biochemical analysis, and the biosensors involved. g. , biosensing) and equipment (e. , biosensors, such as diabetes blood glucose sensors) Provides techniques, experiments and protocols that are ready to be put to use in the lab, or in an academic or industry setting Presents a collection of 3D-CAD and image files on a companion website. g. This fully updated new edition also includes new sections on viscous flows and centrifugal microfluidics, expanding the types of platforms covered to include centrifugal, capillary and electro kinetic platforms 2ea601111f

New devices are launched all the time, prompting the need for a straightforward guide to the design and manufacture of lab-on-a-chip (LOC) devices. Further chapters describe the integration of LOC devices, not only with each other but also into existing technologies. This book presents a modular approach to the construction and integration of LOC components in detection science. Several chapters are devoted to applications, presenting both the sampling regime and detection methods needed. The concept of a miniaturised laboratory on a disposable chip is now a reality, and in everyday use in industry, medicine and defence. With insights into LOC applications, from biosensing to molecular and chemical analysis, and presenting scaled-down versions of existing technology alongside unique approaches that exploit the physics of the micro and nano-scale, this book will appeal to newcomers to the field and practitioners requiring a convenient reference. The editors have brought together some of the leading experts from academia and industry to present an accessible guide to the technology available and its potential 2ea601111f

Additional chapters cover Microfluidics for single cell analysis, Fluorescence Based Miniaturized Microfluidic and Nanofluidic Systems for Biomedical Applications, Active Matter Dynamics in Confined Microfluidic Environments, Challenges and opportunities in micro/nanofluidics and lab-on-a-chip, and Paper-microfluidic signal-enhanced immunoassays. Offers basic understanding of the state-of-the-art design and fabrication of microfluidics/ nanofluidics and lab-on-chip Explains how to develop microfluidics/nanofluidics for biomedical application such as high throughput biological screening and separation Discusses the applications, challenges and opportunities in biomedical and translational research applications of microfluidics/nanofluidics. Chapters in this updated release include An introduction

to microfluidics and their applications, Design and fabrication of Micro/Nanofluidics devices and systems, Detection and separation of proteins using Micro/Nanofluidics devices, Micro/Nanofluidics devices for DNA/RNA detection and separation, Paper based microfluidics a forecast towards the most affordable and rapid point-of-care devices, Paper based micro/Nanofluidics devices for biomedical applications, Advances of Microfluidics Devices and their Applications in Personalized Medicine, and much more. Micro/Nanofluidics and Lab-on-Chip Based Emerging Technologies for Biomedical and Translational Research Applications, Volume 185, Part A represents the collation of chapters written by eminent scientists worldwide 2ea601111f

Material is also presented discussing micro-textured engineered surfaces, high-performance AFM probe-based, micro-grooving processes, fabrication with metals and polymers in bio-micromanipulation and microfluidic applications. Specifically, this includes fundamental aspects of fluid mechanics in micro-scale and nano-scale confinements and microfabrication. Editor Suman Chakraborty brings together leading minds in both fields who also: Cover the fundamentals of microfluidics in a manner accessible to multi-disciplinary researchers, with a balance of mathematical details and physical principles Discuss the explicit interconnection between microfluidics and microfabrication from an application perspective Detail the amalgamation of microfluidics with logic circuits and applications in micro-electronics Microfluidics and Microfabrication is an ideal book for researchers, engineers and senior-level graduate students interested in learning more about the two fields. Microfluidics and Microfabrication discusses the interconnect between microfluidics, microfabrication and the life sciences 2ea601111f

The authors cover not only the most popular methods for the fabrication of microchips (photolithography, laser ablation, and soft lithography), but also microfluidic techniques for such bioanalytical assays and bioprocesses as DNA analysis, PCR, immunoassays, and cell reactors. Hands-on researchers review the principles behind successful miniaturization and describe the key techniques for miniaturizing large-scale biochemical and bioanalytical methods for microchip analysis. Highlights include PCR on a microchip, microscale cell culturing, and the study of cellular processes on a microchip. The protocols offer step-by-step laboratory instructions, an introduction outlining the principles behind the technique, lists of the necessary equipment and reagents, and tips on troubleshooting and avoiding known pitfalls 2ea601111f

