



PhD position in Mechanics of Trabecular Bone

Trabecular bone is a porous type of bone of high clinical relevance, being the main target of osteoporosis, which leads to bone fractures by modifying bone microstructure and material properties. Trabecular bone has a complex anisotropic microstructure featuring a network of small beams (trabeculae). In contrast to man-made lattices, individual trabeculae cannot be considered homogeneous as, due to bone remodeling and mineralization, they are composed of several discrete “bone packets”, possessing different mineral content, stiffness and strength. Such heterogeneity (both in microstructure and material) is a remarkable feature that provides healthy trabecular bone with high damage resistance, and which is not matched in man-made lattice structures. However, it is surprising that state-of-the-art computational approaches to predict the mechanical properties of trabecular bone (especially failure) often disregard tissue heterogeneity. This is mainly due to the huge computational efforts required to simulate failure propagation within complex foam-like microstructures further complicated by heterogeneous material behavior. In the proposed project, a new computational strategy will be developed and informed by state-of-the-art experimental approaches at multiple length scales, to simulate damage propagation on human trabecular bone microstructures from clinically relevant locations.

The proposed work will be performed in the Mechanics of Biological and Bioinspired Materials Laboratory (www.biomat.uliege.be) at the University of Liege (Belgium) in the framework an inter-university consortium (ULiege-UCLouvain) and in close collaborations with experts in scientific computing (Prof. Geuzaine, ULiege), mesh generation (Prof. Remacle, UCLouvain) and materials damage (Prof. Simar, UCLouvain).

The candidate should possess a master’s degree in biomedical / mechanical engineering or in a closely related field. Previous experience with computer simulation (finite element analysis) and experimental mechanical testing will be an asset. The candidate should also be proficient in English. Salary is highly competitive. The 4-year position is available starting from October 2023 or on mutual agreement. Applications are evaluated as received until the position is filled.

For an informal discussion on the proposed project, please contact Davide Ruffoni (druffoni@uliege.be).

To apply, please send a one page motivation letter, a detailed CV (including transcript) and the contact information of two referees to:

Prof. Davide Ruffoni

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