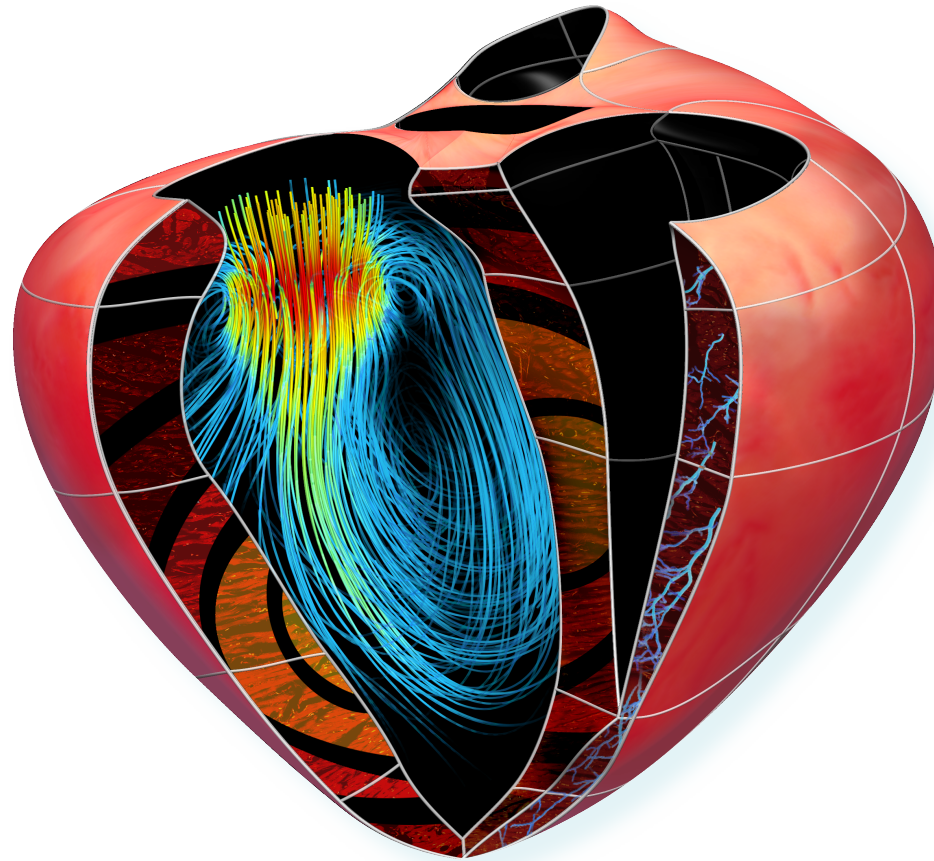
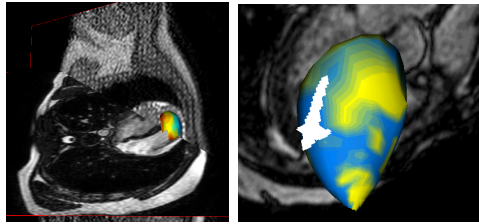


Translating multi-scale modelling to the Heart of the clinic: developing personalised cardiac models



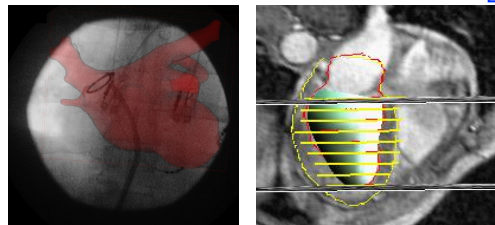
Imaging

Multimodal Registration Acquisition



Electrical/MR

Excitation

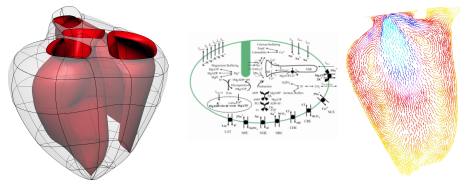


X-Ray/MR

Motion

Multi-scale Models

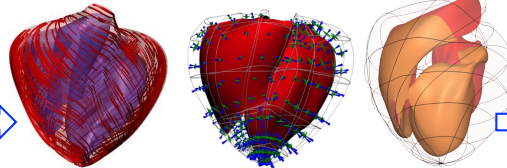
Anatomical Functional



Geometry

EC Cell

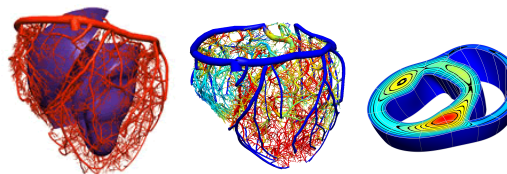
Ventricular Flow



Microstructure

Mechanics

Activation



Vasculature

Coronary Flow

Perfusion

Computational
OpenCMISS
SOFA
OPENFEM
LIFEV
Cheat

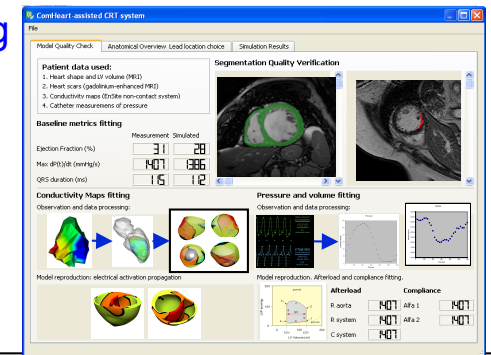
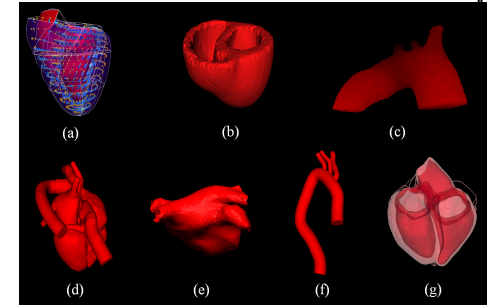
Numerical
basis reduction, POD
FEM, FD, ALE

