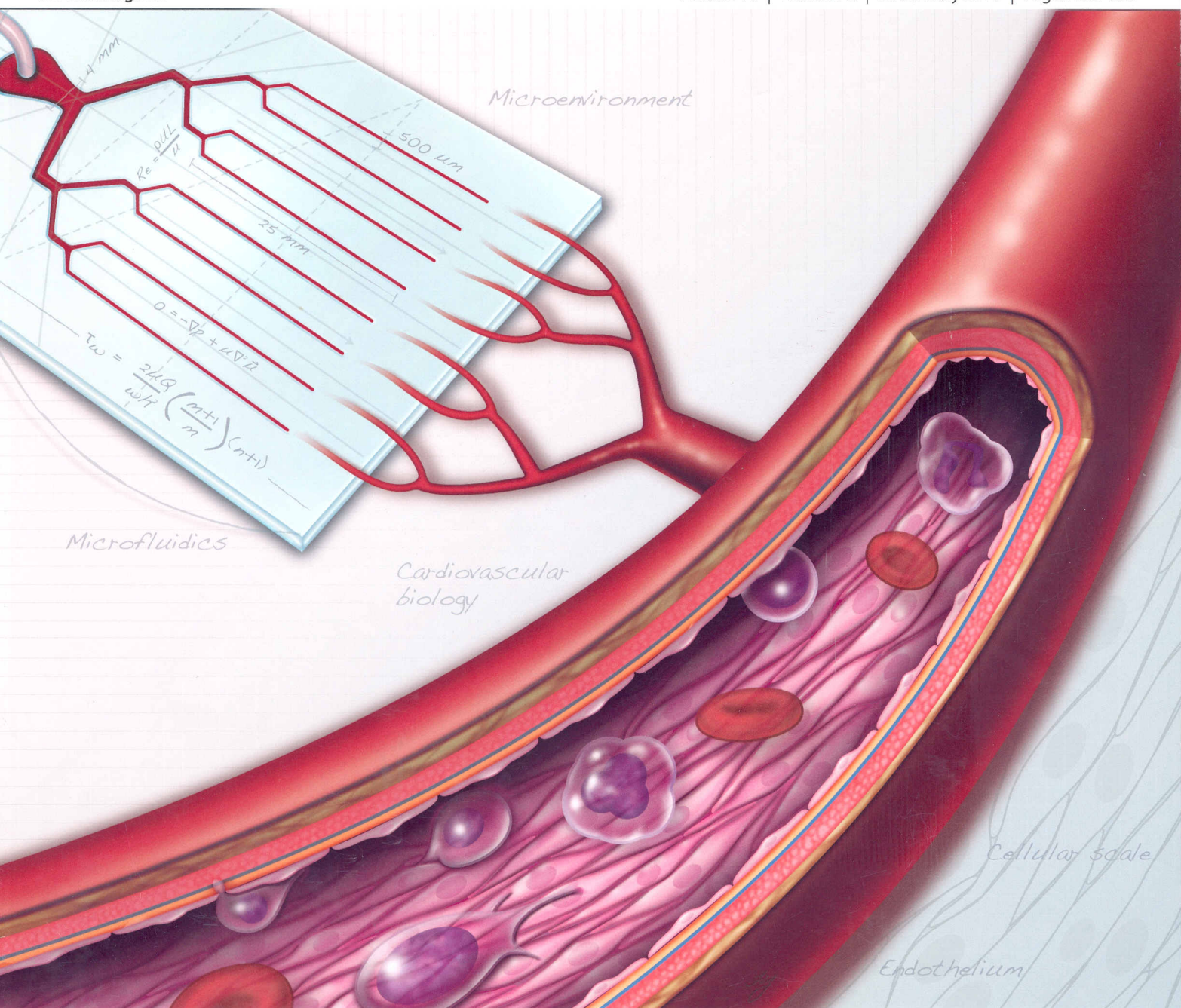


Lab on a Chip

Micro- & nano- fluidic research for chemistry, physics, biology, & bioengineering

