

Software Tools for Image-Based Modeling, Simulation, and Visualization

January 4, 2014 (Saturday)
8:30 am - 5:30 pm.

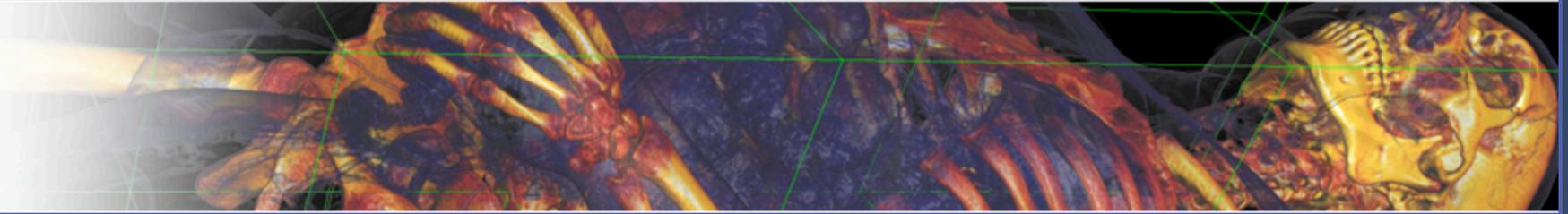
The SCI Institute

Welcome!!

Welcome from Utah/Boston

University of Utah

CENTER FOR INTEGRATIVE BIOMEDICAL COMPUTING



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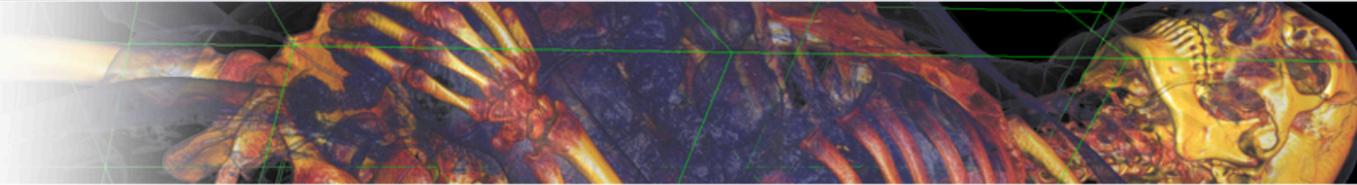


CIBC

Center for Integrative Biomedical Computing

Goals

- **Produce cutting edge software for biomedical researchers and clinicians**
- **Develop new techniques and algorithms in image processing, geometric modeling, simulation and visualization**
- **Carry out original research in segmentation, bioelectric field**

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The NIH/NIGMS Center for Integrative Biomedical Computing

The Center for Integrative Biomedical Computing (CIBC) is dedicated to producing open-source software tools for biomedical image-based modeling, biomedical simulation and estimation, and the visualization of biomedical data. The Center works closely with software users and collaborators in a range of scientific domains to produce user-optimized tools and provides advice, technical support, workshops, and education to enhance user success. Biological projects and collaborations drive our development efforts, all with a single unifying vision: to develop the role of image-based modeling and analysis in biomedical science and clinical practice.

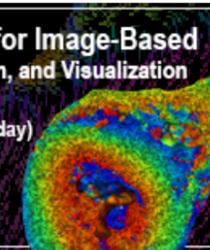
[BTRC Software Dissemination](#)

Upcoming Events

Software Tools for Image-Based Modeling, Simulation, and Visualization

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8:30 am - 5:30 pm.

The SCI Institute



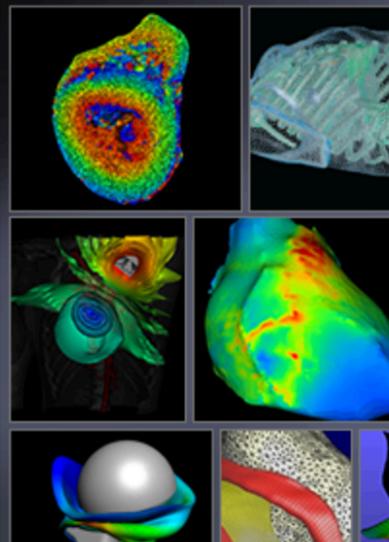
Research Highlights

IBBM 2014

Summer Course on Image based Biomedical Modeling

July 14-24, 2014 Park City, Utah

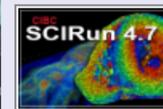
Creating field specific expertise and hands-on experience in bioelectric or biomechanical problems that arise in current research and clinical practice. Providing training in numerical methods, image analysis, and computational tools necessary to carry out end-to-end, image based, subject specific simulations using freely available software.



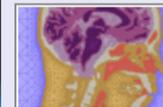
CIBC News



Professor Johnson receives Fernbach Award



SCIRun 4.7 with BioMesh3D Released



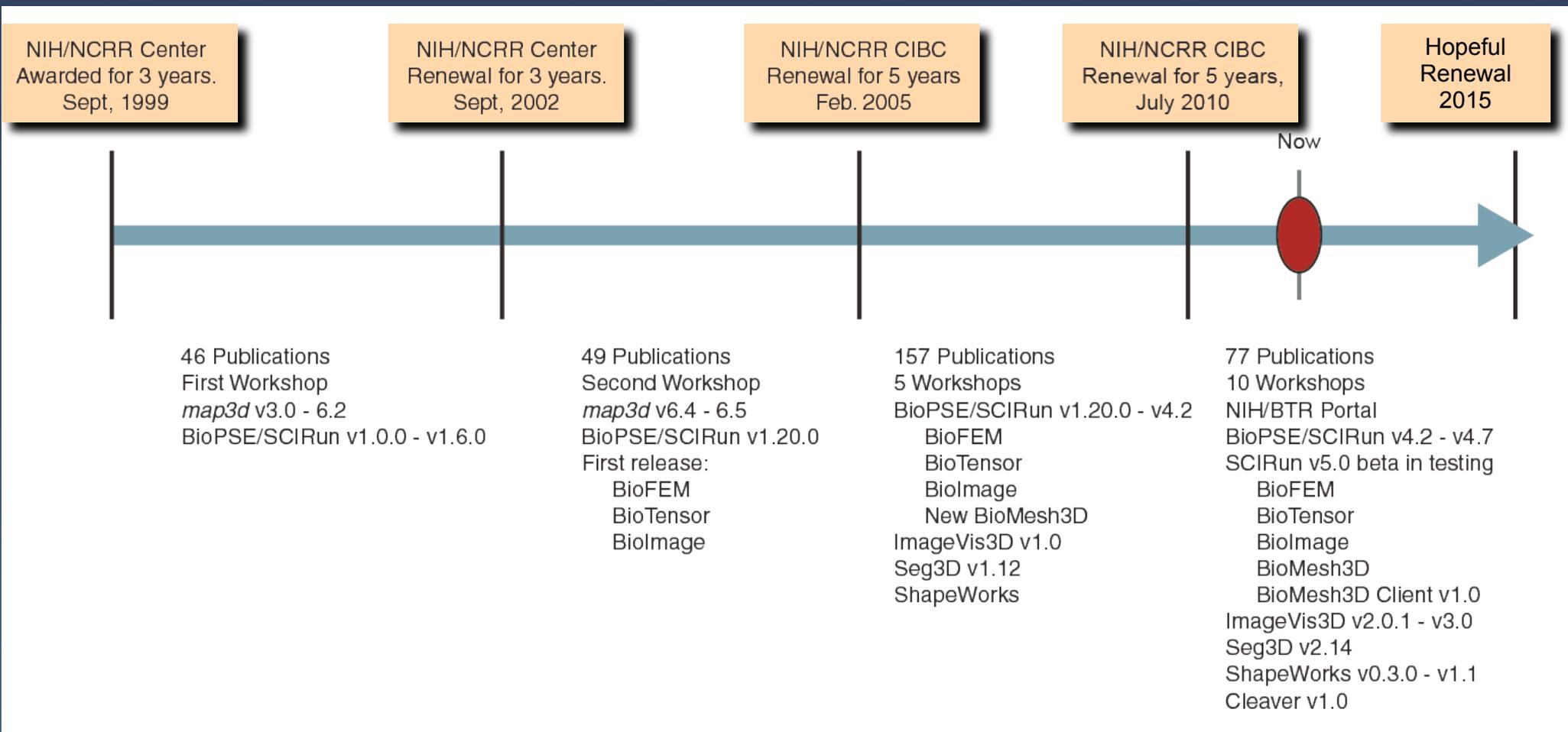
Cleaver v1.5 Released



ImageVis3D 3.0.0 Released

[Show All](#)

