COMPUTATIONAL MODELLING IN BONE MECHANOBIOLOGY

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There are many reasons that justify that bone tissue modelling is one of the most interesting challenges for engineers: its main functionality is mechanics, it presents a hierarchical structural composite material, it has been designed by the blind force of natural selection, it is an evolutive (adaptative) material able to modify the properties and geometry in function of the environment that is supporting.

All these aspects require the application of the more sophisticated techniques in numerical modelling: multi-physics models based on biophysical mechanisms, multi-scale models that link different levels and times, stochastic approaches to consider variability in results, and validation of numerical results with experimental and clinical evidences.

Therefore, currently, computational modelling is one of the most powerful tools to investigate the interaction between mechanics and biology in events so important in the bone, such as, morphogenesis, growth, development, adaptation, damage and regeneration. This fact has motivated that many computational researchers are starting to work on this challenging field.

Specific topics of interest in this Minisymposium include:

- Bone morphogenesis and development
- Bone remodeling and modeling
- Tissue differentiation
- Bone osseointegration: interaction bone-implant
- Bone fracture healing simulation
- Mechanobiology of bone cells mechanosensing
- Computacional simulation of different bone pathologies: osteoporosis, osteolysis, necrosis, etc.
- Bone tissue engineering simulation
- Distraction osteogenesis
- Treatment of bone images