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ISSN 1473-0197

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Simmons
Endothelial cell biology

Wang
Counting single molecules

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Lab on a Chip

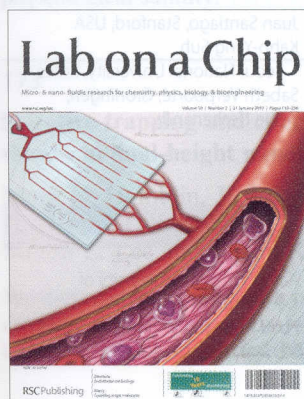
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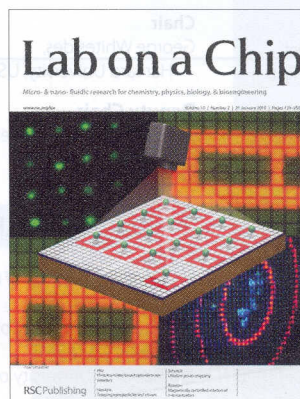
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ISSN 1473-0197 CODEN LCAHAM 10(2) 133–256 (2010)



Cover

See Young and Simmons, pp. 143–160.
Microfluidic systems that mimic the blood vessel microenvironment can provide new insights into endothelial cell biology. Image reproduced by permission of Edmond W. K. Young and Craig A. Simmons from *Lab Chip*, 2010, **10**, 143.



Inside cover

See Hsu, Ohta, Chiou *et al.*, pp. 165–172.
Practical cell control made easy; a new tool for home projector-based optical manipulation for cells in their native environment. The background shows cell array, separation, collection and interaction functions. Image reproduced by permission of Hsan-yin Hsu, Aaron T. Ohta, Pei-Yu Chiou, Arash Jamshidi, Steven L. Neale and Ming C. Wu from *Lab Chip*, 2010, **10**, 165–172.

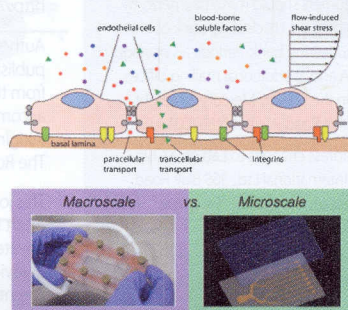
CRITICAL REVIEW

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Macro- and microscale fluid flow systems for endothelial cell biology

Edmond W. K. Young and Craig A. Simmons*

We critically review traditional macroscale cell culture flow systems used to study the effects of mechanical forces on endothelial cells *in vitro* and newer microscale systems that have the potential to answer important biological questions.



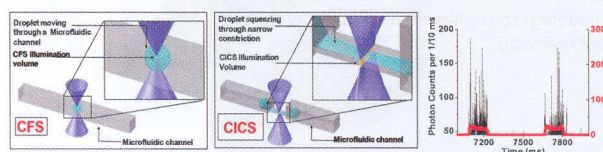
COMMUNICATION

161

Counting single molecules in sub-nanolitre droplets

T. D. Rane, C. M. Puleo, K. J. Liu, Y. Zhang, A. P. Lee and T. H. Wang*

We demonstrate single biomolecule detection and quantification within picoliter droplets through application of a droplet-specific spectroscopic platform.

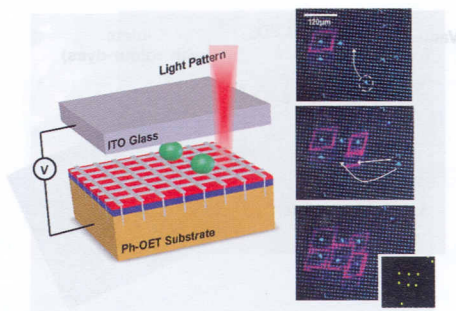


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Phototransistor-based optoelectronic tweezers for dynamic cell manipulation in cell culture media

Hsan-yin Hsu,* Aaron T. Ohta,* Pei-Yu Chiou,*
Arash Jamshidi, Steven L. Neale and Ming C. Wu

We report a novel phototransistor-based optoelectronic tweezers (Ph-OET) device capable of dynamic, optically-controlled single cell manipulation in cell culture media and physiological buffers. The Ph-OET provides the crucial ability to operate in fluids with physiological salinity.