Serving as both an elementary introduction and advanced guidebook, this book interests and inspires scholars and students who are currently studying or wish to study microfluidics-based cell analysis methods. This book summarizes the various microfluidic-based approaches for single-cell capture, isolation, manipulation, culture and observation, lysis, and analysis. Single-cell analysis reveals the heterogeneities in morphology, functions, composition, and genetic performance of seemingly identical cells, and advances in single-cell analysis can

overcome the difficulties arising due to cell heterogeneity in the diagnostics for a targeted model of disease. It also offers lessons learned and tips from front-line investigators to help researchers overcome bottlenecks in their own studies. This book provides a detailed review of the state-of-the-art techniques presenting the pros and cons of each of these methods. Highlighting a number of techniques, such as microfluidic droplet techniques, combined microfluidics-mass-spectrometry systems, and nanochannel sampling, it describes in detail a new microfluidic chip-based live single-cell extractor (LSCE) developed in the editor's laboratory, which opens up new avenues to use open microfluidics in single-cell extraction, single-cell mass spectrometric analysis, single-cell adhesion analysis and subcellular operations

The book covers the whole breadth of this dynamic field, including classical microfabr. The entire scope of the BioMEMS field-at your fingertipsHelping to educate the new generation of engineers and biologists, Introduction to BioMEMS explains how certain problems in biology and medicine benefit from and often require the miniaturization of devices

The second part introduces various applications of microfluidics in nanotechnology, such as drug delivery, tissue engineering and biomedical diagnosis. The book focuses on microfluidics with applications in nanotechnology. The first part summarizes the recent advances and achievements in the field of microfluidic technology, with emphasize on the the influence of nanotechnology

Microfluidics for Biological Applications provides researchers and scientists in the biotechnology, pharmaceutical, and life science industries with an introduction to the basics of microfluidics and also discusses how to link these technologies to various biological applications at the industrial and academic level. The material presented here is divided into four parts, Part I gives perspective on the history and development of microfluidic technologies, Part II presents overviews on how microfluidic systems have been used to study and manipulate specific classes of components, Part III focuses on specific biological applications of microfluidics: biodefense, diagnostics, high throughput screening, and tissue engineering and finally Part IV concludes with a discussion of emerging trends in the microfluidics field and the current challenges to the growth and continuing success of the field. Readers will gain insight into a wide variety of biological applications for microfluidics

Together, microfluidics and chemical engineering can lead to a more complete and comprehensive process. Microfluidics represent great potential for chemical processes design, development, optimization, and chemical engineering bolsters the project design of industrial processes often found in large chemical plants. Featuring coverage on a broad range of topics such as design techniques, hydrodynamics, and numerical modelling, this book is ideally designed for engineers, chemists, microfluidics and chemical engineering companies,

academicians, researchers, and students. Process Analysis, Design, and Intensification in Microfluidics and Chemical Engineering provides emerging research exploring the theoretical and practical aspects of microfluidics and its application in chemical engineering with the intention of building pathways for new processes and product developments in industrial areas 2ea601111f

