Tailored Atrial Fibrillation Management via Image Processing

SCI Contributors
Josh Blauer | Greg Gardner | Darrell Swenson PhD | Josh Cates PhD | Rob MacLeod PhD

Clinical Collaborators
Nassir Marrouche MD | Ravi Ranjan MD | Chris McGann MD | Nazem Akoum MD

Johns Hopkins
Kathleen McDowell | Natalia Trayanova PhD

U. of Graz Austria
Gernot Plank PhD

SCI INSTITUTE • EXHIBIT • EXPLORE • EXCITE • EXPERIENCE • EXCHANGE SCI **X** 2012
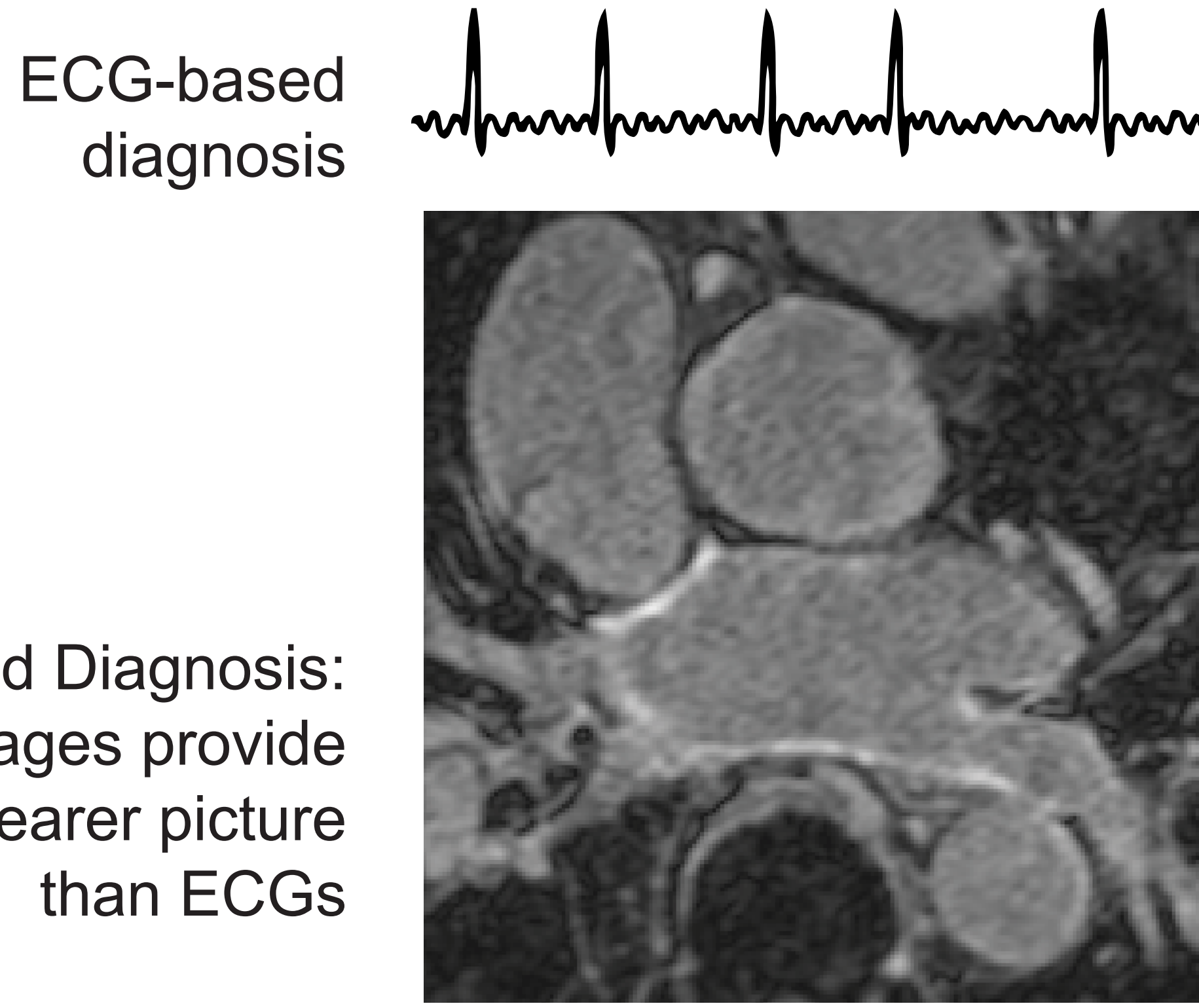
Medical Motivation:

