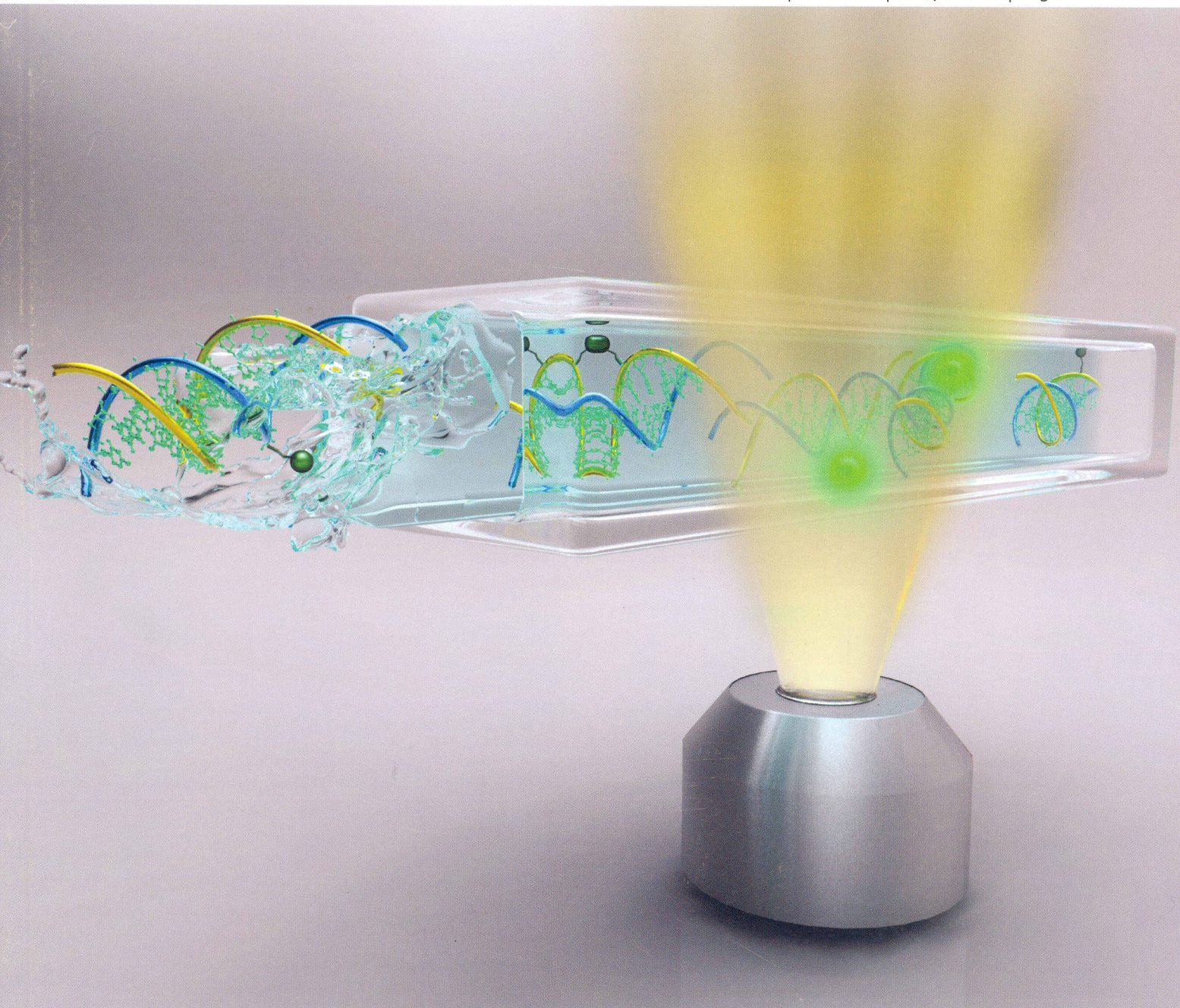


Lab on a Chip

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

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Napoli *et al.*
Nanofluidic technology for
biomolecule applications

Rasooly *et al.*
Immunoassay detection of SEB



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Cover

See Napoli *et al.*, pp. 957–985.
A review is given of the important forces and phenomena in nanofluidics, and their application for the analysis of biomolecules in nanofabricated devices. Image reproduced by permission of M. Napoli, J. C. T. Eijkel and S. Pennathur from *Lab Chip*, 2010, **10**, 957.