Parallel Computing
PETsc,
MUMPS

Data assimilation
unscented Kalman
filtering variational
approaches

Software

Visualization

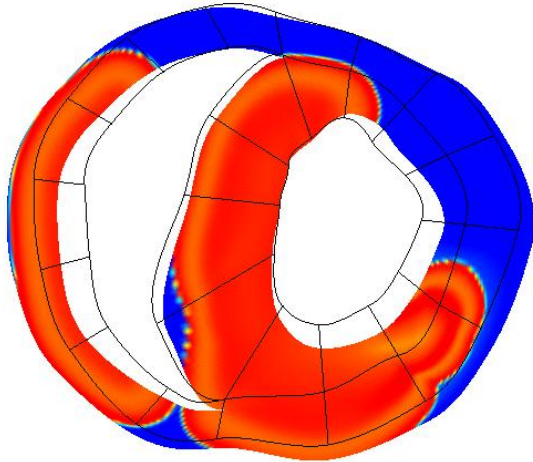


Modelling tools and technologies

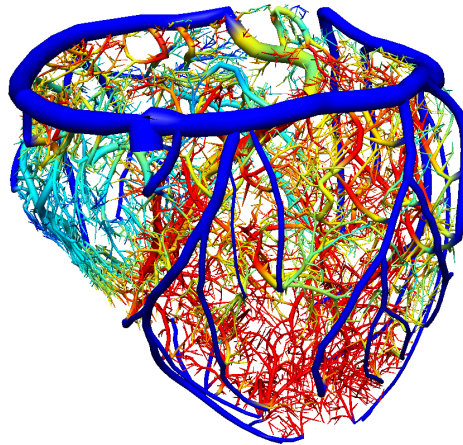
Patient Therapy

Patient

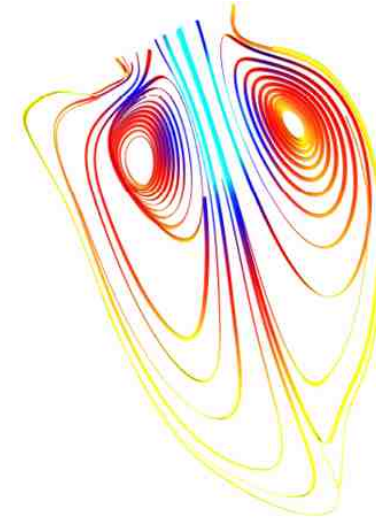
Computational Modelling Applications



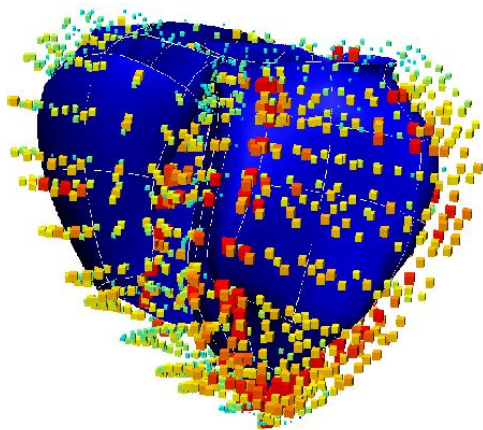
Cardiac activation and contraction



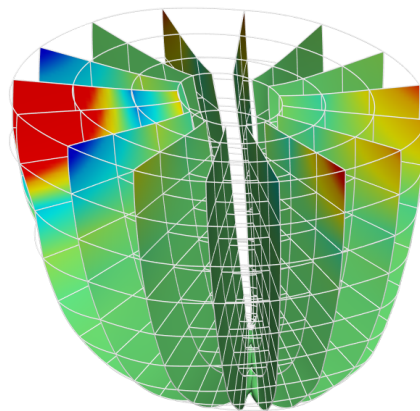
Coronary Blood flow



