

2013 Cell-to-Macroscale Working Group

This WG aims to discuss and share numerical methods that facilitate integration of subcellular and cellular scale to macroscale in the human body, and identify associated multiscale modeling issues from the numerical standpoint.

2013 Accomplishments:

Special Issue on **Multi-scale Modeling and Simulation of Biological Systems**, *Journal of Computational Physics*, 244, 1-336, July 1 2013 Guest Editors: Ching-Long Lin, Grace C.Y. Peng, and George Karniadakis

This special issue consists of **21** papers that cover at least one aspect of the following common themes with applications to one of the following six biological systems.

Themes: Fluid–structure interaction; Image-registration driven simulation; Three-dimensional to one-dimensional model coupling and interface conditions; Combined continuum-mesoscale-atomistic-level simulation; Interface and boundary conditions: accuracy and dynamical importance; Multiscale geometry representation and boundary conditions; Integration of imaging data with modeling and computer simulation; Direct versus indirect interactions between processes that operate at disparate scales; Uncertainty in materials properties, boundary conditions, and geometry; Sensitivity and uncertainty in multiscale and multi-physics integration; Cell models

Biological systems: (1) Cardiovascular systems, (2) Respiratory systems, (3) Cells/proteins, (4) Biochemical processes, (5) Bone mechanics, (6) Predicting surgery outcomes

Discussion Topics

1. The objectives of this WG seem to overlap with those of other WGs (e.g. Theoretical & Computational Methods WG, Biomechanics WG, High Performance Computing WG). We need to discuss the new WG title, new goals and objectives, and the new (co-)leadership and WG plans for 2013-2014 if we decide to keep this WG.
2. New themes and biological systems for model integration, or other issues
 - Bridging individual and population scales.
 - Translational issues for multiscale models.

2014 Plans

1. Host two IMAG MSM webinar scientific presentations.
2. Support “New Index of Predictive Models” by encouraging WG members to enter their model indices which can be cross-listed at the WG wiki.
3. Planning of related MSM sessions at major conferences.