COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

Deformation Mechanisms at the Mesoscale: From 2D Materials to High Entropy Alloys

Matthew Daly

Assistant Professor
Materials Engineering
University of Illinois Chicago

Tuesday, April 2nd, 2024
3:00 PM
Room 1200 EECS

ME Seminar Link
Passcode: 137981

Add ME Seminar to Google Calendar

Abstract:
Despite considerable progress in the scientific understanding of deformation processes, the mechanical properties of engineered materials remain limited to fractions of their theoretical values. One of the persistent barriers impeding new breakthroughs in mechanical property offerings is the problem of scaling. That is, while materials often exhibit near-theoretical properties at the nanoscale, the preservation of these exceptional characteristics in the bulk is a pervasive challenge.

In response to this issue, my group focuses on examining deformation processes at the mesoscale. At this intermediate scale, much remains unknown about how nanoscale defect behaviors aggregate and transition into the emergent bulk mechanical properties. Our efforts are supported by a complementary blend of experimental and computational techniques such as small-scale *in situ* mechanical testing and targeted simulations. This suite of tools is specifically designed to capture the essential physics of deformation processes and then relay that information across the relevant length scales of microstructure. This emphasis on scaling rules and the aggregate effects of deformation processes underpins the broader objective of my work, which is to develop materials systems that overcome traditional strength-ductility trade-offs. In this seminar, I will present case studies under this theme in 2D materials, metallic multilayers, high entropy alloys, and time permitting, new efforts in metal additive manufacturing.

Bio:

Dr. Matthew Daly is currently an Assistant Professor of Materials Engineering at the University of Illinois Chicago (UIC). Prior to this appointment, he completed his postdoctoral work at Northwestern University through a fellowship from the Natural Sciences and Engineering Research Council of Canada. He received his Ph.D. in Materials Science and Engineering from the University of Toronto in 2017, and his Bachelor's and Master's of Applied Science degrees in Mechanical Engineering from the University of Waterloo. His research interests include: the mechanics of nanostructured materials; advanced materials and microstructure design; in situ characterization techniques; mechanical metallurgy and atomistic modeling. Dr. Daly earned the Governor General of Canada Gold Medal for his research in 2012, and more recently is the recipient of a 2022 NSF CAREER Award. He is an active member of the TMS and SES professional societies. With TMS he is the recipient of the 2023 Young Leaders Professional Development Award. Additionally, he has won several awards for his teaching at UIC, such as the Edmund Burke Faculty Award for teaching excellence in 2019 and the UIC College of Engineering teaching award in 2022. Further details on Dr. Daly's research and his group's activities (The Advanced Materials and Microstructures Lab) are available at amml.lab.uic.edu.