



Tony Wang

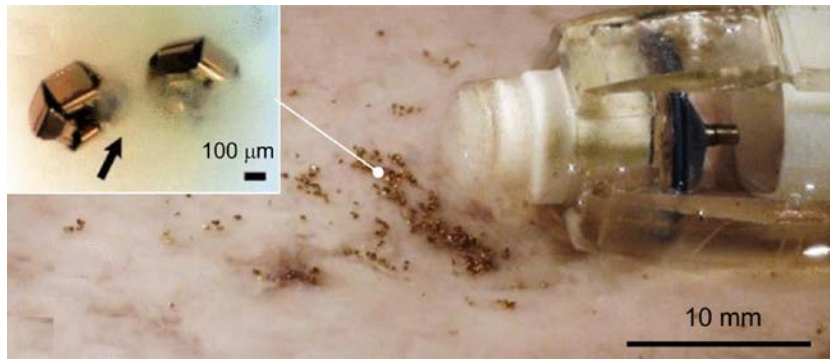
Ph.D. Student, Electrical and Computer Engineering
Third Year ARCS Scholar
Dasher Award




Microrobots for Neurosurgical Applications

Microrobots for Microsurgical Tasks

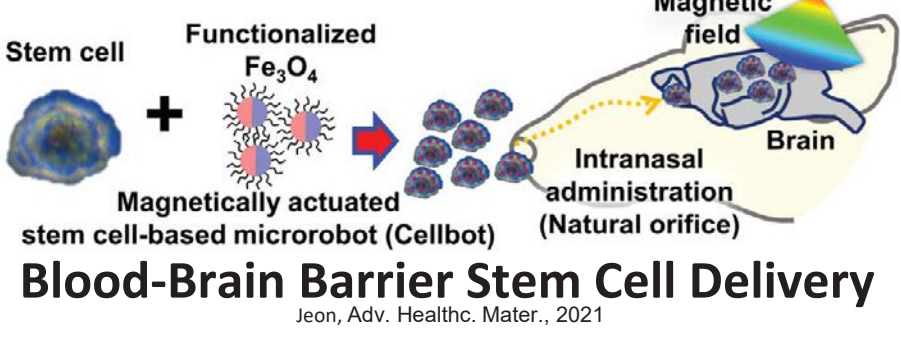
- Benefits of microrobots
 - Minimal invasiveness
 - Access to tight spaces in the body



Endoscope Carrying Microgrippers
Yim, IEEE Trans. Biomed. Eng., 2014



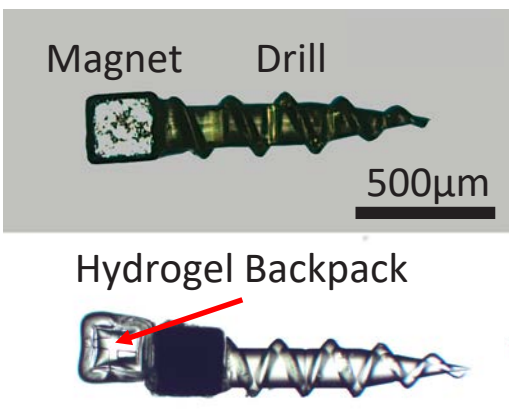
OctoMag
Kummer, IEEE Trans. Robot., 2010



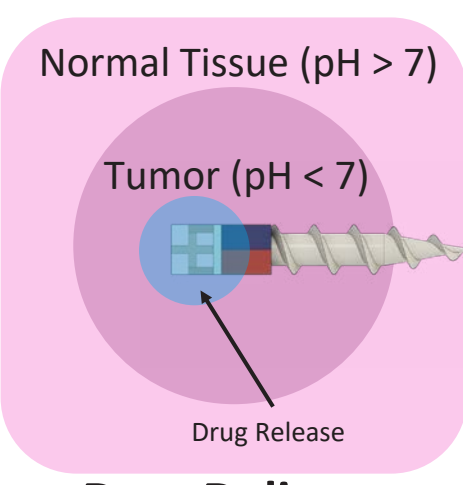
Blood-Brain Barrier Stem Cell Delivery
Jeon, Adv. Healthc. Mater., 2021