Inside cover

See Gao, Sniadecki *et al.*, pp. 991–998.
Flexible post force sensor used for direct measurement of platelet forces during the clot retraction of a microthrombus. Image reproduced by permission of Xin M. Liang, Sangyoon J. Han, Jo-Anna Reems, Dayong Gao and Nathan J. Sniadecki from *Lab Chip*, 2010, **10**, 991.

HIGHLIGHT

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Research Highlights

Petra S. Dittrich*

Petra Dittrich reviews the current literature in miniaturisation and related technologies.



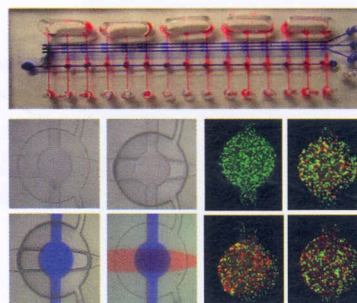
TUTORIAL REVIEW

939

Microfluidic cell culture systems for drug research

Min-Hsien Wu, Song-Bin Huang and Gwo-Bin Lee*

Fundamentals, niches, techniques, applications and challenges

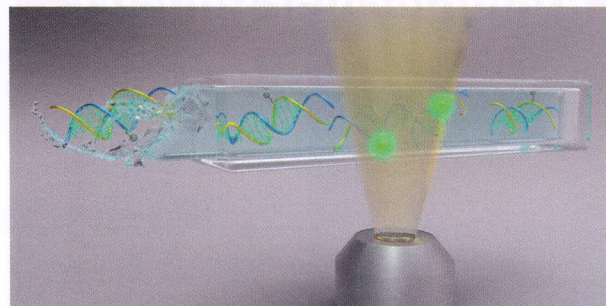


957

Nanofluidic technology for biomolecule applications: a critical review

M. Napoli,* J. C. T. Eijkel and S. Pennathur

In this review, we present nanofluidic phenomena, particularly as they relate to applications involving analysis of biomolecules within nanofabricated devices.



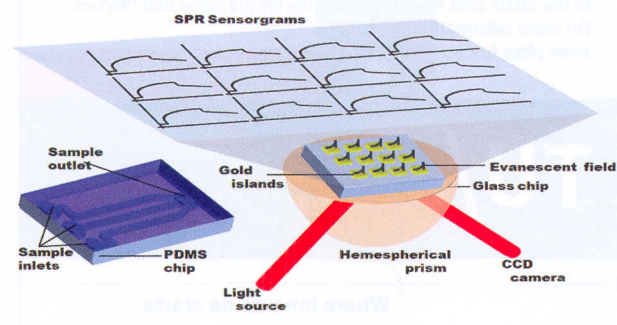
COMMUNICATION

986

Electrokinetic label-free screening chip: a marriage of multiplexing and high throughput analysis using surface plasmon resonance imaging

Ganeshram Krishnamoorthy,* Edwin T. Carlen, Johan G. Bomer, Daniël Wijnperlé, Hans L. deBoer, Albert van den Berg and Richard B. M. Schasfoort

We demonstrate a new electrokinetic biochip integrated with a commercial surface plasmon resonance imaging system that can be used for high throughput screening applications and kinetics parameter extraction of multiple interactant–protein complex formation simultaneously.



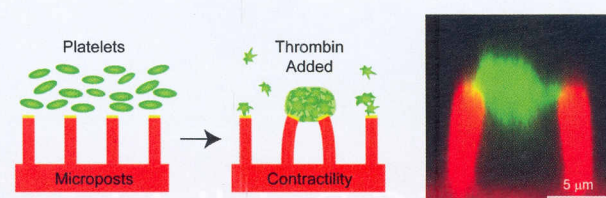
PAPERS

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Platelet retraction force measurements using flexible post force sensors

Xin M. Liang, Sangyoon J. Han, Jo-Anna Reems, Dayong Gao* and Nathan J. Sniadecki*

Platelet contractile forces play a major role in thrombosis and hemostasis. We have developed a new approach to analyze platelet forces at the microscale using flexible post sensor arrays.

