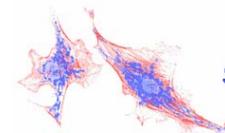


A Scientific Wonderland - Bio-nano Technology for Human Health -

***Pak Kin Wong
Aerospace and Mechanical Engineering
University of Arizona***

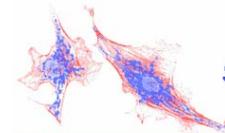
<http://www.ame.arizona.edu/research/sbl>

***Sunrise Drive Elementary School
Oct 4th, 2006***



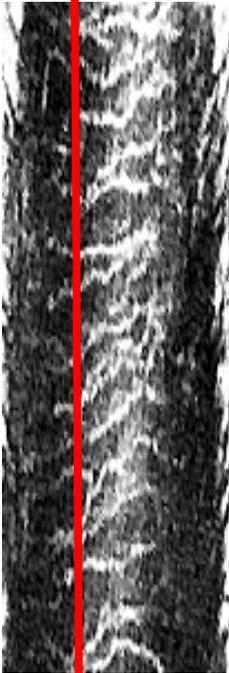
***Systematic Bioengineering Laboratory
University of Arizona***

How large is one nanometer?



How large is one nano meter ?

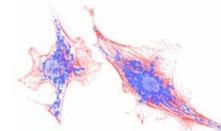
Hair



Slice 100,000 times



Nano meter



How large is one nano meter ?

Nano meter



Meter



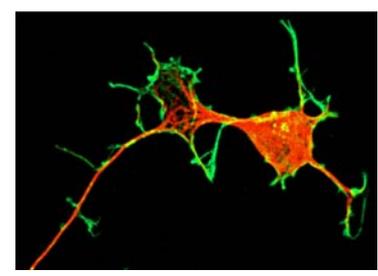
Human

reduce 1000 times



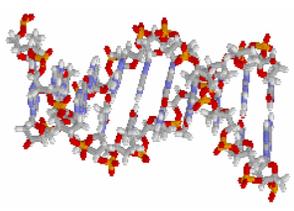
Ant

reduce 1000 times



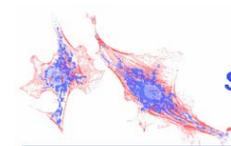
Cell

reduce 1000 times

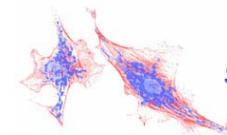


DNA

Nanotechnology

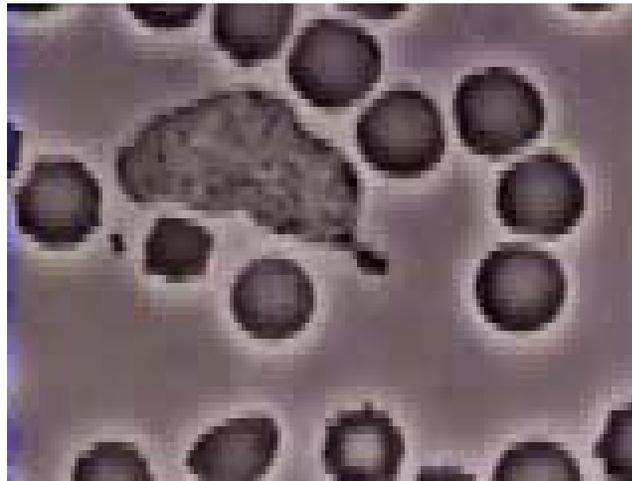


Why do we study cells and molecules?