A Microdriller for Drug Delivery Applications

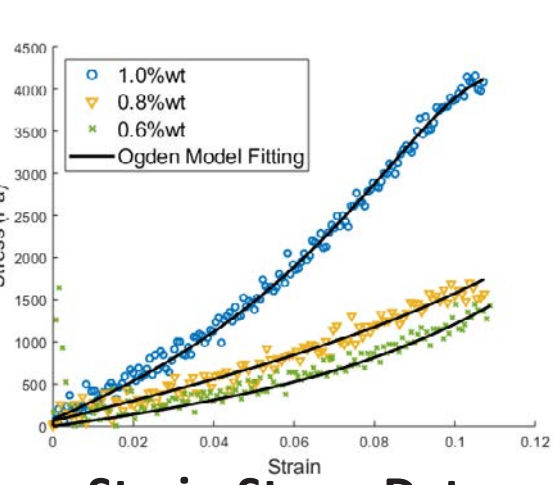
- Smallest microdriller to date
- First microdriller capable of drug delivery
- Tested on tissue phantoms and brain tissue



Our Microdriller

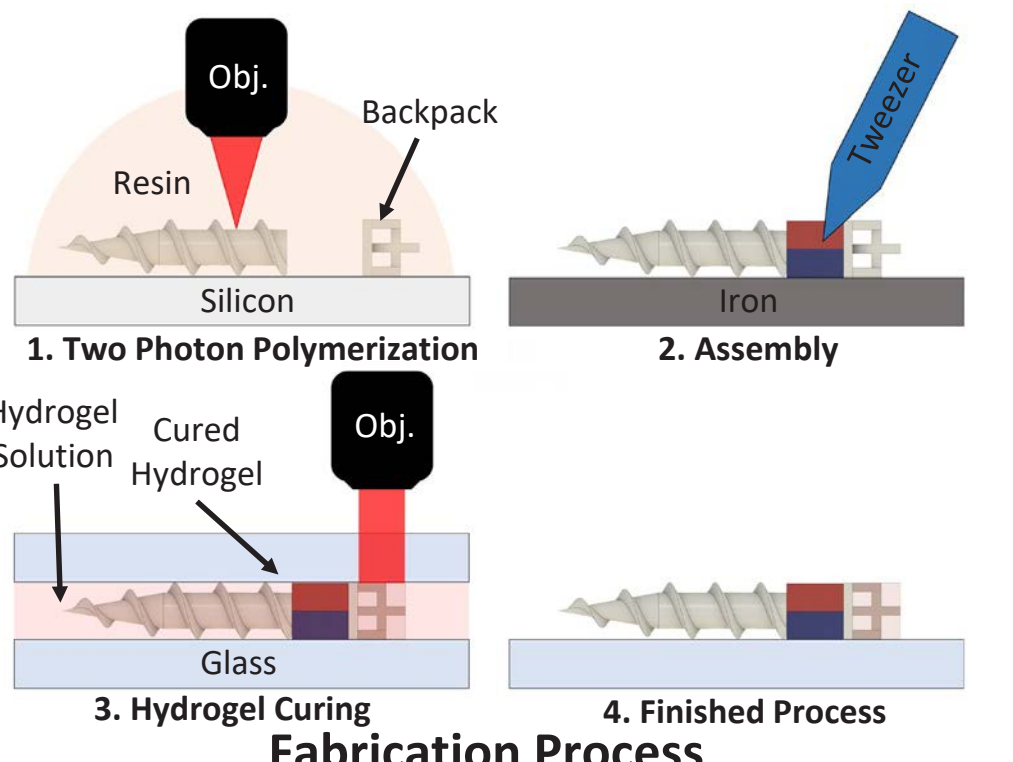


