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The maximally crumpled state: crumpling dynamics and the evolution of damage networks

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When describing the dynamics of a sheet of paper being crumpled one may be tempted to only take the elastic response of the thin sheet into account and consider only those deformations which minimize the elastic energy of the crumpled sheet. However, most materials yield and deform plastically, leaving permanent scars in the thin sheet. Indeed, the simple process of crumpling a sheet of paper with our hands results in a complex network of interconnected permanent creases of many sizes and orientations, along which the sheet preferentially bends. Thereby, history dependence is introduced into the process. I will present an experimental study of the dynamics of crumpling. Specifically, we investigate how a crease network evolves when a thin elastoplastic sheet is repeatedly crumpled, opened up and then re-crumpled. Is there a *maximally crumpled state* after which the sheet can be deformed into a sphere without further plastic deformations?

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Technological Institute M416

For further information see http://esam.northwestern.edu

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Refreshments will be served at 3:30pm in M416