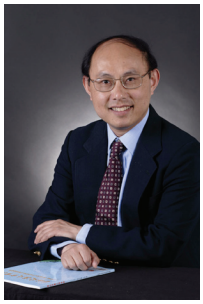
CLEAN ENERGY INSTITUTE
UNIVERSITY of WASHINGTON

Interdisciplinary Seminar Series Lecture:
Soft generators that harvest energy from renewable sources

When stretched, a thin membrane of a dielectric elastomer expands its area and reduces its thickness. The deformation can increase the electric capacitance of the membrane over a thousand times. This electromechanical coupling is being developed as soft generators to harvest energy from renewable sources, such as human movements, ocean waves and waste heat. This talk describes recent theory and experiments to answer following questions. How much energy can be converted per cycle? What are desirable materials, circuits and setups? How do dissipative processes such as viscosity and leakage affect efficiency? We model a generator as a system of two degrees of freedom, represented on either the force-displacement plane or the voltage-charge plane. In such a plane, a point represents a state of the generator, a contour represents a cycle of operation, and the area enclosed by the contour represents the energy converted per cycle. The allowable states are determined by considering modes failure, such as material rupture, loss of tension, electrical breakdown, and electromechanical instability. Energy conversion of hundreds of joules per kilograms per cycle has been demonstrated.

Thursday, January 16
4:00 – 5:00 PM
Physics/Astronomy Auditorium (PAA) A110

Reception will take place in PAA at 3:30 PM prior to start of lecture



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Zhigang Suo is the Allen E. and Marilyn M. Puckett Professor of Mechanics and Materials at Harvard University. He earned his BS degree from Xi'an Jiaotong University in 1985 and his PhD degree from Harvard University in 1989. He was a professor at the University of California at Santa Barbara and at Princeton University. Suo works on deformation, fracture, and mass transport in solids. He co-founded iMechanica, the web of mechanics and mechanicians. He is a recipient of the Humboldt Research Award and is a member of the United States National Academy of Engineering.