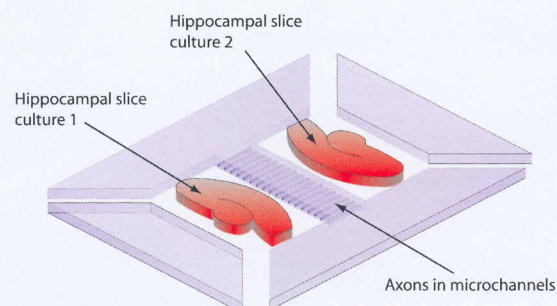


999

Building and manipulating neural pathways with microfluidics

Yevgeny Berdichevsky,* Kevin J. Staley and Martin L. Yarmush*

We developed a platform for co-cultures of brain slices in microchannel-connected compartments. Slices form functional connections, but drug application can be restricted to only one slice.

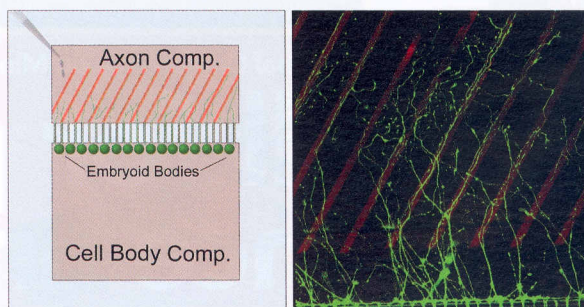


1005

Combined microfluidics/protein patterning platform for pharmacological interrogation of axon pathfinding

Peng Shi, Stephane Nedelec, Hynek Wichterle and Lance C. Kam*

In this report, microfabricated Campenot chambers are combined with multicomponent, micropatterned surfaces to demonstrate that different aspects of axon guidance by *N*-cadherin occur through different signaling pathways.

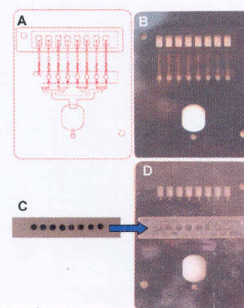


1011

Lab-on-a-chip for carbon nanotubes based immunoassay detection of Staphylococcal Enterotoxin B (SEB)

Minghui Yang, Steven Sun, Yordan Kostov and Avraham Rasooly*

Functional elements of a multi-channel LOC system for immunoassay detection of Staphylococcal Enterotoxin B (SEB).

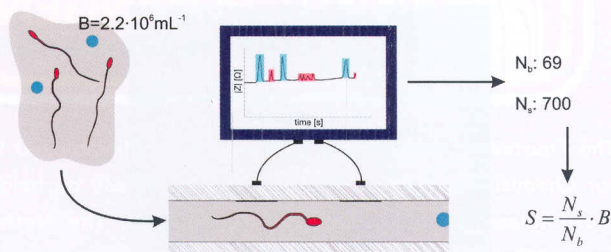


1018

On-chip determination of spermatozoa concentration using electrical impedance measurements

Loes I. Segerink,* Ad J. Sprenkels, Paul M. ter Braak, Istvan Vermees and Albert van den Berg

In this paper we describe a microfluidic chip that is able to calculate the concentration of spermatozoa using electrical impedance measurements without knowing the actual flow speed.

