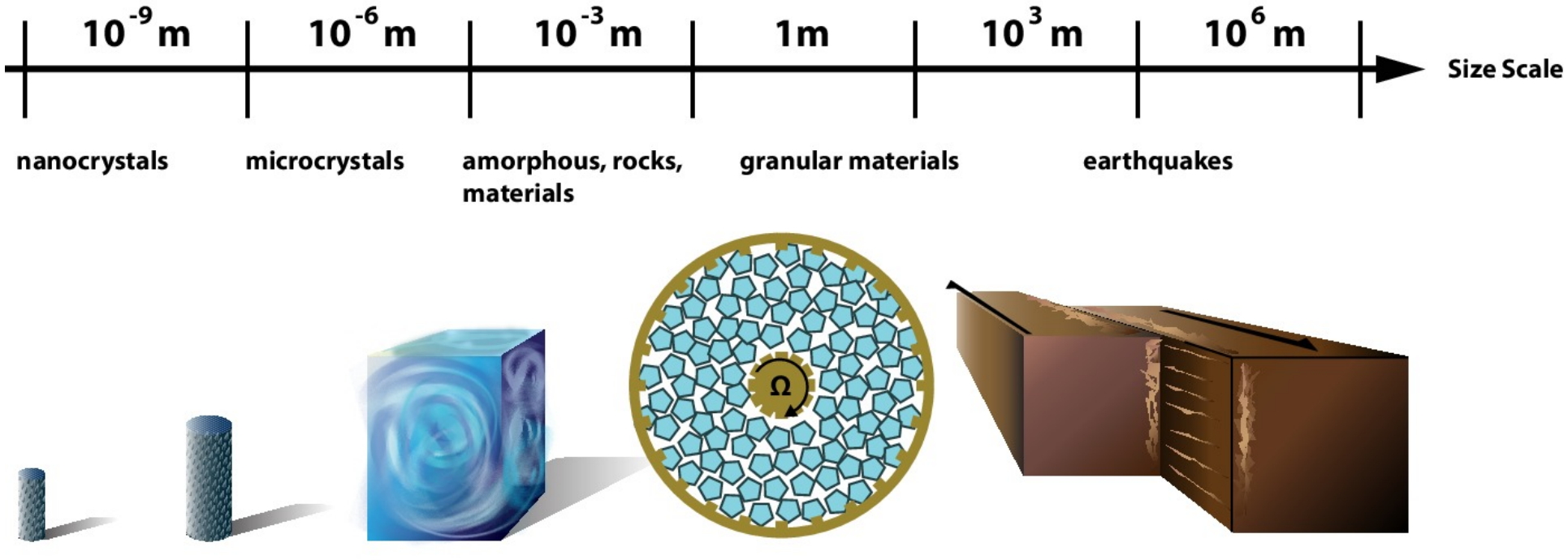
Boston University Physics Colloquium



Unifying Theory for Universal Quake Statistics: from Compressed Nanopillars to Earthquakes

The deformation of many solid and granular materials is not continuous, but discrete, with intermittent slips similar to earthquakes. Here, we suggest that the statistical distributions of the slips, such as the slip-size distributions, all follow approximately the same regular (powerlaw) functions, with the same cutoffs, for systems spanning 13 decades in length, from tens of nanometers to hundreds of kilometers; for compressed nano-crystals, amorphous materials, sheared granular materials, lab-sized rocks, and earthquakes. The similarities are explained by asimple analytic model, which suggests that results are transferable across scales. This study provides a unified understanding of fundamental properties of shear-induced deformation in systems ranging from nanocrystals to earthquakes. It also provides many new predictions for future experiments and simulations. The studies draw on methods from the theory of phase transitions, the renormalization group, and numerical simulations. Connections to other systems with avalanches, such as magnets and neuron firing avalanches in the brain are also discussed.

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December 11, 2012 (Tuesday) at 3:30pm (Refreshments at 3:00pm)

SCI 109, Metcalf Science Center, Boston University

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