The Raymond D. Mindlin Lecture

Department of Civil Engineering & Engineering Mechanics, Columbia University
Engineering Mechanics Committee, ASCE Metropolitan Section
Engineering Mechanics Institute, ASCE

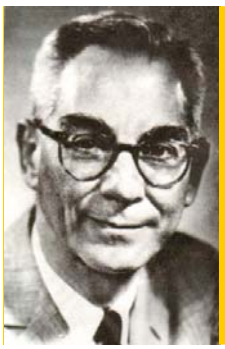
SOFT MACHINES

Professor Zhigang Suo
Harvard University

May 6, 2014 (2:30-3:30 pm)
750 Schapiro Center, Columbia University

Abstract: A soft material like rubber is a highly stretchable electrical insulator. When an external force stretches a sheet of a soft material, the sheet expands area and reduces thickness. The deformation can increase the electric capacitance of the sheet over a thousand times. We develop this electromechanical coupling as generators to harvest energy from renewable sources, such as human movements, ocean waves, and waste heat. This talk describes theory and experiments to answer following questions. How much energy can be converted per cycle? What are desirable materials, circuits and setups? We have demonstrated energy conversion of hundreds of joules per kilograms per cycle. Also using this electromechanical coupling, we have developed transparent loudspeakers and wearable, sensitive skins.

Biosketch: Professor 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.



The Department of Civil Engineering and Engineering Mechanics established the Mindlin Lecture to honor the pioneering contributions of Prof. Raymond D. Mindlin to the field of applied mechanics. His research encompassed photoelasticity and experimental mechanics; classical three-dimensional elasticity (e.g., Mindlin's problem); generalized elastic continua (strain-gradient and couple-stress theory); frictional contact and granular media; waves and vibrations in isotropic and anisotropic plates (Mindlin's Plate Theory); wave propagation in rods and cylinders; theory of electro-elasticity and piezoelectric crystal resonators, and crystal lattice theories.
A member of the National Academy of Engineering and the National Academy of Sciences, Prof. Mindlin received the National Medal of Science for applied mechanics and mathematics in 1979. He had been awarded the Medal for Merit in 1946, by President Harry S. Truman, for his work in developing the radio proximity fuse, a detonator for weapons used in offensive warfare that was a significant factor in World War II. ASCE created the **Mindlin Medal** in 2009.

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