Provide physicians with a better understanding of the tissue-changes underlying atrial fibrillation through computer modelling and image analysis
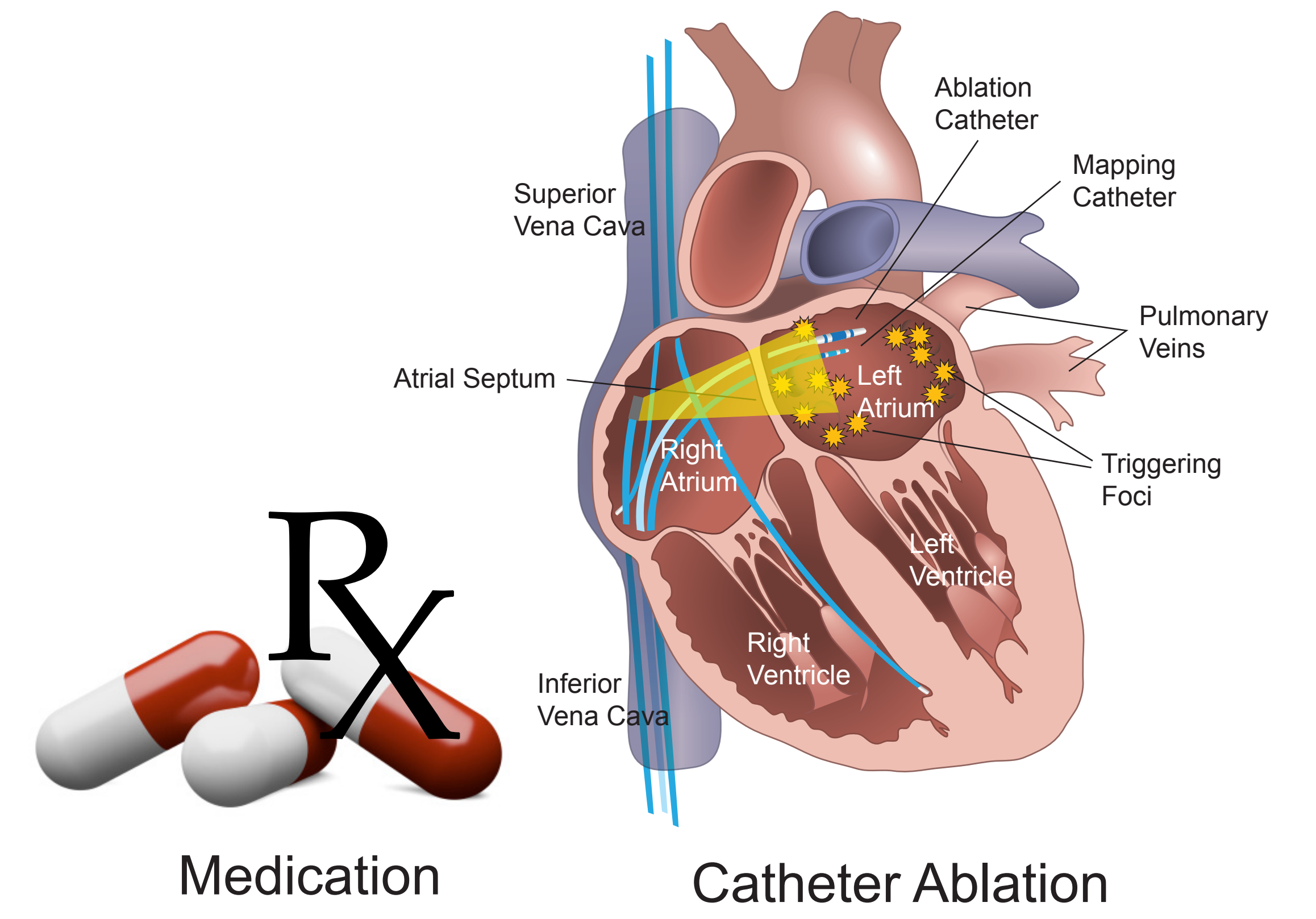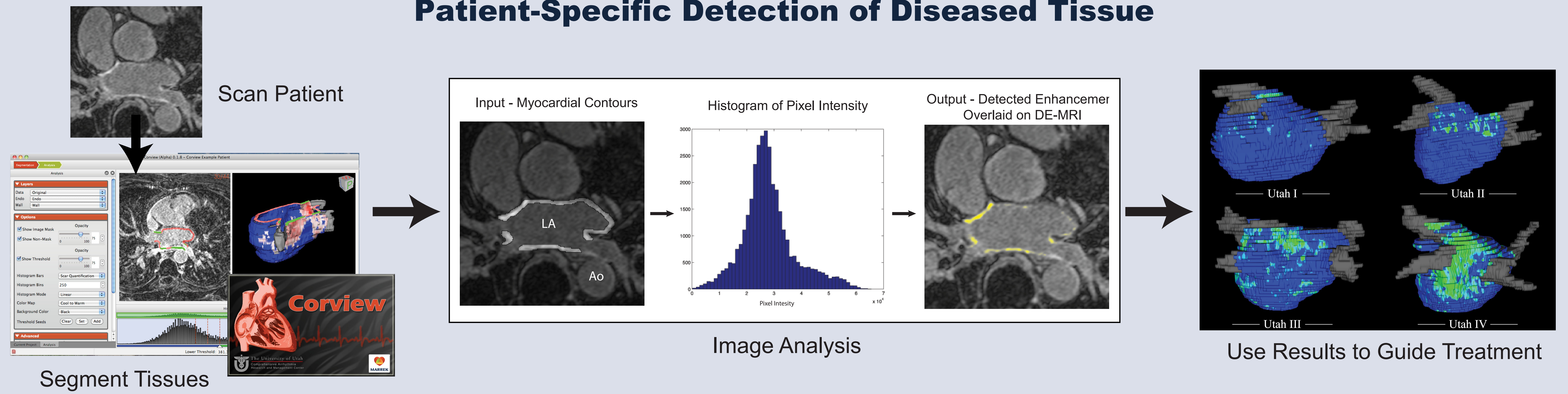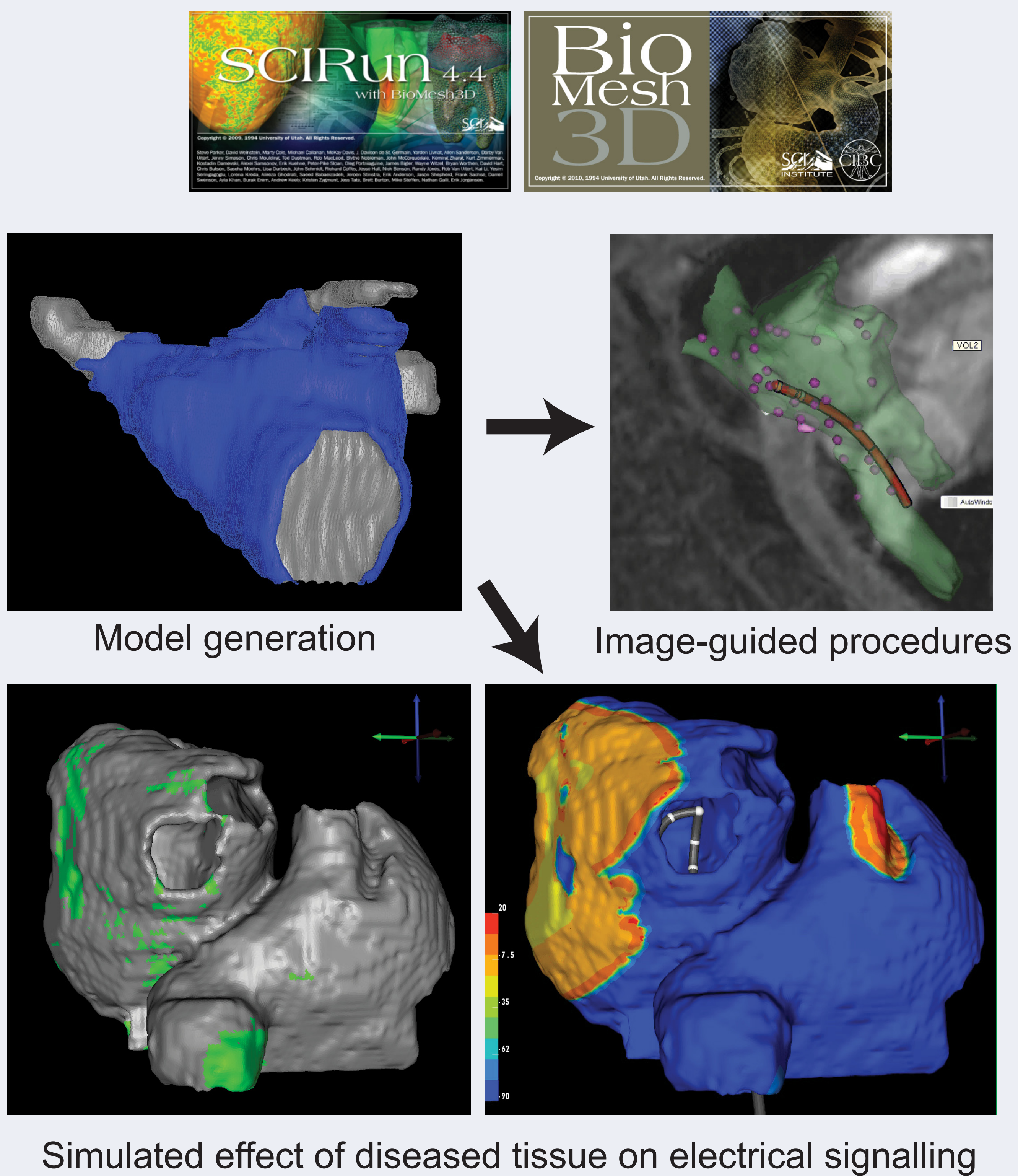

