

HELMERICH RESEARCH CENTER CONF ROOM #153 |
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SCHOOL OF
**MATERIALS SCIENCE
AND ENGINEERING**
College of Engineering, Architecture and Technology

MSE SEMINAR SERIES

Recent Advances in Multimaterial Extrusion Additive Manufacturing

ABSTRACT

The convergence of human creativity, bioinspiration, and advanced computational tools holds the potential to yield the most captivating—and efficient—designs for new engineering materials, structures, and systems. Yet, realizing these designs in the physical realm presents an ongoing challenge. Amidst this pursuit, Additive Manufacturing (AM), or 3D Printing, has emerged as a compelling alternative to conventional methodologies. However, it has yet to fully meet its lofty expectations, often faltering when confronted with the intricate demands of materials options, structural complexity, throughput speed, and repeatability. Consequently, these limitations have hampered advancements in various related research domains. In this talk, I will present how we can design and physically realize objects with exceptional properties for applications in architected materials, soft robotics, and beyond. This includes overcoming mutual exclusivities, integrating multifunctionality, and surpassing properties found in natural materials. First, we will explore how specific design requirements can lead to new AM technologies, realizing designs that cannot be manufactured through other means. Second, we will explore how these specialized AM processes can inspire unexpected designs outside the initial scope. Lastly, I will show examples of new fabrication techniques that address the general limitations of AM, expanding the available design space for soft matter fabrication.

JOCHEN MUELLER, PH.D



Jochen Mueller is an assistant professor in the Department of Civil and Systems Engineering at Johns Hopkins University with secondary appointments in Mechanical Engineering and Materials Science. He performs research at the intersection of additive manufacturing, architected materials, and computational design. Developing new fabrication processes to enhance the structural complexity, material versatility, and throughput speed in 3D printing, Mueller's research group combines the fabrication processes with computational tools to create or manipulate existing materials and structures to change their properties and improve their performance. In 2020, Mueller received the Lopez-Loreta Prize to conduct research on how to improve the materials used in prosthetic devices. Holding a doctorate from ETH Zurich, a master's in mechanical engineering from Imperial College London, and a bachelor's in mechanical engineering from Albstadt-Sigmaringen University, Mueller completed a postdoctoral fellowship at Harvard University in the Wyss Institute for Biologically Inspired Engineering before moving to Hopkins. He received the ETH Medal in 2018 for his doctoral dissertation.