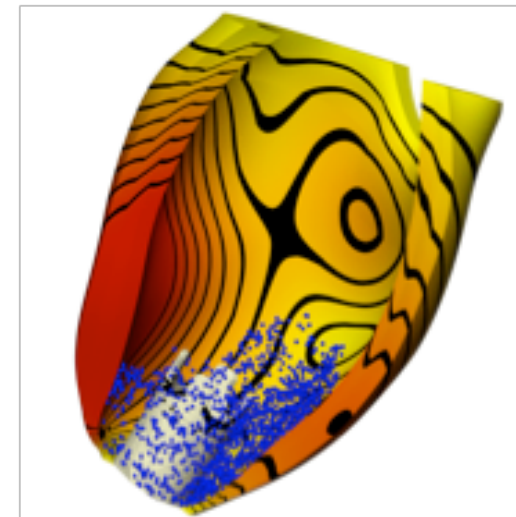
Ventricular Blood flow



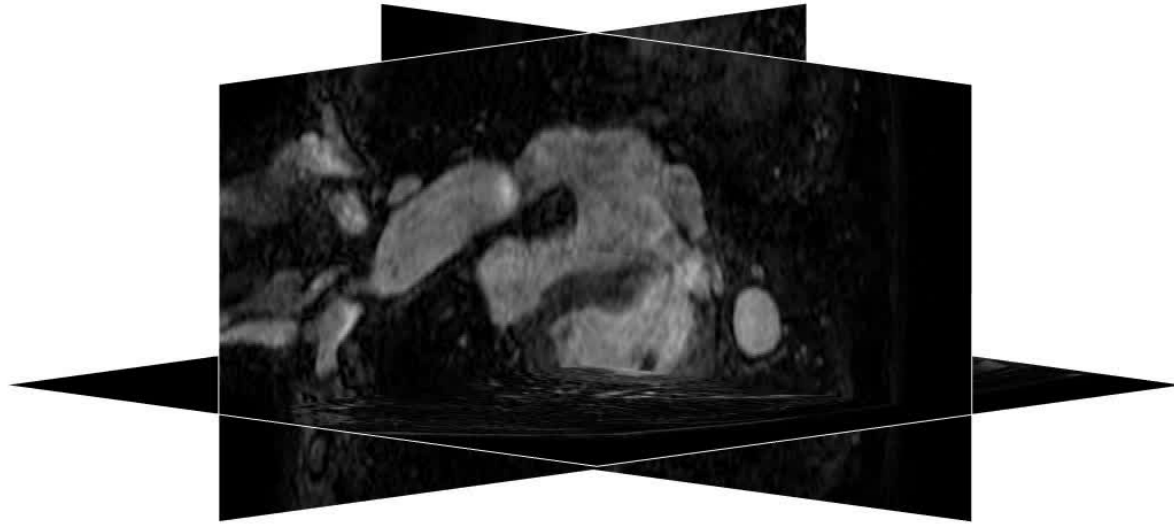
Regional work through the cardiac cycle

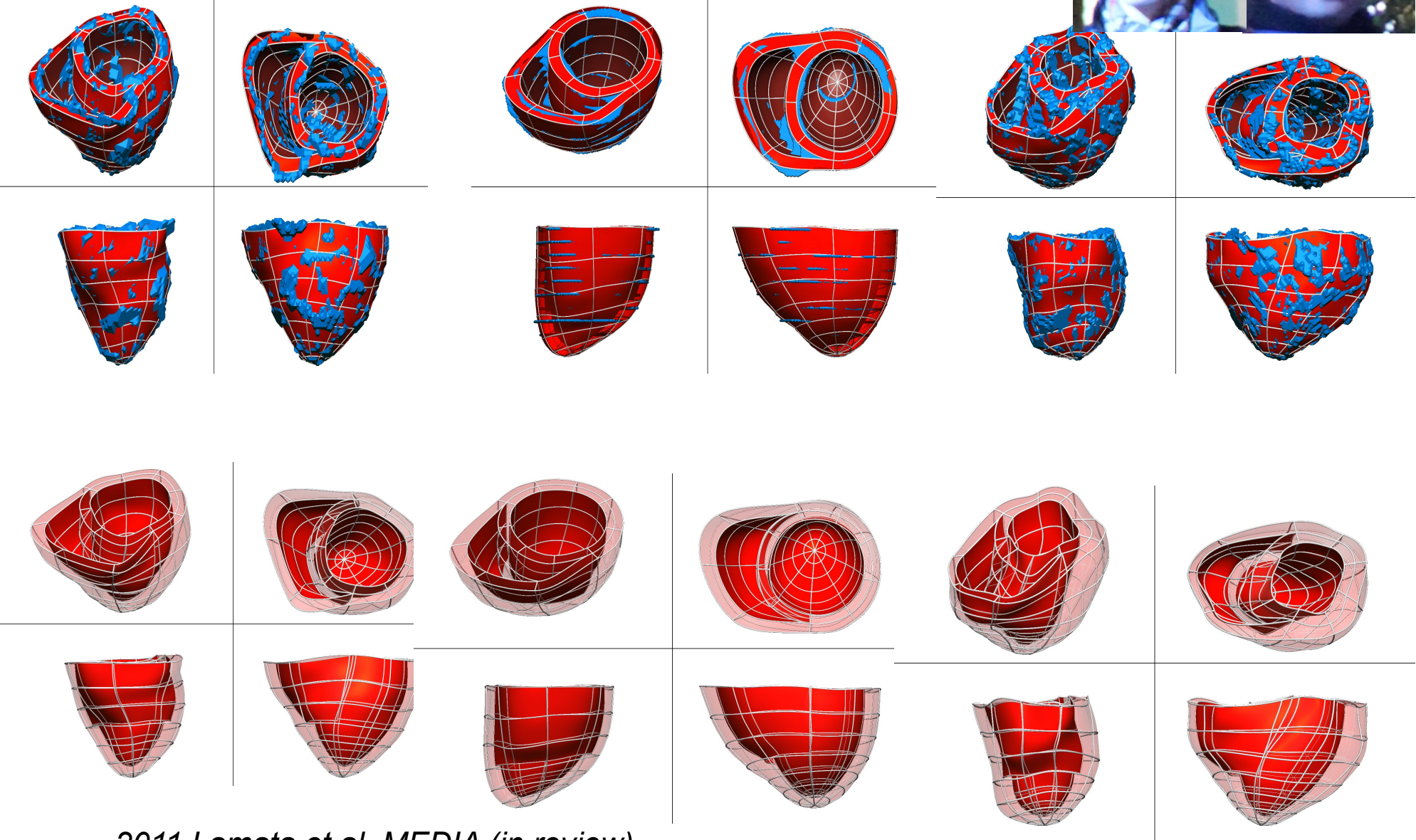


Perfusion during contraction



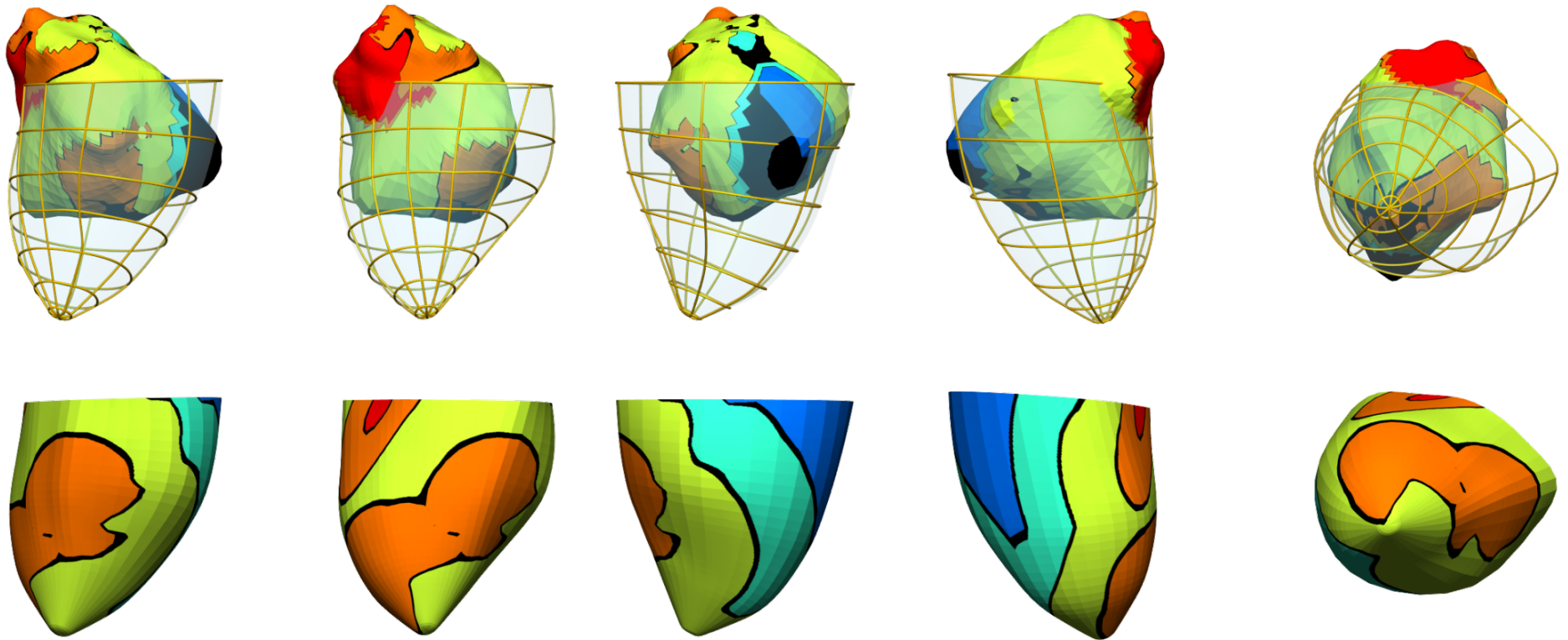
Residence times

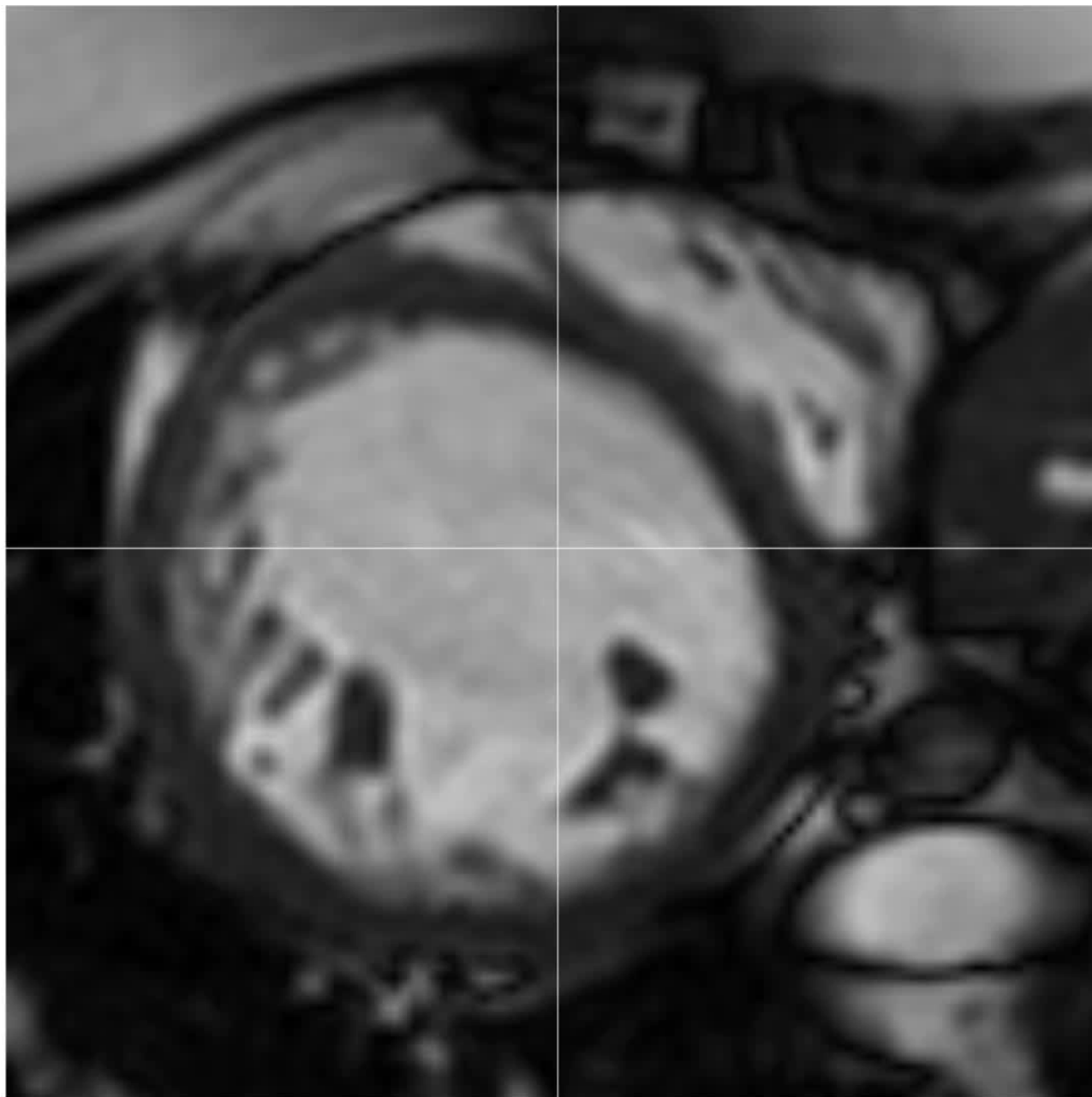




2011 Lamata et al. MEDIA (in review)

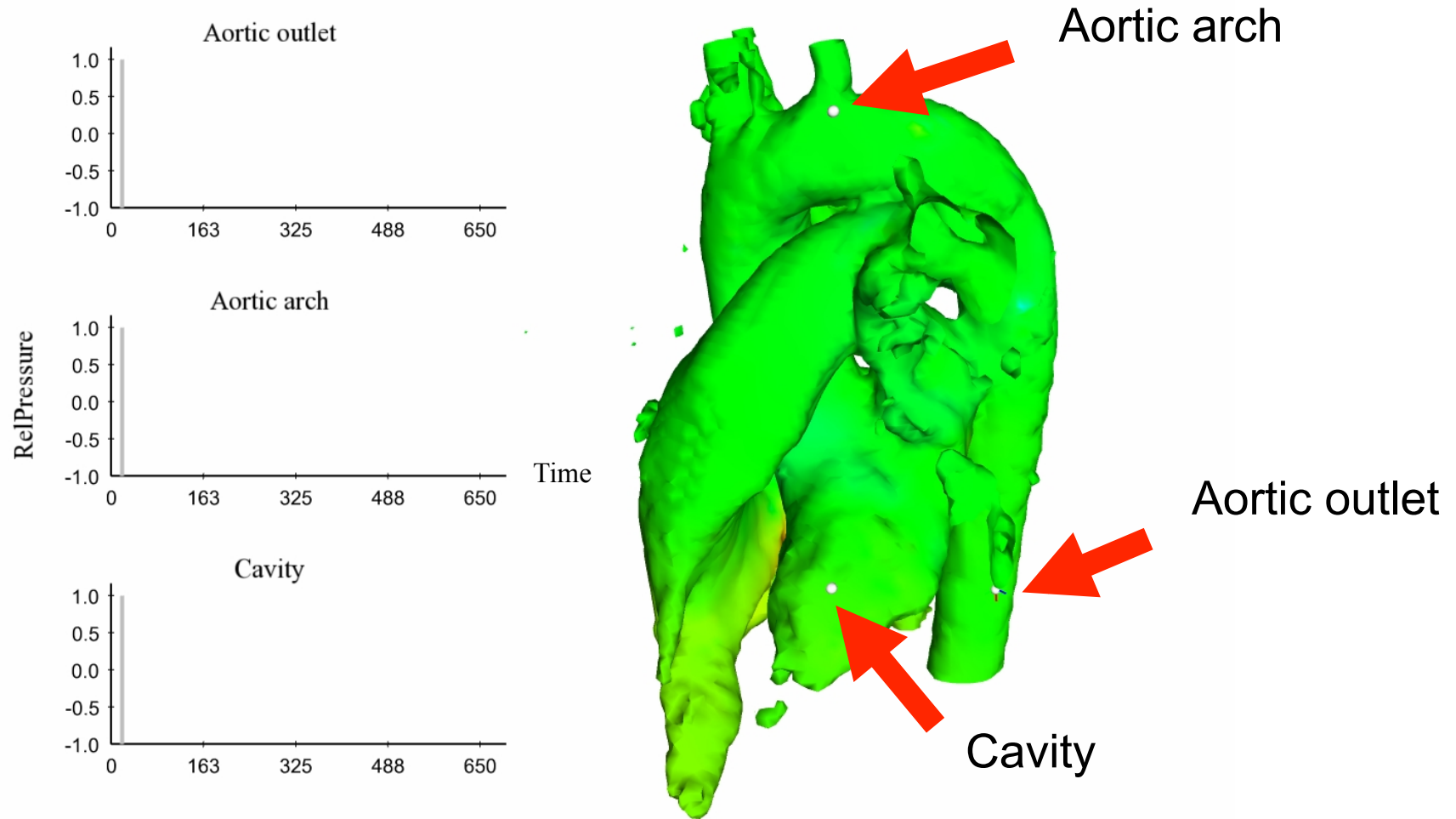
Fitting Electrical Conduction

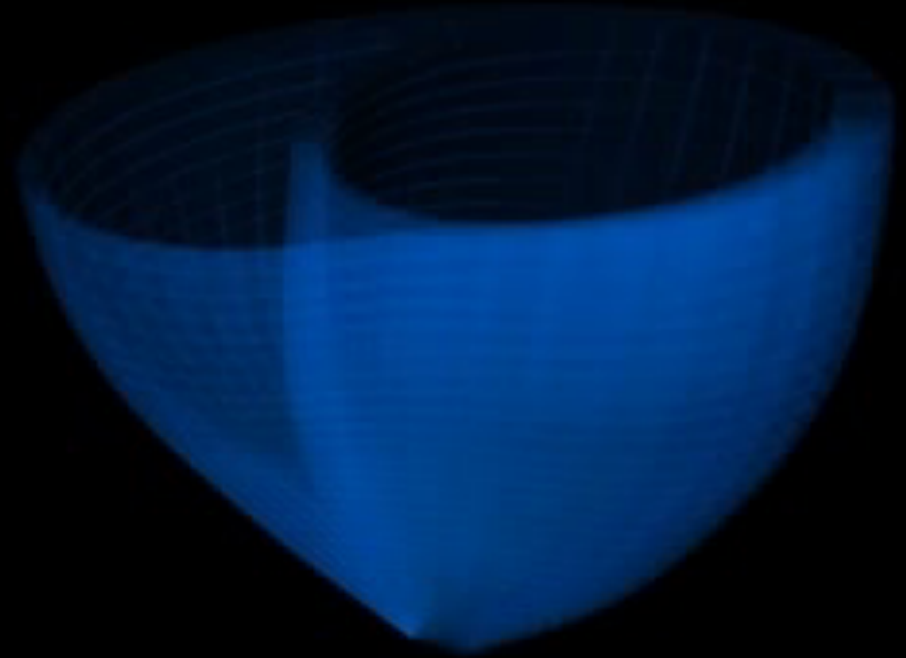
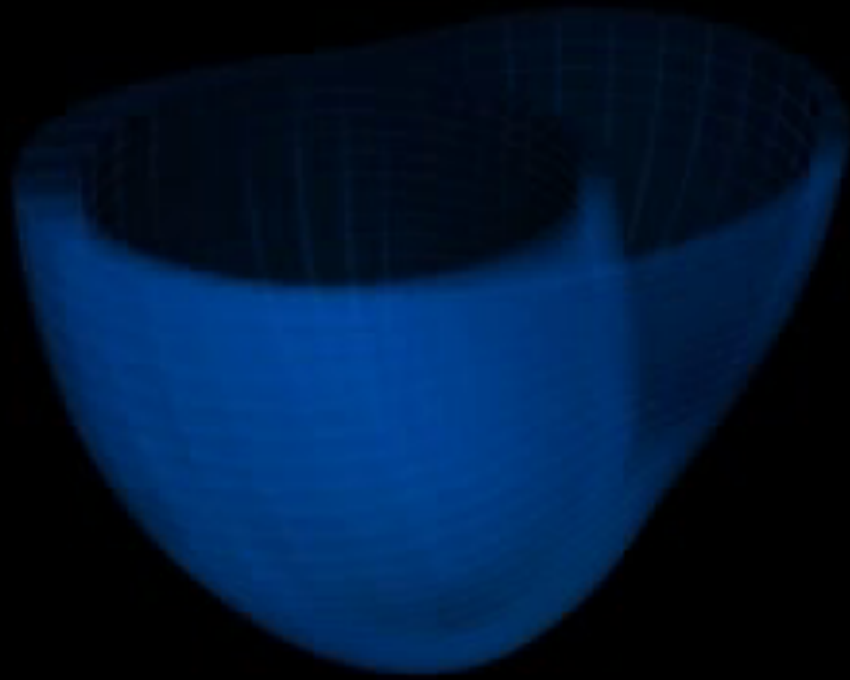




