

# Café scientifique LTDS

Salle de cours B11 – Bât H10 – 13h

Jeudi 11 octobre 2012

## Friction, noise, rough surfaces and statistics

**Alain Le BOT**

*LTDS, Ecole Centrale de Lyon,  
Equipe TPCDI*

The friction noise emitted when rubbing hands or small objects is a wide band noise generated by impacts between antagonist asperities of rough surfaces. Since microscopic shocks are random events, this is a problem of statistical mechanics. In this study, we propose to analyze the problem in terms of (vibrational) energy balance. A direct numerical simulation which consists in solving the elastodynamics equations with contact delivers a crucial information on the rate and strength of impacts. While experiments gives some empirical laws such as acoustical power versus sliding speed and roughness. We present an experiment which investigates the dependence of sound with the nominal contact area. It is found that in some cases, the acoustical power is proportional to the contact area while in some others, the sound is constant. This paradoxical result is explained by introducing a dissipation law of vibration at the interface of solids. In the regime where this dissipation process dominates, the sound is found to be constant.

## Thermal method to determine crack nucleation conditions under fretting loading

**Bruno BERTHEL**

*LTDS, Ecole Centrale de Lyon,  
Equipe MMP*

Fretting is a small amplitude oscillatory movement, which may occur between contacting surfaces subjected to vibration or cyclic stress. Fretting is therefore encountered in assemblies of components subjected to vibration, and thus concerns a wide range of industries (e.g., helicopters, aircraft, trains, ships, trucks and electrical connectors). Fretting damage on the contacting surface is critically controlled, under sliding conditions, by the amplitude of slip displacement. Under partial slip conditions, initiation of fatigue cracks is generally a more significant concern than wear. Determination of crack nucleation conditions requires time-consuming and expensive destructive methods giving dispersive results. Locally, fretting is a cyclic multiaxial loading. The aim of this study is to develop a new method based on the thermal response of the material like experimental approaches based on an analysis of self-heating during a stepwise loading fatigue test or multiaxial fatigue test .