DESIGN OF ELASTOMERIC COMPOSITES FOR THE ADDITIVE MANUFACTURING OF ROBOTS

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This talk will present multidisciplinary work from material composites and robotics. We have created new types of actuators,[1] sensors,[2] displays,[3] and additive manufacturing techniques for soft robots.[4] For example, we now use stretchable optical waveguides as sensors for high accuracy, repeatability, and material compatibility with soft actuators. For displaying information, we have created stretchable, elastomeric displays as skins for soft robots. We have created a new type of soft actuator based on molding of foams and we have developed new chemical routes for stereolithography printing of elastomer based soft robots. All of these technologies depend on the iterative and complex feedback between material and mechanical design. I will describe this process, what is the present state of the art, and future opportunities for science in the space of additive manufacturing of elastomeric robots.

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2.   Zhao, H., et al., Optoelectronically innervated soft prosthetic hand via stretchable optical waveguides. Science Robotics, 2016. 1(1): p. DOI: 10.1126/scirobotics.aai7529.
3.   Larson, C., et al., Highly stretchable electroluminescent skin for optical signaling and tactile sensing. Science, 2016. 351(6277): p. 1071-1074.
4.   Peele, B., et al., 3D Printing Soft Actuators via Digital Mask Projection Stereolithography. Bioinspiration & Biomimetics, 2015. 5(055003).