

# Soft Materials Mechanics and Immunomechanics

## Xuanhe Zhao

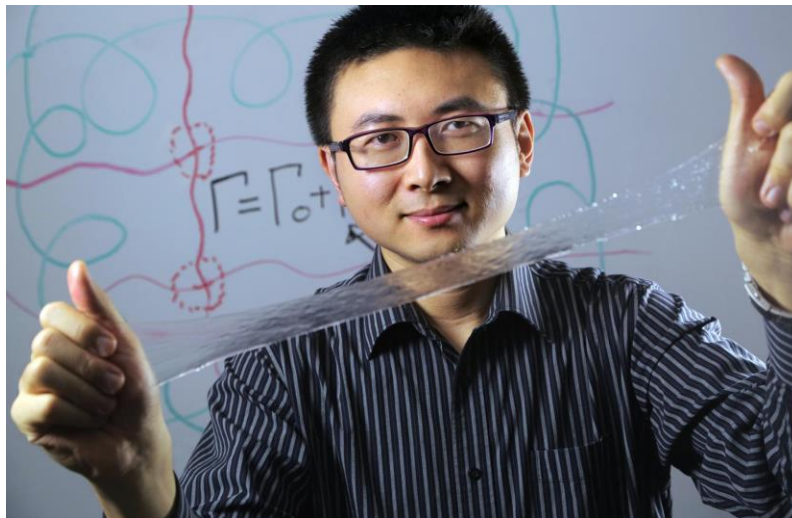
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### Abstract:

Whereas human tissues and organs are mostly soft, wet, and bioactive, machines are commonly hard, dry, and abiotic. Merging humans, machines and their intelligence is of imminent importance in addressing grand societal challenges in health, sustainability, and artificial intelligence. However, merging humans and machines is extremely challenging due to their fundamentally contradictory properties. At MIT Zhao Lab, we exploit soft materials to form long-term, non-fibrotic, and high-efficacy interfaces between humans and machines. In this talk, I will discuss two fundamental questions in soft materials mechanics and immunomechanics:

- What is the intrinsic fracture energy that determines the fracture and fatigue of polymer networks?
- Can soft materials mechanics interplay with the immune system to mitigate foreign body reaction and prevent fibrous-capsule formation?

I will conclude the talk with a vision for future human-machine convergence – synergized with modern technologies such as artificial intelligence, synthetic biology, and precision medicine.



### Bio:

Dr. Xuanhe Zhao is a Professor of Mechanical Engineering at MIT. The mission of Zhao Lab is to advance science and technology between humans and machines to address grand societal challenges in health and sustainability. A major current focus is the study and development of soft materials and systems. Dr. Zhao has won early career awards from NSF, ONR, ASME, SES, AVS, Adhesion Society, JAM, EML, and Materials Today. He is a Clarivate Highly Cited Researcher with over 41,000 citations on his papers. Bio adhesive ultrasound, an invention based on Zhao Lab's work published in Science, was named TIME Magazine's Best Inventions of the year in 2022. SanaHeal Inc., a startup company based on Zhao Lab's work published in Nature, was awarded the 2023 Nature Spinoff Prize. Over ten patents from Zhao Lab have been licensed by companies and have contributed to FDA-approved and widely-used medical devices.

Monday, March 25<sup>th</sup>, 2024 4:00 – 5:20 p.m.

1310 Yeh Student Center