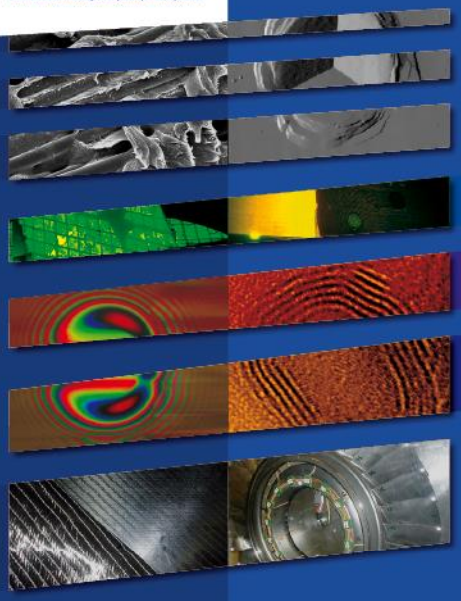

# Café Scientifique invité

## ECL, Amphi 203

## Jeudi 26 juin 2014 - 13h-14h

## Local Slip at Frictional Interfaces: Memory Effects and Predictibility


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Despite the great importance of friction for many natural mechanisms (e.g., earthquakes) and civil engineering applications (e.g., interaction of car tire and road), its underlying mechanics is still not well understood. Studying friction experimentally is challenging because the frictional phenomenon is hidden behind the bulk material of the bodies in contact. To overcome this obstacle, numerical as well as theoretical models are needed to access information at the interface and to improve our knowledge about the mechanics of friction. We apply high-peformance computational techniques and theoretical approaches to model the propagation of slip at frictional interfaces, and compare our results to data from recent experiments [1]. In addition to reproducing experimental observations, our numerical model enables us to obtain high-resolution access to the stress state of the interface, which is crucial for the description of the mechanics of friction. This information reveals that stress concentrations at plexiglas interfaces persist over several slip cycles due to the viscoelastic property of the bulk material [2]. An analytical model confirms this effect and shows that the survival of the stress concentration results from the memory of the strain field close to the interface. Another important observation is the resemblance between the stress states of a local slip event and the stresses close to the tips of material cracks. Lacking a generalized theory for the mechanics of friction, we apply the classical theory of Linear Elastic Fracture Mechanics (LEFM) to predict the propagation of slip regions at frictional interfaces [3]. Comparing quantitatively well with experimental observations [1], this model suggests that dry friction is a fracture mechanics phenomenon and provides evidence for using fracture mechanics modeling techniques for frictional slip.

### References


[1] S. Rubinstein, G. Cohen, and J. Fineberg, ñDynamics of precursors to frictional slidingò, Phys. Rev. Lett., vol. 98, no. 22, p. 226103, 2007.

[2] M. Radiguet, D.S. Kammer, Ph. Gillet, and J.-F. Molinari, ñSurvival of heterogeneous stress distributions created by precursory slip at frictional interfacesò, Phys. Rev. Lett., vol. 111, p. 164302, 2013.

[3] D.S. Kammer, M. Radiguet, J.P. Ampuero, and J.-F. Molinari, ñLinear elastic fracture mechanics predicts slip precursor lengthsò, (submitted).



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