Pressure Estimation Results

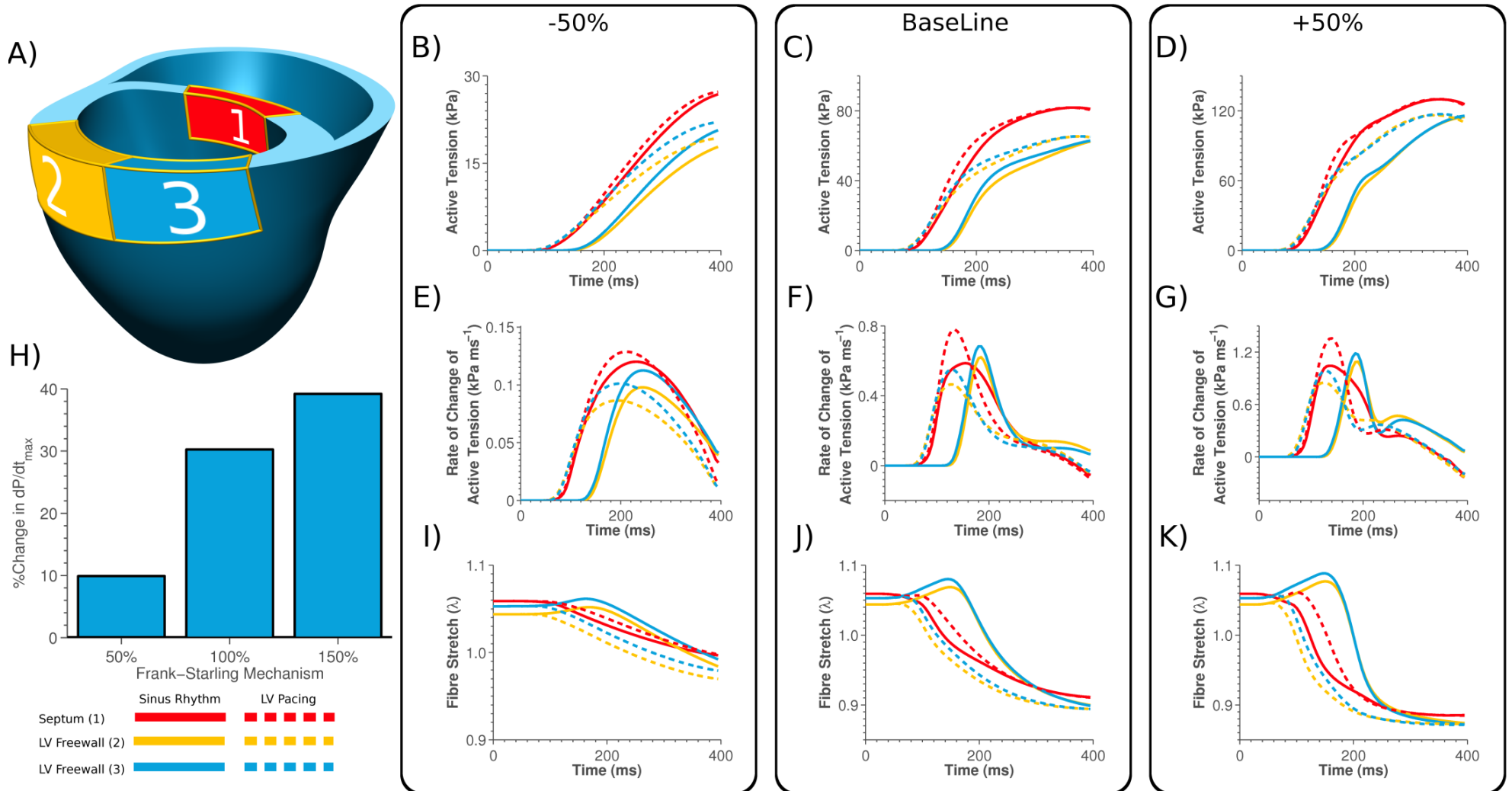
- **Determination of pressure drops**



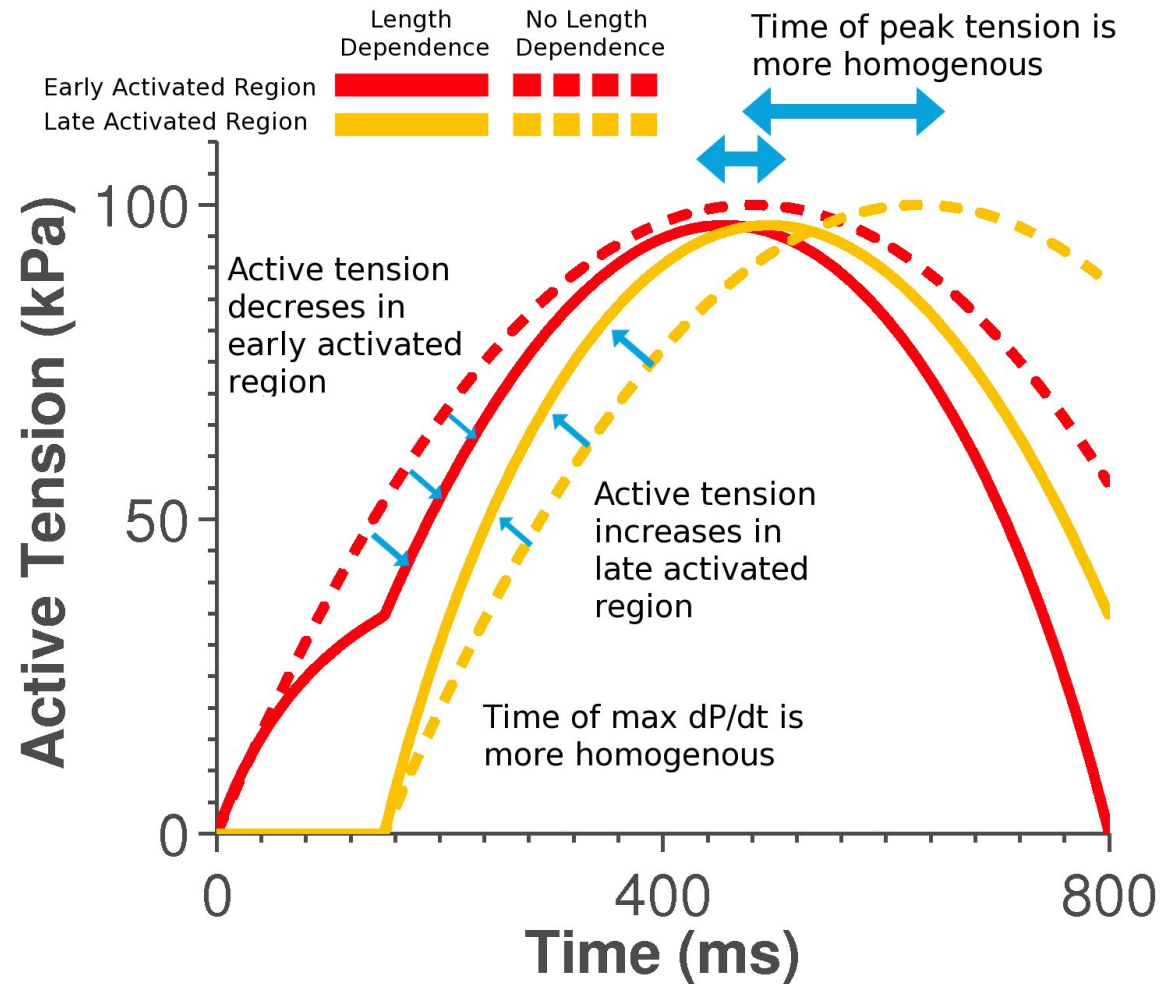
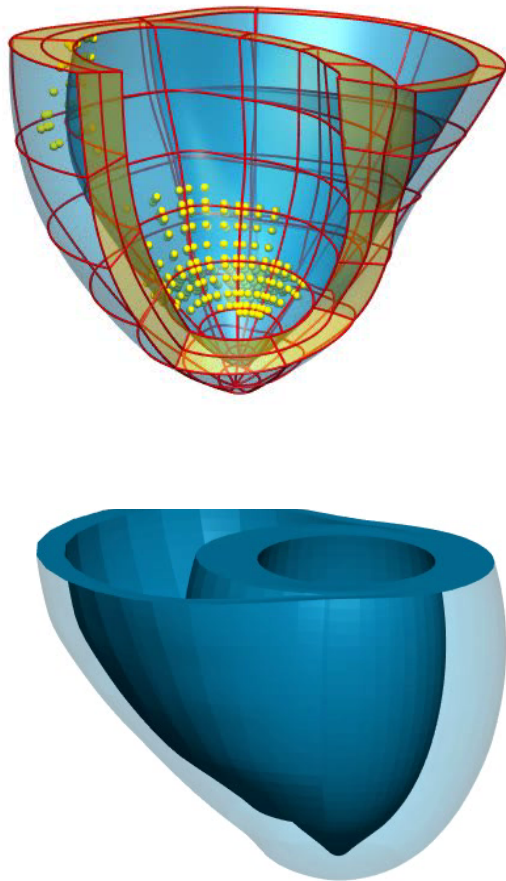


2011 Niederer S.A., et al., *Simulating human cardiac electrophysiology on clinical time-scales*, *Frontiers in Computational Physiology and Medicine* (in press)

Modelling Frank-Starling

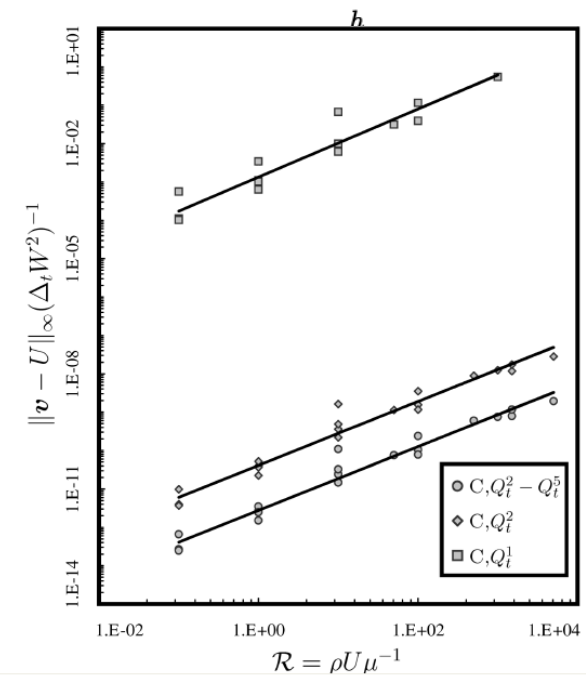
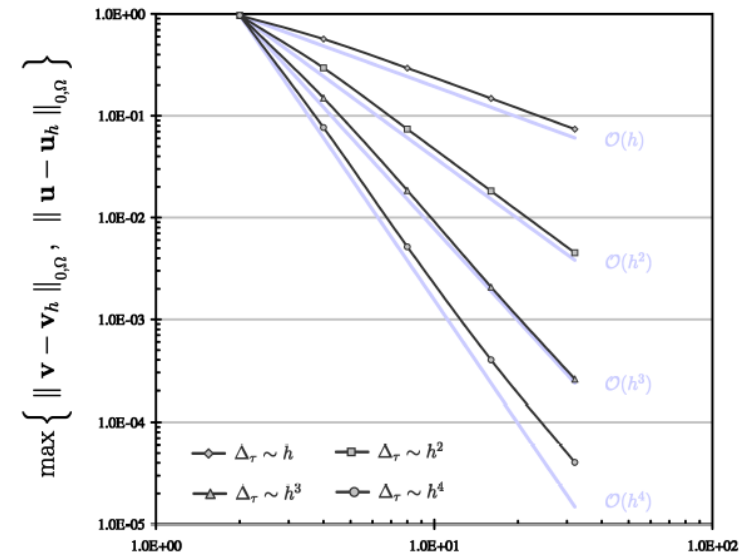
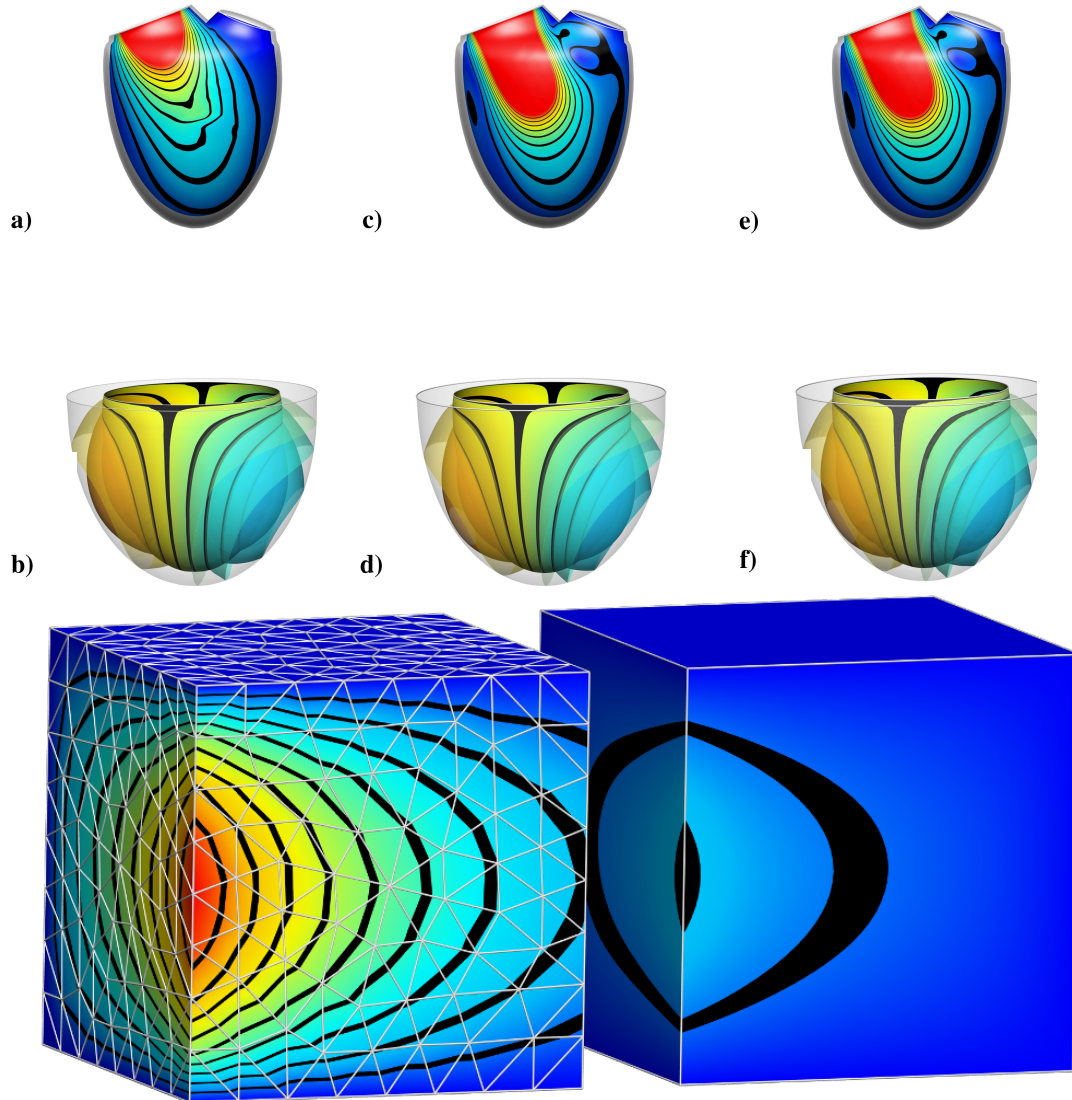


