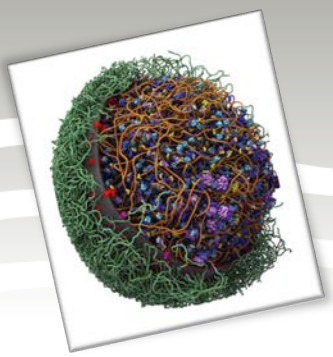
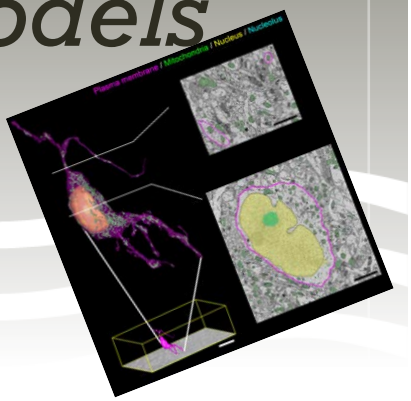
NBCR SUMMER TRAINING PROGRAM 2018

Data to Structural Models





Agenda

Day 1: Monday—August 13th
Introduction to NBCR image analysis and segmentation tools using deep learning. Segmenting large electron tomographic image volumes.

Day 2: Tuesday—August 14th
Creating high-quality triangular and tetrahedral meshes for numerical analysis from segmented image volumes with GAMer.

Day 3: Wednesday—August 15th
Using HexBlender to generate, refine and visualize high-quality hexahedral Lagrange and cubic Hermite meshes from segmented tomographic image volumes, and least squares fitting of three-dimensional anatomic models of geometry and structure using *Continuity*.

Day 4: Thursday—August 16th
Introduction and hands-on tutorial to atomic and subcellular scales simulation packages SEEKR and BrownDye.

Day 5: Friday—August 17th
Introduction lecture and hands-on tutorial on cellPACK and cellVIEW tools.

NBCR is pleased to offer a Summer Training Program (STP) August 13th — 17th, 2018

on the theme of image-based meshing and structural modeling. This week-long intensive program will introduce 12-20 students to principles, methods, and NBCR tools for generating high-quality three-dimensional meshes for numerical analysis in multi-scale modeling of subcellular, cell, tissue, and organ biophysics.

Structural models will be derived from structural data obtained primarily from 3D imaging modalities, including electron tomography, multi-photon and confocal microscopy, and whole-body medical imaging modalities like CT and MRI.

The course will include: (1) automated and manual segmentation and annotation strategies; (2) improving the quality of surface meshes and generating volumetric meshes with GAMer; 3) using Hex-Blender to construct 3D models as well as developing high-order finite-element meshes, including patient-specific organ models with Continuity. Participants will learn to build meshes and models that are suitable for a range of biophysical modeling applications from stochastic Monte Carlo, Brownian Dynamics simulations, subcellular and whole-cell transport to whole-organ biomechanics and electrophysiology investigations. Introductions and hand-on tutorials to:) 4) SEEKR and BrownDye and; 5) cellPACK and cellVIEW tools.

In consultation with the course organizers, those accepted into the program will be encouraged to bring and work with their own data sets.