

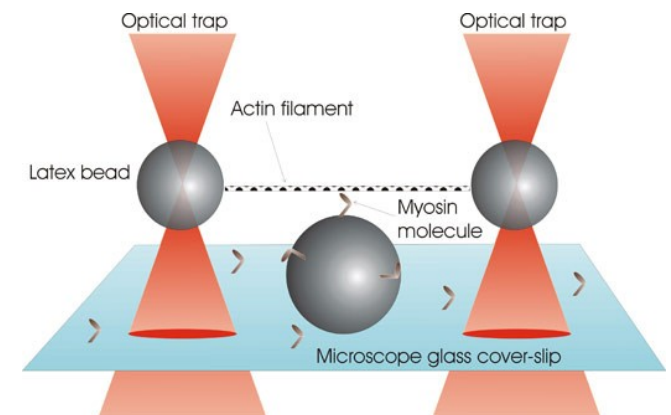
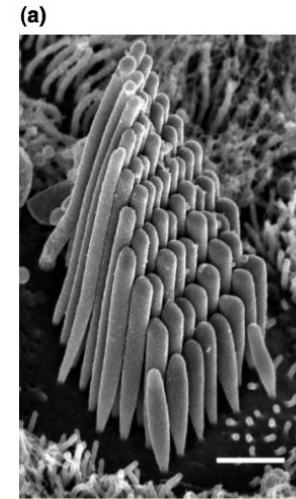
Applications for High Speed Force Sensing and Actuation

- 1) Mechanotransduction (touch sensation, hearing)
- 2) Single Molecule Force Spectroscopy

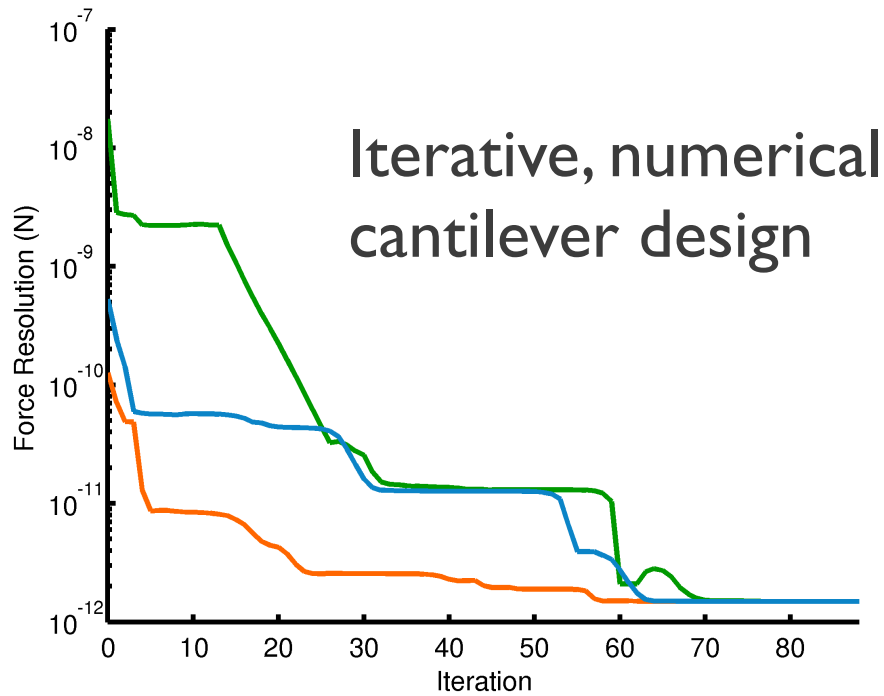
Sensor and actuator requirements

- Rise time < 10 microseconds
- Tip deflection < 1 micron
- MDF < 100 pN with 200 kHz bandwidth
- Closed loop force control in liquid