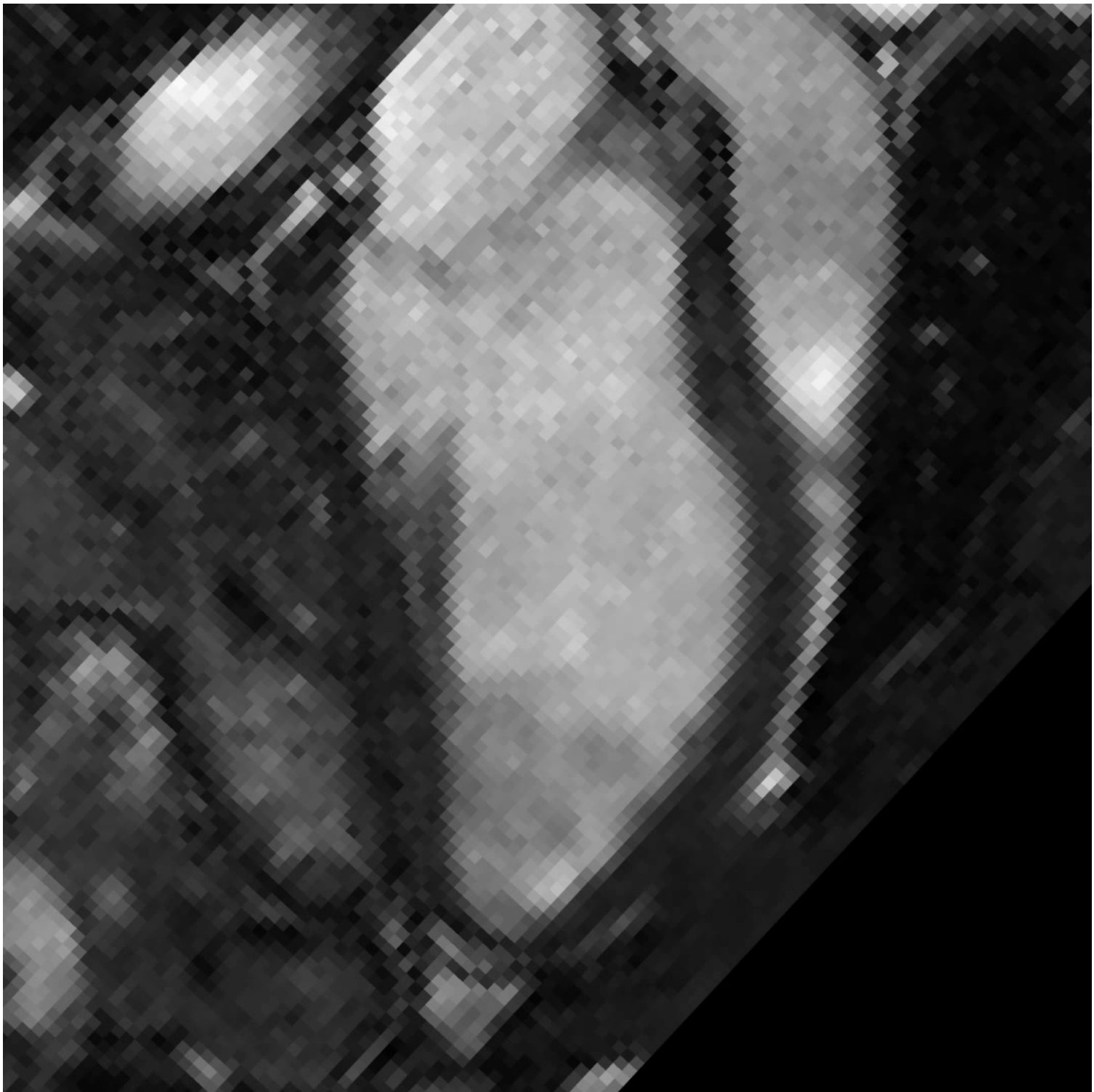
Role of the Frank-Starling Mechanism On Active Tension Synchrony





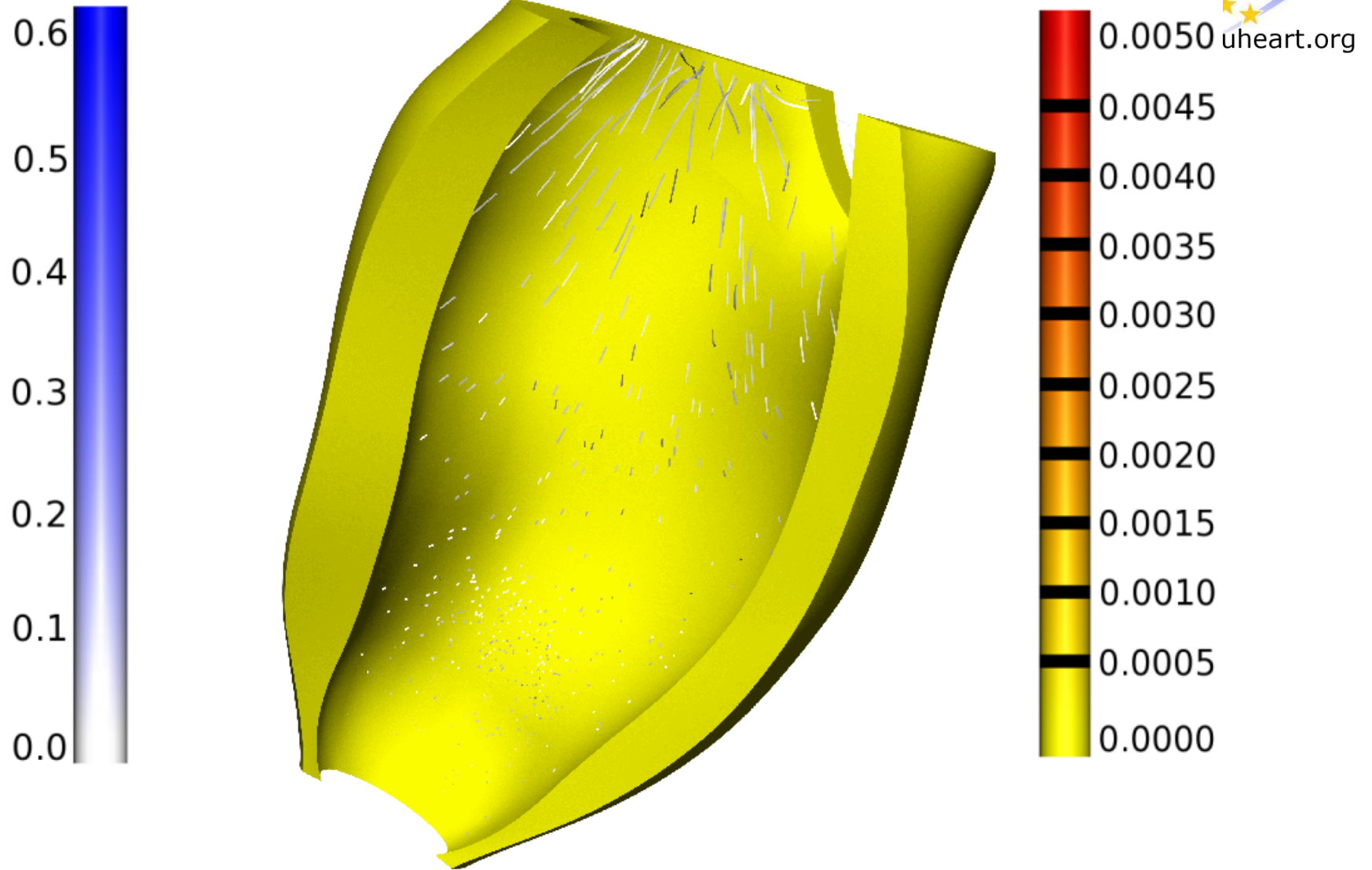
Fluid – Solid Coupling Verification



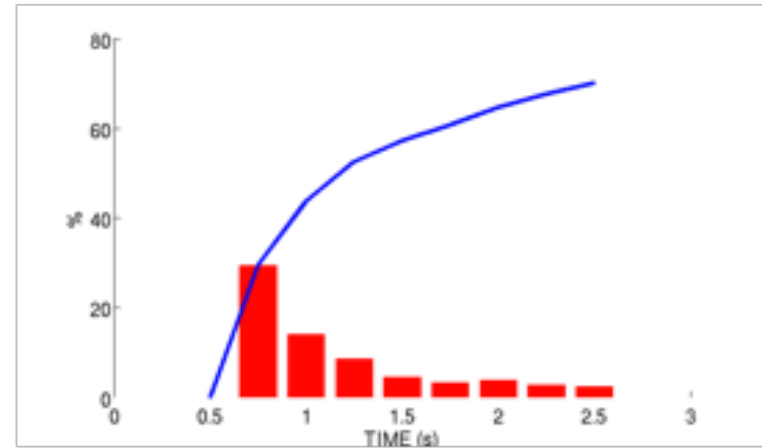
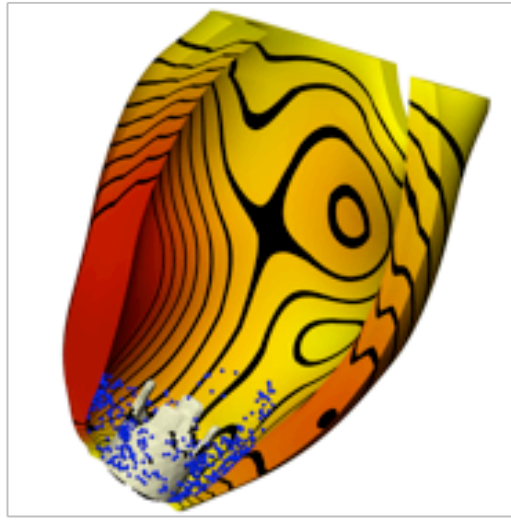
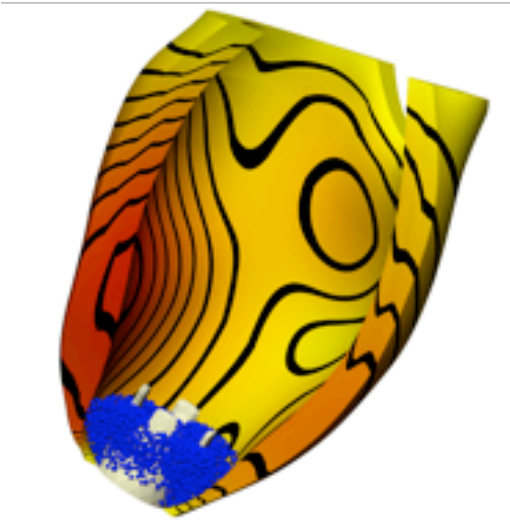
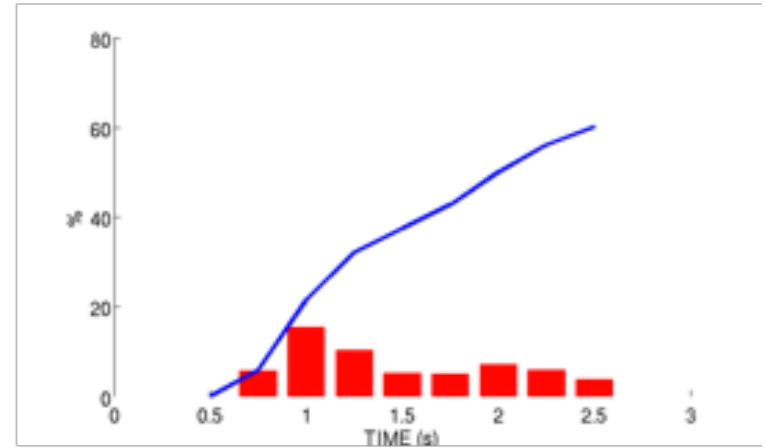
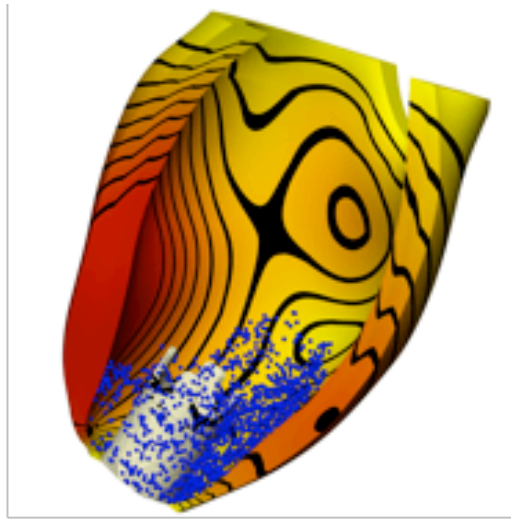
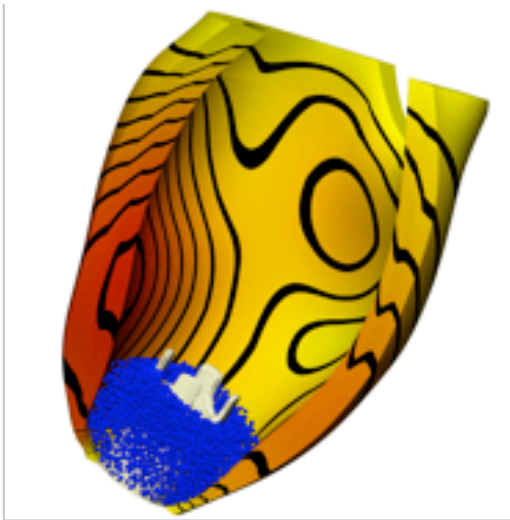


