

Institute
for Life Sciences



UNIVERSITY OF
Southampton

Microfluidic isothermal nucleic acid amplification for biological environmental monitoring

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Where & How:



Institute for Life Sciences



Southampton Nanofabrication Centre



National Oceanography Centre

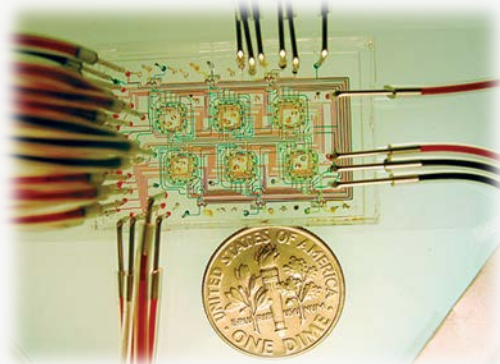
17/04/2013

Biological Environmental Monitoring

- Need for sensitive and specific detection:
 - Bathing and drinking water quality
 - Nosocomial infections
 - Antibiotic resistance
- Challenges:
 - Autonomous
 - Robust
 - Versatile
 - Versatile
 - Semi-continuous
 - Sample-to-answer



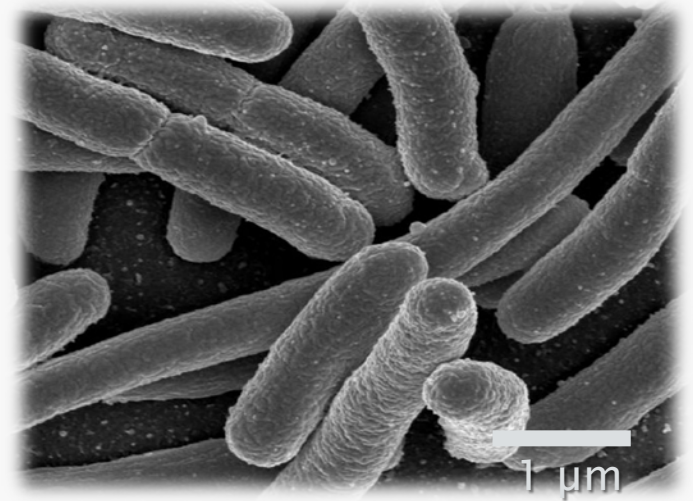
*Image courtesy of
serc.carleton.edu*



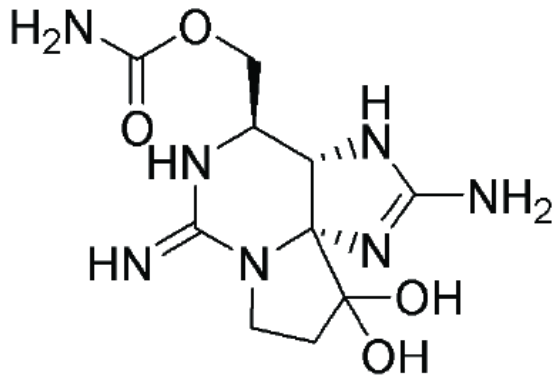
- Microfluidic integrated sensors combined with molecular methods can address this need.

BEM Applications: DNA amplification

- Point-of-care diagnosis of norovirus infections to prevent wider spread
- Genotyping of bacterial infection in blood

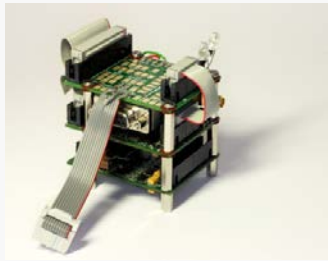


American Association for the Advancement of Science



saxitoxin

- Water monitoring for biotoxins and their producers
- Emerging pollutants in the aquatic environment



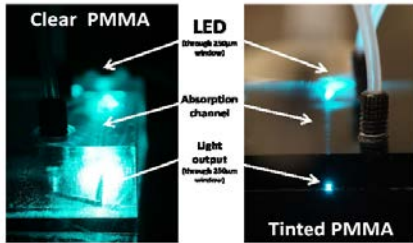
Pressure tolerant electronics



Integrated Analytical systems

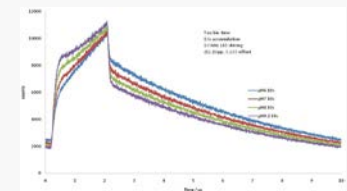
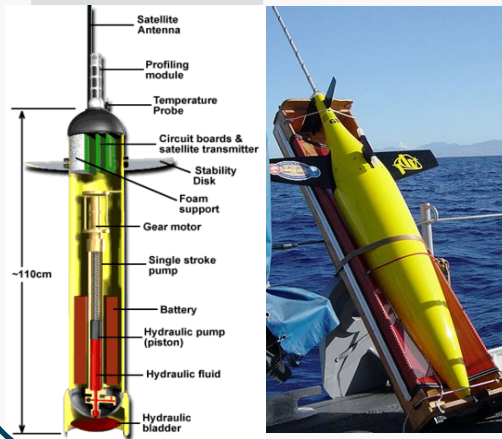


