SANDIA BIOSCIENCE

SAND2015-1390C

Sandia Automated Molecular Biology Platform:

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Manager

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Sandia MedTech Showcase

U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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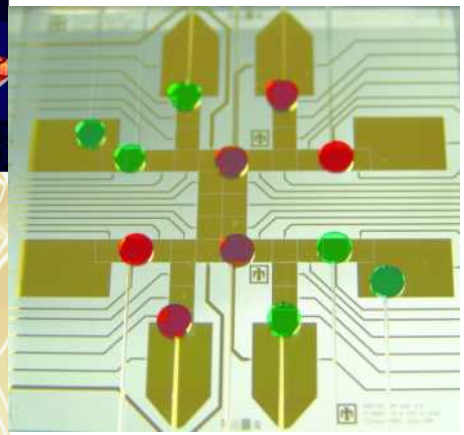
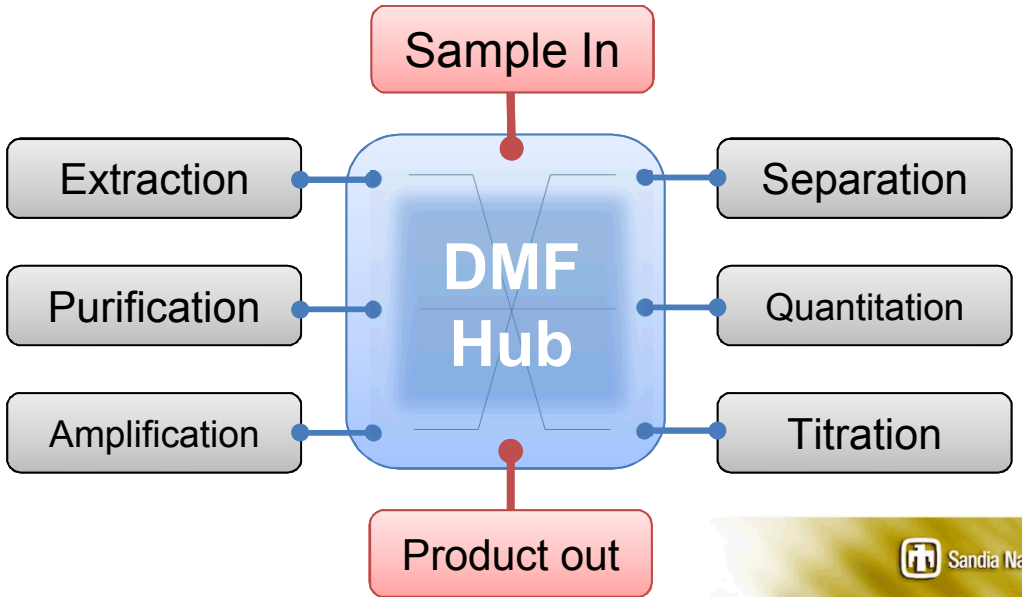
Technology Overview

- Automate laboratory sample preparation at the microfluidic scale
- Flexible fluidic hub to seamlessly connect capabilities together
- Programmable processing and workflow

