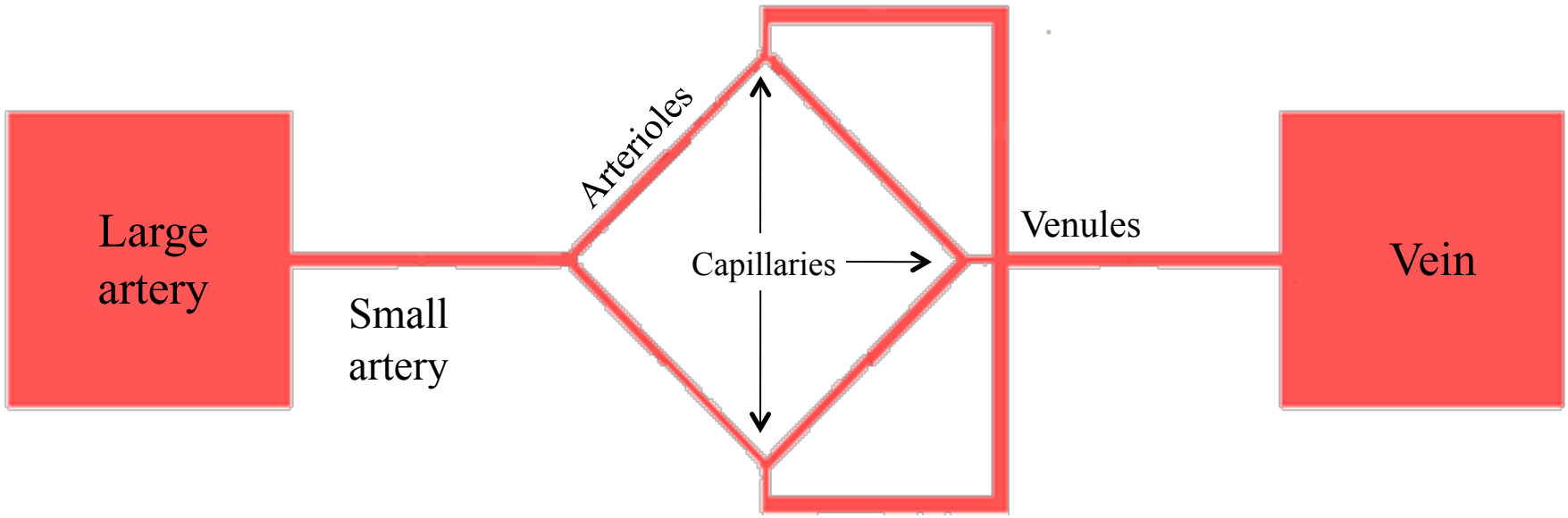
# Microvascular Chips

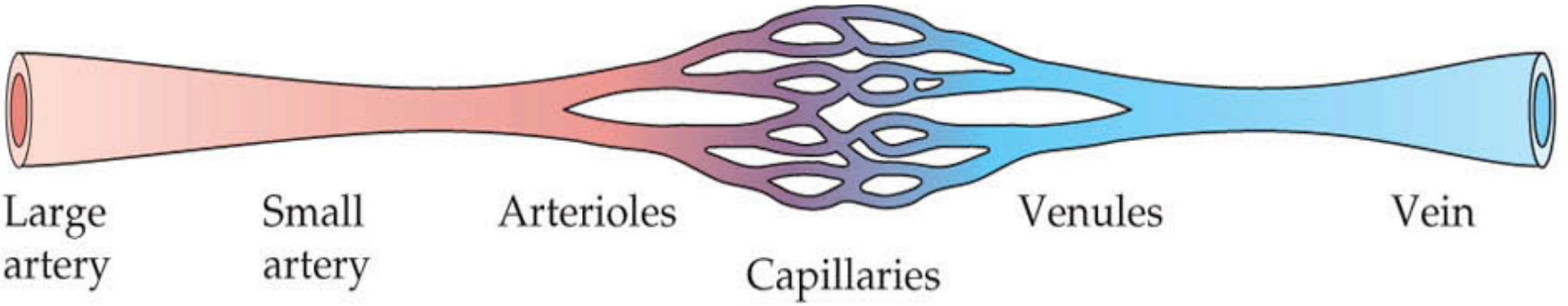
## The Vascular System Modeled by Microfluidics

By: Marissa Davis, Suni Christiansen, Daniela Zuniga Sacks, Jhori Varner, Jonlin Chen

# Purpose

Simulate how the flow changes in a “blood vessel” after blockage occurs, by using a micro fluidic chip.