What is AFib?

Normal Conduction
Normal electrical signals
SA Node

Atrial Fibrillation
Disorganized electrical signals
SA Node

Diagnosis

ECG-based diagnosis

MRI-Based Diagnosis: Images provide a clearer picture than ECGs

Treatments

Ablation Catheter
Mapping Catheter
Superior Vena Cava
Atrial Septum
Pulmonary Veins
Left Atrium
Right Atrium
Triggering Foci
Left Ventricle
Inferior Vena Cava
Right Ventricle

Rx

Medication | Catheter Ablation

Patient-Specific Detection of Diseased Tissue

Scan Patient

Segment Tissues

Corview

Input - Myocardial Contours
LA
Ao

Histogram of Pixel Intensity
Pixel Intensity

Output - Detected Enhancemer Overlaid on DE-MRI

Image Analysis

Utah I | Utah II
Utah III | Utah IV

Use Results to Guide Treatment

Simulation and Personalized Models

SCIRun 4.4 with BioMesh3D
BioMesh 3D

Model generation

Image-guided procedures

Simulated effect of diseased tissue on electrical signalling

Regionalization of Diseased Tissue

ShapeWorks

Establish point-based correspondence between subjects

ViewScene 1 Window 1
File Views Help

0.75
0.56
0.38
0.19
0

Successful

ViewScene 1 Window 1
File Views Help

0.75
0.56
0.38
0.19
0

Unsuccessful

NewWindow Autoview Go Home Set Home LockView < Configure >

Diseased tissue is increasingly prevalent in patients with failed treatments

---

SCI www.sci.utah.edu

SCI **X** EXHIBIT • EXPLORE • EXCITE • EXPERIENCE • EXCHANGE • SCI INSTITUTE

THE UNIVERSITY OF UTAH