Recommendation Title: Creating multi-scale models of cellular, tissue and musculoskeletal function

Recommendation Code: LF1F

Category: Cell/Tissue, Joint, Limb/Whole Body

Recommendation

Background and Relevance

Computational models of cell, tissue and musculoskeletal systems have provided insight to mechanisms underlying form and function. From computational studies, we can identify relationships between muscle forces, joint loads, tissue remodeling characteristics, molecular function, protein expression, and cell metabolism. However, we have limited understanding about how structures and functions at the micro-scale interact to influence organs, limbs or whole body systems. Transcending research across time and scale domains is complicated by differences in nomenclature, background knowledge, computational architecture and proximity of potential collaborators. The development of a comprehensive understanding of injury and disease processes will depend on successful integration of experimental data and computational models of cell, tissue and musculoskeletal systems.

Objectives

- Build multi-scale models and simulations to understand (1) how cell/tissue function affects whole body function and (2) how whole body function influences cell/tissue function
- Implement a common language

Recommended Actions

- Collaborate across scale and discipline. Join the best models of cell, tissue, cartilage, muscle, musculoskeletal system and neural control. Develop technology to expedite time to convergence at all scales.
- Develop technology to expedite modeling and simulation (1) across time and scale domains and (2) including experimental evidence.
- Host translational workshops with introductory tutorials. Use caution with jargon.