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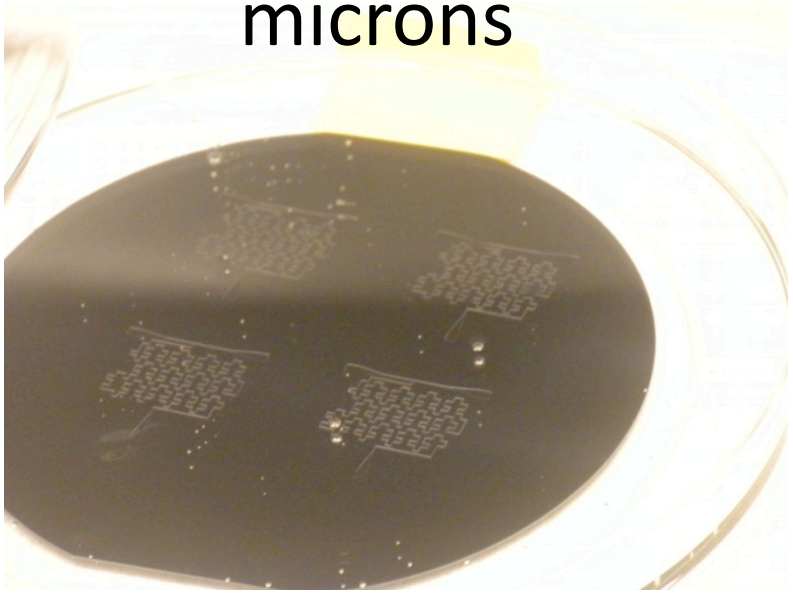
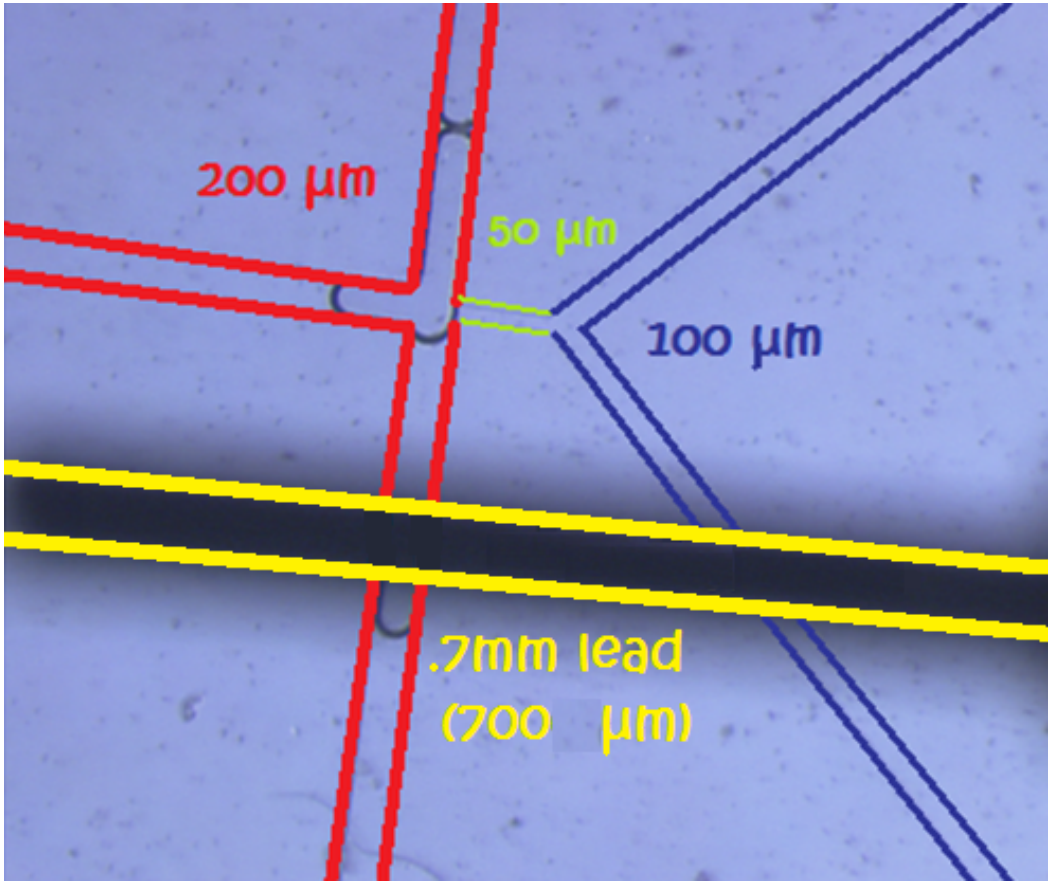
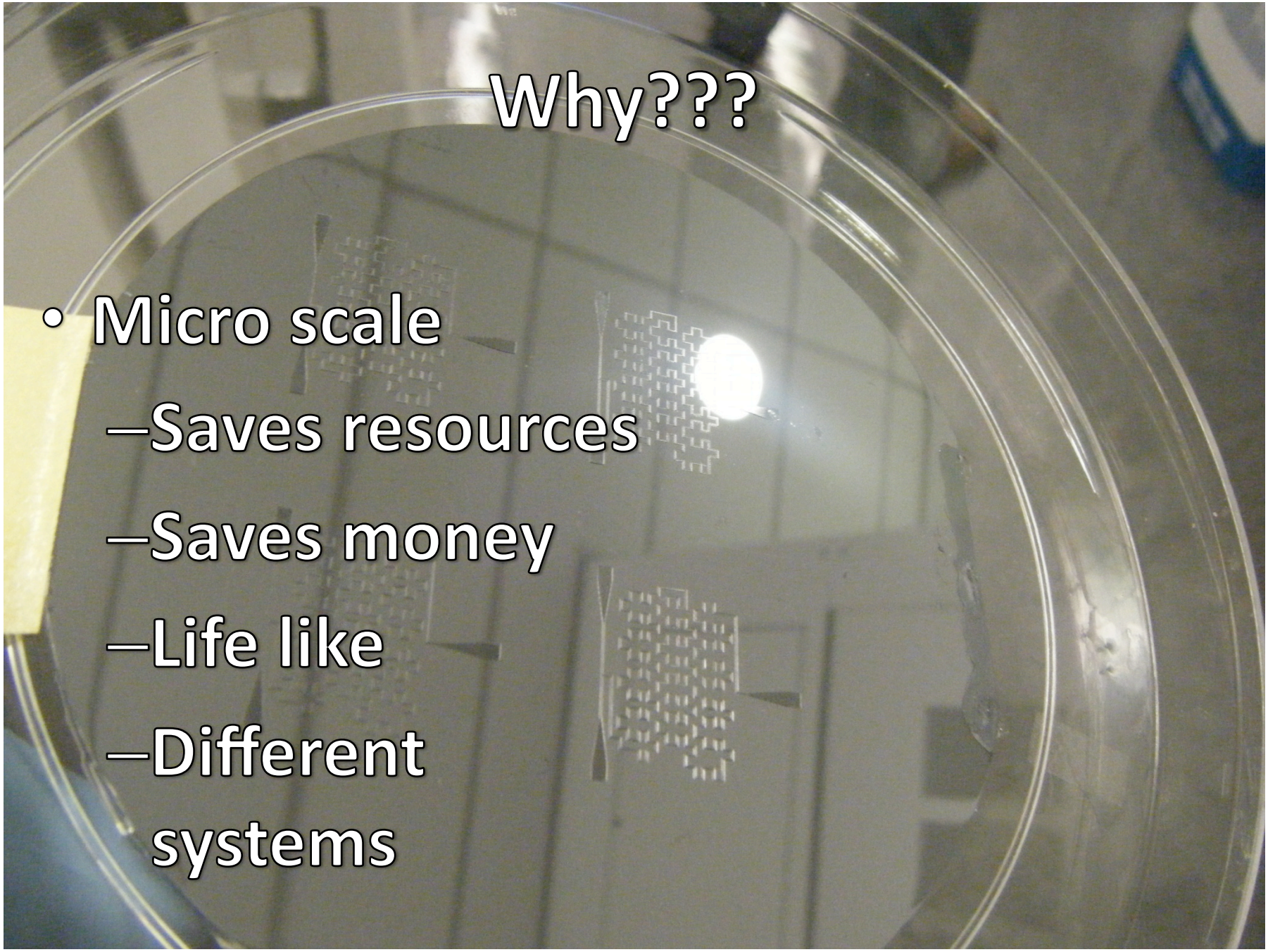
# Crash Course in Microfluidics

