PHYSICAL MATHEMATICS SEMINAR

Odd Elasticity

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ABSTRACT:

Hooke's law states that the deformations or strains experienced by an elastic object are proportional to the applied forces or stresses. The number of coefficients of proportionality between stress and strain, i.e. the elastic moduli, is constrained by energy conservation. In this Letter, we generalize continuum elasticity to media in which energy is not conserved, such as solids with microscopic activity. This generalization, which we dub odd elasticity, reveals that two additional elastic moduli exist in an isotropic solid with non-conservative interactions. Such an odd-elastic solid can be regarded as a distributed engine: work is locally extracted, or injected, during quasi-static cycles of deformation. By coarse graining illustrative microscopic models, we show how odd elasticity emerges in active metamaterials composed of non-reciprocal springs that actuate internal torques in response to strain. Our predictions, corroborated by simulations, uncover phenomena ranging from activity-induced auxetic behavior and buckling to wave propagation powered by self-sustained active elastic cycles.

TUESDAY, FEBRUARY 19, 2019
2:30 PM – 3:30 PM
Building 2, Room 131

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/seminars/pms/

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