Fully comprehensive introduction to the rapidly emerging area of micro systems technology Transport Phenomena in Micro Systems explores the fundamentals of the new technologies related to Micro-Electro-Mechanical Systems (MEMS). Brings together in one collection recent and emerging developments in this fast-growing area of micro systems Covers multidisciplinary fields such as materials science, mechanical engineering, microtechnology and biotechnology, et al Comprehensive coverage of analytical models in microfluidics and MEMS technology Introduces micro fluidics applications include the development of inkjet printheads, micro-propulsion, and micro thermal technologies Presented in a very logical format Supplies readers with problems and solutions. This book spans multidisciplinary fields such as material science and mechanical engineering, engineering, physics, chemistry, microtechnology and biotechnology. It deals with the behavior, precise control and manipulation of fluids that are geometrically constrained to a small, typically sub-millimeter, scale, such as nl, pl, fl, small size, low energy consumption, effects of the micro domain and heat transfer in the related devices. The author describes in detail and with extensive illustration micro fabrication, channel flow, transport laws, magnetophoresis, micro scale convection and micro sensors and activators, among others 2ea601111f

It provides the fundamental science background for newcomers and advanced techniques and concepts for experienced researchers and professionals. This comprehensive handbook presents fundamental aspects, fabrication techniques, introductory materials on microbiology and chemistry, measurement techniques, and applications of microfluidics and nanofluidics. The second volume focuses on topics related to experimental and numerical methods. Reflecting the inherent nature of microfluidics and nanofluidics, the book includes as much interdisciplinary knowledge as possible. It also covers fabrication and applications in a variety of areas, from aerospace to biological systems 2ea601111f

This book aims to present readers with a valuable compendium of significant advances in applying the multidisciplinary microfluidic technologies to address energy and environmental problems in a plethora of areas such as environmental monitoring and detection, new nanofluid application in traditional mechanical manufacturing processes, development of novel biosensors, and thermal management. Microfluidics have aroused a new surge of interest in recent years in environmental and energy areas, and inspired novel applications to tackle the worldwide challenges for sustainable development. This book will provide a new perspective to the understanding of the ever-growing importance of microfluidics 2ea601111f

Microfluidics deals with fluids flowing in miniaturized systems, and has practical applications in the pharmaceutical, biomedical and chemical engineering fields. This text provides an introduction to this emerging discipline 2ea601111f

With this knowledge in mind, the following sections highlight important advances in developing and applying biosensors and microfluidic devices in cancer research at universities and in the industry. With recent technological advances, particularly biosensors, microfluidic devices have increased their usefulness and importance in oncology and cancer research. Over the last decades, considerable effort has been made to develop new technologies to improve the diagnosis and treatment of cancer. It begins with a detailed introduction to the fundamental aspects of tumor biology, cancer biomarkers, biosensors and microfluidics. It offers new visions of how this technology can influence daily life in hospitals and companies, improving research methodologies and the prognosis of cancer patients. Finally, the transfer of these technologies into the clinical environment for the diagnosis and treatment of cancer patients will be highlighted. This book offers a comprehensive overview of the development and application of microfluidics and biosensors in cancer research, in particular, their applications in cancer modeling and theranostics. Microfluidics has proven to be a powerful tool for manipulating biological fluids with high precision and efficiency and has already been adopted by the pharmaceutical and biotechnology industries. By combining the recent advances made in the development and application of microfluidics and biosensors in cancer research in academia and clinics, this book will be useful literature for readers from a variety of backgrounds. The aim of this book is to bring together in a single volume all the knowledge and expertise required for the development and application of microfluidic systems and biosensors in cancer modeling and theranostics. Strategies for identifying and evaluating potent disease biomarkers and developing biosensors and microfluidic devices for their detection are discussed in detail 2ea601111f

A useful reference for non-specialists and a basic guideline for research scientists and technicians already active in this field or intending to work in microfluidics. As such, it summarizes recent progress in microfluidics, including its origin and development, the theoretical fundamentals, and fabrication techniques for microfluidic devices. The first book offering a global overview of fundamental microfluidics and the wide range of possible applications, for example, in chemistry, biology, and biomedical science. The book also comprehensively covers the fluid mechanics, physics and chemistry as well as applications in such different fields as detection and synthesis of inorganic and organic materials 2ea601111f