- Nanotechnology
- Simulates small systems: blood vessels
- Average red blood cell: 8 microns





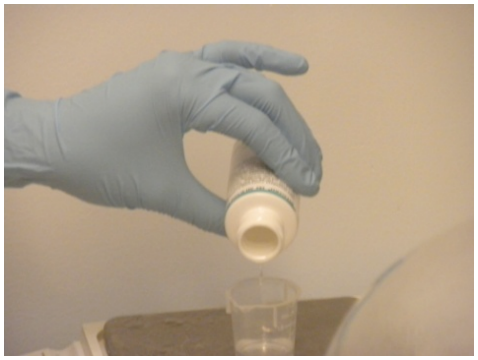


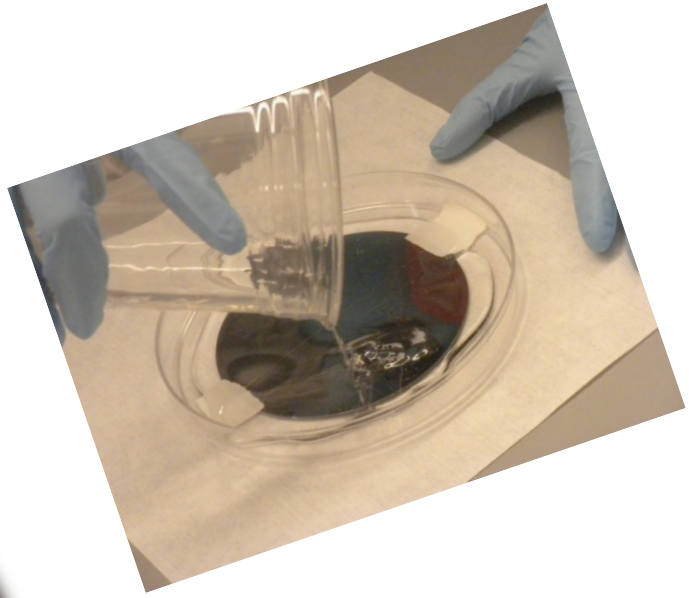
# Why???

- Micro scale
  - Saves resources
  - Saves money
  - Life like
  - Different systems

