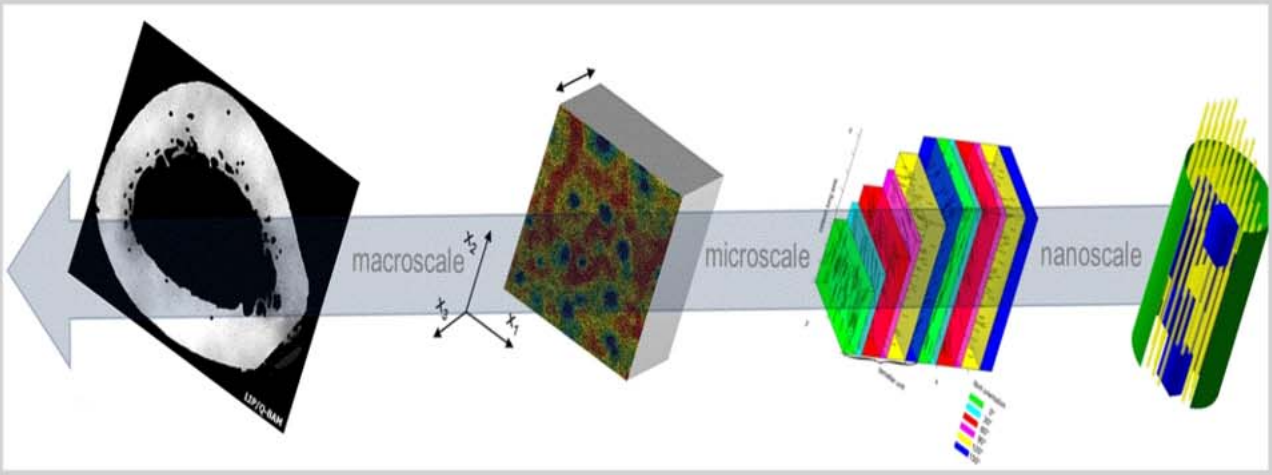
SEMINARIO JOSÉ ANTONIO GARCÍA GARCÍA

MÁSTER DE ESTRUCTURAS

MULTISCALE ELASTIC IMAGING & MODELING OF MUSCULOSKELETAL TISSUES



Prof. Dr. Kay RAUM

Julius Wolff Institut & Berlin-Brandenburg School for Regenerative Therapies, Charité - Universitätsmedizin Berlin

Día: Lunes 12 de diciembre 2011 a las 12:00h
Lugar: Seminario I, 4ª planta de
E.T.S. Ingeniería de Caminos, C y P, Campus Fuentenueva

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Sophisticated technical materials that are used in everyday life are often inspired by nature.

Lightweight honeycomb constructions and carbon fiber reinforced sandwich composites, for example, are used to construct airplanes, cars or modern sports equipment and aim to optimize various properties, e.g. weight, toughness and strength that cannot be achieved by a single material.

Hard biological tissues, e.g. mineralized tendons, bone and teeth are natural examples of achieving unique combinations and also great variability of stiffness and strength. In order to achieve these goals, bone uses various design concepts, e.g. reinforcing a soft and flexible collagen matrix by stiff, but brittle mineral particles, sandwich compounding of anisotropic (directional) films, weight reduction by directional pores and spongy networks. Although many details of the genetics, biology, pathology and mechanics of bone have been uncovered, we still lack of a detailed understanding of bone structure at the nano- and microscales. Towards this goal, both experimental data of heterogeneous elastic and structural parameters from all length scales (from the centimeter to the nanometer scale) and theoretical models that can simulate the deformation behavior based on these data are required.

In this presentation the concept of multi-modal coupled multi-scale assessment of tissue properties (using quantitative ultrasound, synchrotron radiation μCT and vibrational microscopy) and modeling (using various homogenization techniques) will be presented with an emphasis of applications in musculoskeletal research, e.g. bone and cartilage healing.