This book provides a comprehensive, state-of-the-art review of microfluidic approaches and applications in pharmatechnology. It is appropriate for students with an interdisciplinary interest in both the pharmaceutical and engineering fields, as well as process developers and scientists in the pharmaceutical industry. The authors cover new and advanced technologies for screening, production by micro reaction

technology and micro bioreactors, small-scale processing of drug formulations, and drug delivery that will meet the need for fast and effective screening methods for drugs in different formulations, as well as the production of drugs in very small volumes. Readers will find detailed chapters on the materials and techniques for fabrication of microfluidic devices, microbioreactors, microsystems for emulsification, on-chip fabrication of drug delivery systems, respiratory drug delivery and delivery through microneedles, organs-on-chip, and more

The book shows how to take advantage of the performance benefits of microfluidics and serves as an instant reference for state-of-the-art microfluidics technology and applications. Now in its Third Edition, the Artech House bestseller, *Fundamentals and Applications of Microfluidics*, provides engineers and students with the most complete and current coverage of this cutting-edge field. The book details the various industry standards that are applicable to the subsystems of Li-ion energy storage systems and how the requirements of these standards may impact the design of their system. Professionals get practical guidance in choosing the best fabrication and enabling technology for a specific microfluidic application, and learn how to design a microfluidic device. The book is packed with numerous examples of issues that have caused field failures and how a proper design/assembly process could have reduced the risk of these failures. The book includes technical details of all state-of-the-art Li-on energy storage subsystems and their requirements, and provides a system designer a single resource detailing all of the common issues navigated when using Li-ion batteries to reduce the risk of field failures. This revised and expanded edition provides updated discussions throughout and features critical new material on microfluidic power sources, sensors, cell separation, organ-on-chip and drug delivery systems, 3D culture devices, droplet-based chemical synthesis, paper-based microfluidics for point-of-care, ion concentration polarization, micro-optofluidics and micro-magnetofluidics. Checklists are included to help readers evaluate their own battery system designs and identify gaps in the designs that increase the risk of field failures. Readers find discussions on a wide range of applications, including fluid control devices, gas and fluid measurement devices, medical testing equipment, and implantable drug pumps. addressed at the design stage to reduce the risk of failures in the field is presented. Moreover, engineers get simple calculations, ready-to-use data tables, and rules of thumb that help them make design decisions and determine device characteristics quickly

Furthermore, this book focuses on a detailed description of the thermal transport behavior, challenges and implications that involve the development and use of HTFs under the influence of atomistic-scale structures and industrial applications. Microfluidics and nanofluidics span a broad array of disciplines including mechanical, materials, and electrical engineering, surface science, chemistry, physics and biology. Also, this book deals with transport and interactions of colloidal particles and biomolecules in microchannels, which have great

importance to many microfluidic applications, such as drug delivery in life science, microchannel heat exchangers in electronic cooling, and food processing industry. In the present book, various applications of microfluidics and nanofluidics are introduced 2ea601111f

Laboratory Methods in Microfluidics features a range of lab methods and techniques necessary to fully understand microfluidic technology applications. Microfluidics deals with the manipulation of small volumes of fluids at sub-millimeter scale domain channels. Practical for students, instructors, and researchers, this book provides a much-needed, comprehensive new laboratory reference in this rapidly growing and exciting new field of research. Provides a number of detailed methods and instructions for experiments in microfluidics Features an appendix that highlights several standard laboratory techniques, including reagent preparation plus a list of materials vendors for quick reference Authored by a microfluidics expert with nearly a decade of research on the subject. The unique properties of microfluidic technologies, such as rapid sample processing and precise control of fluids in assay have made them attractive candidates to replace traditional experimental approaches. This exciting new field is becoming an increasingly popular subject both for research and education in various disciplines of science, including chemistry, chemical engineering and environmental science 2ea601111f

Microfluidics is a microtechnological field dealing with the precise transport of fluids (liquids or gases) in small amounts (e. g. This book provides a useful introduction into this burgeoning field, and a specific application of microfluidics is presented. It also gives a survey of microfluidics. microliters, nanoliters or even picoliters) 2ea601111f

