

Lab on a Chip

Devices and applications at the micro- and nanoscale
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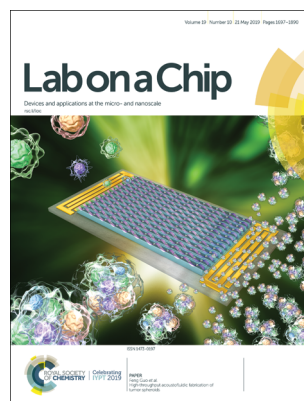
IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 19(10) 1697-1890 (2019)



Cover

See Xing Wang, Aram J. Chung *et al.*, pp. 1747-1754.
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Inside cover

See Feng Guo *et al.*, pp. 1755-1763.
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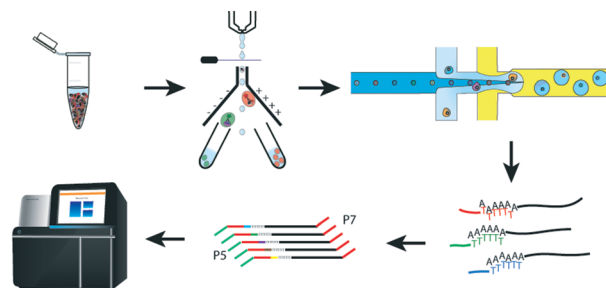
PERSPECTIVE

1706

Droplet-based single cell RNAseq tools: a practical guide

Robert Salomon,* Dominik Kaczorowski, Fatima Valdes-Mora, Robert E. Nordon, Adrian Neild, Nona Farbehi, Nenad Bartonicek and David Gallego-Ortega*

A step-by-step guide for droplet-based single cell RNAseq experiments, practical considerations and technical notes.



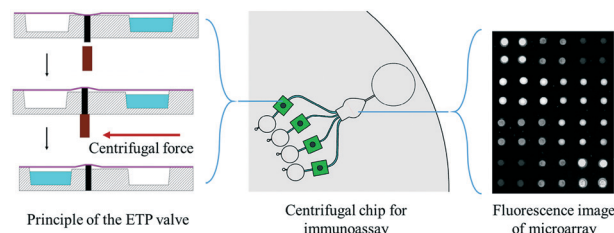
COMMUNICATION

1728

A novel electromagnet-triggered pillar valve and its application in immunoassay on a centrifugal platform

Yiqi Chen, Minjie Shen, Yunzeng Zhu and Youchun Xu*

A novel electromagnet-triggered pillar valve is proposed and applied to realize automatic and multiplex immunoassay on a centrifugal platform.



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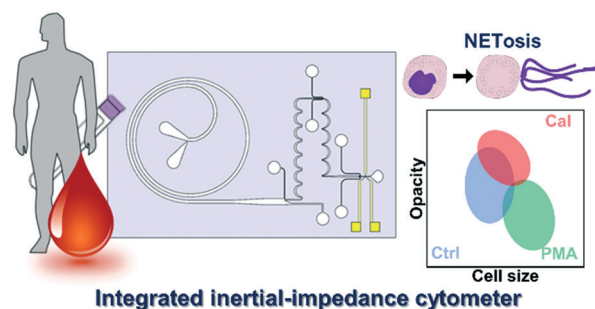
PAPERS

1736

Integrated inertial-impedance cytometry for rapid label-free leukocyte isolation and profiling of neutrophil extracellular traps (NETs)

Chayakorn Petchakup, Hui Min Tay, King Ho Holden Li and Han Wei Hou*

A novel integrated inertial-impedance cytometer for rapid and label-free electrical profiling of neutrophil extracellular traps formation (NETosis).