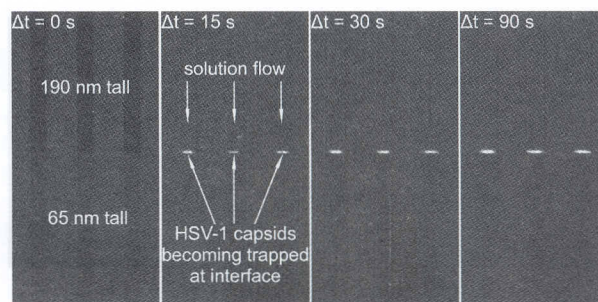


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Selective trapping and concentration of nanoparticles and viruses in dual-height nanofluidic channels

Mark N. Hamblin, Jie Xuan, Daniel Maynes,
H. Dennis Tolley, David M. Belnap, Adam T. Woolley,
Milton L. Lee and Aaron R. Hawkins*

We demonstrate a chip with nanochannels with two segments of different heights. Nano-analytes become trapped when the channel dimensions shrink below the size of the particles.

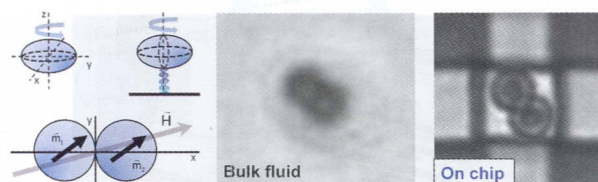


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Magnetically controlled rotation and torque of uniaxial microactuators for lab-on-a-chip applications

Andrea Ranzoni,* Xander J. A. Janssen, Mikhail Ovsyanko,
Leo J. van IJzendoorn and Menno W. J. Prins

We present the equations of motion for two-particle microactuators in fluid, which allow for precise characterization of the particles or of the fluid medium. The detailed understanding of the torque and rotation opens a wide range of possibilities in lab-on-a-chip applications.

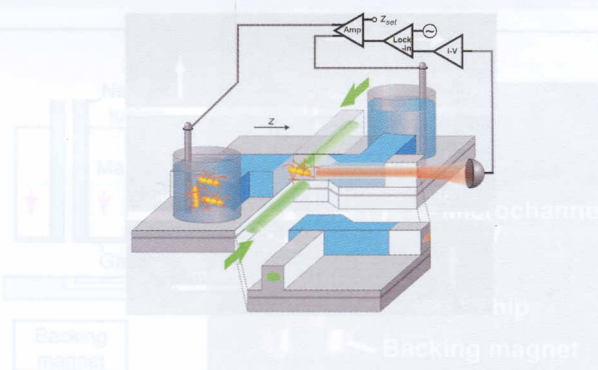


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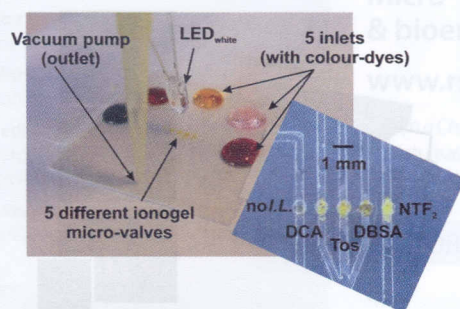
Ultralow power trapping and fluorescence detection of single particles on an optofluidic chip

S. Kühn, B. S. Phillips, E. J. Lunt, A. R. Hawkins
and H. Schmidt*

A feedback-based single particle trap embedded in a planar optofluidic chip is presented. It operates at optical power levels orders of magnitude lower than all-optical traps and enables simultaneous optical analysis of sub-micron trapped particles.