Drug Delivery



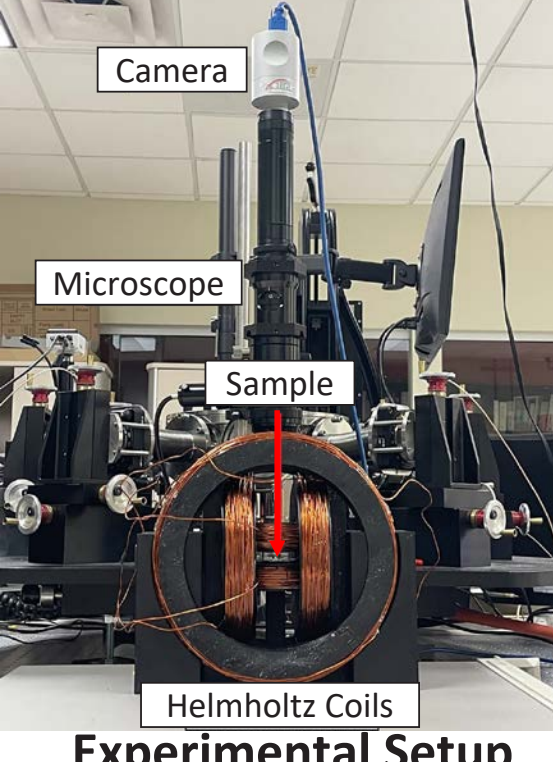
Strain-Stress Data

Fabrication and Setup



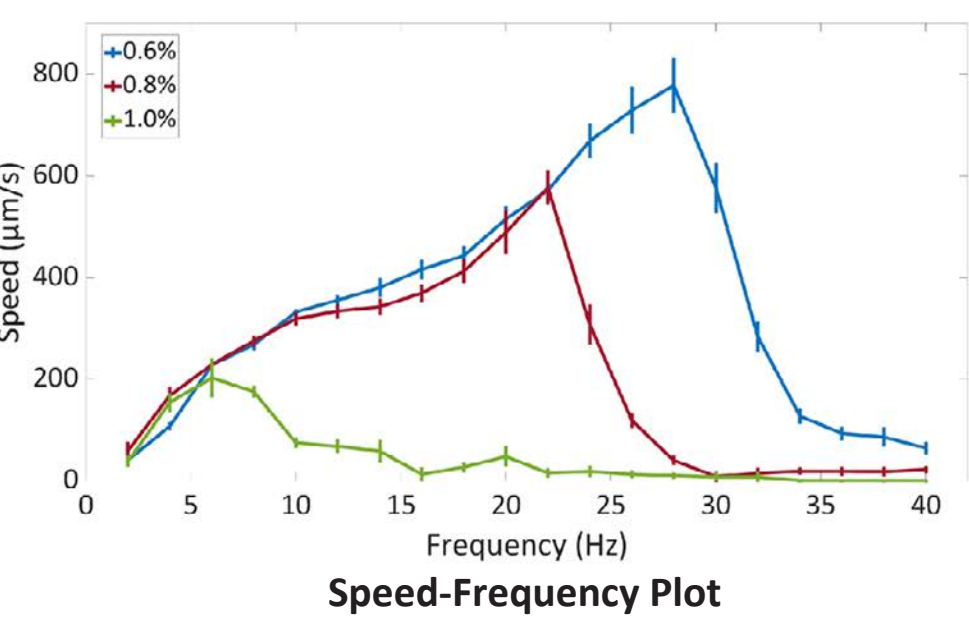
Fabrication Process

- Two Photon Polymerization
- Assembly
- Hydrogel Curing
- Finished Process

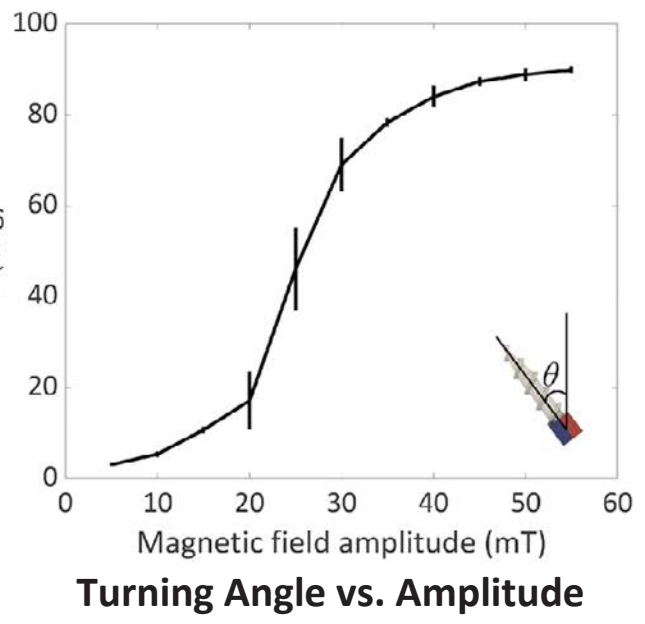


