

Mathematical modelling in biomedical research and applications

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Abstract

Biomechanics studies the mechanics of organs, whereas mechanobiology is the study of how mechanical forces influence the biological response, such as organ restoration. The skeleton is a characteristic of all vertebrates but exists in different forms depending on its function. It has long been established that the skeletal tissues adapt and remodel in response to prevailing mechanical forces applied on them and continue to do so during life. A great example and evidence of skeletal mechanobiology is how astronauts lose significant bone mass during space flight and have to use wheelchairs on their return to avoid bone fractures.

Mathematical modelling is a powerful approach for understanding the mechanisms underlying musculoskeletal pathology and regeneration, in particular how mechanical loads influence the process. This talk presents computational approaches that investigate musculoskeletal biomechanics and mechanobiology. Focus will lie on the use of finite element models across different length scales in biology for biomedical research and applications.