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Liquid Crystalline Materials for Small-scale Robotics

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Soft robotics is a multidisciplinary field that links different fields of research, such as chemistry, materials science, mechanical engineering, instrumentation and control, and artificial intelligence. During the last decade, the development of novel materials and fabrication techniques have been two of the major challenges for further progress in this field. The synthesis and application of structural materials that a) have integrated sensing and actuating capabilities, b) can be programmed, and c) can be scaled down (or up) by various fabrication techniques are highly desirable for the fabrication of soft robots with a reduced number, size, and weight of components. In this seminar, I will talk about the importance of liquid crystal networks (LCNs) in the design and fabrication of soft robotic components. I will present our recent progress in the development of artificial muscles and robotic constructs from LCNs that can be remotely stimulated by a variety of cues, such as heat, light, and electrical fields at different scales. I will also present opportunities to create novel solutions or augment the existing capabilities of microscale robotic systems with an emphasis on their future biomedical applications.