

Summer Research Program 2011/2012

Computer simulation of stress-activated bone remodelling

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Objective

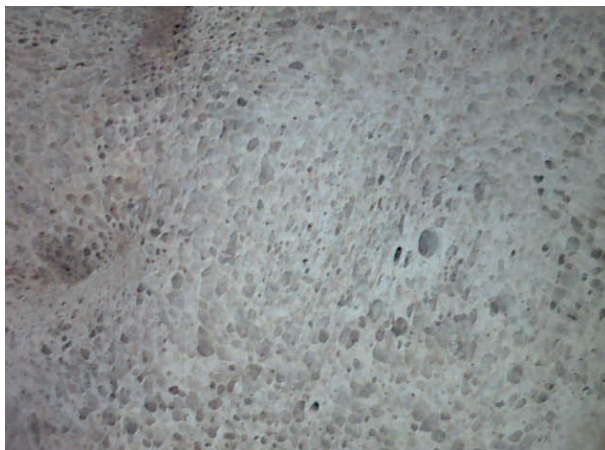
To simulate the evolution of bone microstructure in response to stress over time.

Description

Modelling the behaviour of bone is of interest from both a physiological and an engineering point of view. If we can predict how the structure of bone evolves over time, we can make a more informed choice of materials for bone replacement; the treatment of injuries; and therapy post-injury. From an engineering point of view, understanding the structure and behaviour of natural materials leads to insight into novel approaches to structures.

Bone remodelling encompasses the deposition and resorption processes that occur as bone grows. These processes can be influenced by load, and it is the interplay among the physiological and the mechanical that this project will explore. The project will take a cellular automaton approach to modelling the evolution of the microstructure of bone (seen in the figure below) in response to an applied stress.

Pre-requisites: The project requires a student with an interest in computer simulation and mathematical modelling, and strong skills in Matlab programming.



Microstructure of a sheep vertebra