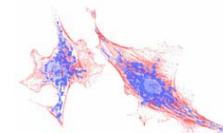
To understanding interesting biology

Cellular police

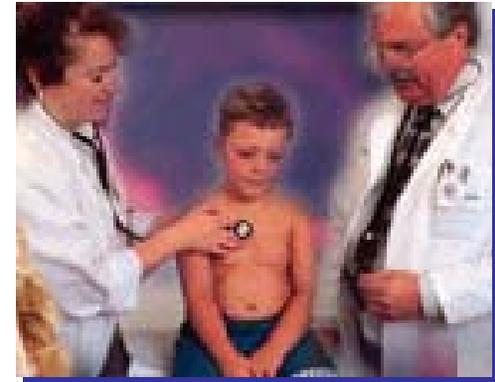
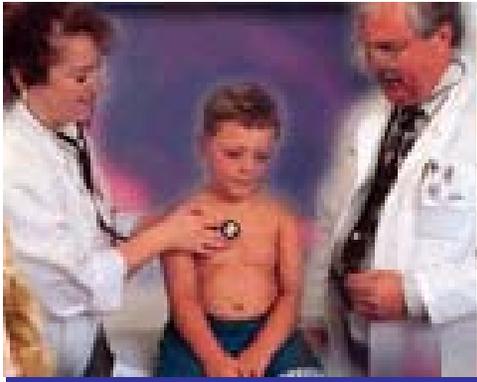