History of the CIBC



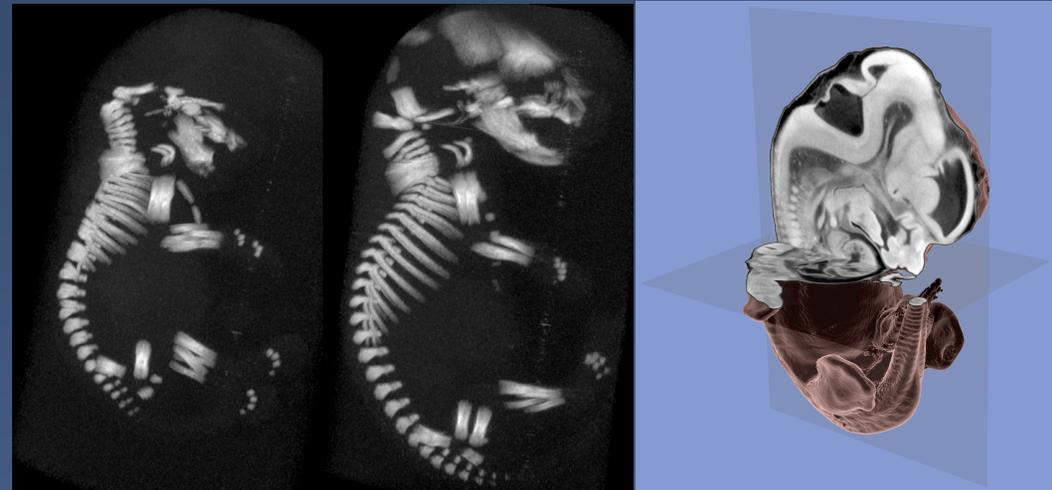
Center Goal

To achieve scientific breakthroughs through the use of computational technology



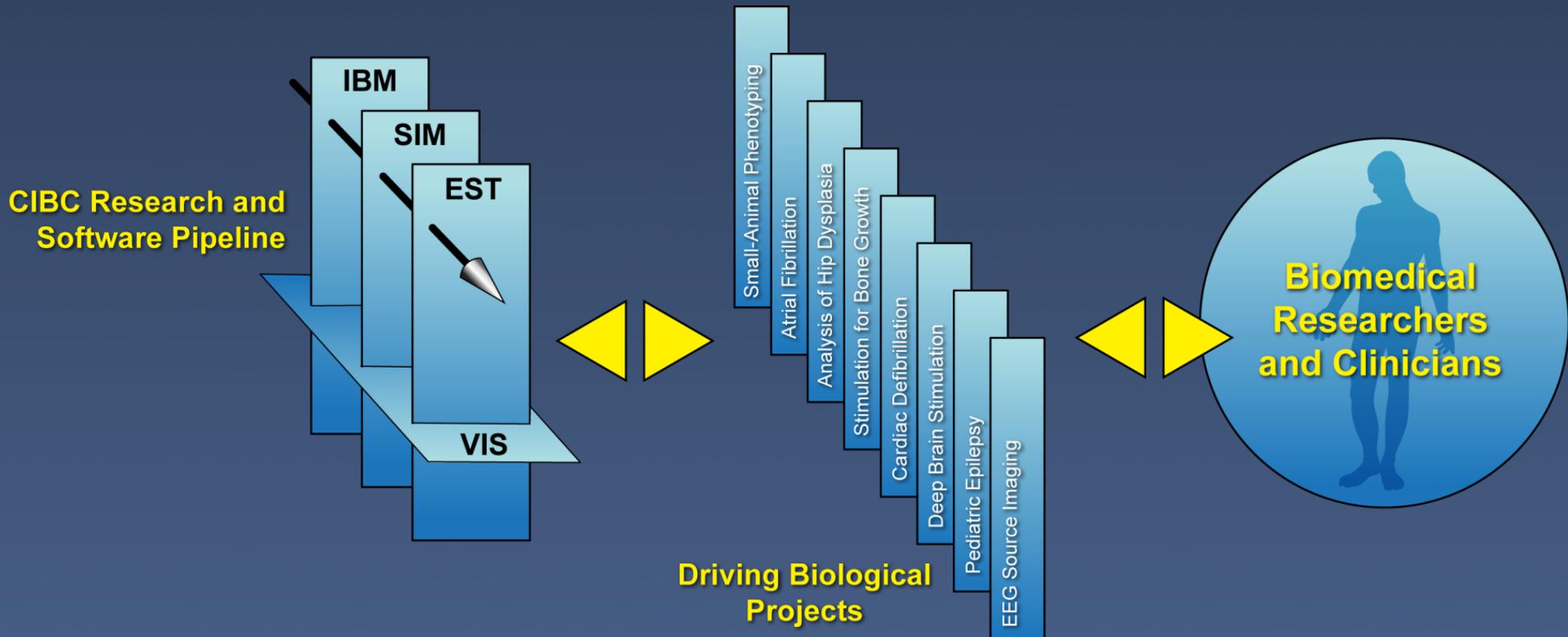
Mario Capecchi
and Charles Keller

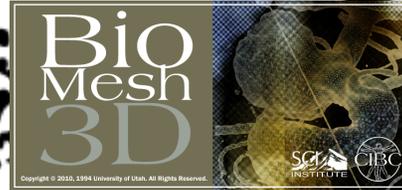
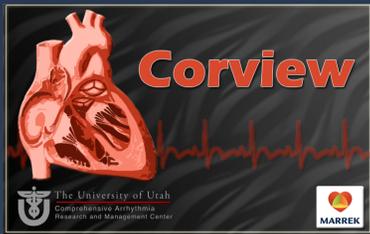
Nobel Prize 2007



J.T. Johnson et al., PLoS Genetics, Vol. 2, No. 1, pp. 471--477, 2006.

Center Organization





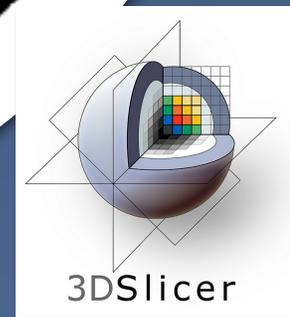
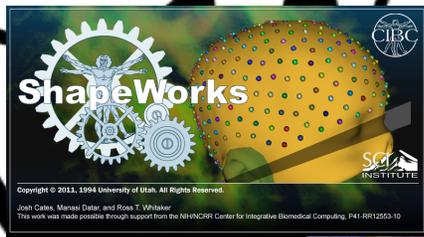
Chris Johnson



Ross Whitaker



Dana Brooks



Center Vision

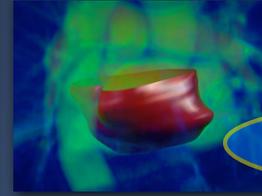
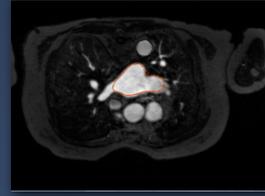