Microfluidics

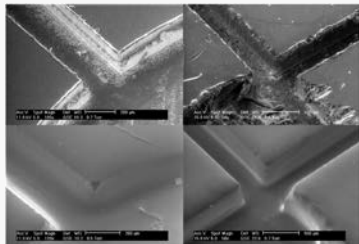


High performance low-cost optics

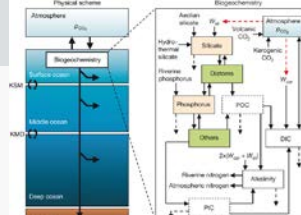
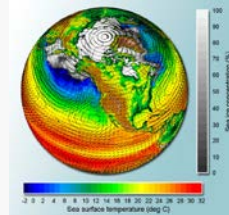
Mass deployed platforms



Assay optimisation



Low-cost manufacturing



Biogeochemical processes



Lab on a chip

LABONFOIL Integrated Platform



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Tsaloglou et al RSC Analyst (2013) 138: 593

Integrated Platform



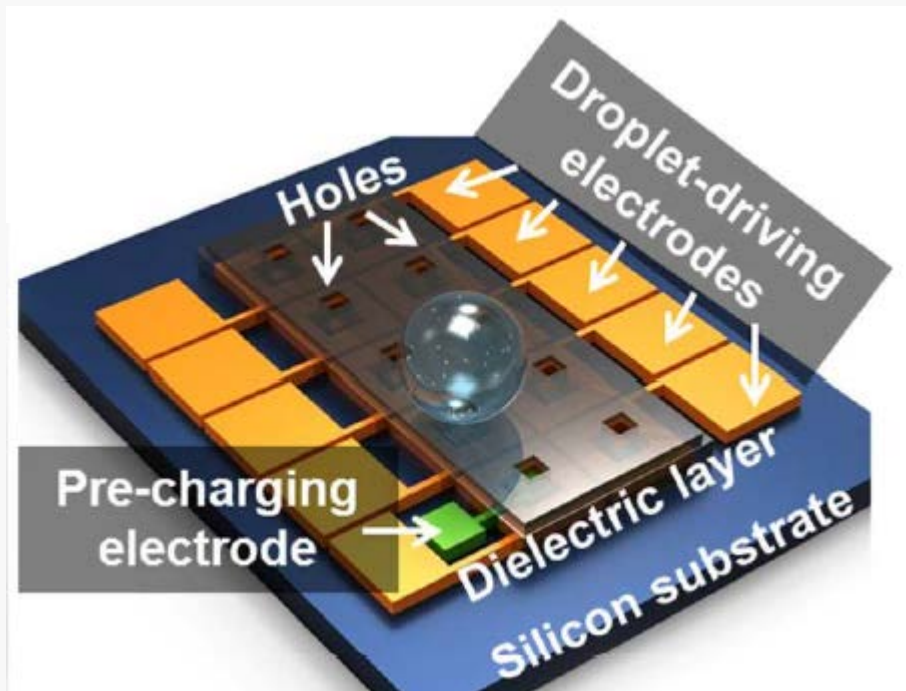
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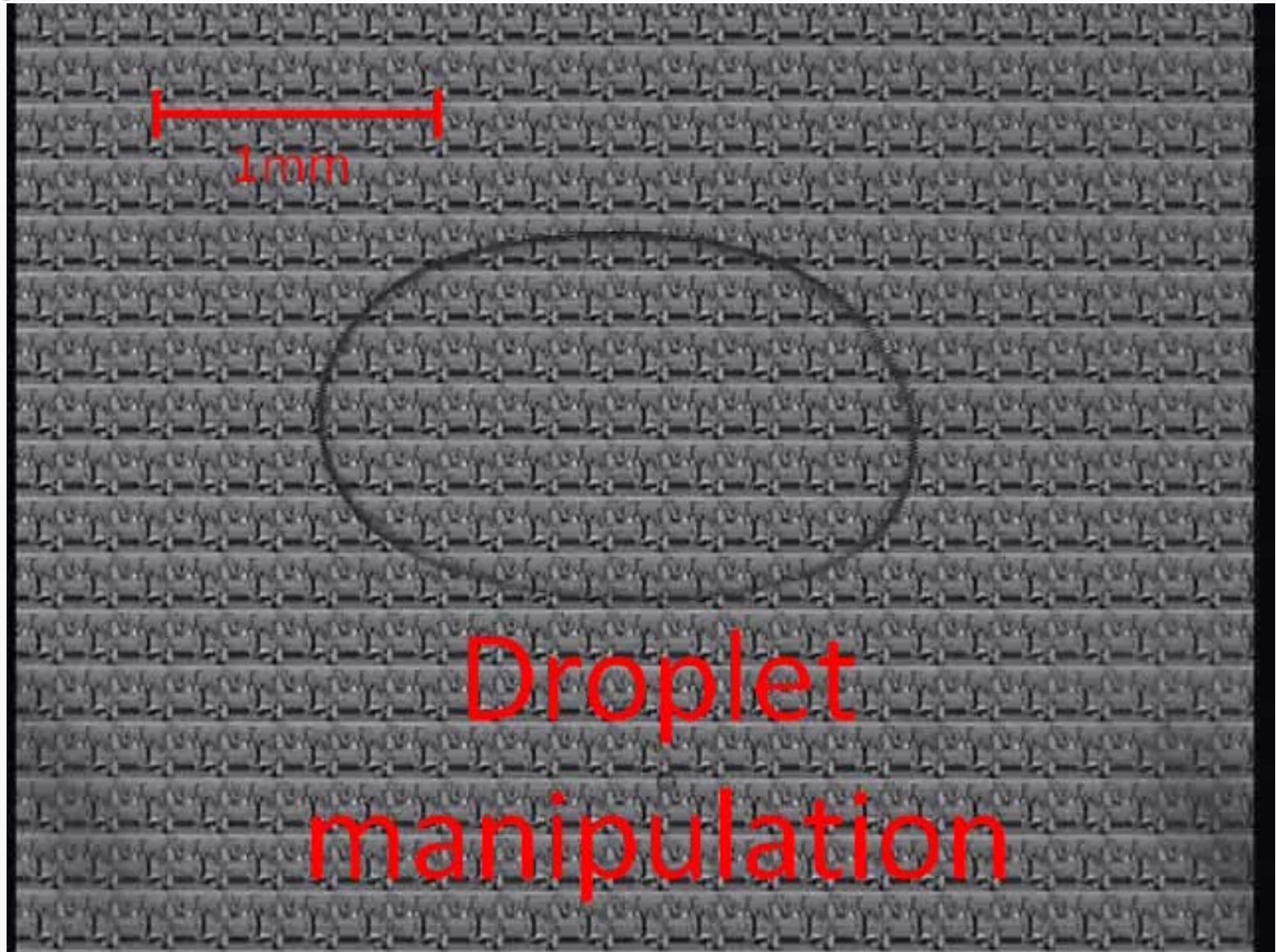
Future Work: Digital Microfluidics