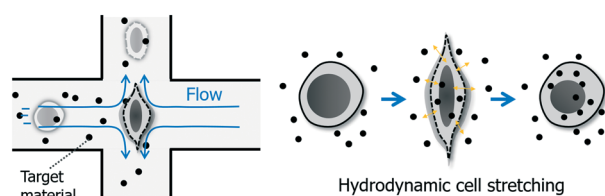
1747

Hydroporator: a hydrodynamic cell membrane perforator for high-throughput vector-free nanomaterial intracellular delivery and DNA origami biostability evaluation

Megan E. Kizer, Yanxiang Deng, GeoumYoung Kang, Paiyz E. Mikael, Xing Wang* and Aram J. Chung*

We present a hydrodynamic cell deformation-induced intracellular delivery platform, termed “hydroporator”.

Hydroporator for Intracellular delivery

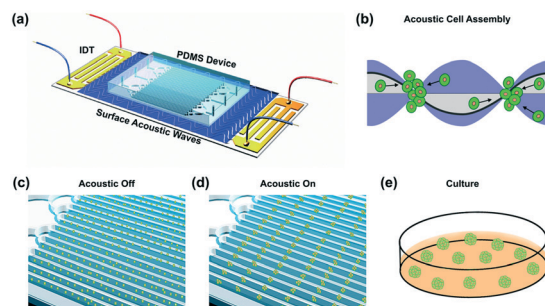


1755

High-throughput acoustofluidic fabrication of tumor spheroids

Bin Chen, Yue Wu, Zheng Ao, Hongwei Cai, Asael Nunez, Yunhua Liu, John Foley, Kenneth Nephew, Xiongbin Lu and Feng Guo*

Three-dimensional (3D) culture of multicellular spheroids, offering a desirable biomimetic microenvironment, is appropriate for recapitulating tissue cellular adhesive complexity and revealing a more realistic drug response.

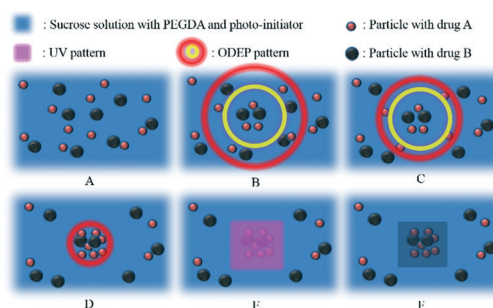


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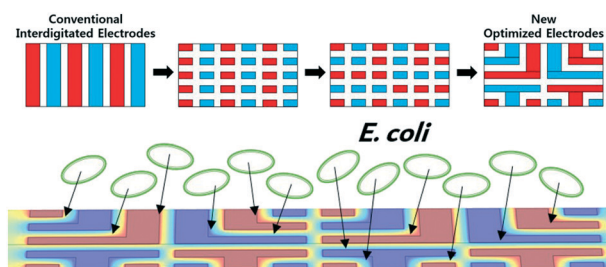
Generating digital drug cocktails via optical manipulation of drug-containing particles and photo-patterning of hydrogels

Yi-Sin Chen, Ko-Chin Chung, Wen-Yen Huang, Wen-Bin Lee, Chien-Yu Fu, Chih-Hung Wang and Gwo-Bin Lee*

An integrated microfluidic system combining 1) ODEP for manipulation of drug-containing particles and 2) UV “direct writing” capable of patterning hydrogels was established for automatic formulation of customized digital drug cocktails.



1772

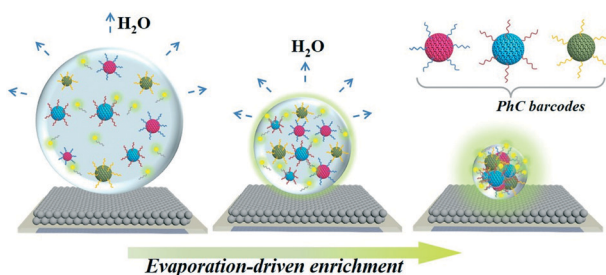


Two-dimensional computational method for generating planar electrode patterns with enhanced volumetric electric fields and its application to continuous dielectrophoretic bacterial capture

Chang-Ho Han, Hyun Wook Ha and Jaesung Jang*

Novel method for generating planar electrode patterns with enhanced dielectrophoretic bacterial capture.