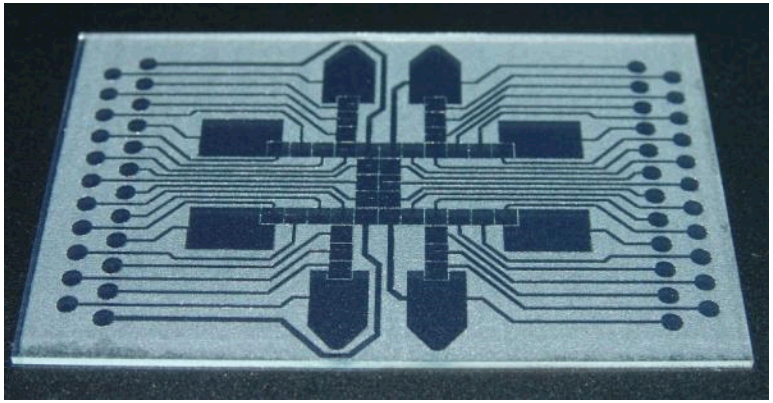




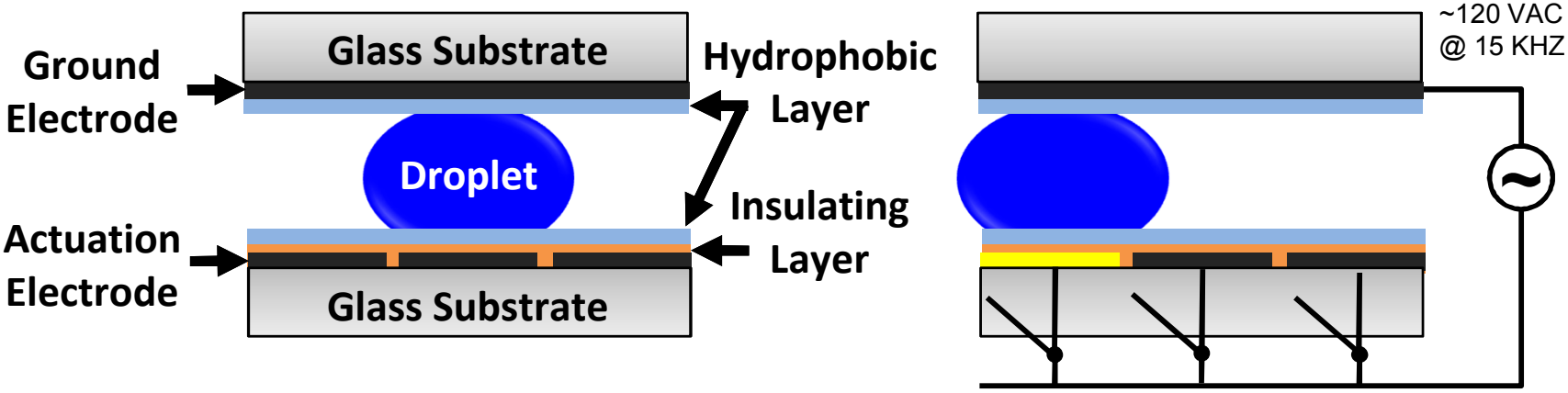
Underlying Technology

Based on principles of electrowetting-on-dielectric (EWOD) and dielectrophoresis

- voltage is applied to electrode pads in an addressable 2-D array (glass, PCB, etched films)
- All aqueous droplets can be manipulated (buffers, ETOH, DMF, bleach… beads, cells, polymers…
- Teflon-coated surface minimizes surface fouling and contamination



46-pad laser-etched design



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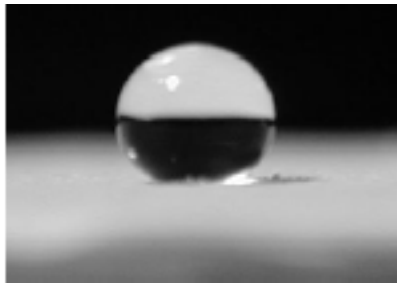
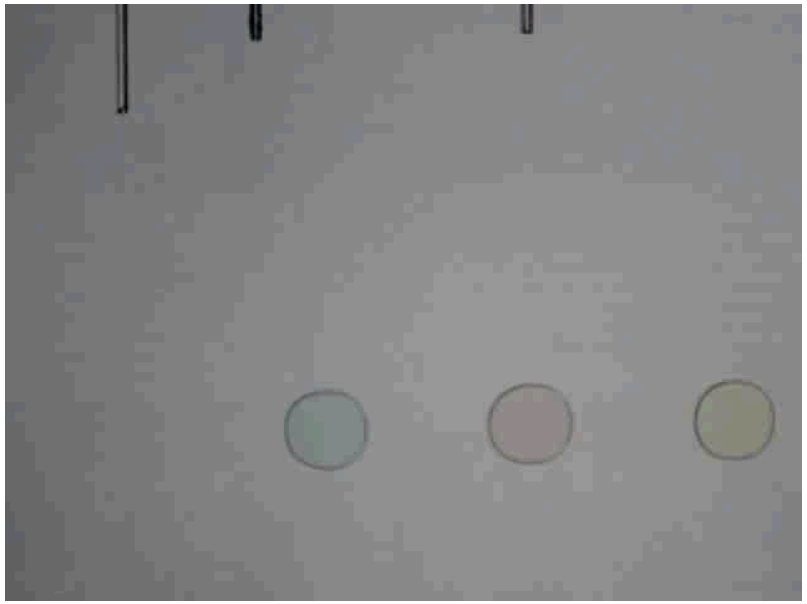
Underlying Technology

