PennState College of Engineering | BIOMEDICAL ENGINEERING

Seminar Series

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Via Zoom:

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587685

Shape Memory Polymers: Design Principles for New Phenomena

November 18 • 12:05–1:20 p.m.

ABSTRACT

Shape memory polymers (SMPs) feature novel and useful properties related to triggered shape transformation. In soft elastomeric form, such materials offer great potential for a range of applications spanning deployable medical devices to materials for soft robots to smart packaging. This talk will provide an overview of multiple phenomena observed for SMPs and the underpinning mechanisms. Having established a baseline understanding of shape memory design principles, focus will then turn to a soft composite approach to the preparation of shape memory elastomers with tailored functional properties, including mechanically triggered shape change, surface wrinkling, and self healing. Attention will be given to biomaterials development and possible healthcare applications, including vascular grafts. The talk will conclude with a discussion of reversible SMPs of use for soft, large strain actuation.

BIO

Dr. Patrick T. Mather earned bachelor of science and master of science degrees from Penn State, in engineering science and engineering mechanics respectively. He went on to receive his doctorate in materials at University of California, Santa Barbara in 1994 with dissertation research focused on the rheology of liquid crystals. Following work as a materials research engineer for Air Force Research Lab, Dr. Mather's academic career has included the University of Connecticut, Case Western Reserve University, and Syracuse University, where he helped create and served as director of the Syracuse Biomaterials Institute, a sustainable, interdisciplinary effort with more than twenty faculty spanning three institutions and seven departments. From 2016 to 2021, Dr. Mather served as dean of engineering at Bucknell University, where he enjoyed the opportunities and challenges of academic leadership, with a particular focus on inclusive excellence. In 2021, he returned to his academic roots at Penn State to become the dean of Schreyer Honors College and professor of chemical engineering. Dr. Mather's research interests center around smart materials, including shape memory polymers, self-healing materials, polymeric nanocomposites, and biodegradable polymers for medical devices. He is the author of over 160 peer-reviewed papers, inventor on more than forty patents, and fellow of both the Society of Plastics Engineering and the American Institute for Medical and Biological Engineering. Dr. Mather is the editor-in-chief for *Polymer Reviews*. He has won several student-nominated teaching awards and prides himself on innovative and engaging teaching methods. Dr. Mather and his wife, Tara, enjoy spending time with their blended family of five grown children (and too many cats to count). You can often catch Tara and Dr. Mather out on the road distance running or tandem cycling.