1783

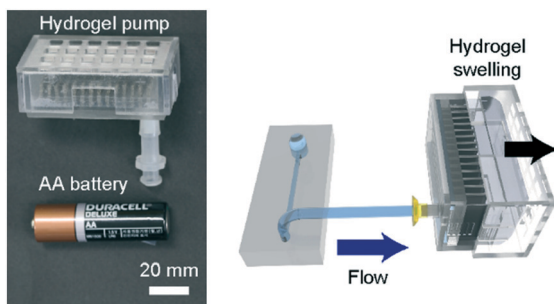


Condensing-enriched magnetic photonic barcodes on superhydrophobic surface for ultrasensitive multiple detection

L. Cai, F. Bian, L. Sun, H. Wang and Y. Zhao*

When PhC barcodes with stable characteristic reflection peaks are integrated with a superhydrophobic substrate they can realize the ultrasensitive multiple detection by the enrichment of the solution upon evaporation. Thus, the detection of miRNA was carried out by the system and it was found the detection limit was improved by about three orders.

1790

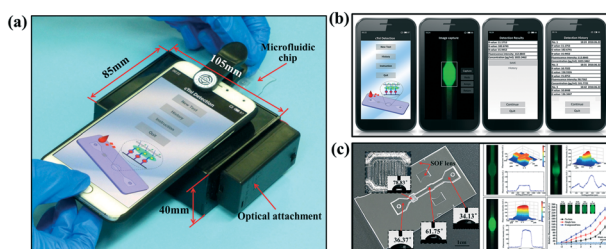


A hydrogel-driven microfluidic suction pump with a high flow rate

Jaedeok Seo, Cong Wang, Sooyoung Chang, Jungyul Park* and Wonjung Kim*

A portable, non-powered, long-term working microfluidic suction pump driven by a superabsorbent polymer was developed.

1797



Smartphone-app based point-of-care testing for myocardial infarction biomarker cTnI using an autonomous capillary microfluidic chip with self-aligned on-chip focusing (SOF) lenses

Chao Liang, Yuanchang Liu, Aiying Niu, Chong Liu,* Jingmin Li* and Dianxiu Ning

We present a smartphone-app platform for point-of-care testing of cTnI, which features the self-aligned on-chip focusing (SOF) lenses for enhancing the fluorescence intensity.

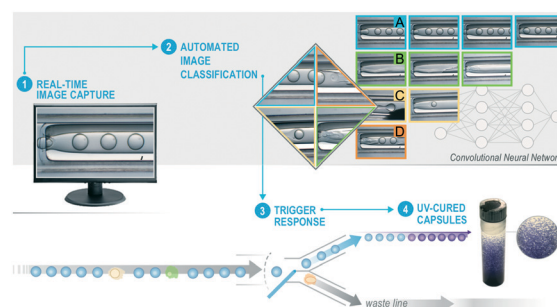
PAPERS

1808

Automated detection and sorting of microencapsulation *via* machine learning

Albert Chu, Du Nguyen, Sachin S. Talathi, Aaron C. Wilson, Congwang Ye, William L. Smith, Alan D. Kaplan, Eric B. Duoss, Joshua K. Stolaroff and Brian Giera*

We automated a traditionally labor-intensive, yet widely-used capsule production system.

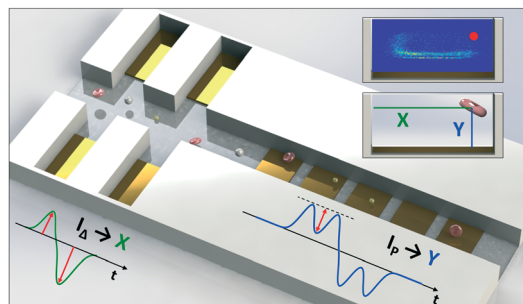


1818

High-throughput electrical position detection of single flowing particles/cells with non-spherical shape

Riccardo Reale, Adele De Ninno, Luca Businaro, Paolo Bisegna and Federica Caselli*

A novel all-electrical approach for cross-sectional position detection of flowing particles and cells.