Core architecture is the Sandia Digital Microfluidic Hub

- Use microliter droplets as sample cargo containers
  - Operated “digital” fashion
  - virtual tubes or microreactors
  - Merge, mix, split (virtual pipetting)





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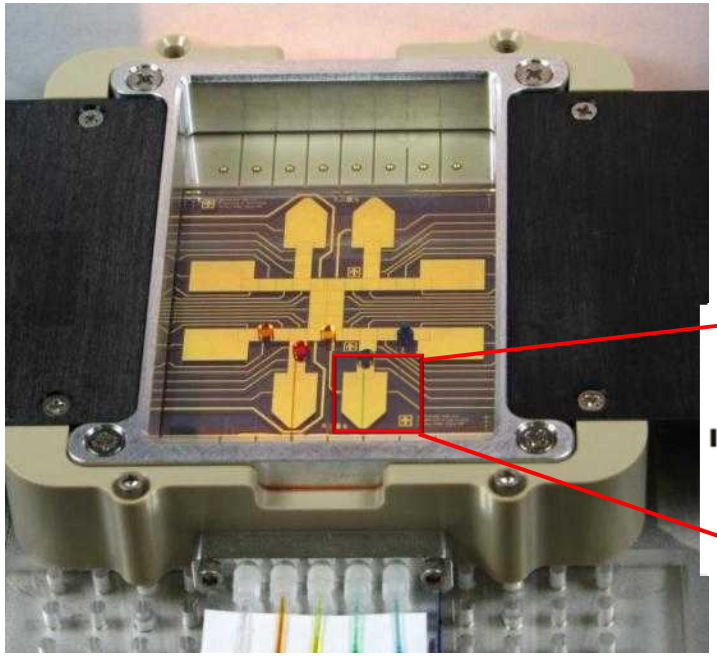
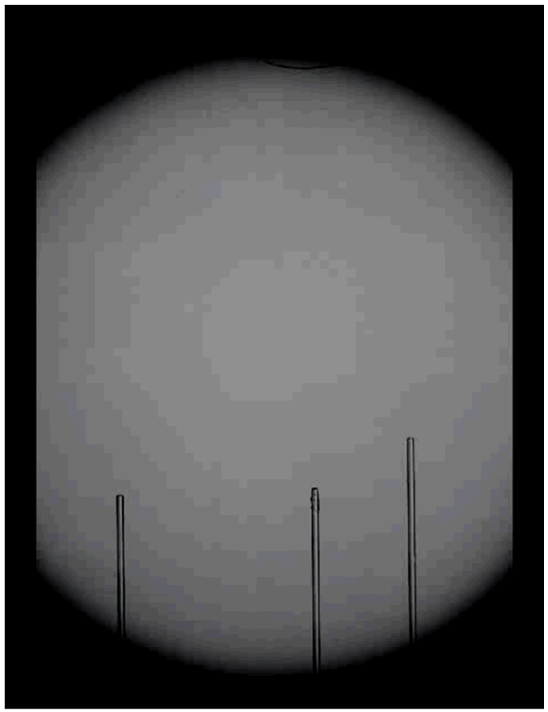
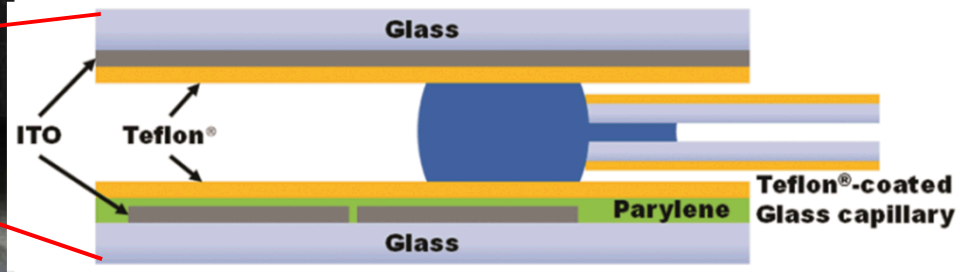
Key Advantages