A neutrophil chasing a bacteria

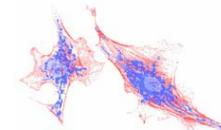
Rogers, 1950s



Medical Diagnosis



2-3 days Cell culture

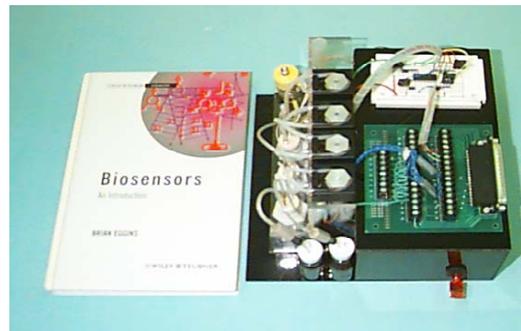


Lab on a chip

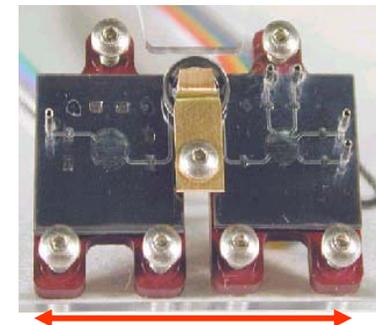
Labor-intensive Bench Top Process



Book Size System



Watch Size Sample Prep.+ Sensor

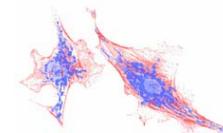


2 cm

Microfluidic
Bio-nano technology

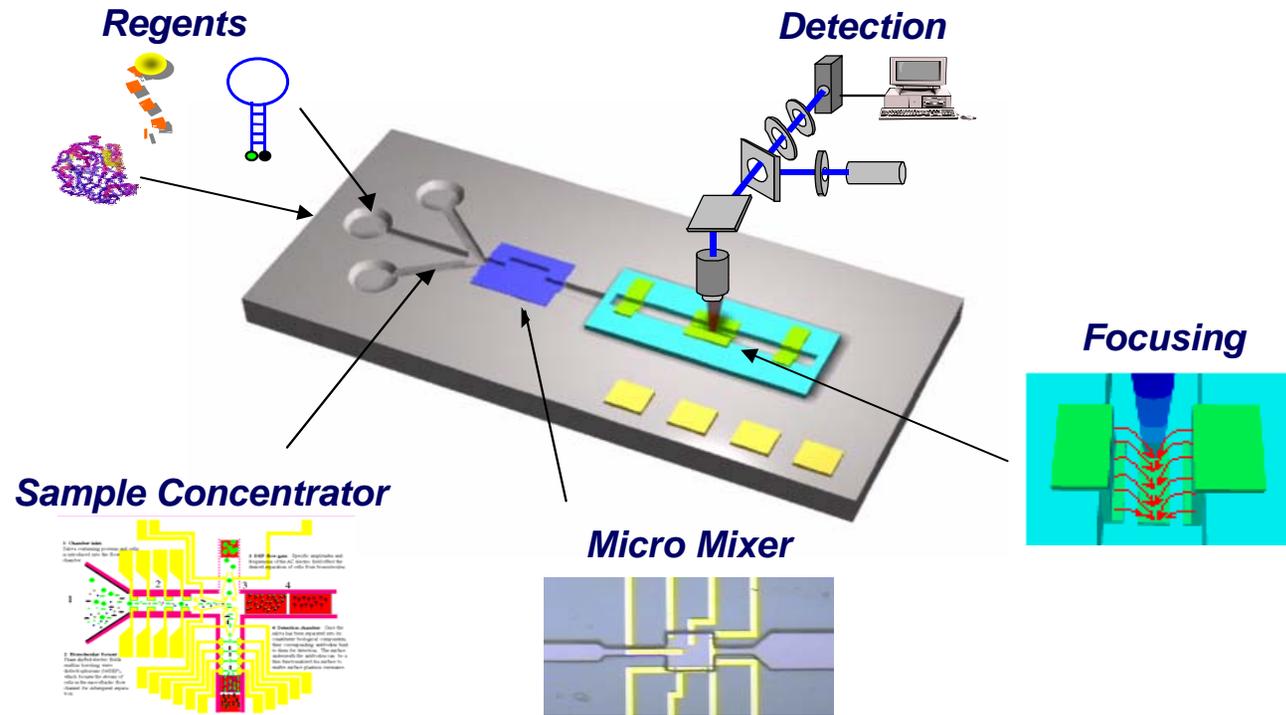


- Rapid
- Sensitive
- Specific

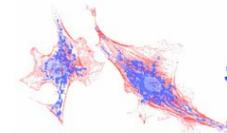


Systematic Bioengineering Laboratory
University of Arizona

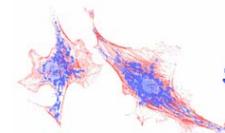
Lab on a chip



We have to move cells and molecules ...



How do we move cells and molecules?

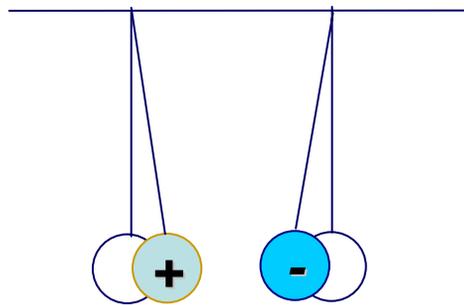


Electrostatic force

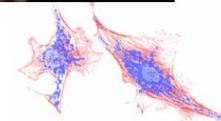
Objects with similar charges repel each other



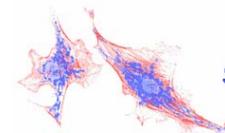
Objects with different charges attract each other



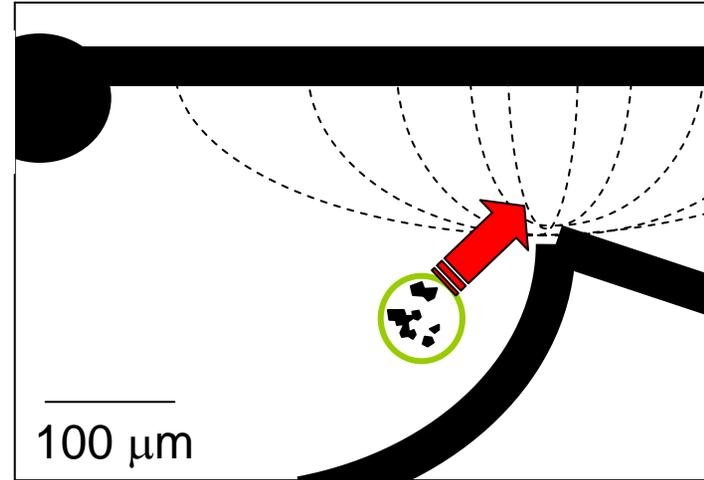
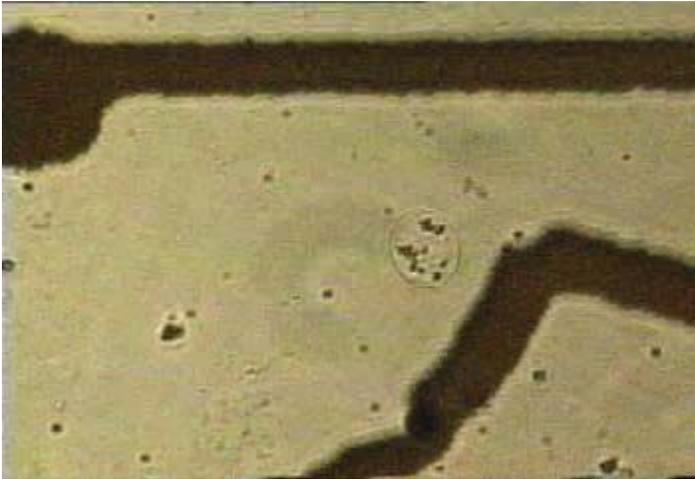
Electrostatic force



