

Wearable reconfigurable metamaterials and origami inspired implantable sensors for human-machine interfaces

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Although not known widely, the field of soft robotics was born out the research in microfluidics which developed the initial methods for transport of fluids (liquids or gasses) along micron or millimeter-sized channels. We have recently discovered that when silicone-based millifluidic devices are worn as sleeves, they can be pressured with gasses to change their material properties, including their geometry and hardness acting as a metamaterial. We have exploited this phenomenon to build wearable devices that can be used in prosthetic sockets as an interface to improve the use and comfort of prosthetic limbs and tested this idea in human trials. Our research also extends beyond wearable robotics. We have been developing flexible origami-inspired implantable sensors that can be inserted into the body with a syringe and unfold like a satellite in orbit to allow minimally invasive physiological monitoring of biometrics from within the body.