Experimental Setup

Mechanical Characterization



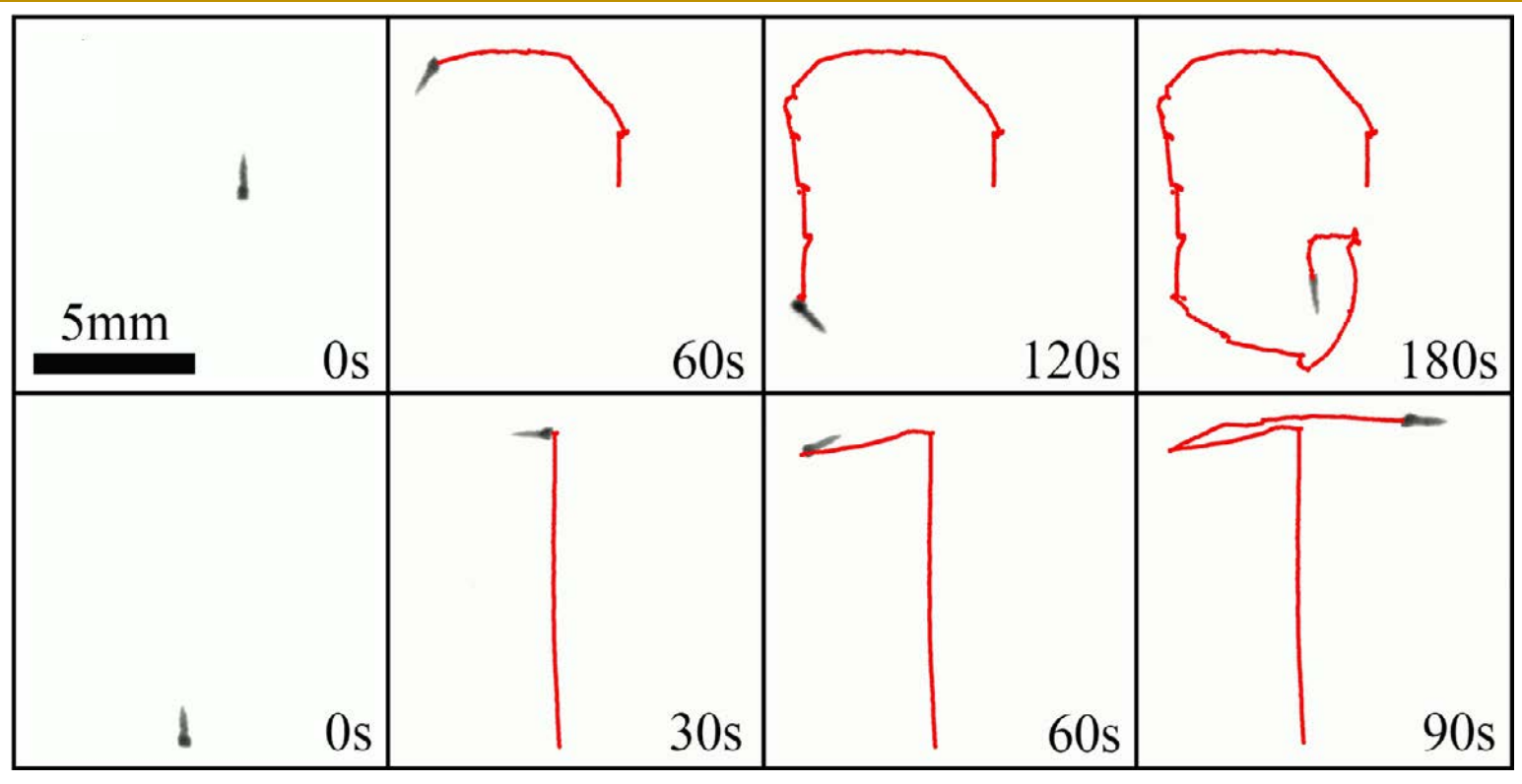
Speed-Frequency Plot



Turning Angle vs. Amplitude

- Microdriller can reach speeds up to 780 μ m/s in 0.6% agar gel

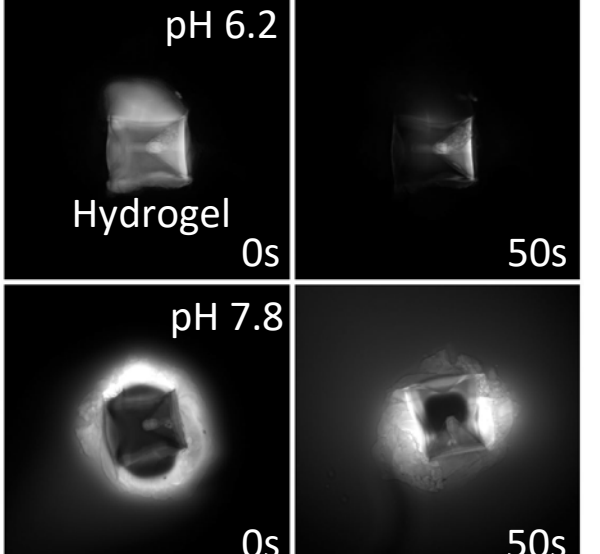
Controllable Motion in Tissue Phantom