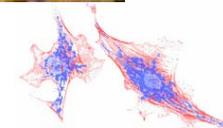
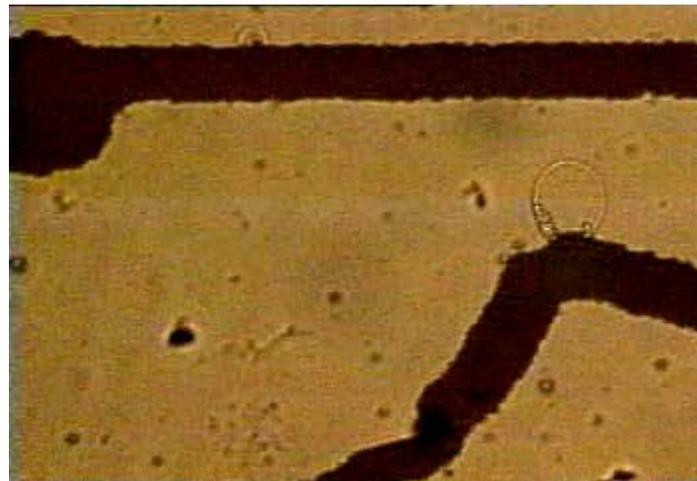
What we do to cells and molecules



Move a cell



Wong et al *IEEE/ASME Trans. Mechatronics*

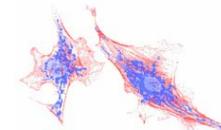
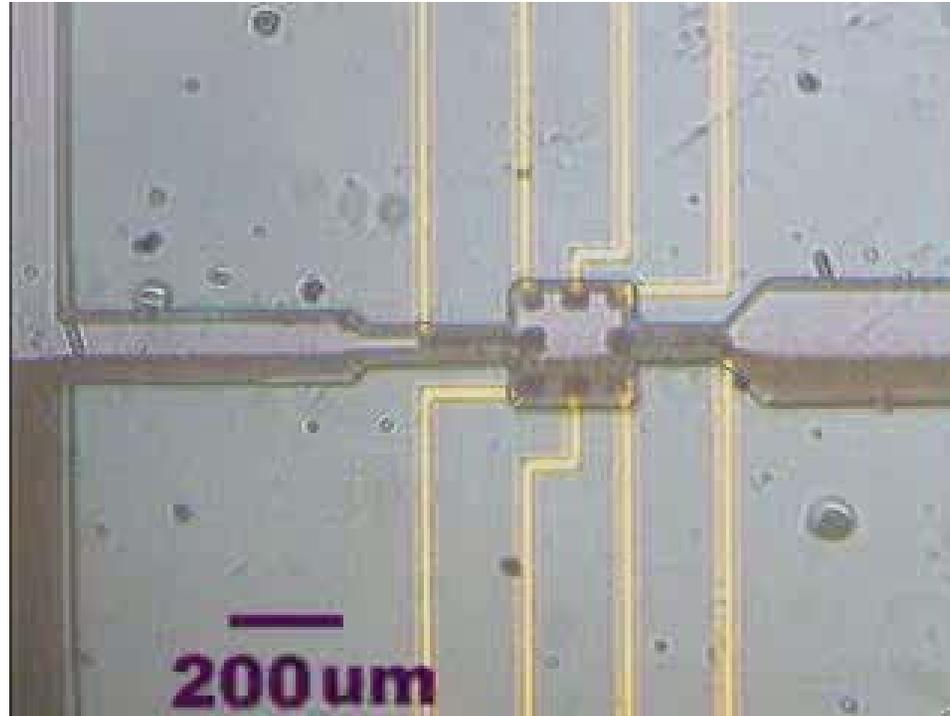