Prakash and Yeom provide readers with an essential toolkit to take micro- and nanofluidic applications out of the research lab and into commercial and laboratory applications. The resulting work covers the fundamentals, processes and applied challenges of functional engineered nanofluidic systems for a variety of different applications, including discussions of lab-on-chip, bio-related applications and emerging technologies for energy and environmental engineering. Case studies introduce and illustrate state-of-the-art applications across areas, including lab-on-chip, energy and bio-based applications. Case studies describing fabrication of complex micro- and nanoscale systems help the reader gain a practical understanding of developing and fabricating such systems. The fundamentals of micro- and nanofluidic systems and micro- and nanofabrication techniques provide readers from a variety of academic backgrounds with the understanding required to develop new systems and applications. To provide an interdisciplinary readership with the necessary toolkit to work with micro- and nanofluidics, this book provides basic theory, fundamentals of microfabrication, advanced fabrication methods, device characterization methods and detailed examples of applications of nanofluidics devices and systems 2ea601111f

It is with its many pedagogical exercises designed as a textbook for an advanced undergraduate or first-year graduate course. The book grew out of a set of well-tested lecture notes. It has applications in chemical engineering, pharmaceuticals, biotechnology and medicine. Throughout the book simple models with analytical solutions are presented to provide the student with a thorough physical understanding of order of magnitudes and various selected microfluidic phenomena and devices. Microfluidics is a young and rapidly expanding scientific discipline, which deals with fluids and solutions in miniaturized systems, the so-called lab-on-a-chip systems. The basic idea of the book is to provide a self-contained formulation of the theoretical framework of microfluidics, and at the same time give physical motivation and examples from lab-on-a-chip technology. After three chapters introducing microfluidics, the governing equations for mass, momentum and energy, and some basic flow solutions, the following 14 chapters treat hydraulic resistance/compliance, diffusion/dispersion, time-dependent flow, capillarity, electro- and magneto-hydrodynamics, thermal transport, two-phase flow, complex flow patterns and acousto-fluidics, as well as the new fields of opto- and nano-fluidics. As the lab-on-a-chip systems grow in complexity, a proper theoretical understanding becomes increasingly important. It is also well suited for self-study 2ea601111f

The material presented here is divided into four parts, Part I gives perspective on the history and development of microfluidic technologies, Part II presents overviews on how microfluidic systems have been used to study and manipulate specific classes of components, Part III focuses on specific biological applications of microfluidics: biodefense, diagnostics, high throughput screening, and tissue engineering and finally Part IV concludes with a discussion of emerging trends in the microfluidics field and the current challenges to the growth and continuing success of the field. Readers will gain insight into a wide variety of biological applications for microfluidics. Microfluidics for Biological Applications provides researchers and scientists in the biotechnology, pharmaceutical, and life science industries with an introduction to the basics of microfluidics and also discusses how to link these technologies to various biological applications at the industrial and academic level 2ea601111f

The result is a specialist reference for materials scientists, organic, polymer and physical chemists, and chemical engineers. A comprehensive and systematic treatment of our current understanding of the microfluidic technique and its advantages in the controllable fabrication of advanced functional polymeric materials. Clear diagrams and illustrations throughout the text make the relevant theory and technologies more readily accessible. Introducing and summarizing recent advances and achievements in the field, the authors cover the design and fabrication of microfluidic devices, the fundamentals and strategies for controllable microfluidic generation of multiphase liquid systems, and the use of these liquid systems with an elaborate combination of their structures and compositions for generating novel polymer materials, such as microcapsules, microfibers, valves, and membranes 2ea601111f

