



INSTITUTE SEMINAR

Friday, 21 February 2014

12:00 pm

Boson

Speaker:

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Title:

Microstructural Characteristics of the Mammalian Cortical Bone

Abstract:

Cortical bone, found in the central part of long bones like femur, is known to adapt to local mechanical stresses. This adaptation has been linked exclusively with Haversian remodelling involving bone resorption and formation of secondary osteons. Compared to primary/plexiform bone, the Haversian bone has lower stiffness, fatigue strength and fracture toughness, raising the question why nature prefers an adaptation that is detrimental to bone's primary function of bearing mechanical stresses. Here, we show that in the goat and bovine femur, Haversian remodelling occurs only at locations of high compressive stresses. At locations corresponding to high tensile stresses, we observe a microstructure that is non-Haversian. Compared with primary/plexiform bone, this microstructure's mineralisation is significantly higher with a distinctly different spatial pattern. Thus, the Haversian structure is an adaptation only to high compressive stresses rendering its inferior tensile properties irrelevant as the regions with high tensile stresses have a non-Haversian, apparently primary microstructure.
