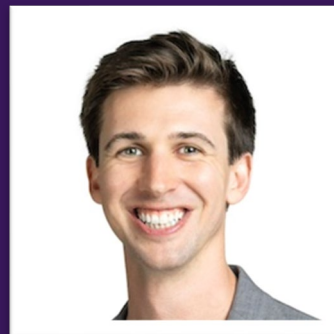


THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT
FALL COLLOQUIUM SERIES PRESENTS:

Professor Ryan Truby

Junior Professor, Assistant Professor of Materials Science and Engineering

Northwestern University



Materializing Intelligence: Robotic Materials for Real-World Robots

Robots still lag far behind living organisms in efficiency, adaptability, and resilience. Most are built from rigid, motorized mechanisms and lean on ever more computationally intensive perception, control, and learning pipelines to cope with the real world. Animals, by contrast, derive these capabilities directly from their material composition and morphology. For example, muscles provide compliant, back-drivable actuation; event-based mechanoreceptors translate body-environment interactions into rich feedback; and multiscale tissue architectures impart toughness and graceful degradation. Our research group, the Robotic Matter Lab, develops *robotic materials*, or material systems that empower robots to operate, learn, and adapt in real-world environments as animals do. In this talk, I will show how we establish performance-through-processing relationships to inversely design robotic materials for new actuation and sensing capabilities, and how we advance digital design and additive manufacturing platforms that reveal new structure-property relationships in soft, architected, and structural robotic materials. First, I will present our work in architecting elastomers from structural to molecular scales as artificial muscles. I will then introduce our efforts to create iontronic materials for robot perception using polymerizable ionic liquids. Finally, I will share our recent efforts to advance the multiscale design and 3D printing of robotic materials. Altogether, these efforts advance a body-up, rather than compute-down, paradigm for robotics in which actuation, perception, and learning are materialized in the bodies of robots themselves.

Ryan Truby is the June and Donald Brewer Junior Professor and Assistant Professor of Materials Science and Engineering and Mechanical Engineering at Northwestern University. Prior to Northwestern, Ryan was a Postdoctoral Associate at MIT's Computer Science and Artificial Intelligence Laboratory, and he received his Ph.D. from Harvard University. His honors include a DARPA Director's Fellowship, DARPA Young Faculty Award, Office of Naval Research and Air Force Office of Scientific Research Young Investigator Awards, the Outstanding Paper Award at the 2019 IEEE International Conference on Soft Robotics, and an Inaugural 2018 Schmidt Science Fellowship. In 2026, he was named to ASME's *Mechanical Engineering* Watch List and selected among 100 early-career engineers for the National Academy of Engineering's 2024 Grainger Foundation Frontiers of Engineering Symposium. He also received the Schmidt Science Fellows Program's Inaugural Community Leadership Award in 2025. At Northwestern, he was a 2023 Searle Fellow and has twice received Murphy Society Awards for curricular innovations.

Tuesday, Nov. 10 • 4 pm CT • Tech L211

In person only; no Zoom

Questions? Contact allison.macknick@northwestern.edu