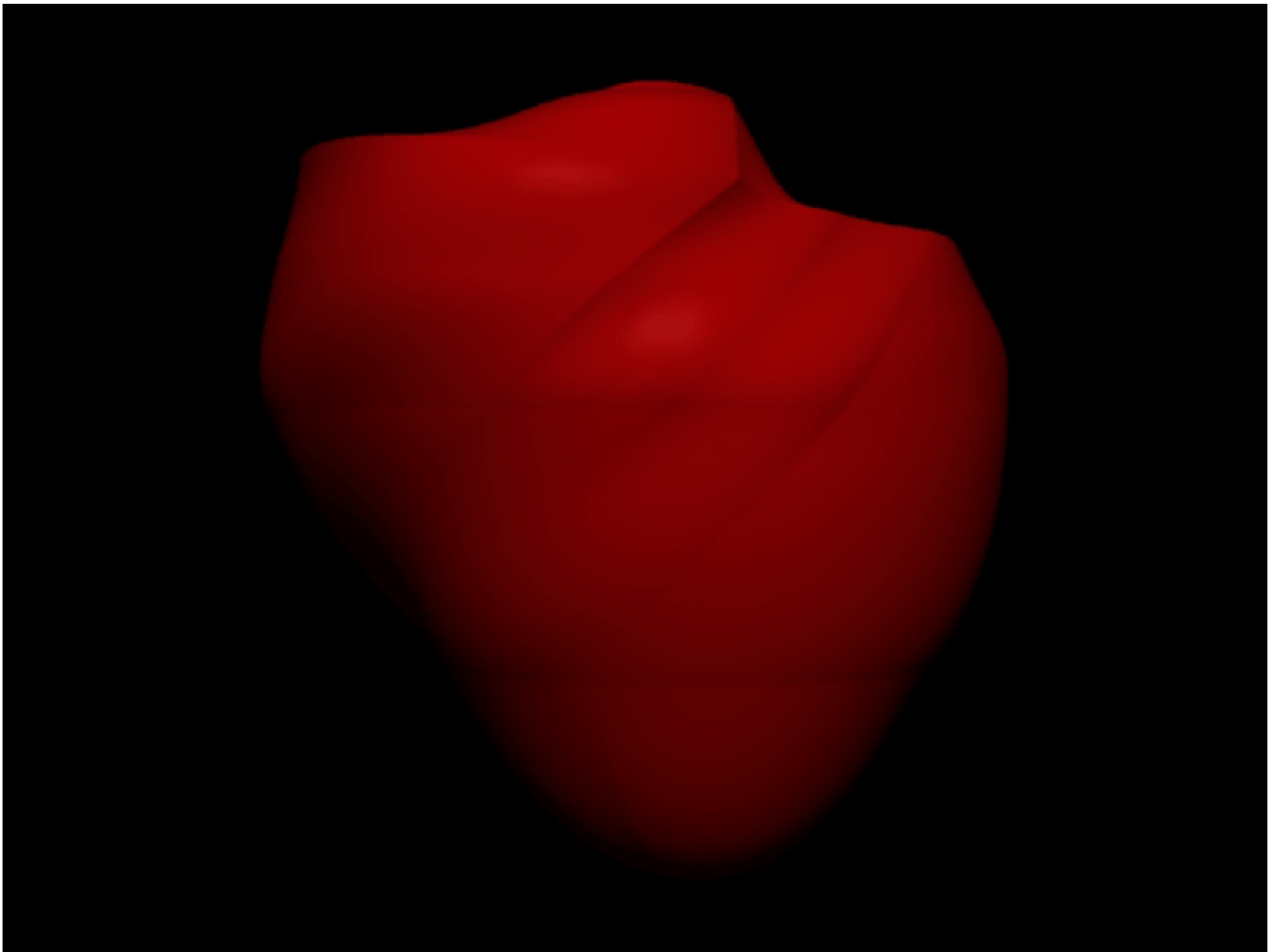


Characteristics of LVAD Support

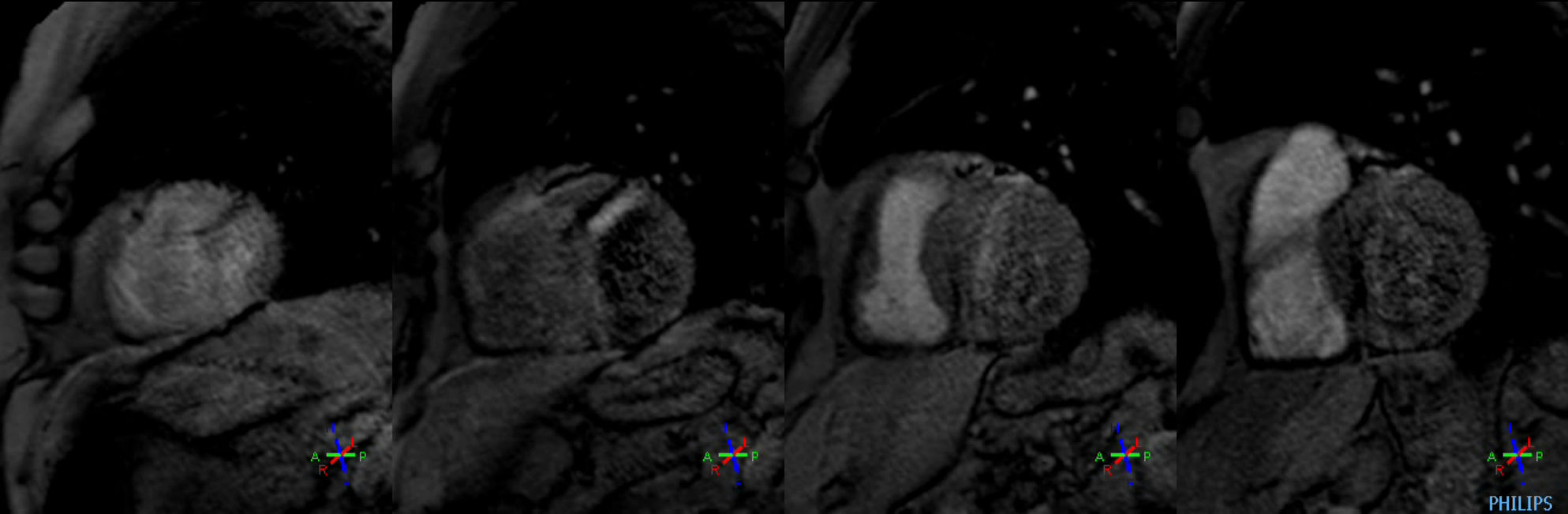


LVAD Residence Times



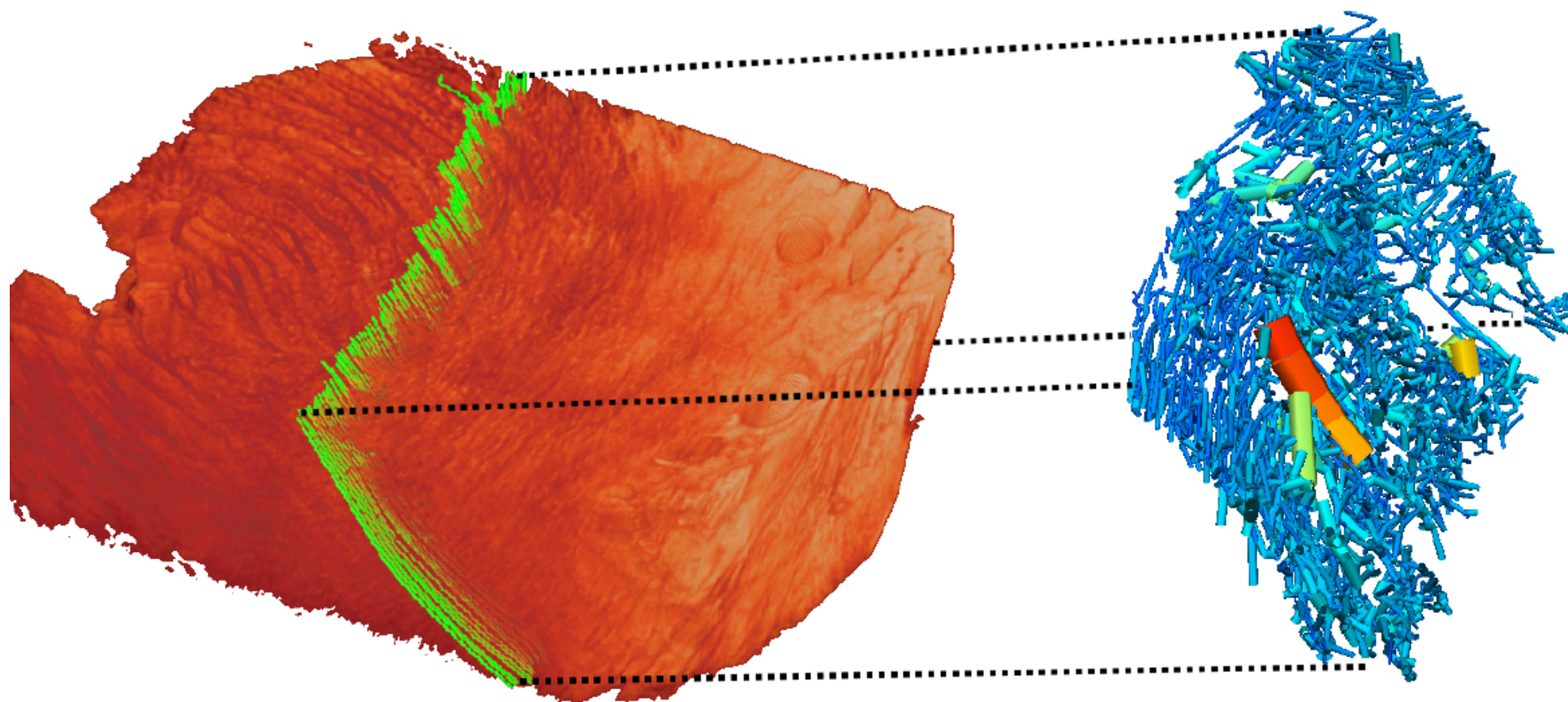
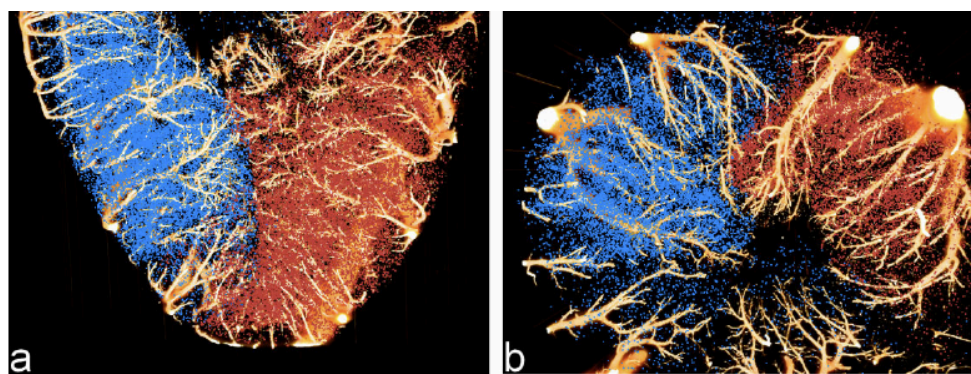


