Common coordinate scaffolds for mapping and modeling organs

Peter Hunter
1. Heart scaffold

2. Stomach scaffold
A biological CAD platform: Heart scaffold
Tricubic Hermite Elements establish the material coords
Material axes
Exporting meshes for simulation

2x refinement

4x refinement
Species dependent scaffolds

Generic scaffold

- for species 1
- .. species 2
- .. species 3

+ individual variability

Tissue structure

Vasculature

Intracardiac neurons
The heart physiome

- Heart cell-cell connections
- Proteins
- Genomic sequence
- Amino acid sequence

3D cell

Cellular processes

Tissue

Torso

m = 10^9 nm

nm
Molecular scale

Cellular scale

Tissue/organ scale

Clinical scale
1. Heart scaffold

2. Stomach scaffold
Stomach scaffold
Structure & function in the stomach

Ghrelin (signals hunger)

Gastrin (stimulates appetite)

PYY (suppresses appetite)

5-HT (responds to noxious stimuli)

Somatostatin (pH control)

Data from John Furness group at U.Melbourne
Mapping neurites in the stomach

Data from Terry Powley group at Purdue