The coupling between electrochemistry and materials behavior is rich with opportunities for design of devices and systems that can potentially address our most pressing technological and societal needs. This talk will give several examples, including: 1) exploitation of electrochemomechanical coupling for a new class of actuators based on solid-state electrochemistry; 2) designing "electrochemical shock" resistant battery electrodes for long-life batteries; and 3) high energy density, low-cost, passively-driven flow batteries based on electrochemically active non-Newtonian fluids.

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