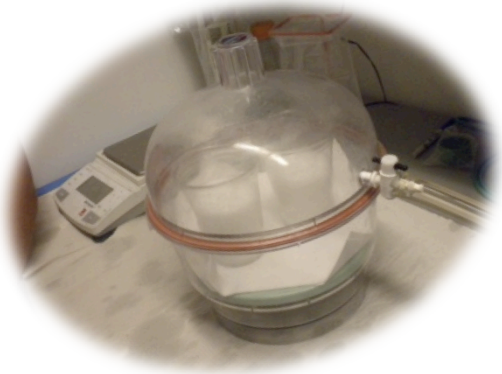
# Making the Chip

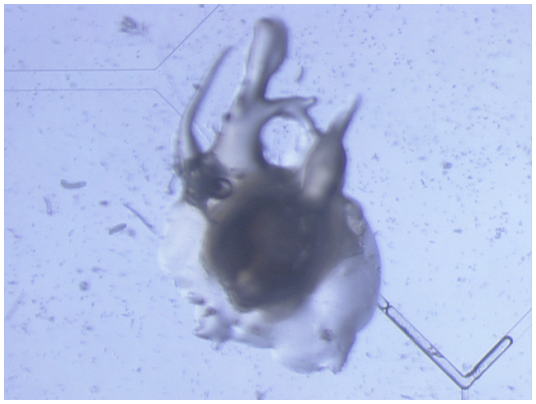
PDMS

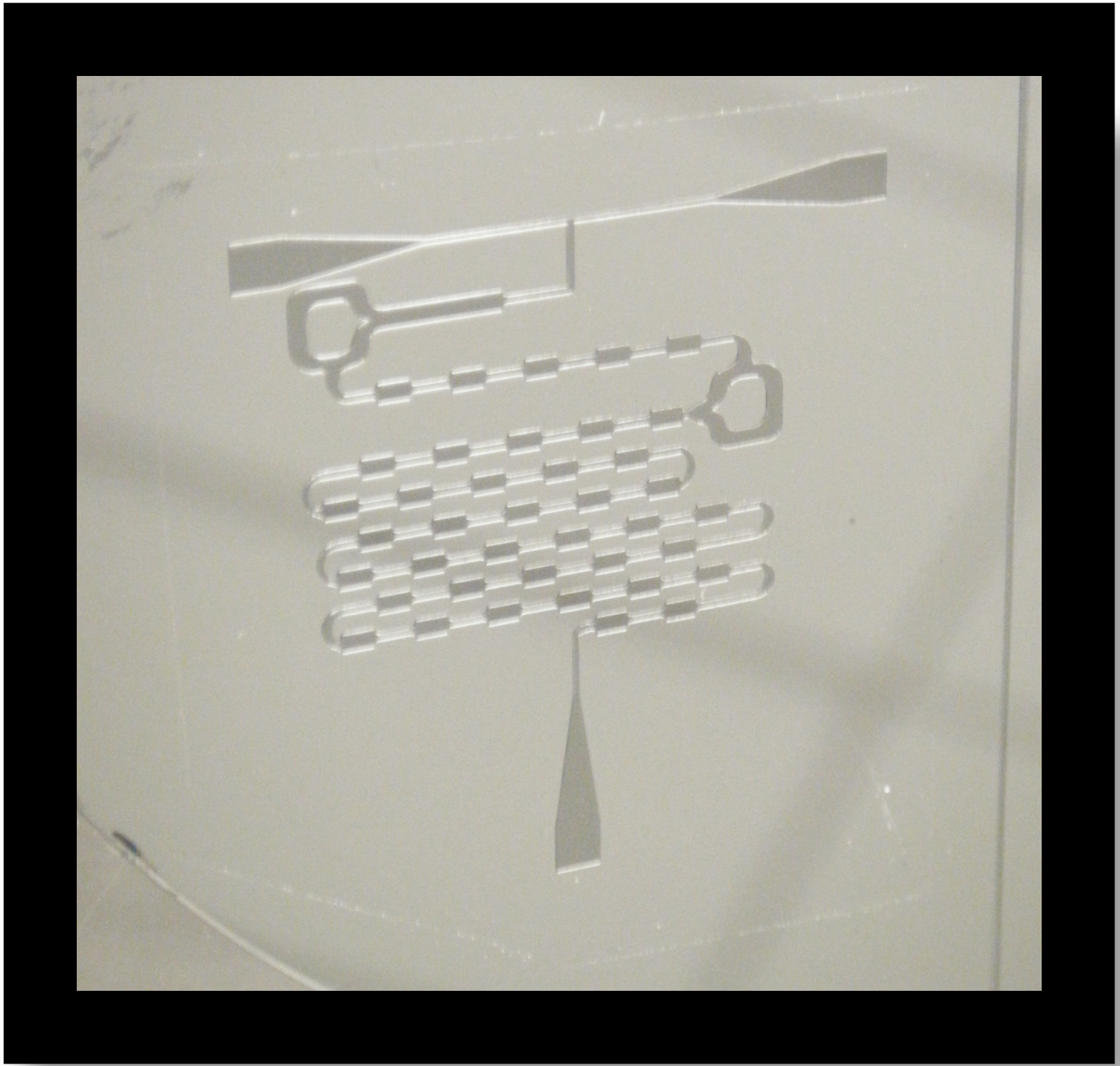




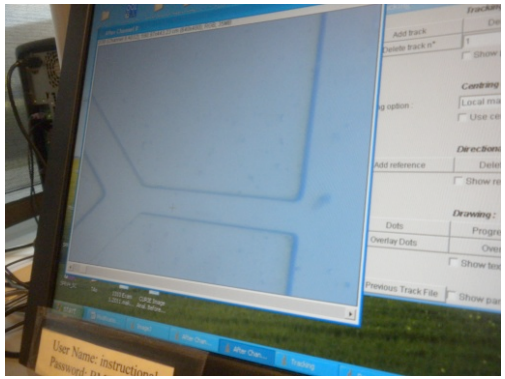
Chip

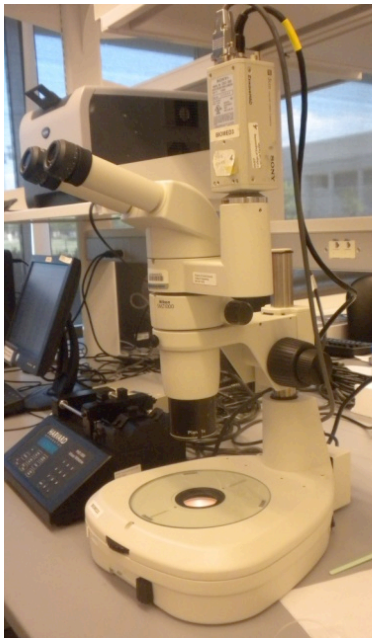