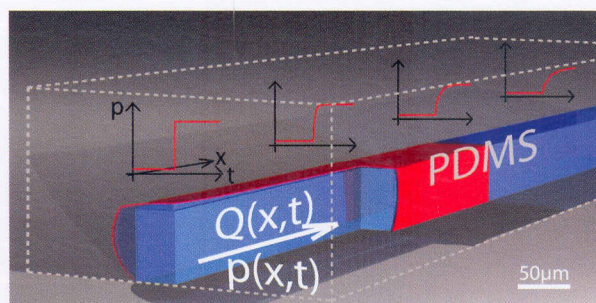


1025

Diffusive spreading of time-dependent pressures in elastic microfluidic devices

Bernhard K. Wunderlich, Ulrich A. Kleßinger and Andreas R. Bausch*

The physical basis of the transmittance of flows through microfluidic devices is scrutinized in this paper to shed new light on the possibilities and limitations set by the physics.

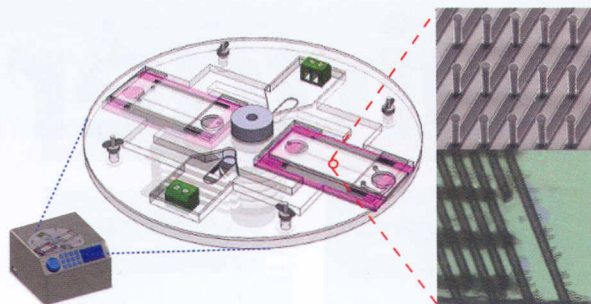


1030

The integration of 3D carbon-electrode dielectrophoresis on a CD-like centrifugal microfluidic platform

Rodrigo Martinez-Duarte,* Robert A. Gorkin III, Kameel Abi-Samra and Marc J. Madou*

Centrifugal pumping reduces footprint, complexity and cost of current DEP platforms by eliminating syringe pumps and fluidic interconnects. Electrokinetic phenomena on CD microfluidics can allow for compact automated platforms for point-of-care diagnostics and cell therapy. Initial results include the selective filtering of yeast cells at flow rates up to $35 \mu\text{L min}^{-1}$.

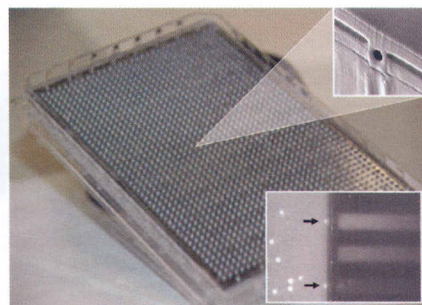


1044

Lateral patch-clamping in a standard 1536-well microplate format

Kum Cheong Tang, Julien Reboud, Yuan Li Kwok, Shu Ling Peng and Levent Yobas*

We demonstrate a method of scaling up cell-trapping lateral junctions to a standard 1536-well microtiter plate format for the rapid analysis of compounds targeting cellular ion channels.

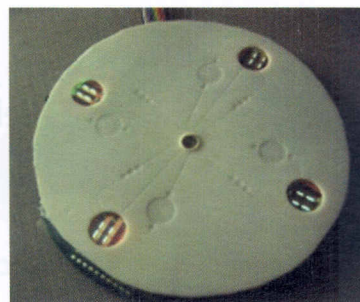


1051

Polypropylene CD-organic light-emitting diode biosensing platform

Srikanth Vengasandra, Yuankun Cai, David Grewell,* Joseph Shinar and Ruth Shinar*

A thin (currently ~ 1 cm) platform for simultaneous photoluminescence-based sensing of multi-bioanalytes. It includes microfluidic features ultrasonically micro-embossed on foamed polypropylene lab-on-CD, sub-micron thick OLED pixels, and a photodetector array.

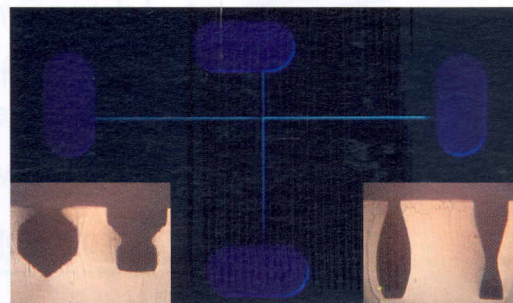


1057

High-speed multiphoton absorption polymerization: fabrication of microfluidic channels with arbitrary cross-sections and high aspect ratios

George Kumi, Ciceron O. Yanez, Kevin D. Belfield and John T. Fourkas*

High-speed multiphoton absorption polymerization makes possible the fabrication of microfluidic systems that can incorporate channels with different heights and highly complex cross-sections in a single device.