Image Processing

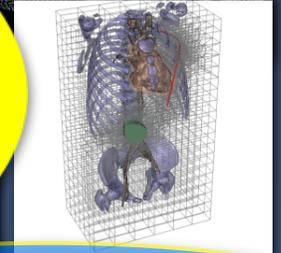
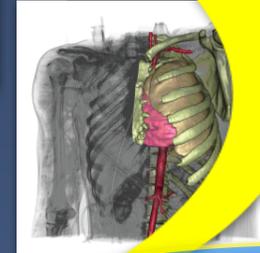
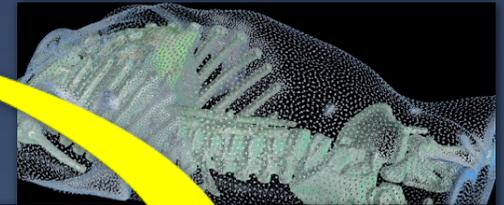
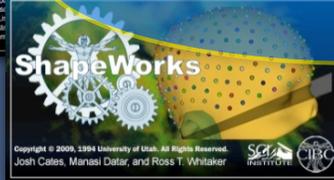
Image & Data Acquisition



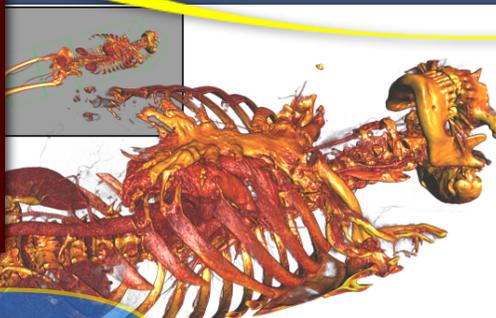
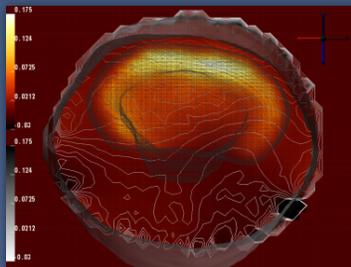
Lab/Clinic



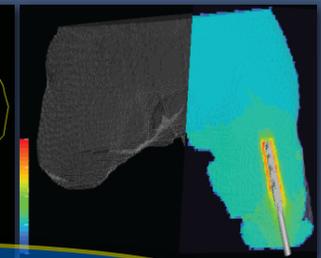
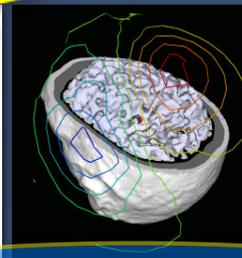
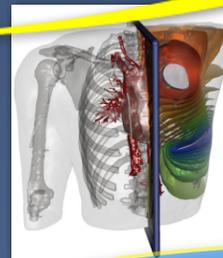
Integrated Software Tools