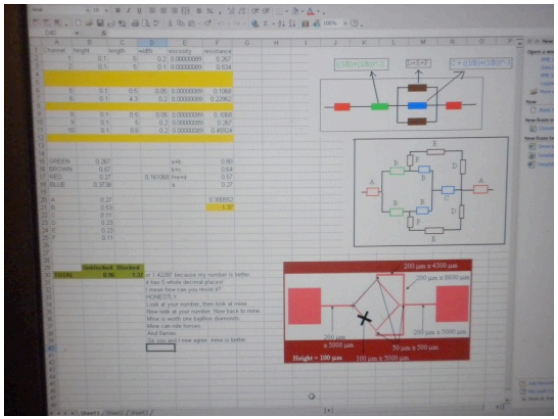




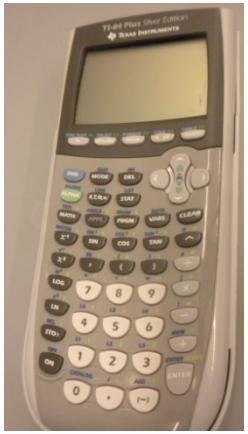
# Tools of the Trade

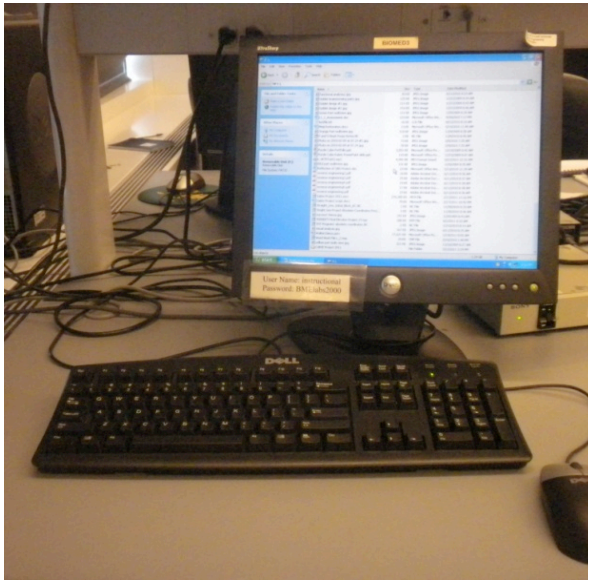


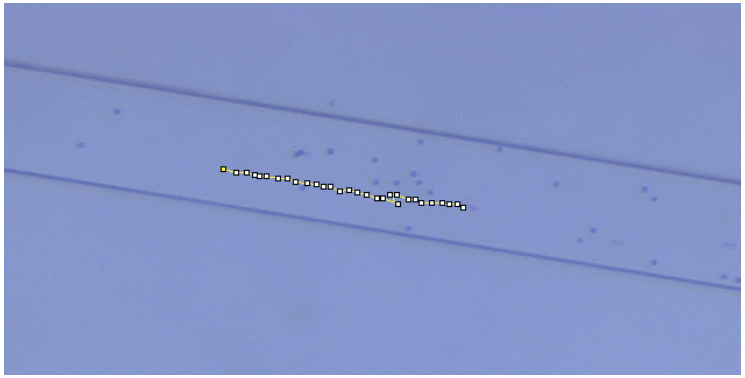


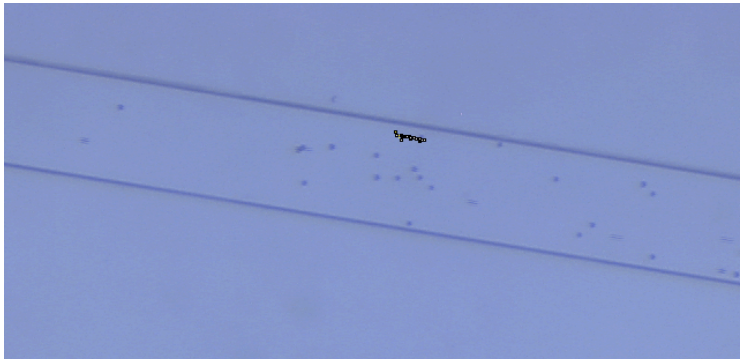