Mixing

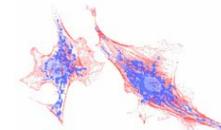
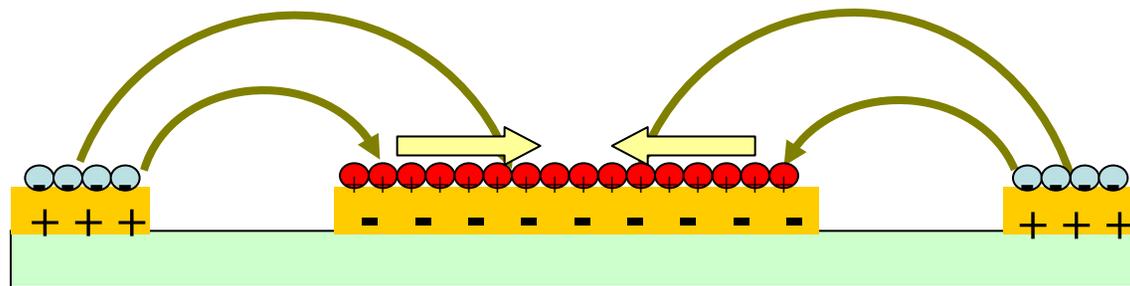
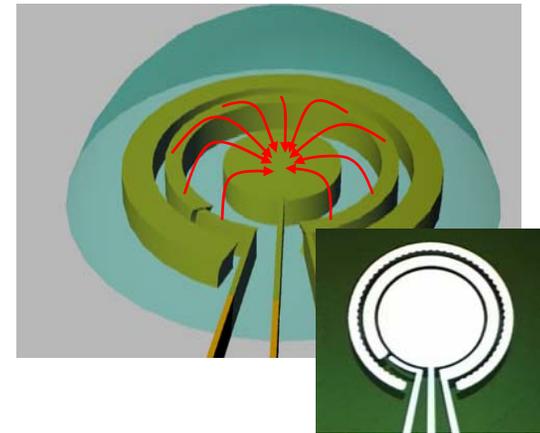
DI water



