

Colloquium

Concerning pleats and slip: Do we have a new perspective on plastic deformation?

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Customarily, initiation of plastic deformation or yielding of a crystal is explained as a non-equilibrium phenomenon mediated by complex, many-body interactions among dislocations. We offer a different viewpoint, where yielding becomes a dynamical transition associated with an equilibrium phase transition from an ideal crystal to one with particle displacements, which are “non-affine”. These could represent “pleated” regions in a bonded network or a crystal where regions have “slipped” with respect to each other. This represents a conceptual advance in understanding yielding using “non-affineness”, a notion more generally useful than dislocations. As a consequence of this perspective, we propose (and demonstrate), probably for the first time, a method for quantitatively and accurately predicting the yield point of crystalline solids. Our idea can also be used to develop protocols, which tailor the yield point of colloidal crystals using dynamic laser traps.

Wednesday, Sep 21st 2016

4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS