

“BNC LAAST Seminar Series”

Friday, January 16th, 2015 @ 9:00am
BRK, ROOM 1001

Professor Karin Dahmen

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Title: Universal Quake Statistics: from Nanopillars to Earthquakes

Bio: Professor Dahmen received her *Vordiplom* in physics from the Universität Bonn, Germany, in 1989, and her Ph.D in physics from Cornell in 1995. Before joining the faculty at Illinois in 1999, she was a Junior Fellow at Harvard University. She has wide-ranging interests in "soft" condensed matter physics, including nonequilibrium dynamical systems, hysteresis, avalanches, earthquakes, population biology, the brain, and disorder-induced critical behavior.

Abstract: The deformation of many solid 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, reflect tuned criticality, with approximately the same regular (power-law) functions, and the same tunable exponential cutoffs, for systems spanning 13 decades in length, from tens of nanometers to hundreds of kilometers; for compressed nano-crystals, to amorphous materials, to earthquakes. The similarities are explained by a simple analytic model, which suggests that results are transferable across scales. This study provides an improved understanding of fundamental properties of shear-induced deformation in solid materials. 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.