The authors discuss simulation and design methods which support the design process of droplet microfluidics in general, as well as design methods for a dedicated droplet routing mechanism, namely passive droplet routing. Provides both a comprehensive “toolbox” for designers working on droplet microfluidic networks in general and an integrated design flow for the passive droplet routing mechanism in particular; Describes for the first time CAD methods for droplet microfluidic networks, along with the first integrated design process; Includes open source implementations, in order to reach the largest possible user group within the domain of microfluidics. This book describes automatic methods for the design of droplet microfluidic networks. Dedicated methods for passive droplet routing are discussed and allow for designing application-specific architectures for a given set of experiments, as well as generating droplet sequences realizing the respective experiments. Together, these methods provide a comprehensive “toolbox” for designers working on droplet microfluidic networks in general and an integrated design flow for the passive droplet routing mechanism in particular. The methods discussed allow for simulating a microfluidic design on a high-abstraction level, which facilitates early validation of whether a design works as intended, automatically dimensioning a microfluidic design, so that constraints like flow conditions are satisfied, and automatically generating meander designs for the respective needs and fabrication settings

One particularly promising application is the microfluidic synthesis of polymer particles with precisely controlled dimensions, and a variety of shapes, morphologies and compositions. Written as a comprehensive introduction for scientists and engineers working in microfabrication and microfluidics, Microfluidic Reactors for Polymer Particles covers topics such as: Applications and methods of generation of polymer particles Physics of microfluidic emulsification Formation of droplets in microfluidic systems High-throughput microfluidic systems for formation of droplets Microfluidic production of polymer particles and hydrogel particles Polymer capsules Synthesis of polymer particles with non-conventional shapes This book is intended for a broad audience, including students, researchers and engineers in industry, with interests in physics, chemistry, materials science, engineering or biotechnology. Microfluidics has applications spanning analytical chemistry, organic and inorganic synthesis, cell biology, optics and information technology. The manipulation of fluids in channels with dimensions in the range from tens to hundreds of micrometers – microfluidics – has recently emerged as a new field of science and technology

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 analyse and model continuum fluid mechanical systems encountered when working with micro- and nanofabricated devices. Worked sample problems are included throughout to assist the student, and exercises at the end of each chapter help facilitate class learning. 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 serves as a useful reference for practising researchers but is designed primarily for classroom instruction 2ea601111f

This book is a go-to resource for the community yearning to adopt and promote droplet microfluidics into different applications. Starting with the basic theory of droplet microfluidics before introducing its use as a tool, the reader is treated to chapters on important techniques, including robust passive and active droplet manipulations and applications such as single cell analysis, which is key for drug discovery. Edited by two leaders, this book has drawn together expertise from around the globe to form a unified, cohesive resource for the droplet microfluidics community 2ea601111f

This book presents a detailed overview of the design, formatting, application, and development of microfluidic chips in the context of cell biology research, enumerating each element involved in microfluidics-based cell analysis, discussing its history, status quo, and future prospects. It also offers an extensive review of the research completed in the past decade, including numerous color figures. Serving as both an elementary introduction and advanced guidebook, the book interests and inspires scholars and students who are currently studying microfluidics-based cell analysis methods as well as those who wish to do so. It highlights a number of cutting-edge techniques, such as 3D cell culture, microfluidic droplet technique, and microfluidic chip-mass spectrometry interfaces, offering a first-hand impression of the latest trends in the field and suggesting new research directions. The individual chapters are based on the respective authors' studies and experiences, providing tips from the frontline to help researchers overcome bottlenecks in their own work 2ea601111f

This book describes the fundamentals of microfluidics and fabrication methods of microfluidic devices that can be adopted for animal-assisted reproduction. It presents microfluidic methods for sorting highly fertile spermatozoa. It discusses the use of microfluidics in sperm sexing and the cryopreservation of animal gametes and embryos. This book also describes the application of microfluidics in vitro fertilization and embryo culture. Lastly, the book examines the potential opportunities of microfluidics in infertility diagnosis, sperm selection and guidance, oocyte selection, insemination, and embryo monitoring 2ea601111f

