Abstract:

Bone is a natural hierarchical composite serving mainly to provide a framework for skeletal motion, to protect organs, and to maintain mineral homeostasis. Interestingly, bone is also a smart composite. It’s able to sense its environment and adapt its structure to mechanical demands. In addition, depending on severity, bone has the ability to self-repair non-traumatic and traumatic fractures physiologically and with the aid of surgery. Age-related declines in bone health are a common problem however (e.g. osteoporosis). Specifically, with advancing age, structural bone deterioration leads to skeletal fragility predisposing individuals to fracture with minimal or no trauma. This presentation will cover multi-scale bone damage and repair studies, using both computational and experimental approaches. Examples studies will also be discussed covering ways mechanics continues to advance orthopaedic implant design, and traumatic fracture fixation approaches.