Technology

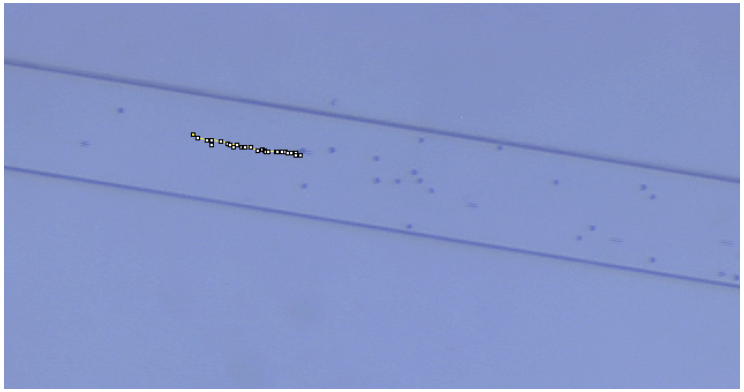


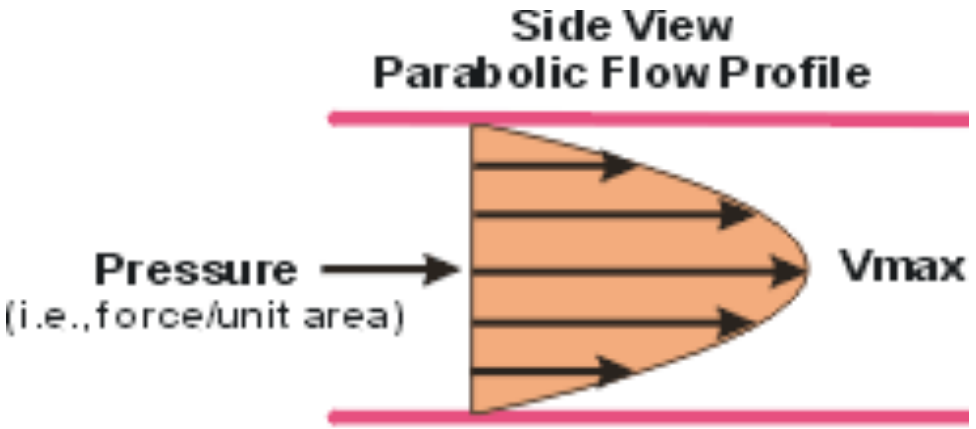


# Picturing the Purpose



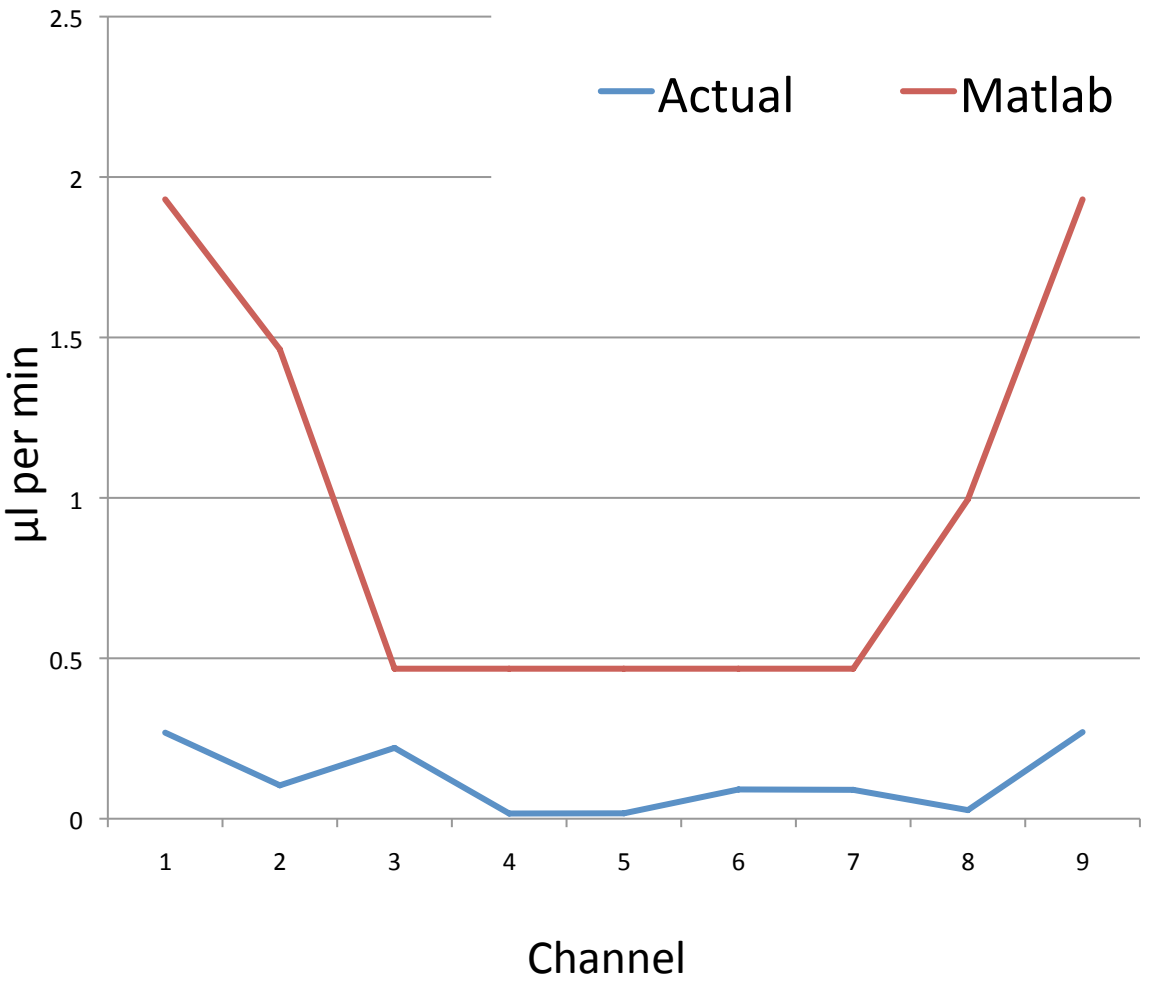






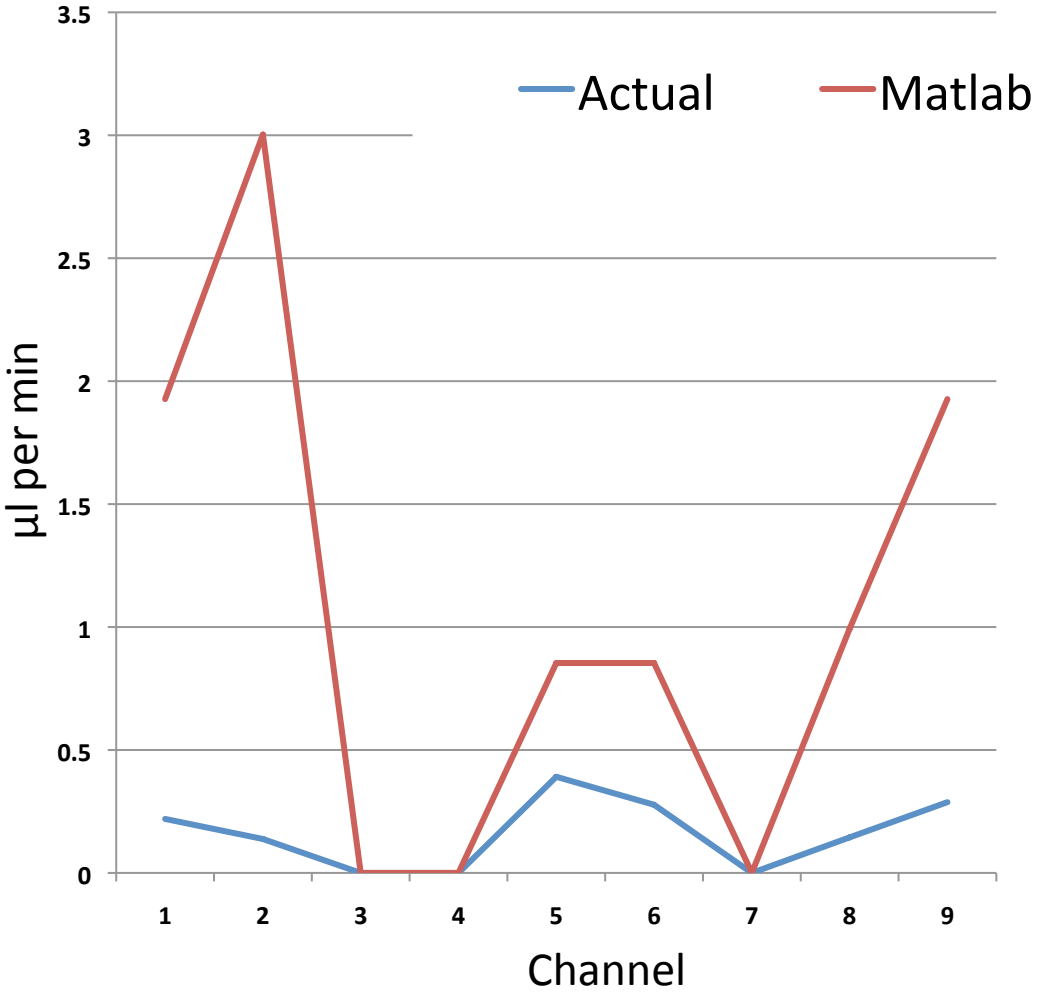
# Unblocked Flow

| Channel | Actual | MatLab |
|---|---|---|
| 1 | 0.268 | 1.930 |
| 2 | 0.104 | 1.463 |
| 3 | 0.221 | 0.468 |
| 4 | 0.016 | 0.468 |
| 5 | 0.017 | 0.468 |
| 6 | 0.091 | 0.468 |
| 7 | 0.090 | 0.468 |
| 8 | 0.027 | 0.995 |
| 9 | 0.270 | 1.930 |