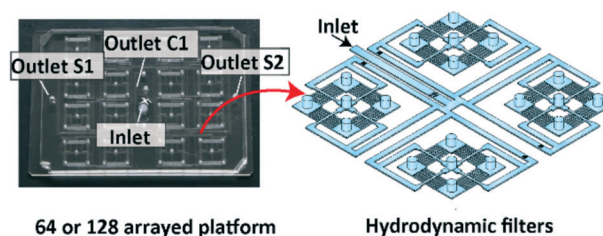


1828

A numbering-up strategy of hydrodynamic microfluidic filters for continuous-flow high-throughput cell sorting

Ryoken Ozawa, Hideki Iwadate, Hajime Toyoda, Masumi Yamada* and Minoru Seki

A numbering-up strategy of hydrodynamic filters was presented to dramatically increase the throughput of cell/particle sorting up to $\sim 15 \text{ mL min}^{-1}$.

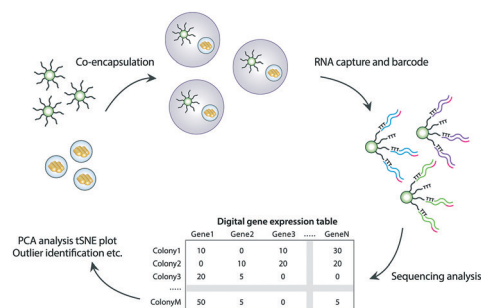


1838

High throughput gene expression profiling of yeast colonies with microgel-culture Drop-seq

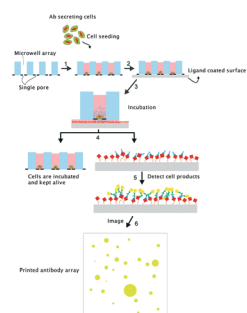
Leqian Liu, Chiraj K. Dalal, Benjamin M. Heineike and Adam R. Abate*

We describe isogenic colony sequencing (ICO-seq), a massively-parallel strategy to assess the gene expression profiles of large numbers of genetically distinct yeast colonies.



PAPERS

1850

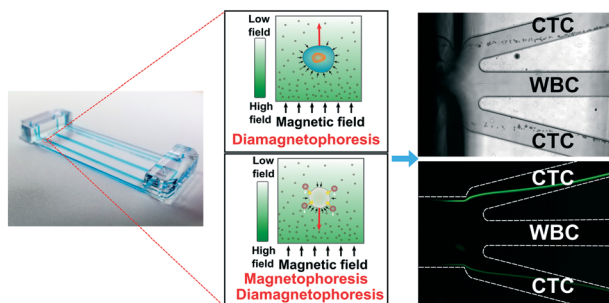


A microwell array platform to print and measure biomolecules produced by single cells

Fikri Abali, Joska Broekmaat, Arjan Tibbe, Richard B. M. Schasfoort, Leonie Zeune and Leon W. M. M. Terstappen*

Here we describe a combined method to monitor the secretion of molecules produced by single cells, followed by a method to isolate the individual cells that produced these molecules.

1860

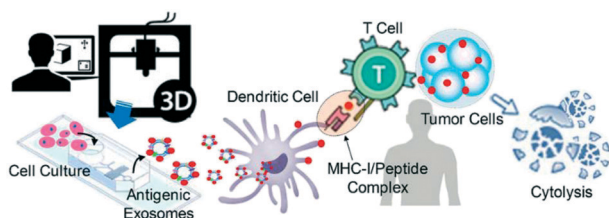


Tumor antigen-independent and cell size variation-inclusive enrichment of viable circulating tumor cells

Wujun Zhao, Yang Liu, *et al.*

Integrated ferrohydrodynamic cell separation (iFCS) explores cell magnetization in biocompatible ferrofluids and enriches CTCs in an antigen-independent and cell size variation-inclusive manner.