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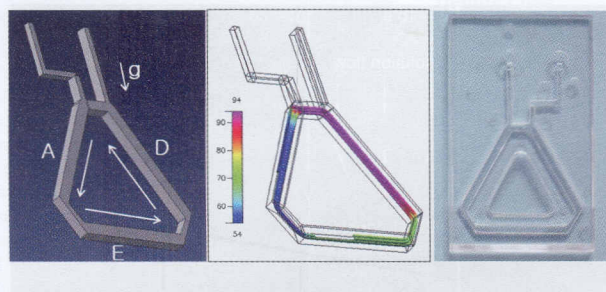


Ionogel-based light-actuated valves for controlling liquid flow in micro-fluidic manifolds

Fernando Benito-Lopez, Robert Byrne, Ana Maria Răduță, Nihal Engin Vrana, Garrett McGuinness and Dermot Diamond*

Novel multifunctional materials based on ionogels have been used as light-actuated valve structures in micro-fluidic platforms. Through variation of the composition of the ionogels, the micro-valves can be tuned to open at different times under similar illumination conditions.

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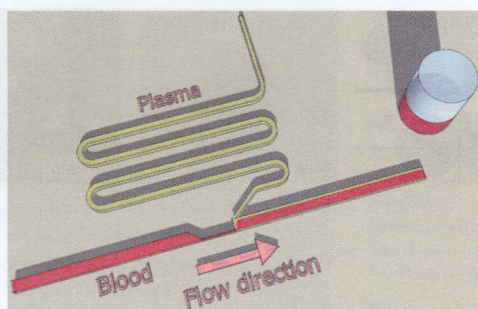


A palmtop PCR system with a disposable polymer chip operated by the thermosiphon effect

Kwang Hyo Chung, Se Ho Park and Yo Han Choi*

This paper describes a palmtop-sized PCR system operated by the thermosiphon effect. The loop channel is molded in a polymer chip. Not only is the polymer chip advantageous for making disposable LOCs, but also has merits in versatile integration, mass production and facile handling.

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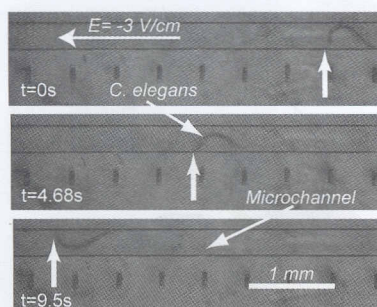


High flow rate microfluidic device for blood plasma separation using a range of temperatures

Angeles Ivón Rodríguez-Villarreal,* Martin Arundell, Manuel Carmona and Josep Samitier

A microfluidic device able to remove up to $97.58 \pm 0.45\%$ of cells from plasma from a whole blood sample at a wide range of temperatures, using high flow rates and powered by hand.

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Electrotaxis of *Caenorhabditis elegans* in a microfluidic environment

Pouya Rezai, Asad Siddiqui, Ponnambalam Ravi Selvaganapathy* and Bhagwati P. Gupta*

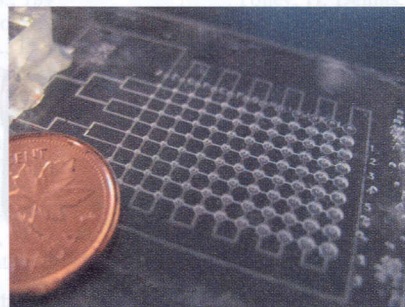
Different developmental stages of *Caenorhabditis elegans* nematodes respond to specific ranges of electric field with different speeds. Application: drug discovery, sorting, and manipulation.

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Microfabricated arrays for high-throughput screening of cellular response to cyclic substrate deformation

Christopher Moraes, Jan-Hung Chen, Yu Sun* and Craig A. Simmons*

A high-throughput screening platform to test for the mechanobiological response of cells to a range of uniform, equibiaxial, cyclic substrate deformations is described and applied to study activation of the canonical Wnt signaling pathway in mesenchymal stem cells.