Geometry Processing



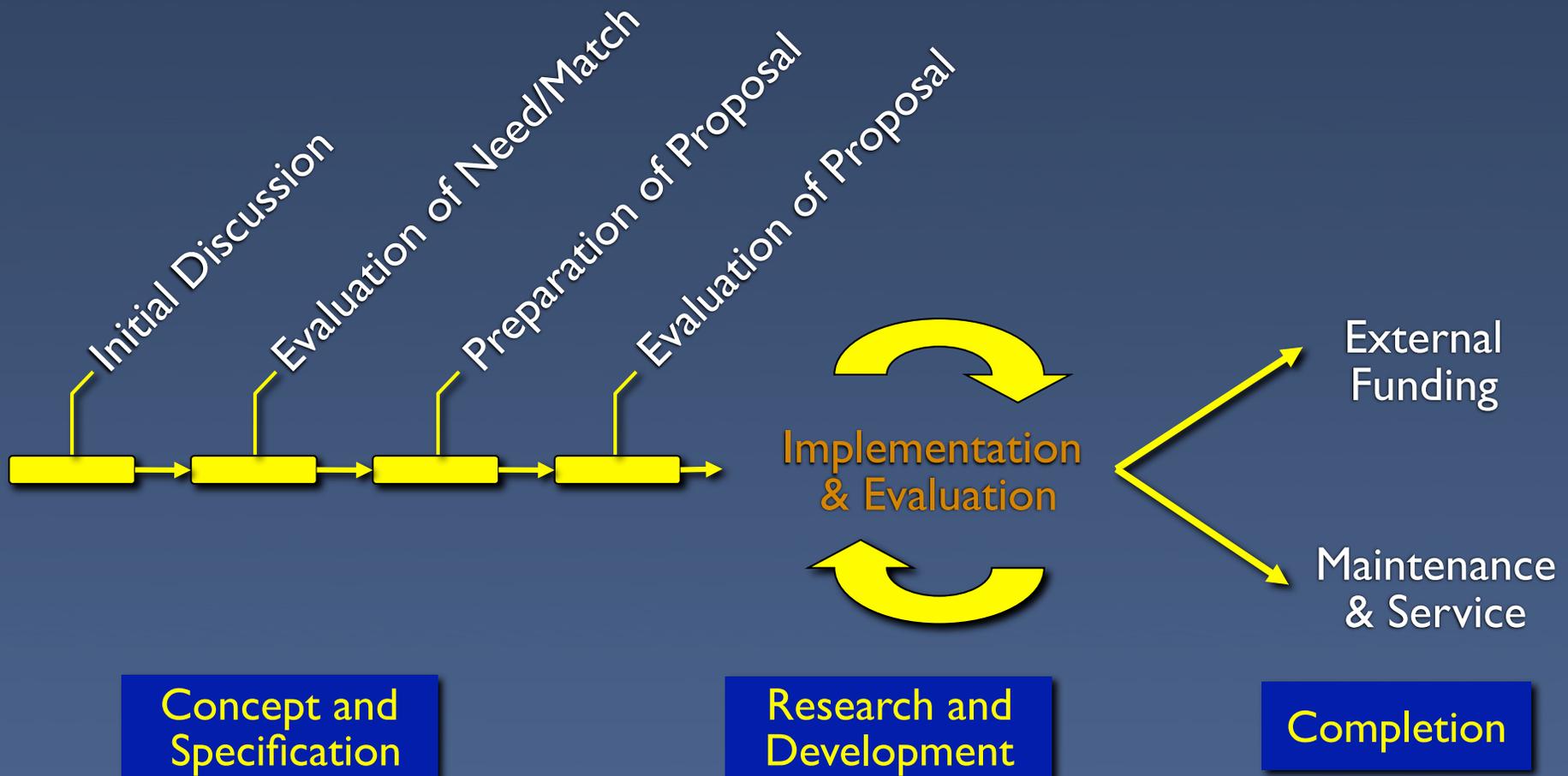
Visualization



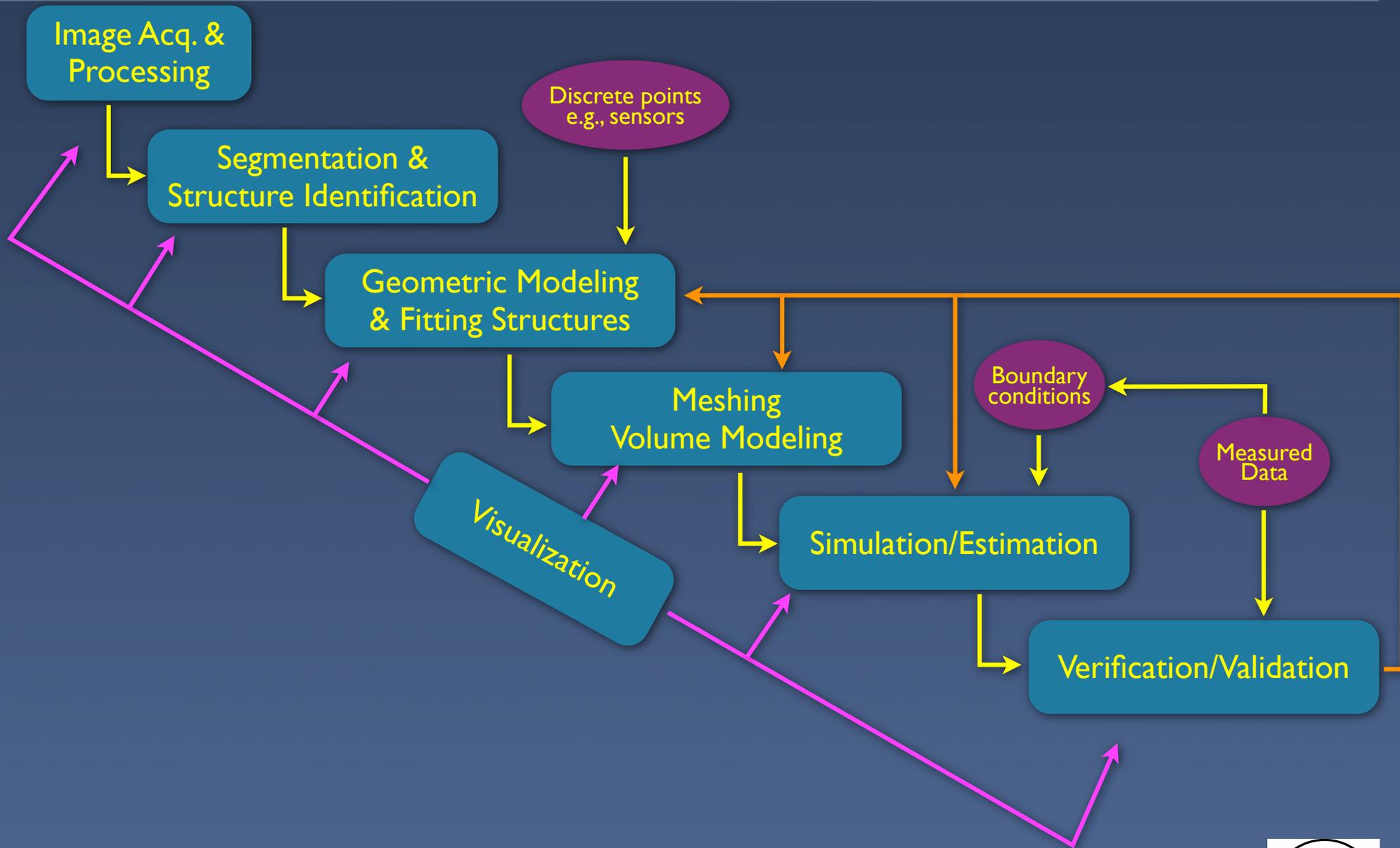
Modeling, Simulation & Validation

Collaborations

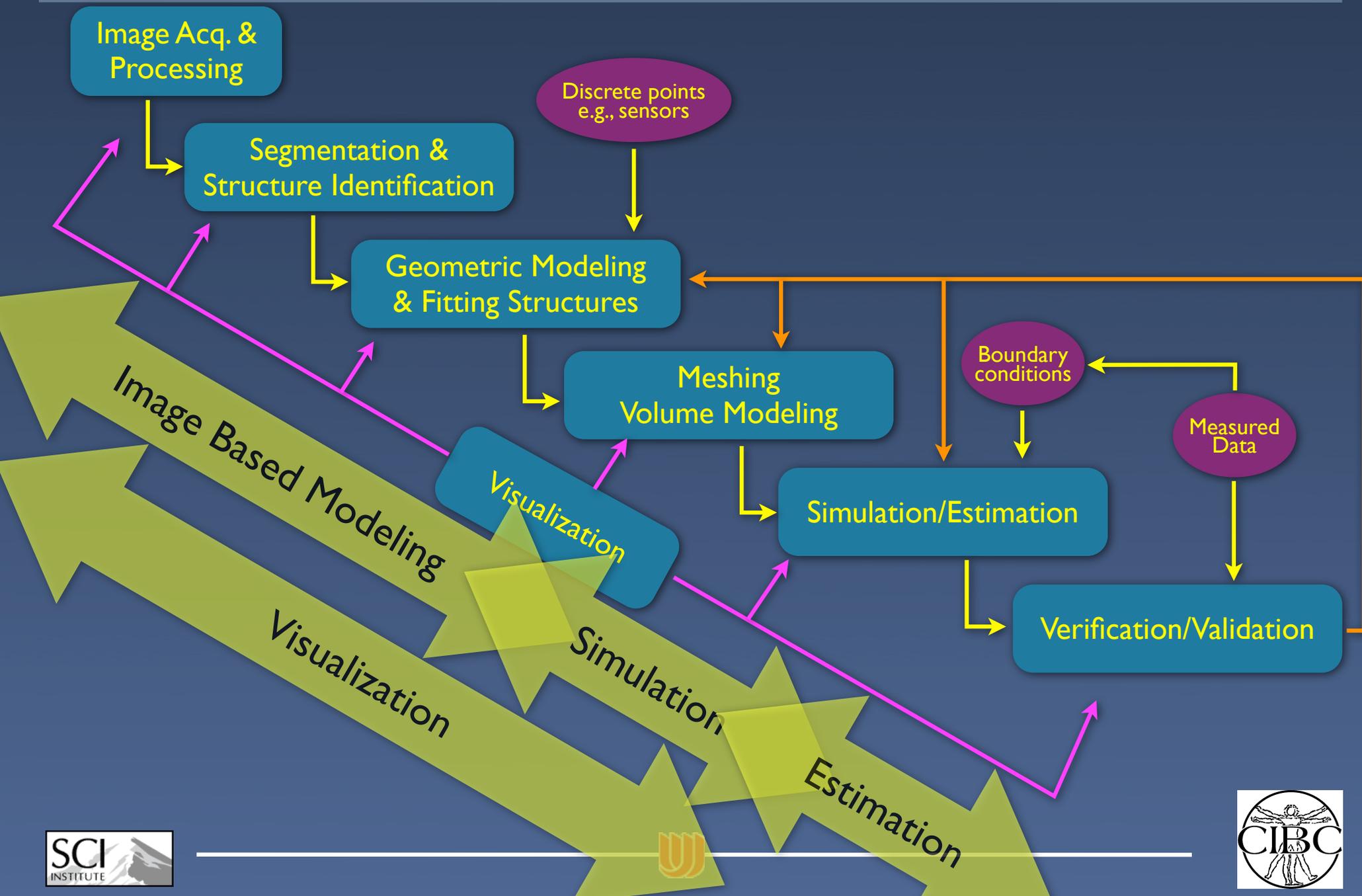
Driving Biological Projects



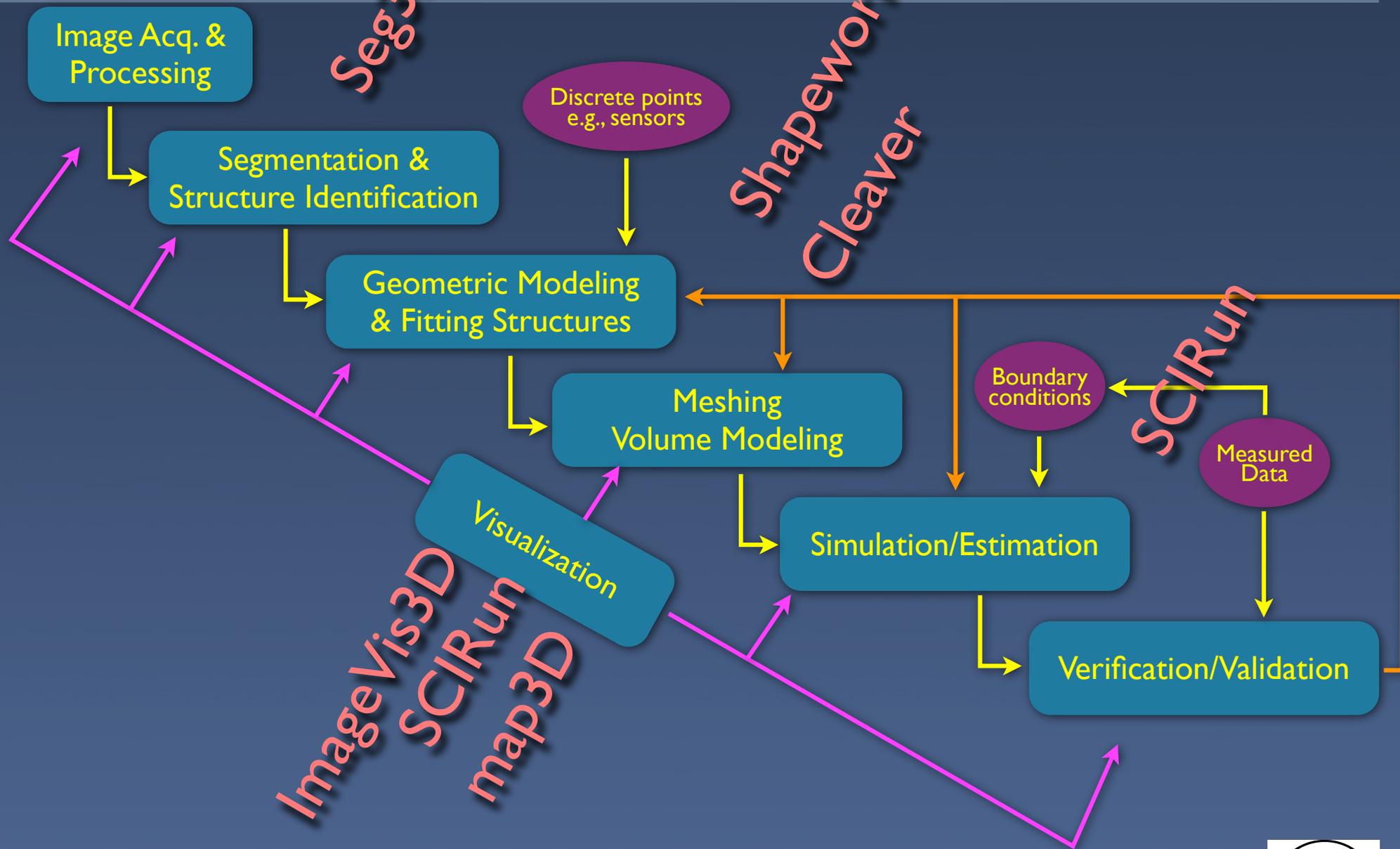
Pipeline Mapping



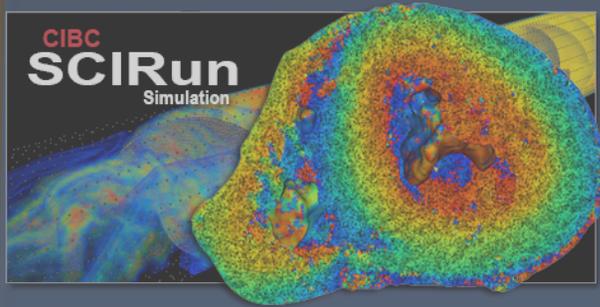
Pipeline Mapping



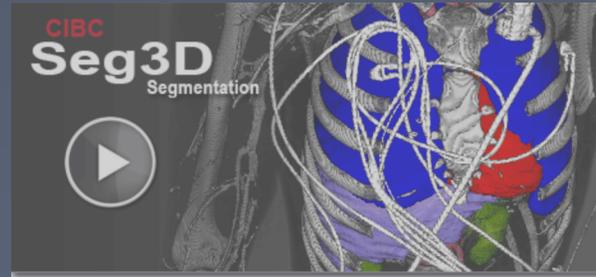
Pipeline Mapping



Center Software Infrastructure



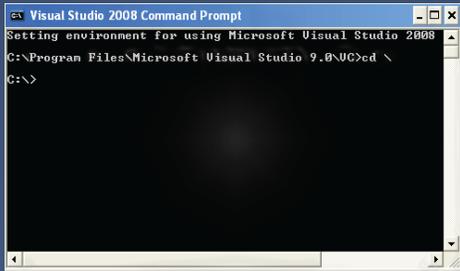
SCIRun (Data flow environment)



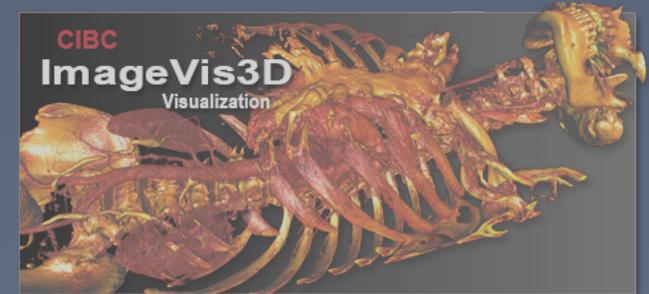
Seg3D (segmentation)



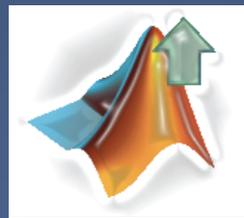
Cleaver (Meshing)



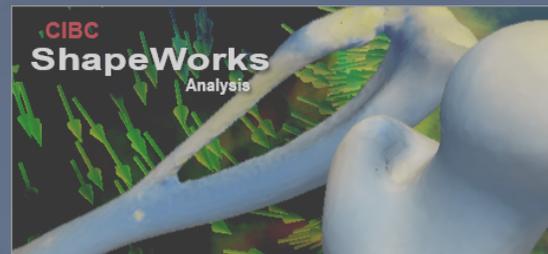
Command line tools



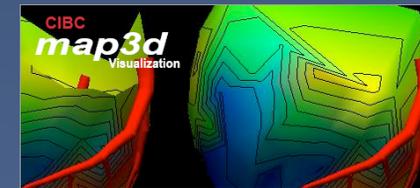
ImageVis3D (Visualization)



Matlab/Python

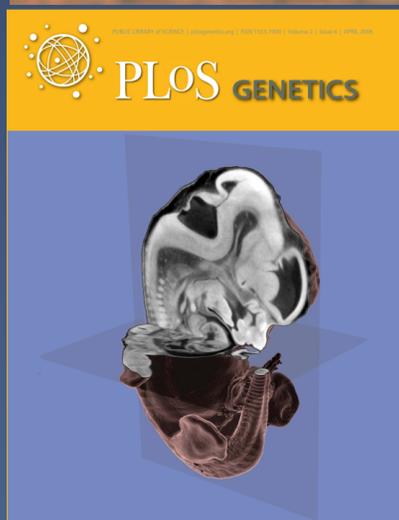
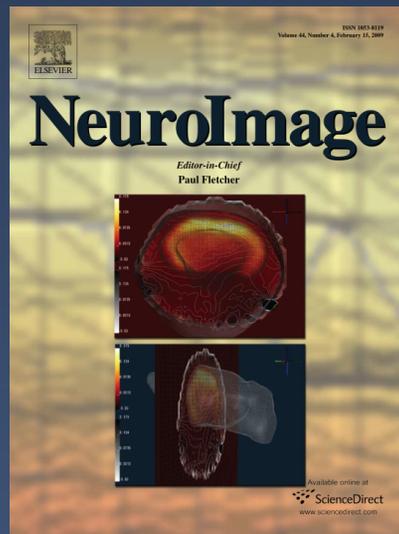


Shapeworks (shape analysis)



map3D (Visualization)

Biomedical Research Impact



HeartRhythm
The Official Journal of the Heart Rhythm Society