- Standardized fluidic interface for transporting fluids and reagents
- Overcomes limitations due to volume scales
- Programmable processing and workflow



Sandia Digital Microfluidic Hub



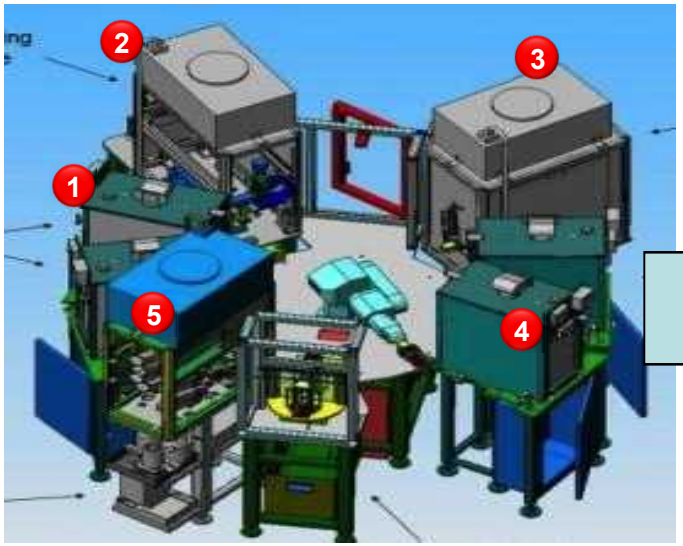


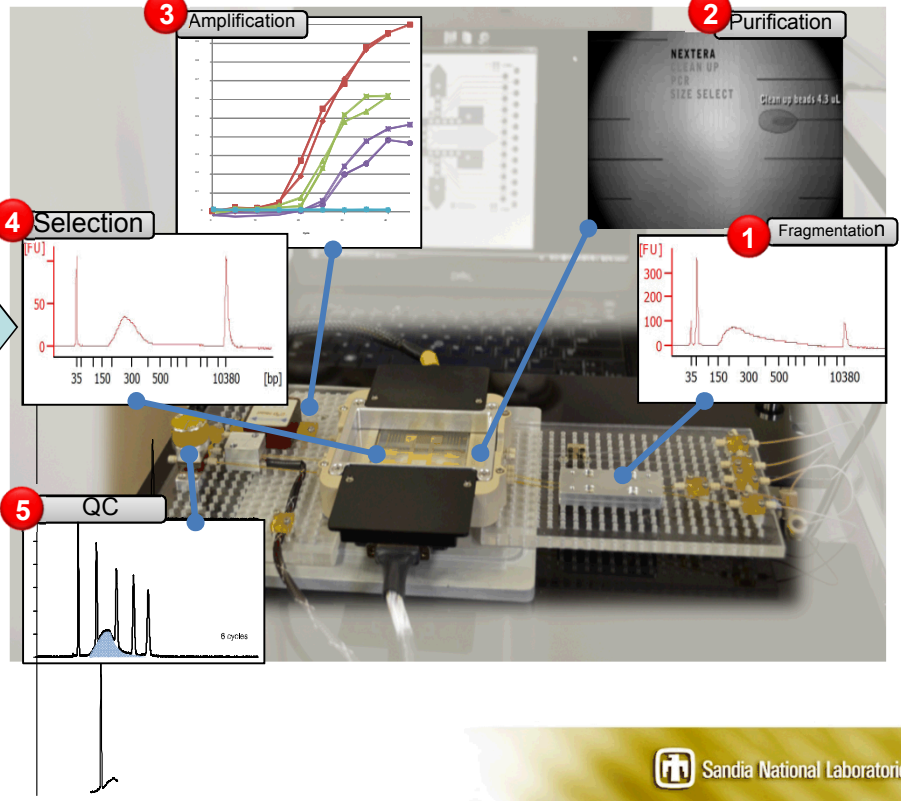
Cross-section view

Differentiating factor from existing technology

Translate robotic liquid handler workflow to the microscale

1. Fragmentation & adapter ligation
2. DNA purification and buffer exchange
3. PCR amplification
4. Size Selection
5. QC & titrate for loading flow cell





