

Microfluidics for Biology and Sustainability

Xuanhong Cheng
Professor
October 26, 2023



LEHIGH
UNIVERSITY

| **Department of Bioengineering**

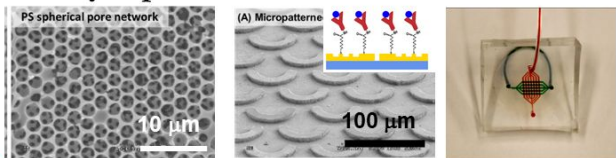
Xuanhong Cheng



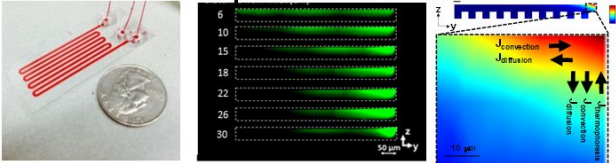
- **Professor, Bioengineering, Materials Science and Engineering**
- **Education and Training**
 - Postdoctoral Fellow, Massachusetts General Hospital, Harvard Medical School, Boston, MA
 - Ph.D., Bioengineering, University of Washington, Seattle, WA
 - B.S., Biology, Wuhan University, Wuhan, China
- **Research Areas**
 - Microfluidics, Lab on a Chip, Point-of-Care Diagnostics, BioMEMS, Biosensors, Biomaterials
- **Sample Publications**
 - Wang, Y.; Nguyen, K. T.; Ismail, E.; Donoghue, L.; Giridharan, G. A.; Sethu, P.; Cheng, X., Effect of pulsatility on shear-induced extensional behavior of Von Willebrand factor. *Artif Organs* 2022, 46 (5), 887-898.
 - Pulyala, P.; Jing, M.; Gao, W.; Cheng, X., Solution composition dependent Soret coefficient using commercial MicroScale Thermophoresis instrument. *RSC Adv.* 2023, 13 (23), 15901-15909.

Cheng Group: Lab of Micro- and NanoTechnology for Diagnostics and Biology

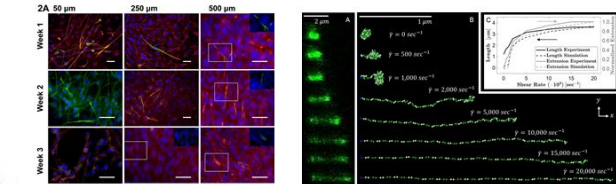
Affinity separation in micro- and nanofluidics



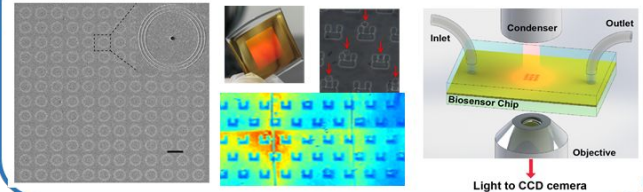
Field induced separation in microdevices



Molecular and cellular behavior in flow



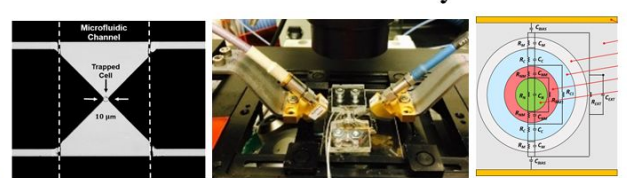
Optical sensors for biomolecule detection