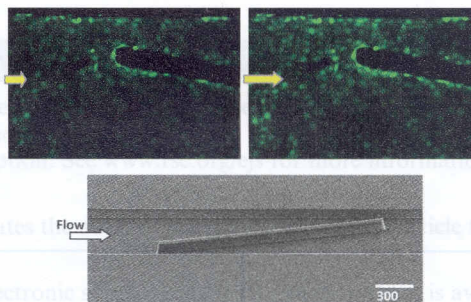


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Spatially resolved shear distribution in microfluidic chip for studying force transduction mechanisms in cells

Jianbin Wang, Jinseok Heo and Susan Z. Hua*

We present a microfluidic chip that is capable of generating complex patterns of shear flow, to study sensory and force transduction mechanisms in cells.

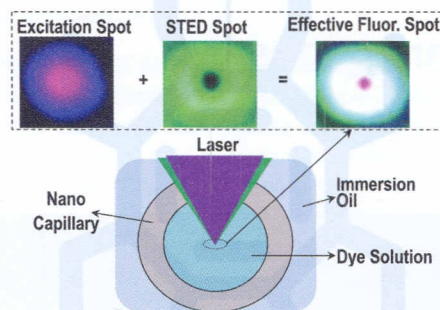


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A novel far-field nanoscopic velocimetry for nanofluidics

Cuifang Kuang and Guiren Wang*

A novel far-field nanoscopic velocimetry for nanotubes with high spatial resolution which is based on the STED and LIFPA techniques is presented.



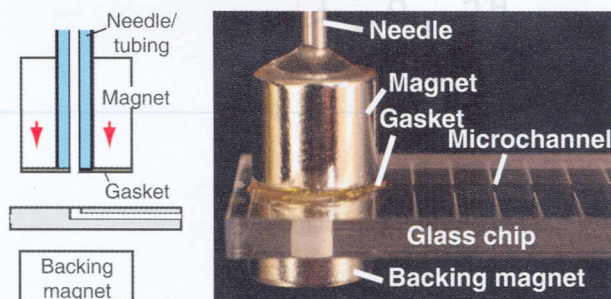
TECHNICAL NOTES

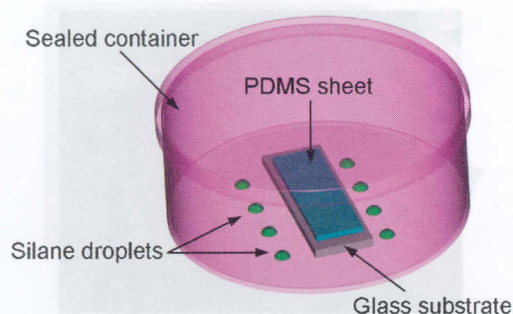
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Magnetic connectors for microfluidic applications

Javier Atencia,* Gregory A. Cooksey, Andreas Jahn, Justin M. Zook, Wyatt N. Vreeland and Laurie E. Locascio

We introduce a new type of connector for hard substrates (e.g. glass, silicon, and plastic) that employs two magnets to produce the sealing force. The connector is simple to fabricate, easy to assemble, low-cost and reusable.

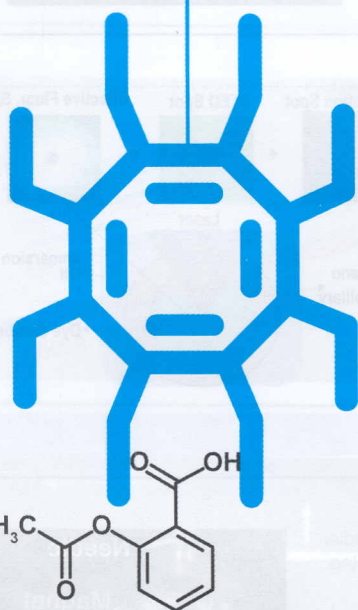




A vapor-assisted method for adhering polydimethylsiloxane and glass

Aarash Y. N. Sofla* and Cristina Martin

PDMS and glass can be permanently bonded if exposed to a certain silane vapor. This inexpensive method does not require oxygen plasma or adhesives, and can be used by inexperienced operators.



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