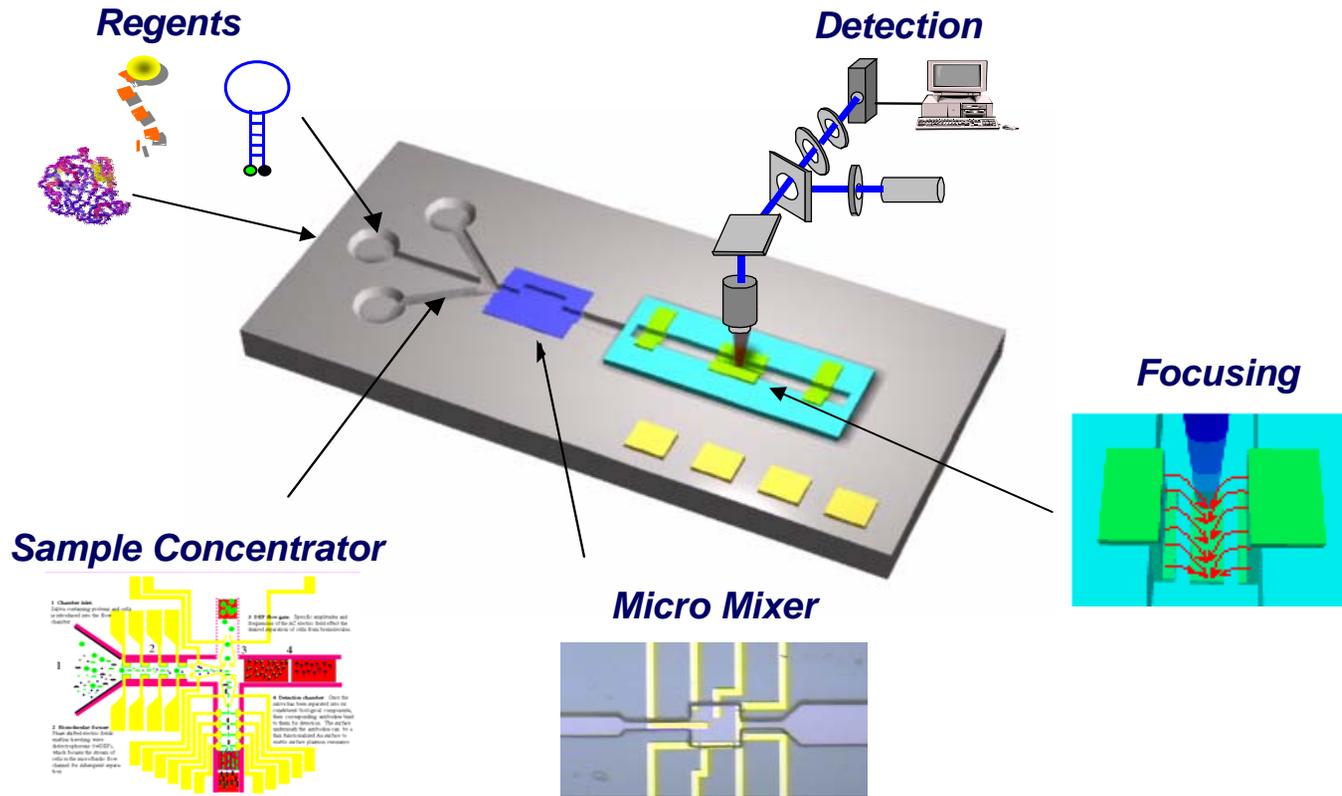
500nm microsphere
in aqueous medium



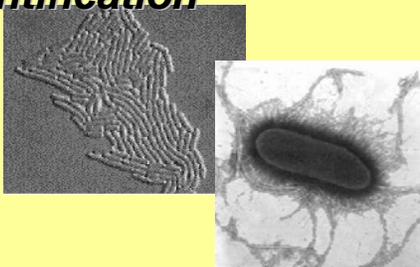
Concentration



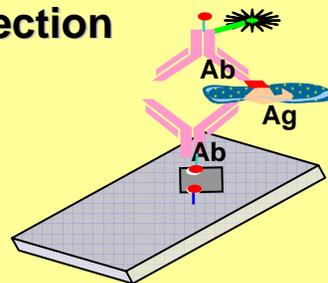
Lab on a Chip Applications



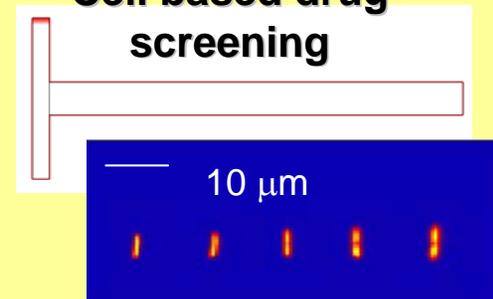
Uropathogenic *E. coli* identification



Oral cancer biomarkers detection



Cell based drug screening



Summary

- **Bio-nano technologies**
understanding our lives – cells and molecules
lots of potential and lots of fun
- **Lab on a chip**
Move, mix, concentrate cells and molecules
rapid, sensitive and specific