- Picolitre- to microlitre-sized droplets, each serving as an isolated vessel for chemical processes
- individual control over droplets on an open array of electrodes:
 - move
 - merge
 - split
 - dispense from reservoirs



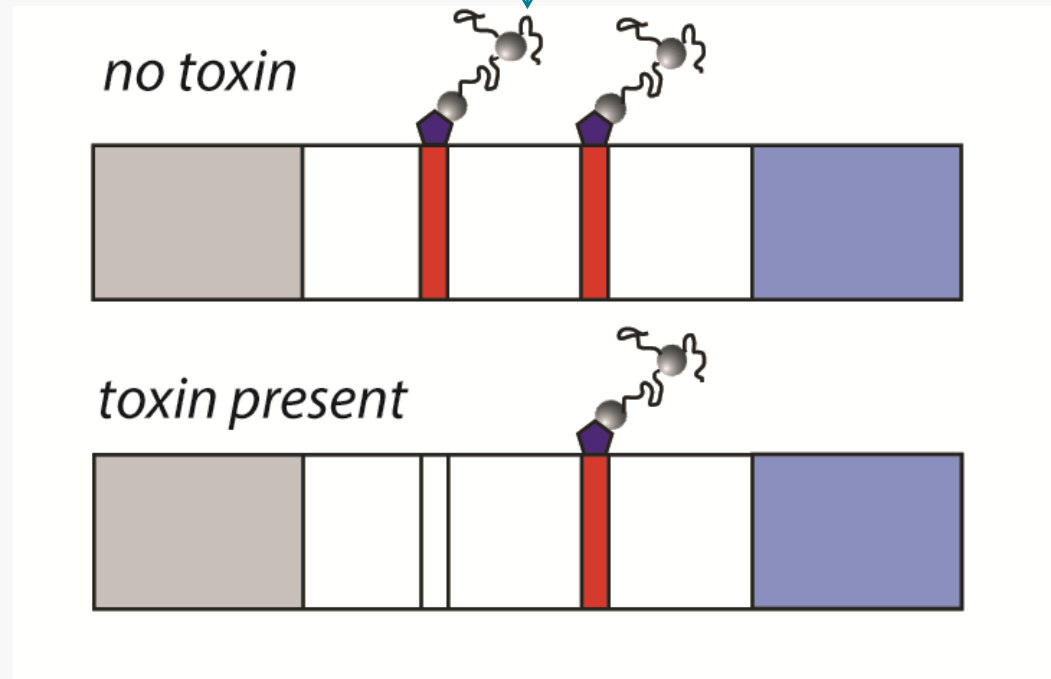
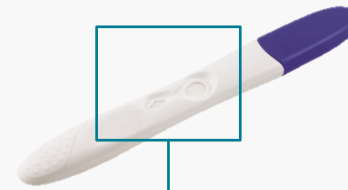
Choi et al (2012) *Lab Chip* 12:
1533-1539

Digital Microfluidics





Paper Microfluidics



Final Word

Thanks for your attention!



Low tide, St. Clement, Jersey, Channel Islands