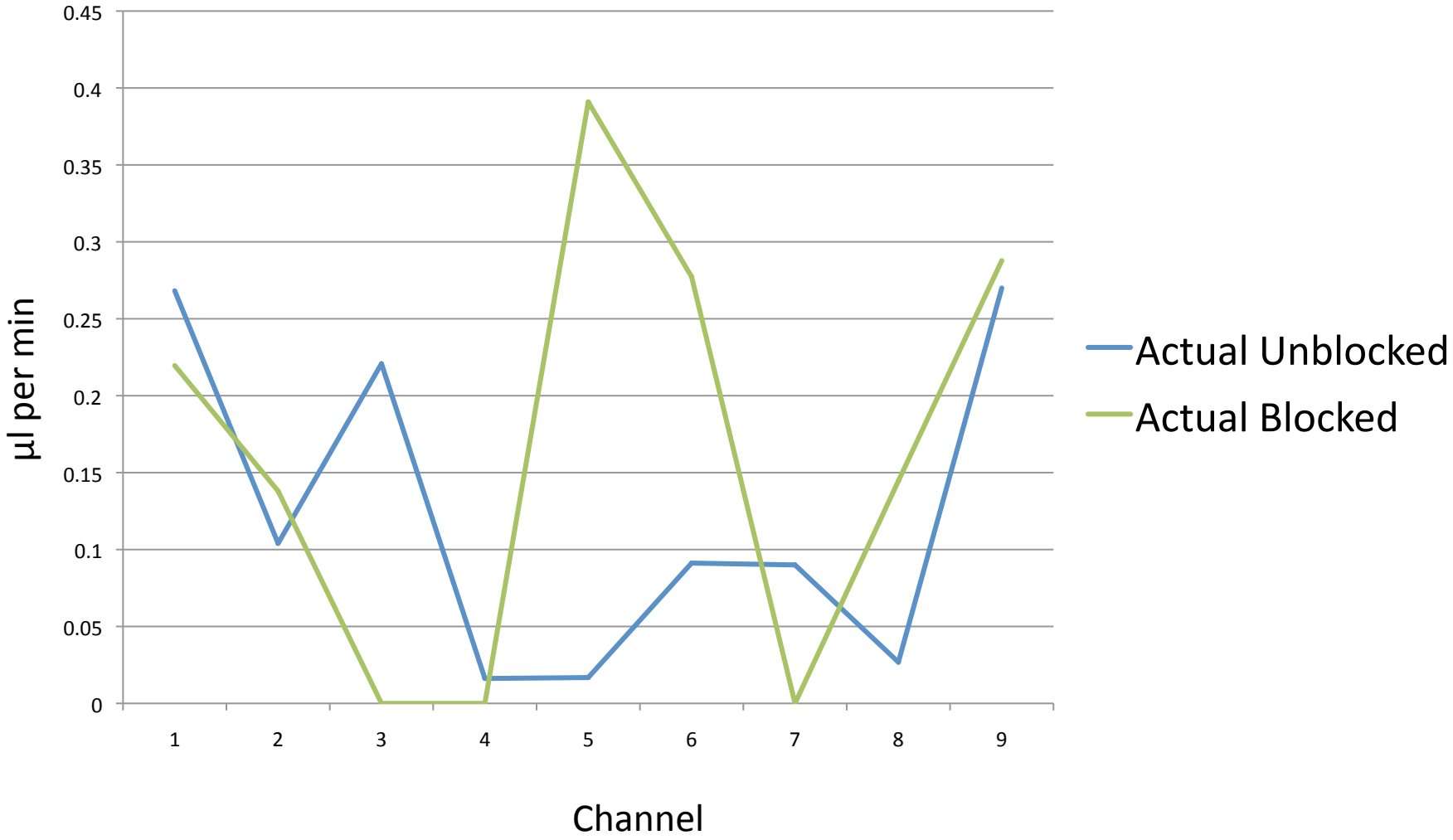


# Blocked Flow

| Channel | Actual | MatLab |
|---|---|---|
| 1 | 0.220 | 1.927 |
| 2 | 0.138 | 3.003 |
| 3 | 0 | 0 |
| 4 | 0 | 0 |
| 5 | 0.391 | 0.854 |
| 6 | 0.277 | 0.854 |
| 7 | 0 | 0 |
| 8 | 0.145 | 0.994 |
| 9 | 0.288 | 1.927 |



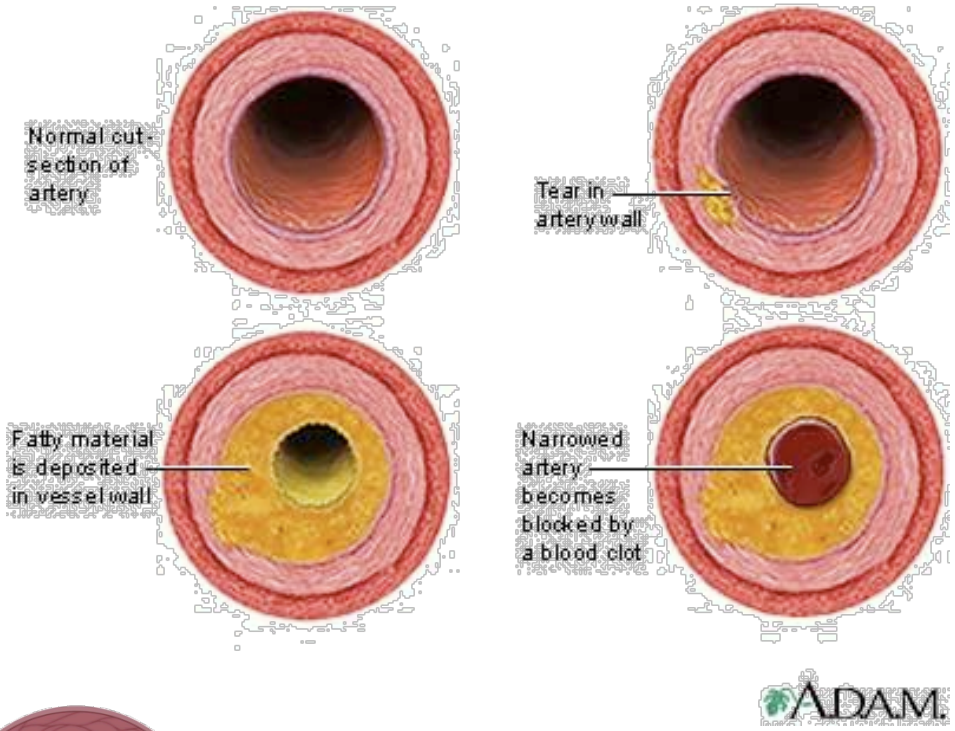
# Blocked vs. Unblocked



# Conclusion

**What all of this means:**

- Not just applicable to strokes
- Shows the dynamics of blood within smaller blood vessels
- Location, location, location!




Dilated Artery | Normal Artery | Constricted Artery


Thank You!

# Acknowledgements


- Professor Shen
- Teaching Assistants
- Program Assistants
- Cornell University
  College of Engineering


Cornell University
College of Engineering

# Any Questions?