1877



Microfluidic on-demand engineering of exosomes towards cancer immunotherapy

Zheng Zhao, Jodi McGill, Pamela Gamero-Kubota and Mei He*

3D printing-based facile microfabrication of a microfluidic culture chip integrates harvesting, antigenic modification, and photo-release of surface engineered exosomes in one workflow, which enables rapid and real-time production of therapeutic exosomes for advancing cancer immunotherapy.

CORRECTION

1887

Correction: A flow focusing microfluidic device with an integrated Coulter particle counter for production, counting and size characterization of monodisperse microbubbles

J. M. Robert Rickel, Adam J. Dixon, Alexander L. Klibanov and John A. Hossack*

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1. Fundamentals in Microfluidics & Nanofluidics

- 1.01 Electrokinetic Phenomena
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- 1.03 Digital Microfluidics
- 1.04 Centrifugal Microfluidics
- 1.05 Acousto- and Magnetofluidics
- 1.06 Platforms Based on Capillary Forces
- 1.07 Nanofluidics/Nanofluidic Phenomena
- 1.08 Modeling / Numerical Simulation
- 1.09 Others

2. Micro- and Nanoengineering

- 2.01 Microscale Fabrication, Patterning, & Integration
- 2.02 Nanoscale Fabrication, Patterning, & Integration
- 2.03 Micropumps, Valves, and Dispensers
- 2.04 Bonding, Sealing & Interfacing Technologies
- 2.05 Novel, Smart, and Responsive Materials
- 2.06 Surface Modification
- 2.07 Others

3. Sensors and Detection Technologies

- 3.01 Physical Sensors
- 3.02 Chemical & Electrochemical Sensors
- 3.03 Biosensors
- 3.04 Optical Detection & Imaging
- 3.05 Label-free Detection
- 3.06 Others

TOPICS

4. Chemical Applications: Separations, Mixers & Reactions

- 4.01 Electrophoretic & Chromatographic Separation
- 4.02 Particle Separation
- 4.03 Micromixers & Microreactors
- 4.04 Chemical & Particle Synthesis
- 4.05 Other Applications in Chemistry

5. Cells, Organisms and Organs on a Chip

- 5.01 Cell Capture, Counting, & Sorting
- 5.02 Single-Cell Analysis
- 5.03 Cell-Culturing & Perfusion (2D & 3D)
- 5.04 Inter- & Intracellular Signaling, Cell Migration
- 5.05 Organisms on Chip (*C. elegans*, Zebrafish)
- 5.06 Organs on Chip
- 5.07 Multi-organ Arrangements and Body on a Chip
- 5.08 Vascularization
- 5.09 Bioinspired, Biomimetic & Biohybrid Devices
- 5.10 Synthetic Biology
- 5.11 Liposomes/ Membranes
- 5.12 Other Applications in Biology

6. Diagnostics, Drug Testing & Personalized Medicine

- 6.01 Liquid Biopsy & Sample Preparation
- 6.02 Nucleic-Acid Analysis
- 6.03 Protein Analysis & Characterization
- 6.04 Cancer Research, Capture & Analysis of Circulating Tumor Cells
- 6.05 Neurobiology/Neuroscience
- 6.06 Clinical Chemistry
- 6.07 Personalized Medicine
- 6.08 Regenerative Medicine & Tissue Engineering
- 6.09 Pathogen Detection & Antibiotics
- 6.10 Diagnostic Devices
- 6.11 Drug Development, Screening & Drug Delivery
- 6.12 Others

7. Other Applications of Microfluidics

- 7.01 Artificial Intelligence and Microfluidics
- 7.02 Fuel Cells
- 7.03 Power Devices
- 7.04 Microfluidics for X-Ray and e-Beam Applications
- 7.05 Others

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