Stretchable Transducers for Energy Harvesting & Soft Robotics

Stretchable transducers consist of a thin membrane of dielectric, sandwiched between compliant electrodes. Such a transducer is a deformable capacitor, enabling energy states to be interchangeably switch between mechanical and electrical. We exploit the large actuation capability of stretchable transducers to produce large displacement, high force actuators that are capable of delicate operations. We also exploit the large energy density to demonstrate light-weight energy generators. We motivate our designs from analysis, and seek optimized configurations that maximizes performance. We produce prototypes that include a muscle module, a stand-alone compact small-scale energy harvester and develop stretchable sensor systems for autonomous sensing of civil structural health. The key material component in soft active materials is elastomeric rubber, in which natural rubber is an excellent candidate. He hopes to engage LPPI to break new grounds and open up new markets for natural rubber.