

Enabling microsystems for monitoring cells

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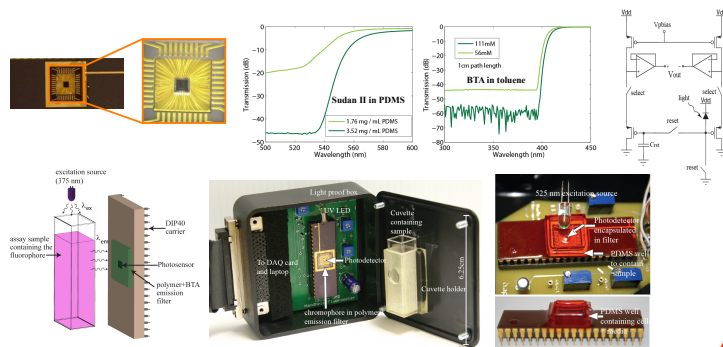
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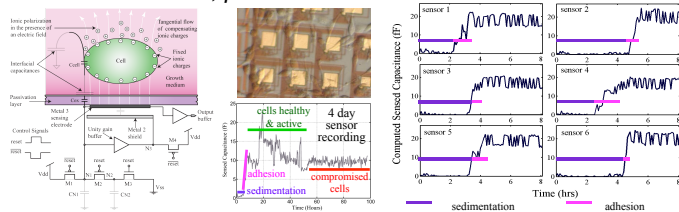
CMOS Sensors

Microfluorometer = custom filter + low noise detector + LED
Thin film absorption filters, differential sensors for noise immunity



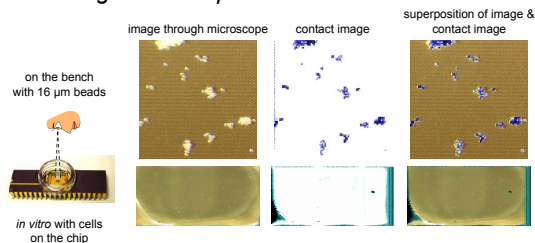
Capacitance sensor

Surface coupling of adherent cells correlates with viability, surface attachment, proliferation



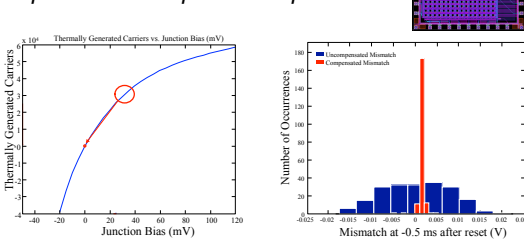
Contact imaging

Detecting cells and particles in the near-field



Low light optical sensors

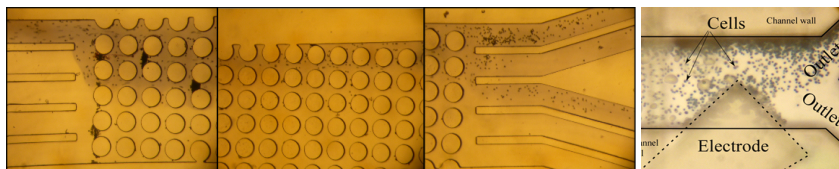
Ultra low dark current, replacement for photomultiplier tubes



Microfluidic Systems

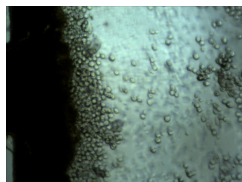
Sample preparation

Passive cell sorting:
deterministic lateral displacement

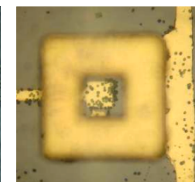


Cell trapping

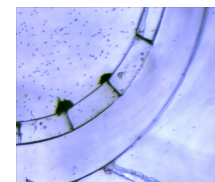
Cell trapping against a monolith frit



Dielectrophoresis to trap cells in microwell



Trapping against a microfabricated filter

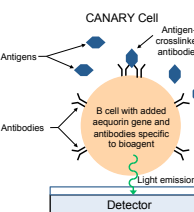


Microsystems enable manipulating and monitoring cells

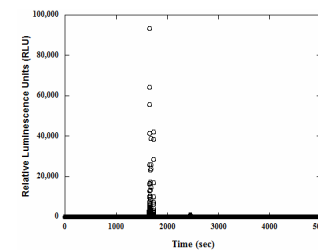
Application: Cell-Based Pathogen Detection

Reporter cells trapped in microfluidic chamber, bioluminesce when exposed to stimulant

IBI's genetically engineered B cells to detect pathogens



Signal from B cells upon introduction of stimulus



Intellectual merit:

New ways to manipulate and monitor cells.
New applications enabled by handheld devices.

Broader impact:

Benefits to society: health, safety, medicine, commerce. Interdisciplinary education.

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