

KITP Conference: Complexity in mechanics: Intermittency and collective phenomena in disordered solids

(Oct 20-24, 2014)

Coordinators: Corey O'Hern and Laurent Ponson

Scientific Advisors: Robert Behringer, J.P. Bouchaud, Karin Dahmen, Pierre Le Doussal, Craig Maloney, Kay Wiese, Stefano Zapperi

Monday, Oct 20, 2014

Session: Multi-scale modeling of fracture of heterogeneous materials, Chair: Robert Behringer (Duke Univ.)

8:50am Lars Bildsten (KITP Director) Welcome
9:00am Laurent Ponson (CNRS, UPMC) Depinning concepts in failure of heterogeneous materials
9:45am Stephane Santucci (ENS-CNRS) Self-affine structure and avalanche dynamics of crack fronts
10:30am **Morning Break**

Multi-scale modeling of fracture of heterogeneous materials, Chair: Pierre Le Doussal (LPT-ENS)

11:45am Alan Needleman (UNT) Prospects and possibilities for connecting ductile fracture toughness and the statistics of fracture surface roughness
LUNCH

Damage spreading and localization in micro-cracked materials

2:00pm Stefano Zapperi (CNR-IENI) Size effects in the fracture of disordered media
3:30pm **Afternoon Break**
4:00pm Jérôme Weiss (UJF) Statistical size effects on a strength obtained from an interpretation of failure as a critical transition
4:45pm Vincent Démery (UMASS) An elastic interface approach to failure in microcracked materials
5:45pm **SHUTTLE TO BWSCI**

Tuesday, Oct 21, 2014

Shear thickening and jamming in granular media, Chair: Pierre Le Doussal (LPT ENS)

9:00am Eric Corwin (Univ. Oregon) Jamming as a renormalizable geometric phase transition

9:45am Eric Brown (Yale)

Shear-induced system-spanning structures

10:30am

Morning Break

Shear thickening and jamming in granular media, Chair: Robert Behringer (Duke Univ.)

11:00am Matthieu Wyart (NYU)

Scaling description of the yielding transition

11:45am Bulbul Chakraborty (Brandeis)

Shear-induced rigidity in athermal materials: The search for a unified statistical framework

LUNCH

Avalanches in all their diversity, Chair: Kay Wiese (LPT ENS)

2:00pm Mark Robbins (JHU)

Critical scaling of avalanches, stress and spatial correlations in shear of disordered systems

2:45pm Lev Truskinovsky (Ecole Poly.)

Criticality in martensites: Plasticity or inertia

3:30pm

Afternoon Break

Avalanches in all its diversity, Chair: Kay Wiese (LPT ENS)

4:00pm Gianfranco Durin (INRIM)

Spatial avalanches in magnetization dynamics

4:45pm Robert Ecke (LANL)

Brittle and non-brittle statistics in a granular-continuum laboratory earthquake experiment

POSTER SESSION

6:45pm

SPECIAL EVENTS DINNER

8:30pm

SHUTTLE TO BWSCI

Wednesday, Oct 22, 2014

Deformation of amorphous materials

9:00am Itamar Procaccia (Weizmann)

Plastic instabilities and shear localization in amorphous solids

9:45am Sri Sastry (JNCASC)

Oscillatory shear deformation of amorphous solids: Transition from localized to ergodic behavior and memory effects

10:30am

Morning Break

11:00am Ken Kamrin (MIT)

Nonlocal continuum modeling of granular flow

11:45am Damien Vandembroucq (ESPCI)

Depinning-like models for amorphous plasticity

LUNCH

**Special Session in Honor of Jim Langer: Behaviors of Glassy Materials, Chair:
Bulbul Chakraborty (Brandeis)**

- 1:30pm Eran Bouchbinder (Weizmann) Continuum physics of deforming glasses: From oscillatory shear to fracture
- 2:15pm Michael Falk{falk} (JHU) Connecting atomistic and continuum descriptions of failure in amorphous solids
- 3:00pm **Afternoon Break**
- 3:30pm Lisa Manning (Syracuse) Glassy behavior in biological tissues
- 4:15pm James Langer (UCSB) Recent adventures in nonequilibrium statistical thermodynamics
- 5:00pm **James Langer Reception**
- 7:00pm **SHUTTLE TO BWSCI**

Thursday, Oct 23, 2014

Nonlinear mechanics and design, Chair: Mark Shattuck (CCNY)

- 9:00am Robert Behringer (Duke Univ.) Breaking granular materials
- 9:45am Christian Santangelo (Amherst) Designing mechanical response with geometry
- 10:30am **Morning Break**
- 11:00am Kirsten Martens (UJF) Nonlinear response of sheared amorphous systems: Mechanical versus thermal yielding
- 11:45am Vincenzo Vitelli (Leiden Univ.) Shear shocks and failure in fragile solids
- LUNCH**

Acoustic metamaterials, Chair: Corey O'Hern (Yale Univ.)

- 2:00pm Vitali Nesterenko (UCSD) Strongly nonlinear discrete metamaterials: Origin of new wave dynamics
- 2:45pm Xioping Jia (ESPCI - CNRS) Irreversible sound-matter interaction in granular media
- 3:30pm **Afternoon Break**
- 4:00pm Karen Daniels (NCSU) Vibrational modes: Effects of particle shape and loading history
- 4:45pm Stefan Luding (Univ. Twente) The effect of disorder on wave propagation: Low-pass filtering in 1D and 3D granular systems
- 5:45pm **RECEPTION**
- 6:45pm **SPECIAL EVENT DINNER**

8:30pm

SHUTTLE TO BWSCI

Friday, Oct 24, 2014

Avalanche dynamics in disordered systems: Towards a common theoretical framework?, Chair: Jean Carlson (UCSB)

9:00am Jim Sethna (Cornell Univ.)

Crackling noise

9:45am Karin Dahmen (UIUC)

Universal quake statistics: From nanocrystals to earthquakes

10:30am

Morning Break

11:00am Pierre Le Doussal (LPT ENS)

Avalanches in disordered elastic systems

11:45am Alan Middleton (Syracuse)

Memory and boundary perturbations in disordered spin systems

LUNCH

Earthquake mechanics and friction at heterogeneous interfaces

2:00pm Yan Kagan (UCLA)

Validated earthquake prediction: Seismicity modeling, statistical analysis, and forecast testing

2:45pm Paul Johnson (LANL)

Laboratory Earthquakes

3:30pm

Afternoon Break

4:00pm Yehuda Ben-Zion (USC)

Insights on non-universal seismicity patterns from data and models

4:45pm Jörn Davidsen (Univ. Calgary)

Earthquake triggering and temporal organization of avalanches during rock fracture

5:45pm

SHUTTLE TO BWSCI