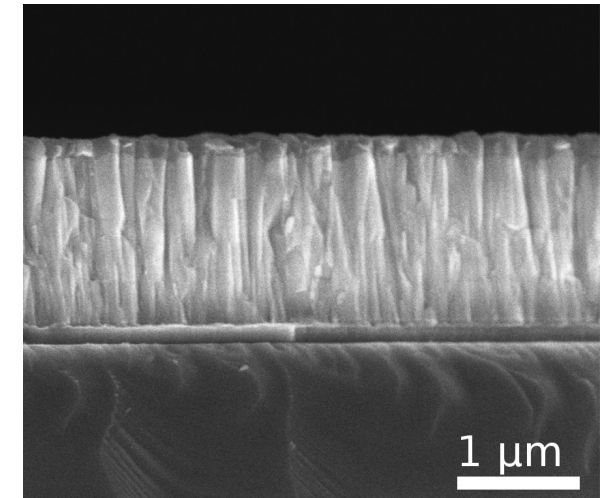
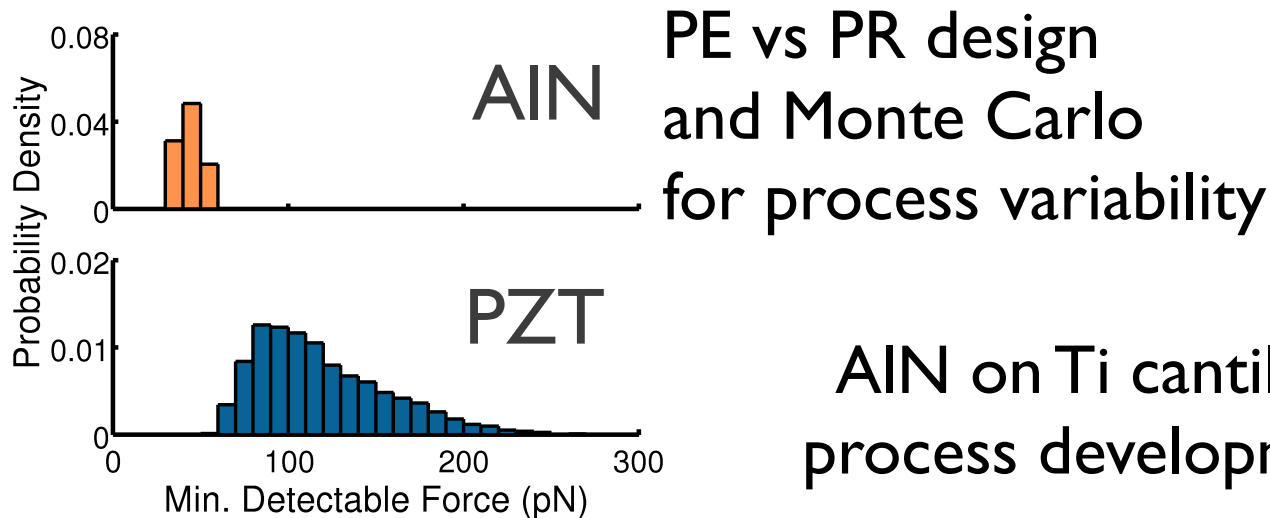
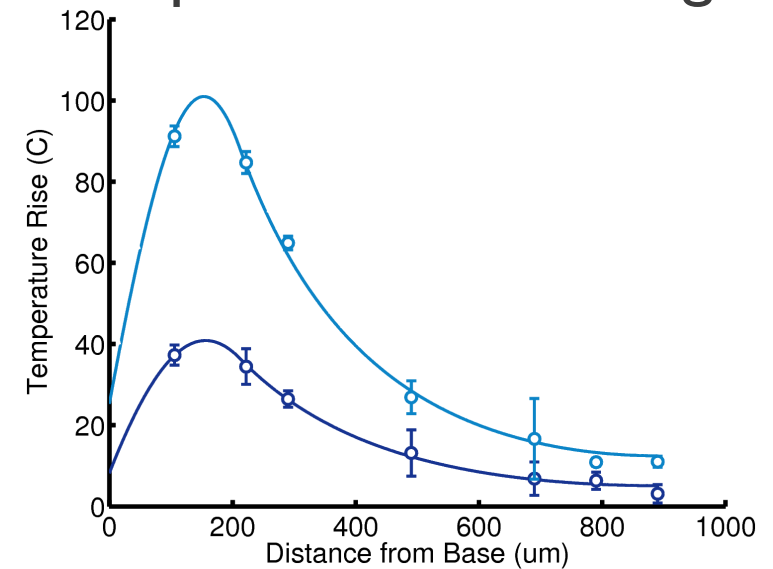
Approach: PR sensor, PE actuator



Four Cantilever Design Innovations



Thermal modeling and temp constrained design



Devices and Performance to Date