Serving as both an elementary introduction and advanced guidebook, this book interests and inspires scholars and students who are currently studying or wish to study microfluidics-based cell analysis methods. This book summarizes the various microfluidic-based approaches for single-cell capture, isolation, manipulation, culture and observation, lysis, and analysis. Single-cell analysis reveals the heterogeneities in morphology, functions, composition, and genetic performance of seemingly identical cells, and advances in single-cell analysis can

overcome the difficulties arising due to cell heterogeneity in the diagnostics for a targeted model of disease. Highlighting a number of techniques, such as microfluidic droplet techniques, combined microfluidics-mass-spectrometry systems, and nanochannel sampling, it describes in detail a new microfluidic chip-based live single-cell extractor (LSCE) developed in the editor's laboratory, which opens up new avenues to use open microfluidics in single-cell extraction, single-cell mass spectrometric analysis, single-cell adhesion analysis and subcellular operations. This book provides a detailed review of the state-of-the-art techniques presenting the pros and cons of each of these methods. It also offers lessons learned and tips from front-line investigators to help researchers overcome bottlenecks in their own studies 2ea601111f

Lately, there has been a growing interest in exploiting the benefits of the ICs for areas outside of the traditional application spaces. These biolab-on-IC systems utilize the IC to facilitate faster, repeatable, and standardized biological experiments at low cost with a small volume of biological sample. One notable area is found in biology Bioanalytical instruments have been miniaturized on ICs to study various biophenomena or to actuate biosystems. The research activities in this field are expected to enjoy substantial growth in the foreseeable future. BioCMOS Technologies reviews these exciting recent efforts in joining CMOS technology with biology 2ea601111f

This text provides an introduction to this emerging discipline. Microfluidics deals with fluids flowing in miniaturized systems, and has practical applications in the pharmaceutical, biomedical and chemical engineering fields 2ea601111f

The book also covers the future outlook, remaining challenges, and emerging opportunities. This book shall be a tremendous up-to-date resource for researchers working in the area globally. This volume provides an overview of the recent advances in the field of paper microfluidics, whose innumerable research domains have stimulated considerable efforts to the development of rapid, cost-effective and simplified point-of-care diagnostic systems. theoretical background of paper microfluidics, fabrication techniques for paper-based devices, and broad applications. The book is divided into three parts viz. Each chapter of the book is self-explanatory and focuses on a specific topic and its relation to paper microfluidics and starts with a brief description of the topic's physical background, essential definitions, and a short story of the recent progress in the relevant field 2ea601111f

Microfluidics—which refers to the technology of miniature fluidic devices and the study of fluids at submillimeter levels—is invisible to most of us because it is hidden beneath ingenious user interfaces. He explains not only the technology but also the efforts, teams, places, and circumstances that enabled these inventions. He also describes how rapid speed microfluidic DNA sequencers have enabled the sequencing of animal, plant, and microbial species genomes; organs on chips facilitate direct tests of drugs on human tissue, leapfrogging over the usual

stage of animal testing; at-home pregnancy tests are based on clever microfluidic principles; microfluidics can be used to detect cancer cells in the early stages of metastasis; and the same technology that shoots droplets of ink on paper in inkjet printers enables 3D printers to dispense layers of polymers. More than 100 color illustrations show readers amazing images of microfluids under the microscope. In this book, Albert Folch, a leading researcher in microfluidics, describes the development and use of key microfluidic devices. Folch reports, for example, that the inkjet printer was one of the first microfluidic devices invented, and traces its roots back to nineteenth-century discoveries in the behavior of fluid jets. Stories behind essential microfluidic devices, from the inkjet printer to DNA sequencing chip. Folch tells the stories behind these devices in an engaging style, accessible to nonspecialists. Hidden from view, microfluidics underlies a variety of devices that are essential to our lives, from inkjet printers to glucometers for the monitoring of diabetes 2ea60111f

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