Improving Accessibility of Microfluidics through Interdisciplinary Component-based Design

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WHY?

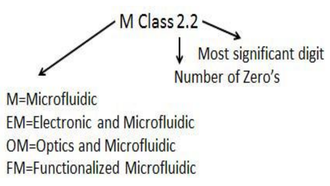
Microfluidic Applications:

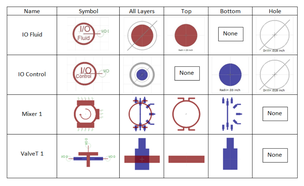
- Stem Cells-Toxicity Testing-Lab In a Dish
- Preventative Medicine-Body Fluid Profiling
- Drug Development-Protein-Protein Interaction

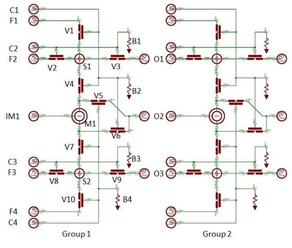
Microfluidics holds undeniable potential, but how can it reach that potential?

INNOVATION

Symbolic Interdisciplinary Component (SiC) Library:

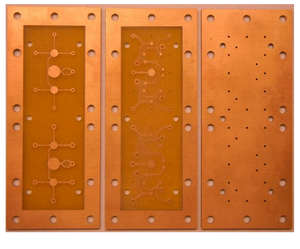




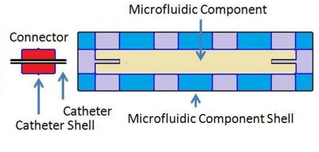


Microfluidic Schematic Built from Symbolic Components

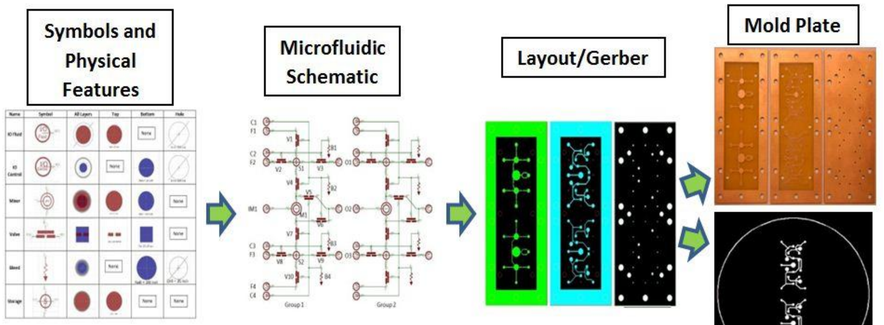
Use of PC Table Top Milling Machine to Translate CAM File to Mold Plate



Standardized Microfluidic Interconnection



Symbolic Design of Microfluidics

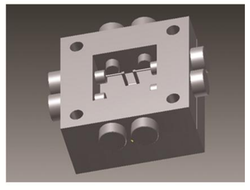


Symbolic Microfluidic Design

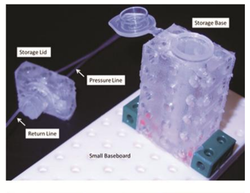
1. Link a Symbol to a Physical Component Layout
2. Interconnect Components in a Microfluidic Schematic
3. Translate a Schematic to Board Layout
4. Board layout translates directly in Mold Plate or Artwork
5. From a Mold Plate a microfluidic device is fabricated

Component-based Microfluidics

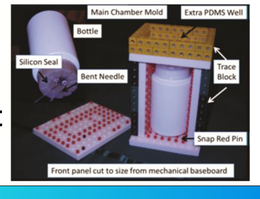
Stand Alone Valve Component



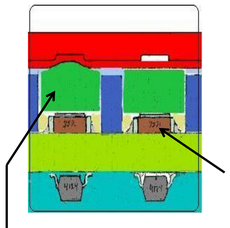
Storage Component



Pressure or Vacuum Chamber Component



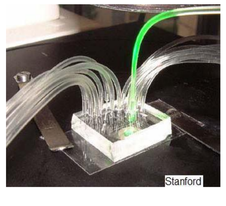
Stand Alone Valve Component



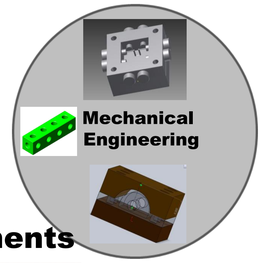
Infrastructure is a Problem

Current microfluidic infrastructure

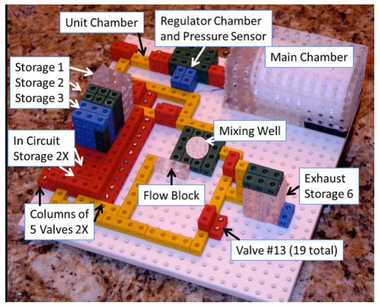
- Solenoids
- Drivers and Software

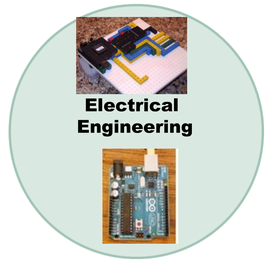


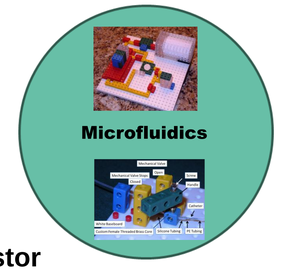
Interdisciplinary Components

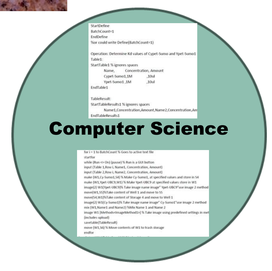


System of Components









FUTURE WORK

- Expansion of the current symbolic interdisciplinary Component (SiC) library.
- Continued development of the microfluidic software control language.
- Integration of stand alone valve, microcontroller, optics, and electronics.
- Development of multi-scale fabrication techniques.
- Applying microfluidics system to stem cell research, drug development, and preventative medicine.

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