



UNIVERSITÀ DEGLI STUDI  
DI TRENTO

Dipartimento di Ingegneria  
Meccanica e Strutturale

## AVVISO DI SEMINARIO

Si comunica che

**Mercoledì 7 dicembre 2011 alle ore 14:30** presso la **Sala Conferenze R2** il

**Prof. Gennady S. Mishuris**

Institute of Mathematics and Physics, Aberystwyth University - UK  
terrà un seminario dal titolo:

### **Waves and fracture in heterogeneous elastic lattice structure**

Waves in periodic structures, in particular lattices, is a classical topic which received a second wind when artificial 'crystals' were revealed as band-gap materials that can control the propagation of waves of different natures. Within certain limits, a properly designed lattice may control the crack path as artificial crystals (the band-gap materials) can control the propagation of waves of different frequencies and polarization. There are some essential peculiarities in lattice fracture mechanics.

Here, the crack growth is considered as a consequence of breaks of the bonds. There is no crack tip singularity as there usually is for continuum models, and the fracture theory can be based on the classical criteria of the 1-D bond strength. In general, there exist dynamic effects even in the case of a slow crack. The discrete pulses caused by bond rupture lead to lattice oscillations and to the dynamic amplification factor, which affects the direction of the propagating crack and the crack propagation speed. Due to lattice oscillations, the total energy release rate is a sum of the bond limiting strain energy and the radiation energy rate.

In the talk we discuss various problems for inhomogeneous rectangular lattices in the state of anti-plane shear. We investigate filtering properties of the entire lattice and then show how it influences possible fault propagation. We consider two types of faults: classic crack and the so-called bridge-crack (this may happen if the strength of bonds within the lattice alternates periodically, so that during the dynamic crack propagation only weaker bonds break, whereas the stronger bonds remain intact). We also consider a lattice where the harmonic 'feeding' wave localized at the crack faces can force the crack to grow. If time permits, we will discuss problem for discrete structural interface too.

The problems have been reduced to the functional equations of the Wiener–Hopf type and then if impossible to obtain analytical results, solved numerically. In particular, it has been shown that the energy release rate can often be derived analytically even without solving the corresponding W-H problem. We discuss stability of the crack propagation, impact of the loading on the crack speed and address the evaluation of the dissipation rate, which is found to be strongly dependent on the crack speed. The talk is based on the joint work with L.I. Slepyan, A.B. Movchan and D. Bigoni.

Tutti gli interessati sono invitati a partecipare.

Il seminario è organizzato dal gruppo di Scienza delle Costruzioni  
(D. Bigoni, L. Deseri, M. Gei, F. Dal Corso, A. Piccolroaz, R. Springhetti)

Il direttore  
Prof. L. Deseri