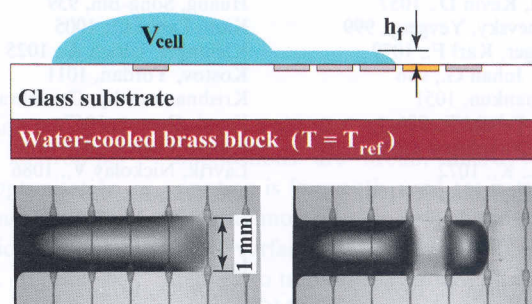


1061

Planar digital nanoliter dispensing system based on thermocapillary actuation

Anton A. Darhuber,* Joseph P. Valentino and Sandra M. Troian

We provide guidelines for design and operation of a planar nanodispensing system based on thermocapillary actuation. Microheaters generate temperature distributions that control liquid flow and trigger droplet formation on demand.

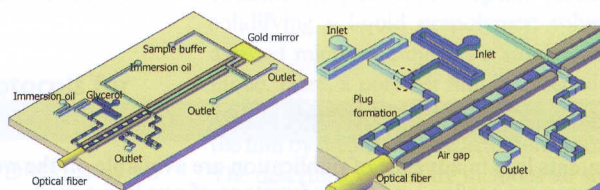


1072

A reconfigurable optofluidic Michelson interferometer using tunable droplet grating

L. K. Chin, A. Q. Liu,* Y. C. Soh, C. S. Lim and C. L. Lin

An optofluidic Michelson interferometer is developed using a tunable droplet grating formed *via* droplet microfluidics.

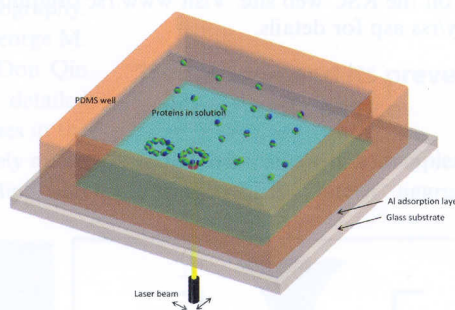


1079

Infrared light induced patterning of proteins on ppNIPAM thermoresponsive thin films: a "protein laser printer"

Xuanhong Cheng,* E. Yegan Erdem, Shoji Takeuchi, Hiroyuki Fujita, Buddy D. Ratner* and Karl F. Böhringer*

A novel method for protein patterning with single micron resolution: the proteins adsorb onto thermoresponsive ppNIPAM film by using a computer-controlled laser beam.



1086

Enclosed pillar arrays integrated on a fluidic platform for on-chip separations and analysis

Nickolay V. Lavrik,* Lisa C. Taylor and Michael J. Sepaniak*

Highly ordered pillar arrays capped with a non-conformal PECVD layer are explored as on-chip separation beds with submicron pores.

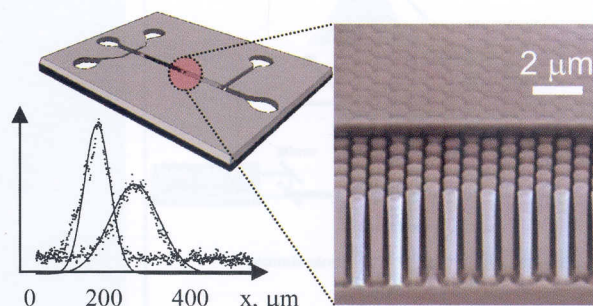


Fig. 1 Fabrication and analysis of a microfluidic device. Left: A differential interference contrast (DIC) optical micrograph of the microfluidic device. 500 nm wide and 250 nm deep pillar array (scale bar is 10 μm). Right: Scanning electron micrograph (SEM) of the pillar array. Below the SEM image is a graph showing the distribution of pillar heights, with a peak around 200 μm. The x-axis is labeled 'x, μm'.