Paper-based molecular sensing



Electrical sensors for cell analysis

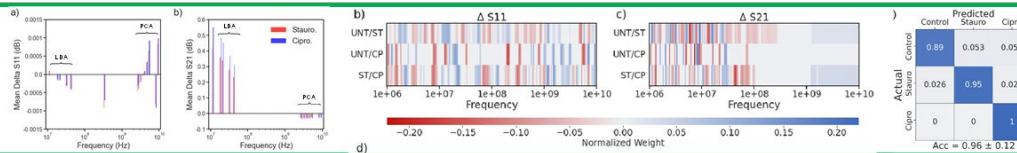


Analyte Processing

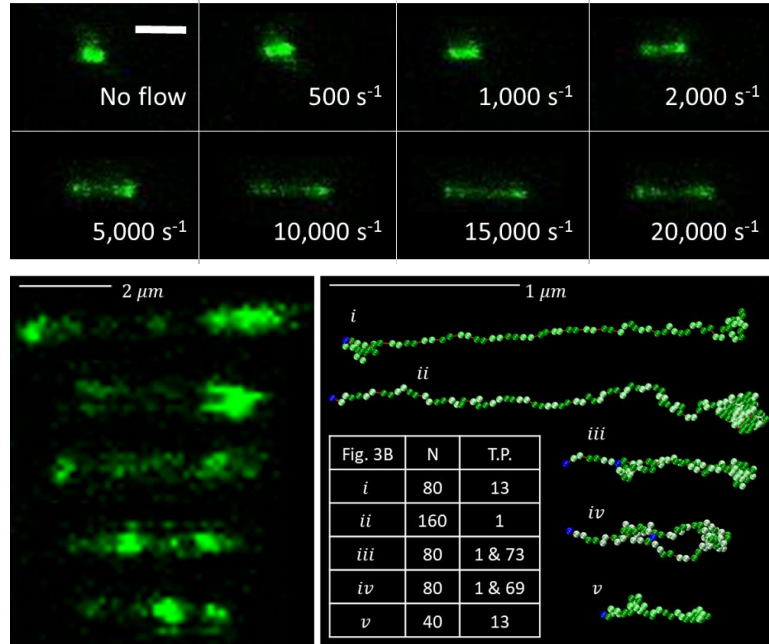
Biosensor & Diagnostics

Signal Processing

Machine-learning based analysis

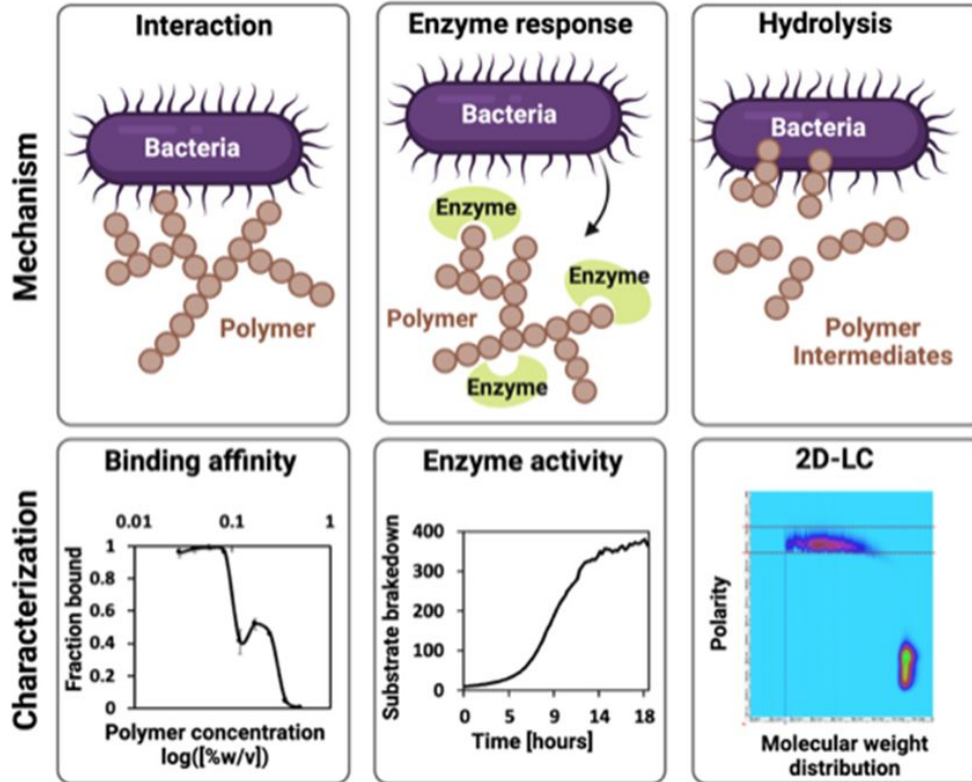


Von Willebrand Factor (vWF) under Flow and Artificial vWF



- **What are the aims?**
 - To understand biomechanics and function of VWF, a clotting factor responsive to high shear
 - To develop artificial molecules mimicking the shear response of VWF
- **Why is this topic significant?**
 - Fundamental understanding of VWF diseases (VWD)
 - Instrumental for development of diagnostics and therapeutics
 - Novel drug carriers
- **How is the topic studied?**
 - Single molecule characterization by force microscopy, microfluidics and optical microscopy
 - Construction of biomimetic materials responsive to shear
- **What are the future directions of this research?**
 - vWF responses to physiological flow
 - Drug carrier for model diseases

Biodegradation of Water Soluble Polymers (WSPs)



- **What are the aims?**
 - To understand how water soluble polymers (WSPs) are degraded by bacteria
- **Why is this topic significant?**
 - Knowledge about the biodegradation process and outcome directs the development of environmentally sustainable WSPs
- **How is the topic studied?**
 - Cell-polymer binding
 - Cell growth, enzyme production and secretion, community dynamics
 - Polymer degradation time and products
- **What are the future directions of this research?**
 - To develop systematic understanding of the polymer structure-degradation relationship

Contact

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