FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI
DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"
INTERNATIONAL DOCTORAL PROGRAM IN SCIENCE

Martedì 31 ottobre, ore 11.00

Functional Oxides

Introduce: Claudio GIANNETTI, Università Cattolica del Sacro Cuore

Interviene:
Mariela MENGHINI, Functional Nanosystems Group, Dept. of Physics and Astronomy KU Leuven

Abstract:

Oxides are a very rich category of materials and display a broad range of physical phenomena such as dielectrics, superconductors, metals, ferroelectrics, ferromagnets, piezoelectrics etc. Therefore, many diverse functionalities can be achieved by using oxides. This lecture discusses the properties that form the basis of many interesting devices and systems based on functional oxides. Particular attention will be given to phenomena like resistive switching and oxides that show a metal to insulator transition.

Martedì 31 ottobre, ore 12.00

Nanoscale mechanics of cells and tissues: from the physics laboratory to the clinical practice

Introduce: Francesco BANFI, Università Cattolica del Sacro Cuore

Interviene:
Gabriele CIASCA, Università Cattolica del Sacro Cuore

Abstract:

Cancer research has historically focused mainly on the role of genetic and biochemical changes in tumour progression. In the last decade, a large body of evidence has emerged that the mechanical tumour microenvironment with its physical stimuli may affect cells as profoundly as biochemical and genetic cues do. In physiological conditions, cells are subjected to a wide number of physical and mechanical forces, which play a fundamental role in the development and maintenance of tissues. Such mechanical cues deeply influence biochemical reactions in cells, modulating many cellular processes, such as proliferation, differentiation and apoptosis, each of which is crucial for organ development and homeostasis.
The manner in which cells sense these forces, and hence respond to them, is largely mediated by the extracellular matrix (ECM), which is the principal extracellular component of all tissues and organs. In many pathological conditions such as cancer, a disruption of the mechanical homeostasis that regulates the complex interplay between cells and their ECM occurs. Tumour initiation and progression indeed are accompanied by major modifications in the mechanical properties of cells and their surrounding ECM.
In this context, the measurements of single cell and tissue deformability by Atomic Force Microscopy (AFM) have allowed scientists to provide a better understanding of the correlation between cell structure, mechanics and functioning during oncogenesis and tumour progression.
Here, recent experimental AFM studies directly comparing the mechanical properties of normal and cancerous cells and tissues are discussed together with a few relevant issues related to the translational process of the AFM in the clinical practice.

[1] G. Ciasca et al. "Nano-mechanical signature of brain tumours." Nanoscale 8.47 (2016): 19629-19643.
[2] G. Ciasca et al. "Changes in cellular mechanical properties during onset or progression of colorectal cancer." WORLD JOURNAL OF GASTROENTEROLOGY 22.32 (2016): 7203-7214.
[3] E. Minelli et al., A fully-automated neural network analysis of AFM force-distance curves for cancer tissue diagnosis, Appl. Phys. Lett. 111, 143701 (2017)

Seminario

Martedì 31 ottobre 2017
Sala Riunioni, ore 11.00
Via dei Musei 41 - Brescia

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