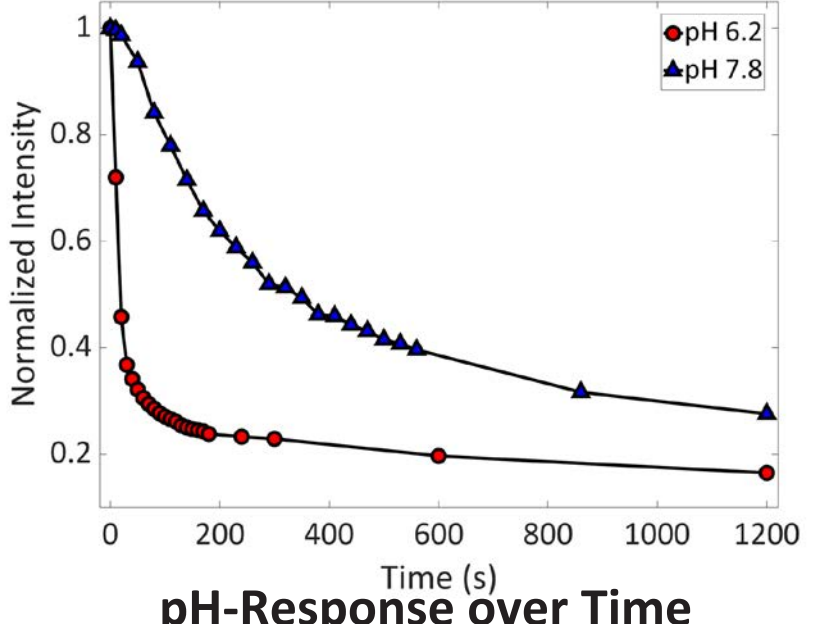
0s, 60s, 120s, 180s, 30s, 60s, 90s

On-Board Hydrogel Release Testing

- Hydrogel release at acidic tumor pH was 140% faster than release at normal tissue pH, showing selectivity



Fluorescence Images



pH-Response over Time