Experimental PostDoctoral position
in bioengineering

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at the Neuroengineering and Bionanotechnology Group, Department of informatics, bioengineering, robotics, and system engineering (DIBRIS) of the University of Genova

Full time, one-year contract ("assegno di ricerca"), renewable.

Characterization of native, diseased and engineered articular cartilage by novel methods and tools based on AFM

Motivation

Degenerative processes in articular cartilage start at the nanometer scale from where they spread to the higher levels of the tissue architecture to cause progressive and irreversible structural and functional damage. Similarly, the efficacy and integration of an implanted engineered cartilage construct repairing a defect depends on the molecular and functional interactions with the native tissue surrounding it. Atomic force microscopy (AFM) allows to image and measure the mechanical and biochemical properties of cartilage down to the nanometer scale, hence it promises to detect and monitor both the degeneration processes occurring in osteoarthritis [1], and also the tissue integration processes with high sensitivity and in a quantitative way.
The ambitious goal of this highly multidisciplinary research is to develop new methods and tools based on AFM that allow the quantitative characterization of articular cartilage structure and mechanical properties, thus providing relevant information for clinical decision making. Optimising hardware, protocols and software towards clinical use is needed to provide improved methods and novel products for clinical diagnostics and monitoring clinical treatments. These methods may be also expanded to other areas of clinical research and practice such as coronary artery plaques and cancer diagnostics.

[1] Stolz, M. *et al*. "Early detection of osteoarthritic and aging articular cartilage in mice and patient samples using AFM", *Nature Nanotechnology*, Vol.4, 186-192 (2009)

Goals

To advance knowledge of structure-property relationships of healthy, osteoarthritic, as well as engineered articular cartilage at the nanoscale.
To develop new methods and experimental protocols to characterize engineered cartilage constructs *in vitro*
To demonstrate the efficacy of such methods in order to develop novel tools for clinical testing of native and engineered cartilage *in vitro* and *in vivo.*

Qualifications expected

- PhD in physics or engineering
- knowledge in soft material mechanics and indentation testing
- practical experience in atomic force microscopy and/or nanoindentation of soft materials
- experience in the software/hardware development of experimental apparatus
- excellent oral and written communication skills in English

Main working tasks include

- development of new tools and methods based on AFM for the inspection of soft biological tissues
- AFM imaging, AFM based nanoindentation and force spectroscopy measurements on cartilage samples
- writing of scientific publications, grant applications and reports; management of scientific projects
- support of laboratory management

Applications, including a full CV, list of publications, a summary of the research experience, skills and the addresses of two referees, can be sent by email to:
Dr. Roberto Raiteri roberto.raiteri@unige.it