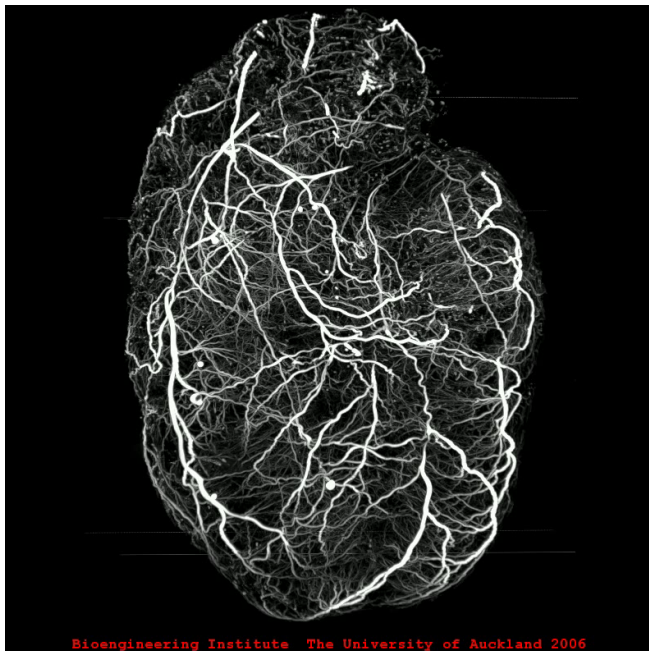
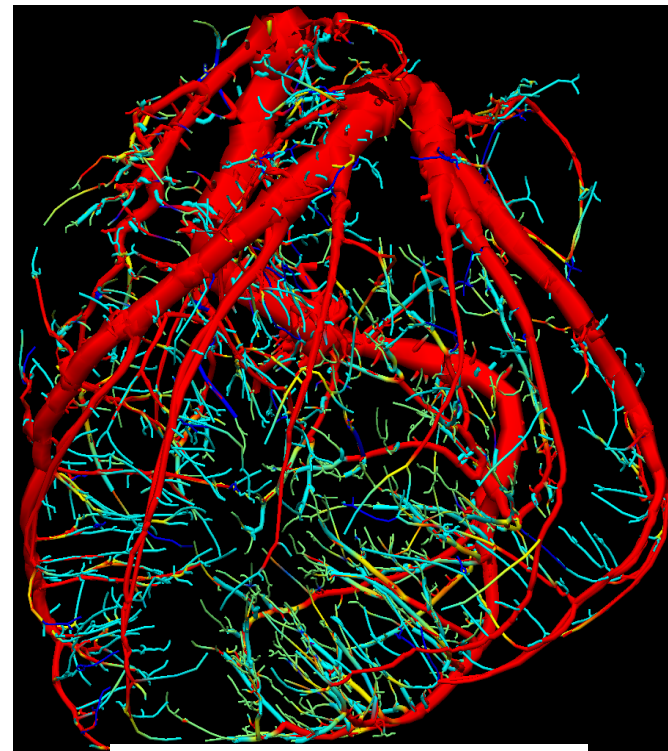
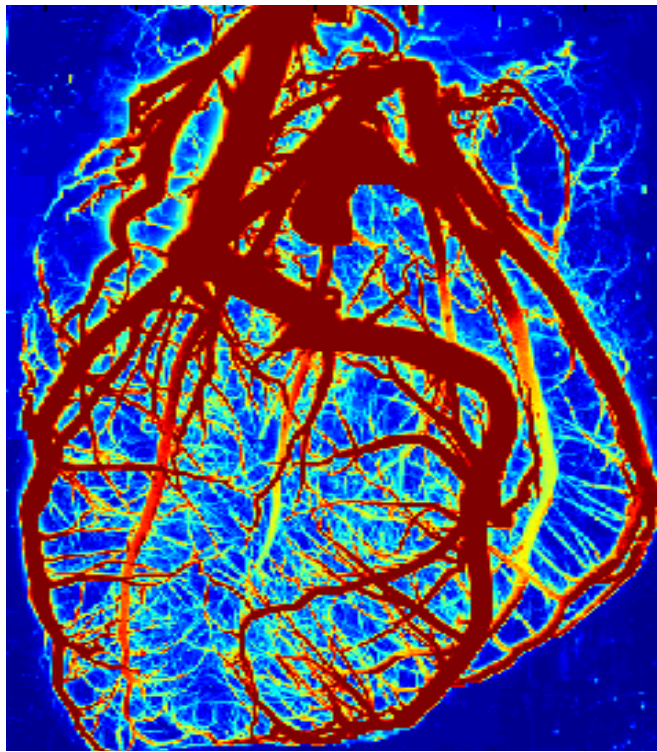
Clinical Data



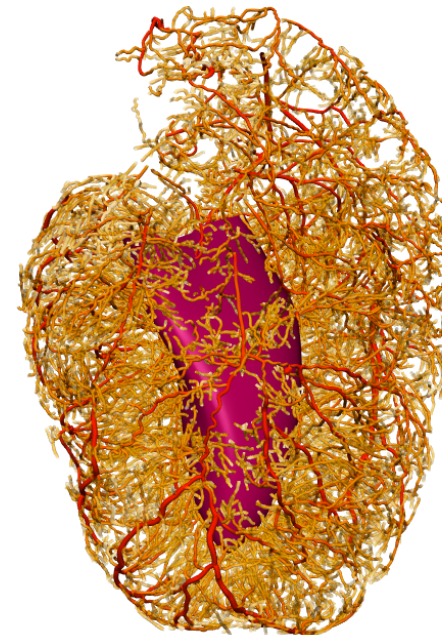
A screenshot of a cardiac MRI analysis software interface. The interface is divided into several panels:

- Top Left:** A grid of small images, possibly representing motion correction or registration results.
- Top Middle:** A cross-sectional MRI slice with a green and blue contour overlaid on the myocardium.
- Top Right:** A software control panel with a list of tools: "define cardiac border", "correct motion", "check motion", "delete", "segment", "trim", "measure" (with sub-options: "area", "perim", "zoom out", "copy to clipboard"), and "study".
- Bottom Left:** A larger cross-sectional MRI slice with a green and blue contour overlaid on the myocardium.
- Bottom Middle:** Four small perfusion maps showing color-coded intensity (red/yellow for high, blue for low) in different views.
- Bottom Right:** Two graphs showing time-series data. The top graph is labeled "myocardium stress" and the bottom graph is labeled "blood stress". Both graphs plot intensity (0 to 250) against time (0 to 45 seconds). The graphs show a peak in intensity around 15-20 seconds, followed by a gradual decline. Below each graph are colored bars (red, green, blue) representing different segments or regions.

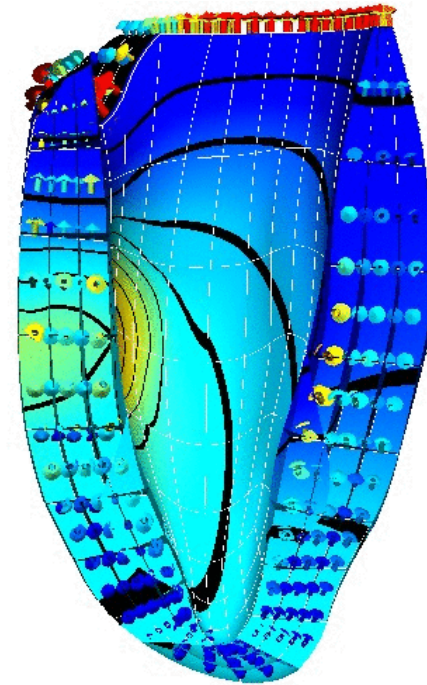
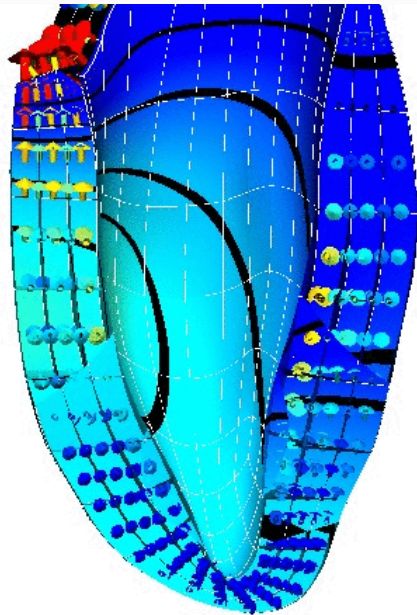
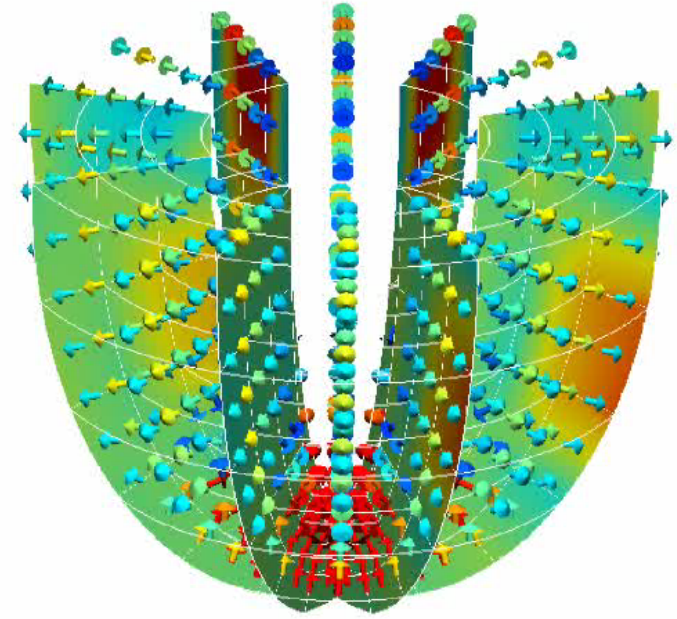
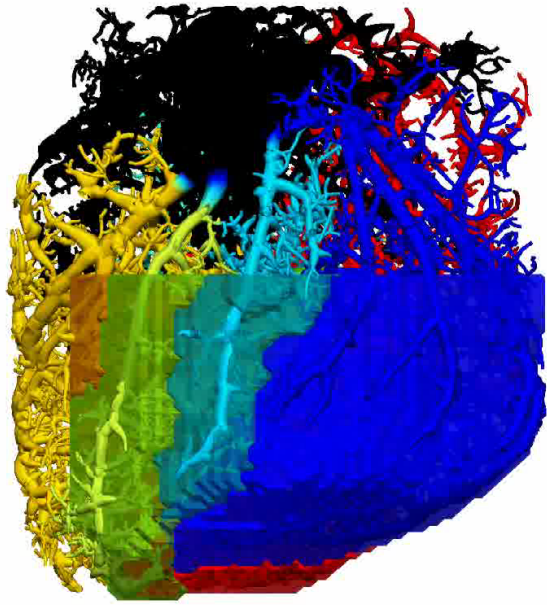




