UNIVERSITÀ DI PISA

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A V V I S O DI S E M I N A R I O

Nell'ambito delle iniziative promosse
dal ***Corso di Dottorato in Ingegneria delle Strutture***

martedì 22 giugno, alle ore 16.30,

il Prof. **Roberto BALLARINI**,
della *Case Western University*, Cleveland (Ohio),

terrà un seminario dal titolo

Cracking the conch conundrum: tough ceramics at the seashore

Abstract. *Natural composite materials are renowned for their mechanical strength and toughness; despite being highly mineralized, with the organic component constituting not more than a few percent of the composite material, the fracture toughness exceeds that of single crystals of the pure mineral by two to three orders of magnitude. The judicious placement of the organic matrix, relative to the mineral phase, and the hierarchical structural architecture extending over several distinct length scales both play crucial roles in the mechanical response of natural composites to external loads. In this talk the results of transmission electron microscopy studies, beam bending experiments, and theoretical modeling are used to show that the resistance of the shell of the conch Strombus Gigas to catastrophic fracture can be understood quantitatively by invoking two energy-dissipating mechanisms: multiple cracking in the outer layers at low mechanical loads, and crack bridging in the shell's tougher middle layers at higher loads. Both mechanisms are intimately associated with the so-called crossed lamellar microarchitecture of the shell, which provides for tunnel cracking in the outer layers and uncracked structural features that bridge crack surfaces, thereby significantly increasing the work of fracture, and hence the toughness, of the material. Despite a high mineral content of about 99% (by volume) of aragonite, the shell of Strombus Gigas can thus be considered "ceramic plywood" (albeit plywood fails in a different manner than the shell), and can guide the bioinspired design of tough, lightweight structures.*

Il seminario sarà tenuto nella sala riunioni del DIS.

Pisa, 16 giugno 2004

Il Presidente del Corso di Dottorato
(*Prof. Stefano Bennati*)