Volume 5, Issue 4 April 2008

New Impact factor 3.777
9th of 74 cardiology journals

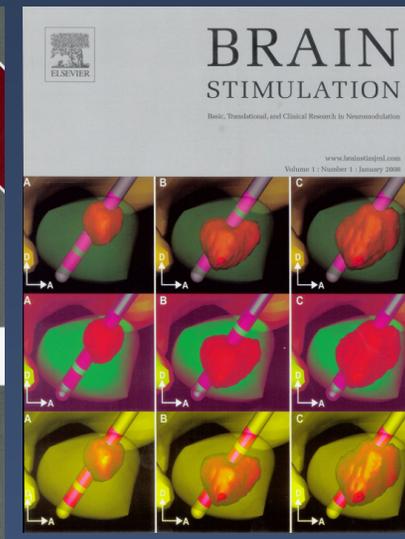
Novel ICD placements in children
Excito-oscillatory dynamics causing VF

The Official Journal of the Cardiac Electrophysiology Society

full-text: www.heartrhythmjournal.com

Heart Rhythm Society
Restoring the Rhythm of Life

ELSEVIER
ISSN 1547-5271



ARCHIVES OF NEUROLOGY
WWW.ARCHNEUROL.COM

Deep Brain Stimulation, Neuroethics, and the Minimally Conscious State: A patient-specific model is used to predict the effects that would be expected during bilateral thalamic deep brain stimulation (DBS) in a severely comatose state patient. Each location of the quadrilateral DBS lead, right, outlined portion, voltage waveforms are shown. The color bar at left indicates voltage, which indicates a positive current and a negative flow through the stimulating tissue. (From review of Chaturvedi A, et al. Department of Neurology, Medical College of Wisconsin, Milwaukee, WI.)