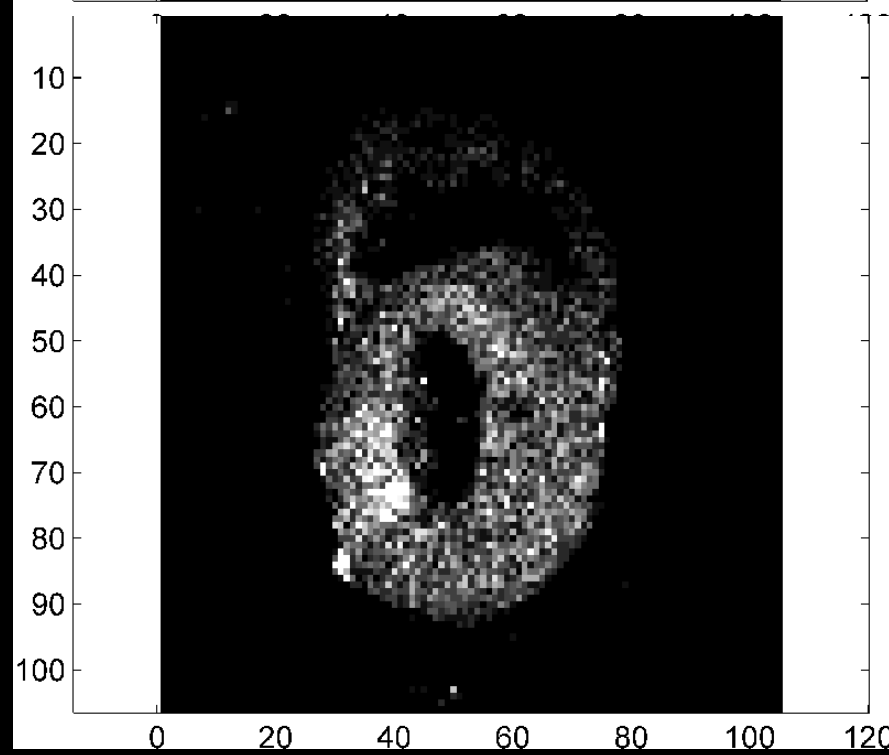
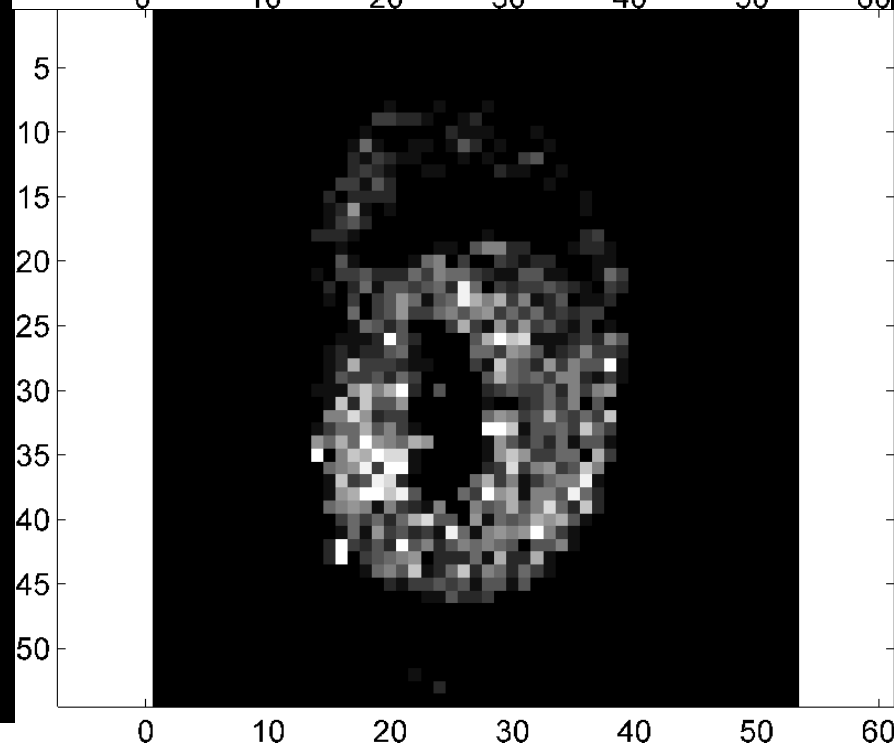
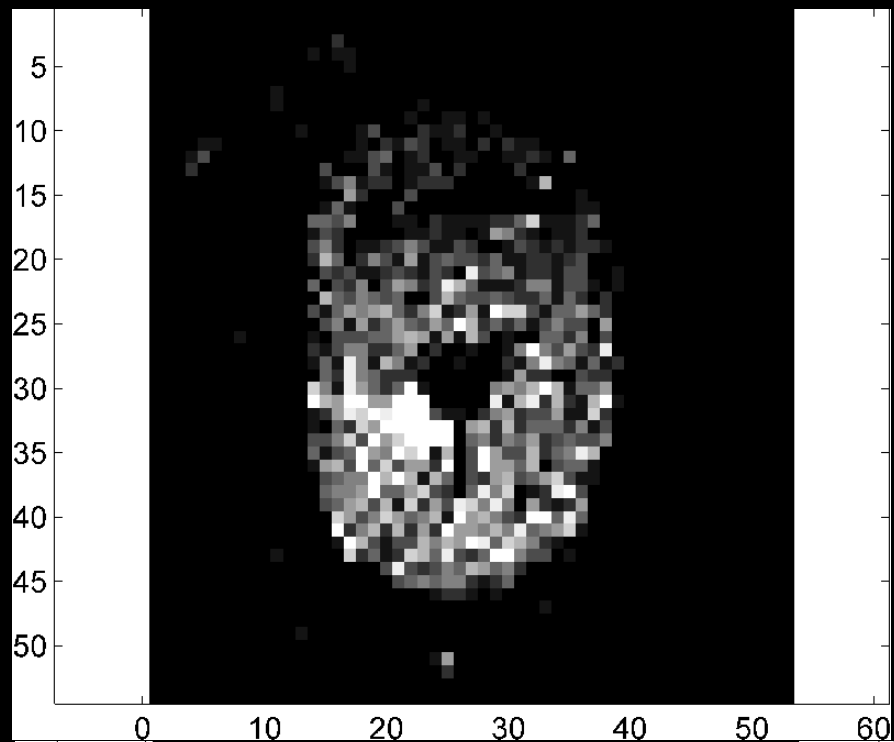
Bioengineering Institute The University of Auckland 2006

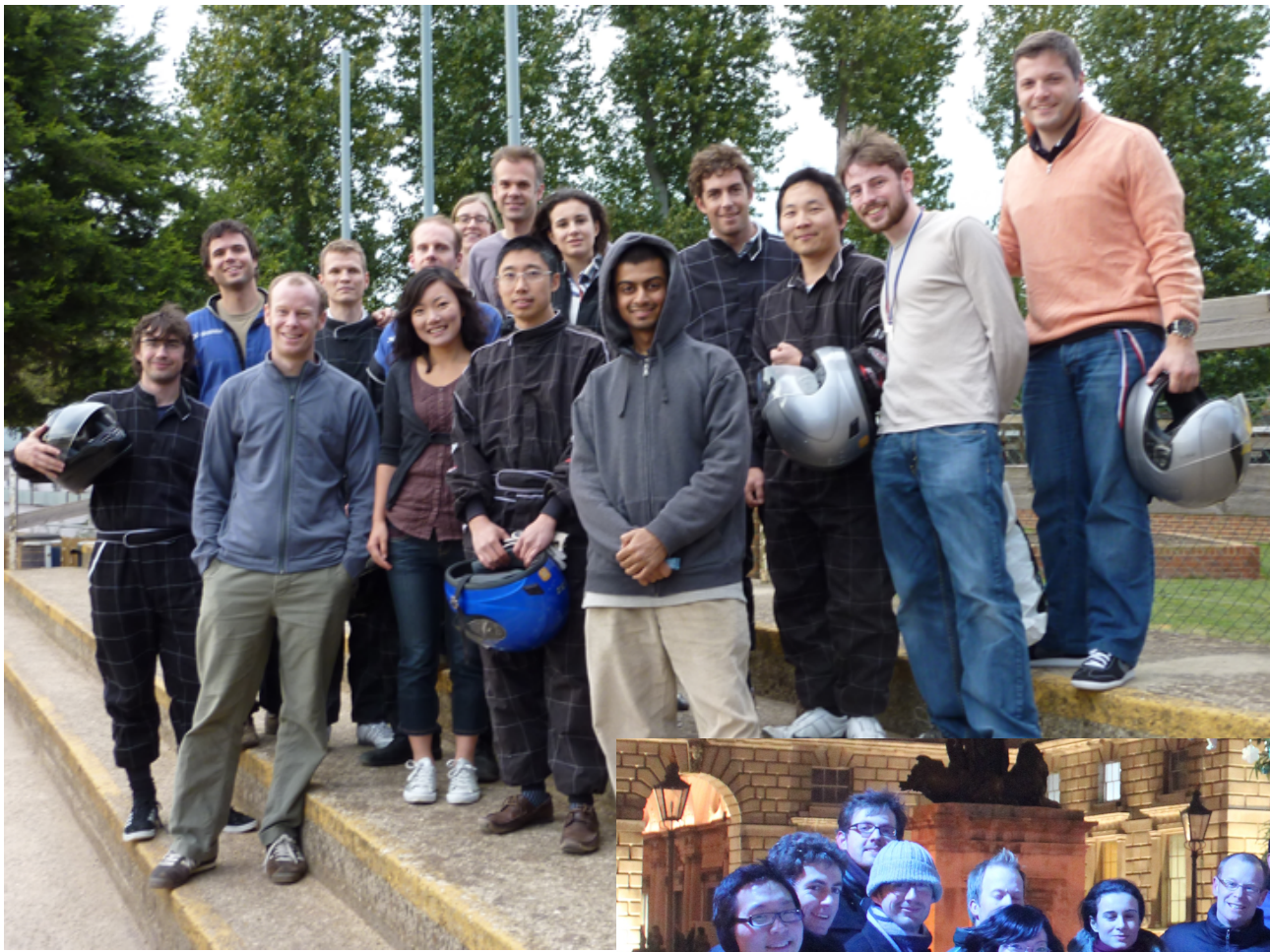


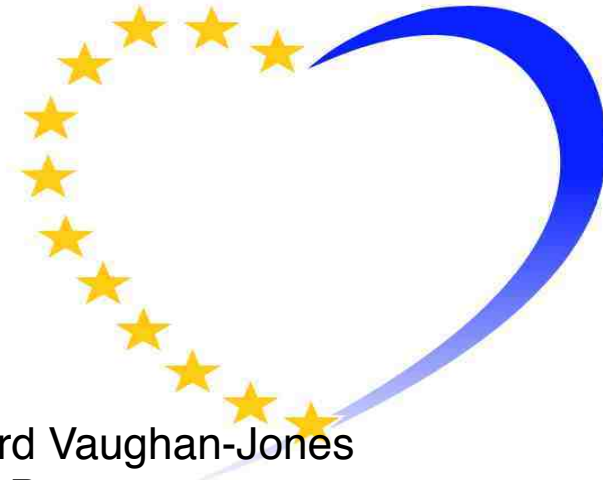
J, Lee, P. Beighley, E. Ritman, N.P. Smith Medical Image Analysis, 2007



And Christain Michler







Richard Vaughan-Jones
David Paterson
Peter Hunter
Barbara Casedei
Pawel Swietach
David Kay
Gernot Plank
Reza Rezavi
Kawel Rhode
Aldo Rinaldi
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Jos Spaan
Eike Nagel