PHYSICS AND ASTRONOMY COLLOQUIUM SPEAKER SERIES

Universal slip statistics: from nanocrystals to earthquakes?

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SB 144
4:00pm
Refreshments provided
Everyone is welcome!

Professor Dahmen received her Vordiplom in physics from the Universitaet 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, and disorder-induced critical behavior.

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Abstract: The deformation of many solid and granular materials is not continuous, but discrete, with intermittent slips similar to earthquakes. 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 tuneable exponential 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 a simple analytic model, which suggests that results are transferable across scales. This study 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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