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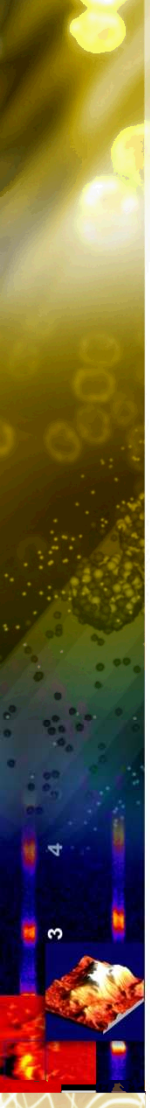
Commercial Applications

- Diagnostic sample preparation
- DNA forensics
- Small-scale laboratory automation
- Analytical instrument QC integration



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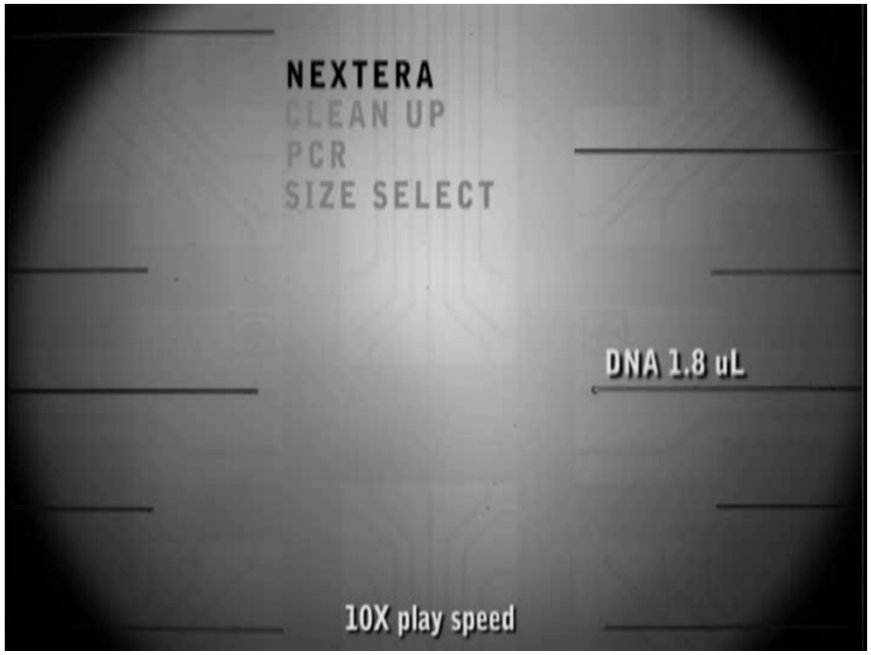
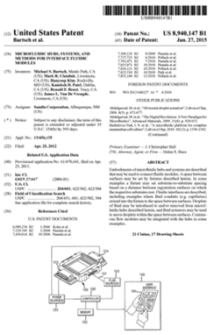
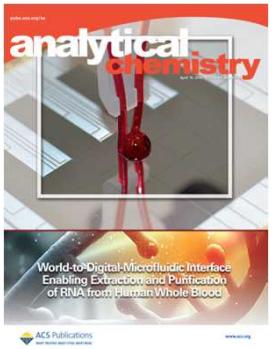


M. Bartsch et al.
US8,940,147 **2015**

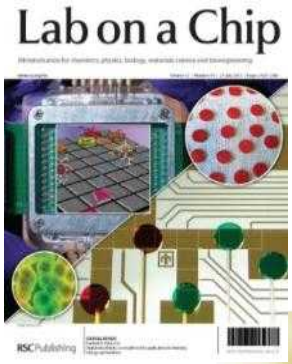


M. Jebrail, et al, A Chem *Lab Chip*, **2014**



H. Kim, et al, *PLOS ONE* **2013**

M. Jebrail, et al, *Lab Chip*, **2012**



Bartsch et al,
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