Central Microbleeds: Evidence of High-Dose Risk Associated With Aspirin Use
P. S. Ghosh, MD, MPH

How Sensitive Detection by Continuous Electroencephalographic Monitoring Affects the Prescribing of Antiepileptic Medications
P. S. Ghosh, MD, MPH, et al.

Deep Brain Stimulation, Neuroethics, and the Minimally Conscious State
N. D. Singhal, MD, et al.

Primary Angiitis of the Central Nervous System
J. Bhatnagar, MD, and D. B. Redburn, MD

Use of Antithrombotic Drugs and the Presence of Cerebral Microbleeds
H. W. Vermeer, MD, et al.

Automatons in Absent Seizures in Children With Idiopathic Generalized Epilepsy
C. E. Scahill, MD, et al.

Ganglionic Acetylcholine Receptor Autoantibody
A. M. Evans, MD, MPH, et al.

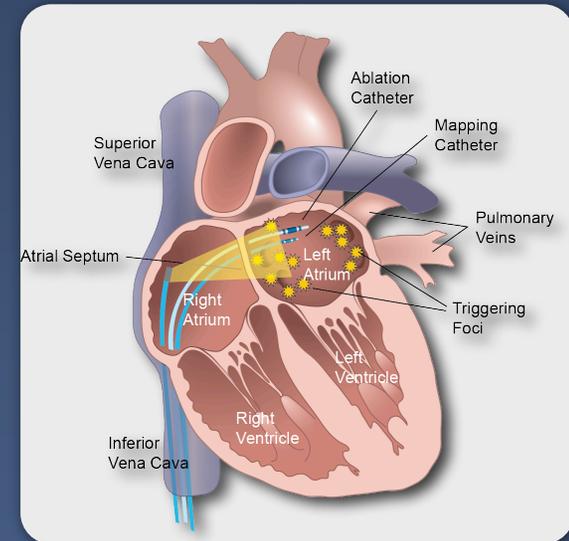
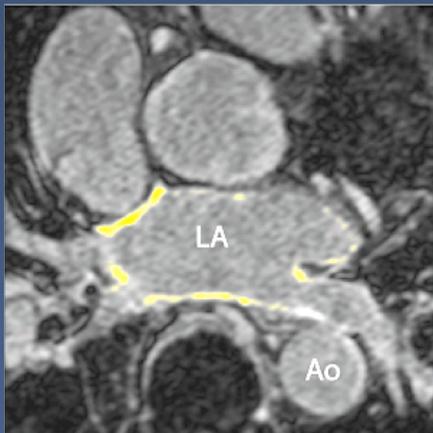
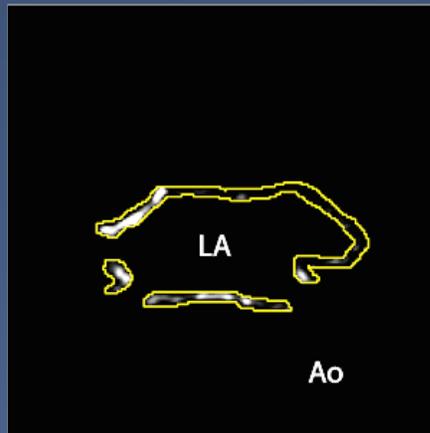
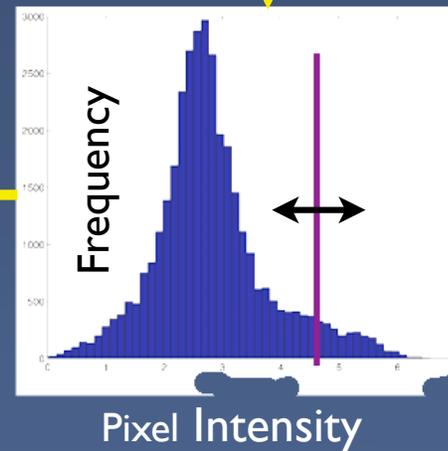
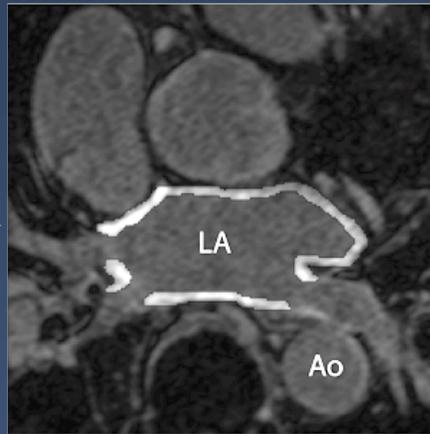
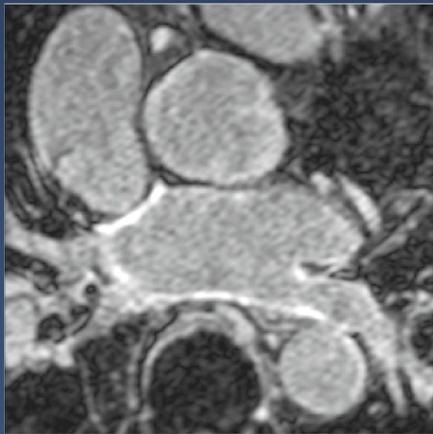
Prospective Differentiation of Multiple System Atrophy From Parkinson Disease, With and Without Autonomic Failure
A. S. Lees, et al.

CONTRACTS TO CONTRIBUTORS ON PAGE 911

JAMA ARCHIVES JOURNALS
Official Journal of the American Neurological Association

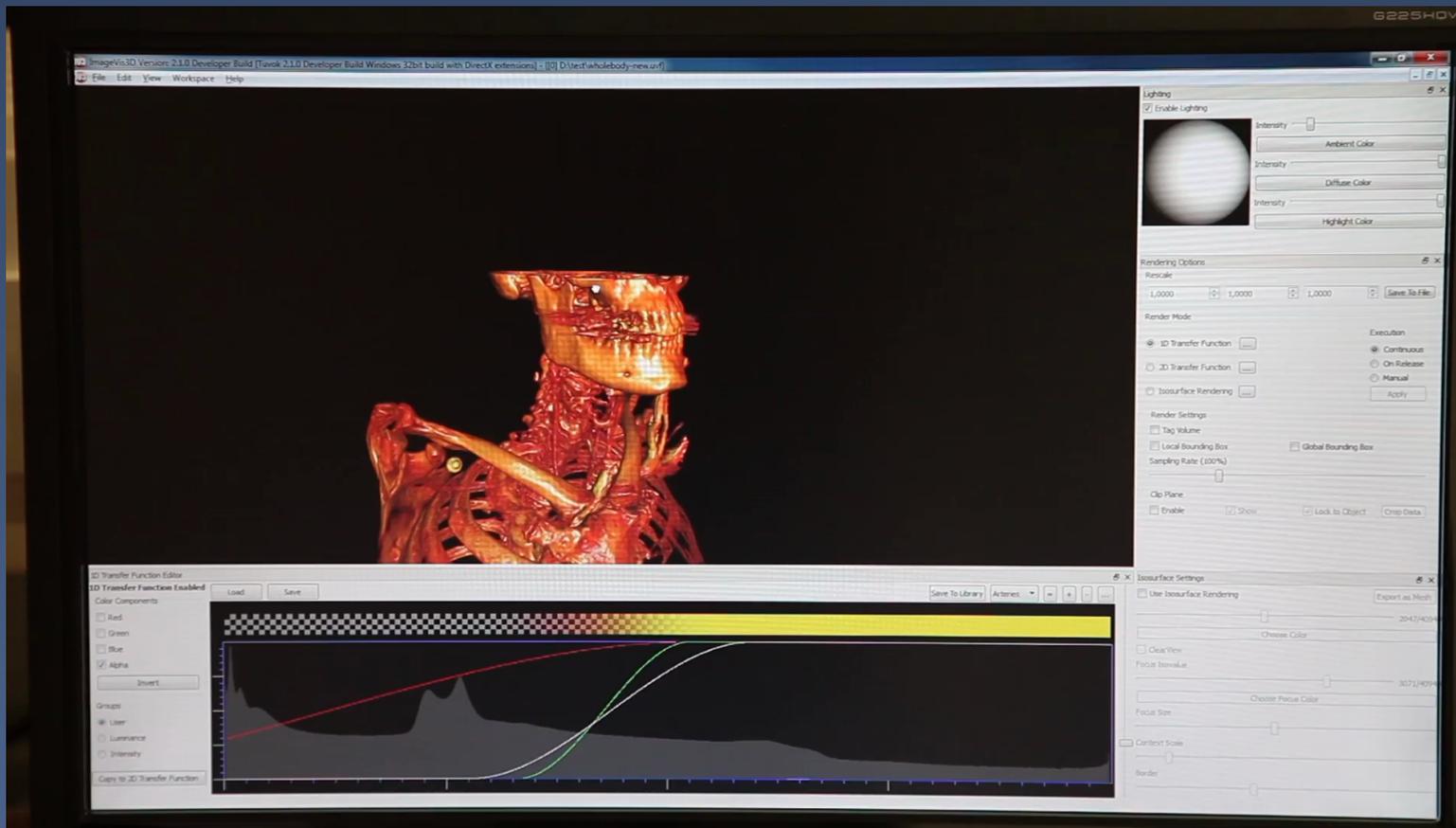
Case Study #1

Atrial Fibrillation



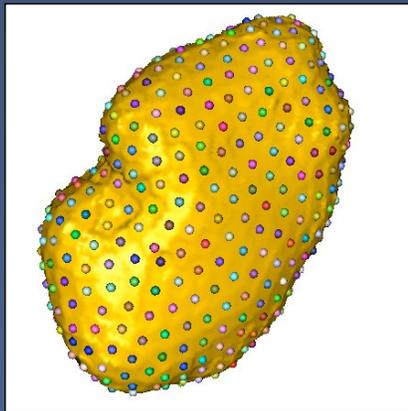
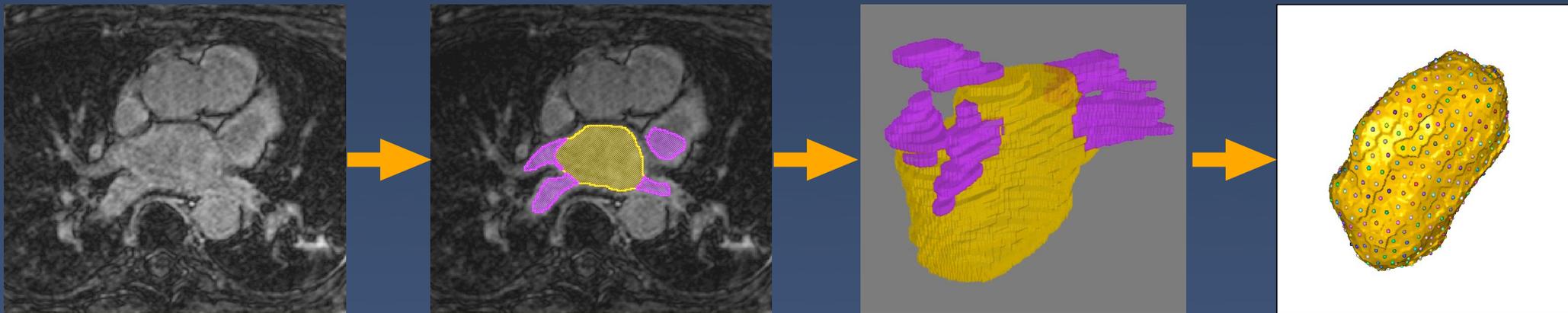
Case Study #2

Data Exploration with ImageVis3D

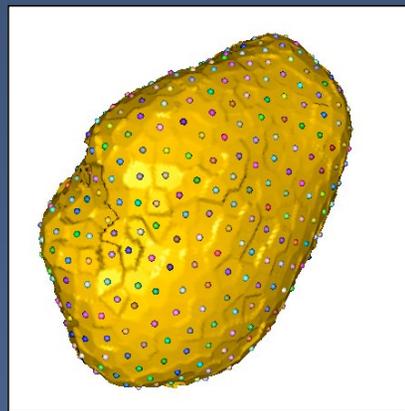


Case Study #3

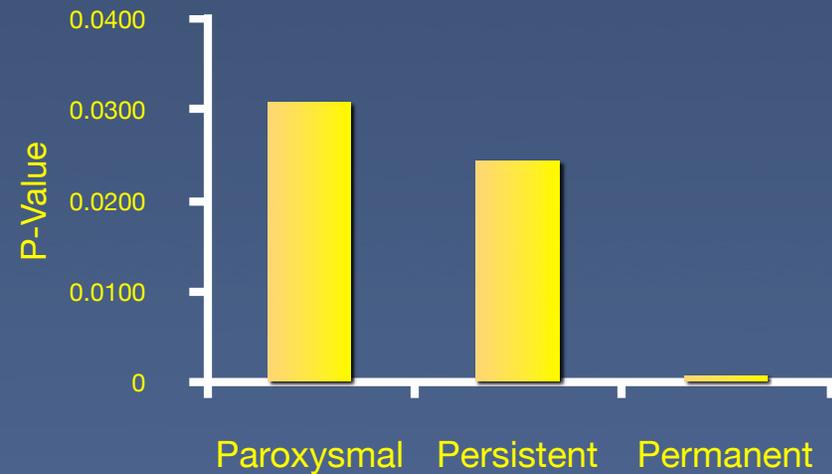
Shape Statistical Modeling



Control

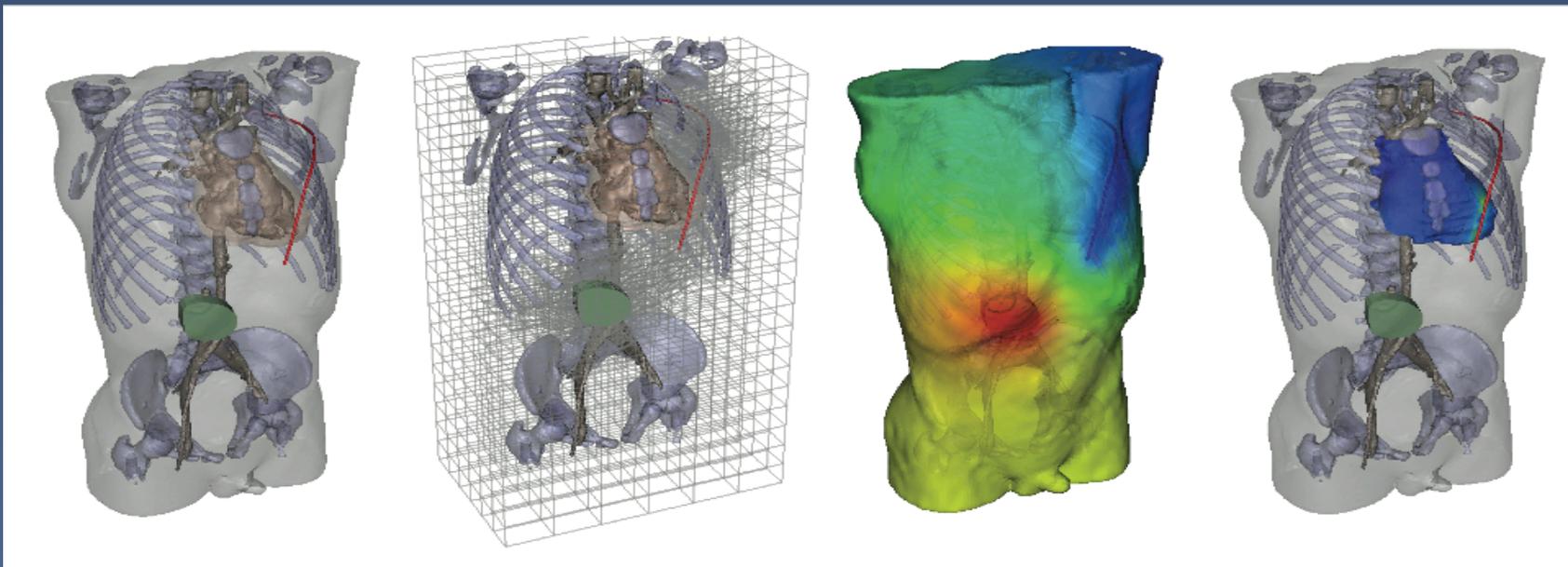
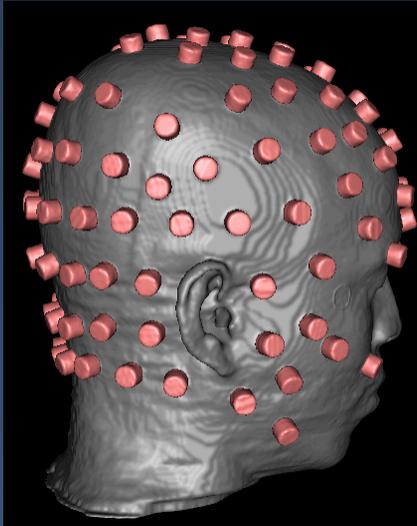


Permanent AF



Case Study #4

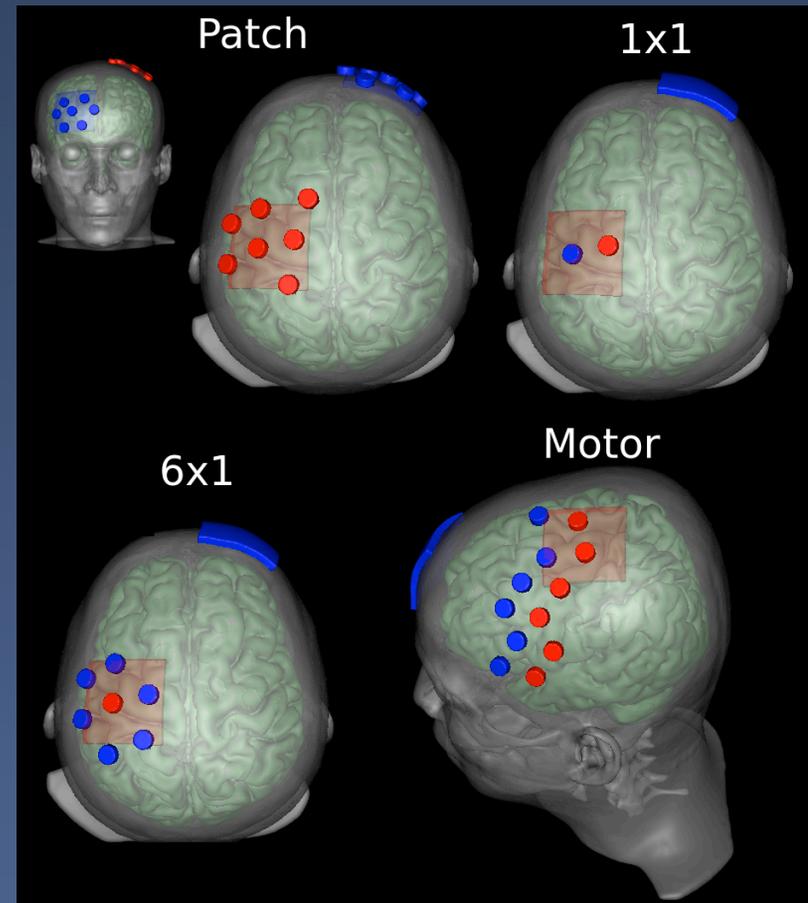
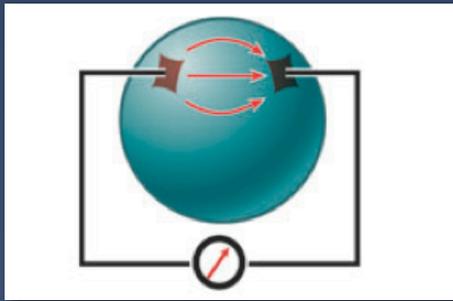
Image Based Mesh Generation



Case Study #5

Transcranial Stimulation High Density Electrodes

Traditional



Key Center Personnel

PI's

- **Chris Johnson**
- **Rob MacLeod**
- **Ross Whitaker**
- **Dana Brooks**

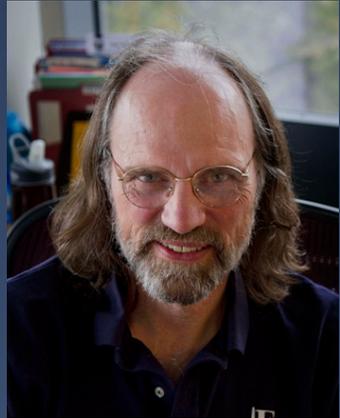
Technical Management

- **Liz Jurrus**

Administrative Team

- **Deb Zemek**
- **Greg Jones**
- **Corinne Garcia**

Workshop Team



Dr. Rob
MacLeod



Dr. Liz
Jurrus



Ayla
Khan



Dr. Shireen
Elhabian



Moritz
Dannhauer



Corinne
Garcia



Brett
Burton



Jonathan
Bronson



James
Hughes



Prateep
Mukherjee



Jess
Tate



Dan
White

Schedule

2014 CIBC Workshop Schedule, Jan 4, 2014

Start	End	Duration		
8:00	8:30	30	Setup for users and installation of SW	
8:30	8:45	15	Introduction	Rob MacLeod
8:45	9:00	15	Case Study I: Image based analysis of patients with atrial fibrillation	Rob MacLeod
9:00	9:15	15	Demo I: Seg3D Demo and tutorial	Rob MacLeod & Jess Tate
9:15	10:00	45	Lab I: Segmentation with Seg3D	
10:00	10:15	15	Break I	
10:15	10:30	15	Case Study II: ImageVis3D as a teaching tool	Liz Jurrus
10:30	10:45	15	Demo II: ImageVis3D demo and tutorial	Liz Jurrus & James Hughes
10:45	11:30	45	Lab II: Visualization with ImageVis3D	
11:30	11:45	15	Case Study III: Statistical shape modeling use cases	Shireen Elhabian
11:45	12:00	15	Demo III: ShapeWorks demo and tutorial with torus data	Shireen Elhabian & Prateep Mukherjee
12:00	12:45	45	Lab III: Shapeworks	
12:45	13:45	60	Lunch/Open Lab	
13:45	14:00	15	Case Study IV: Geometric modeling of the head and heart	Rob MacLeod and Moritz Dannhauer
14:00	14:15	15	Demo IV: Cleaver demo and tutorial	Moritz Dannhauer & Jonathan Bronson
14:15	15:00	45	Lab IV: Mesh generation with Cleaver (Figure out new datasets??)	
15:00	15:15	15	Break II	
15:15	15:30	15	Case Study V: Simulation of brain potentials from transcranial stimula	Moritz Dannhauer and Rob MacLeod
15:30	15:45	15	Demo V: SCIRun demo and tutorial	Moritz Dannhauer & Jess Tate
15:45	16:30	45	Lab V: Simulation with SCIRun	
16:30	16:40	10	Summary and Wrap Up	Rob MacLeod
16:40	17:25	45	Open Lab	