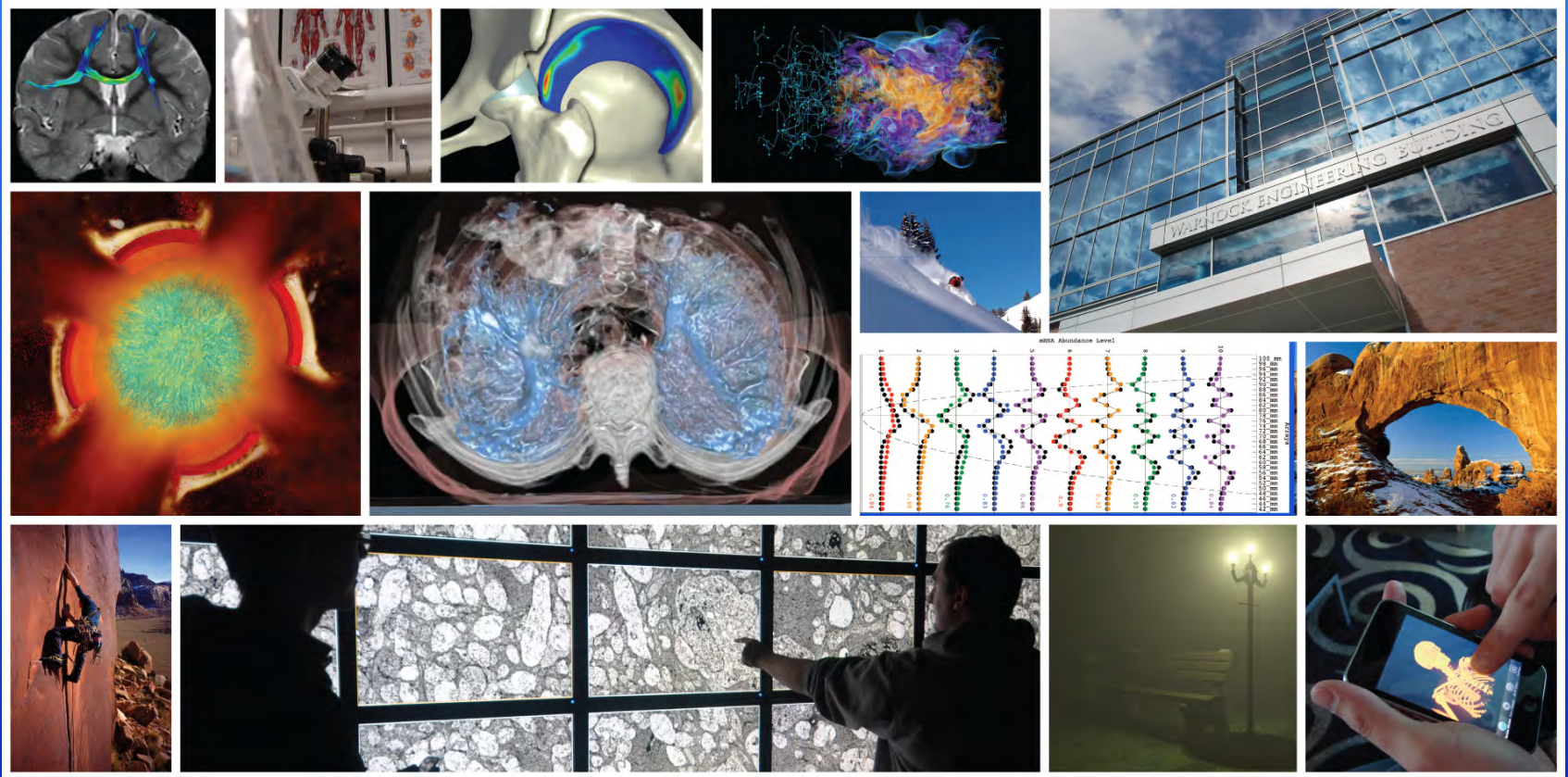


# Collaborations in Biology and Medicine



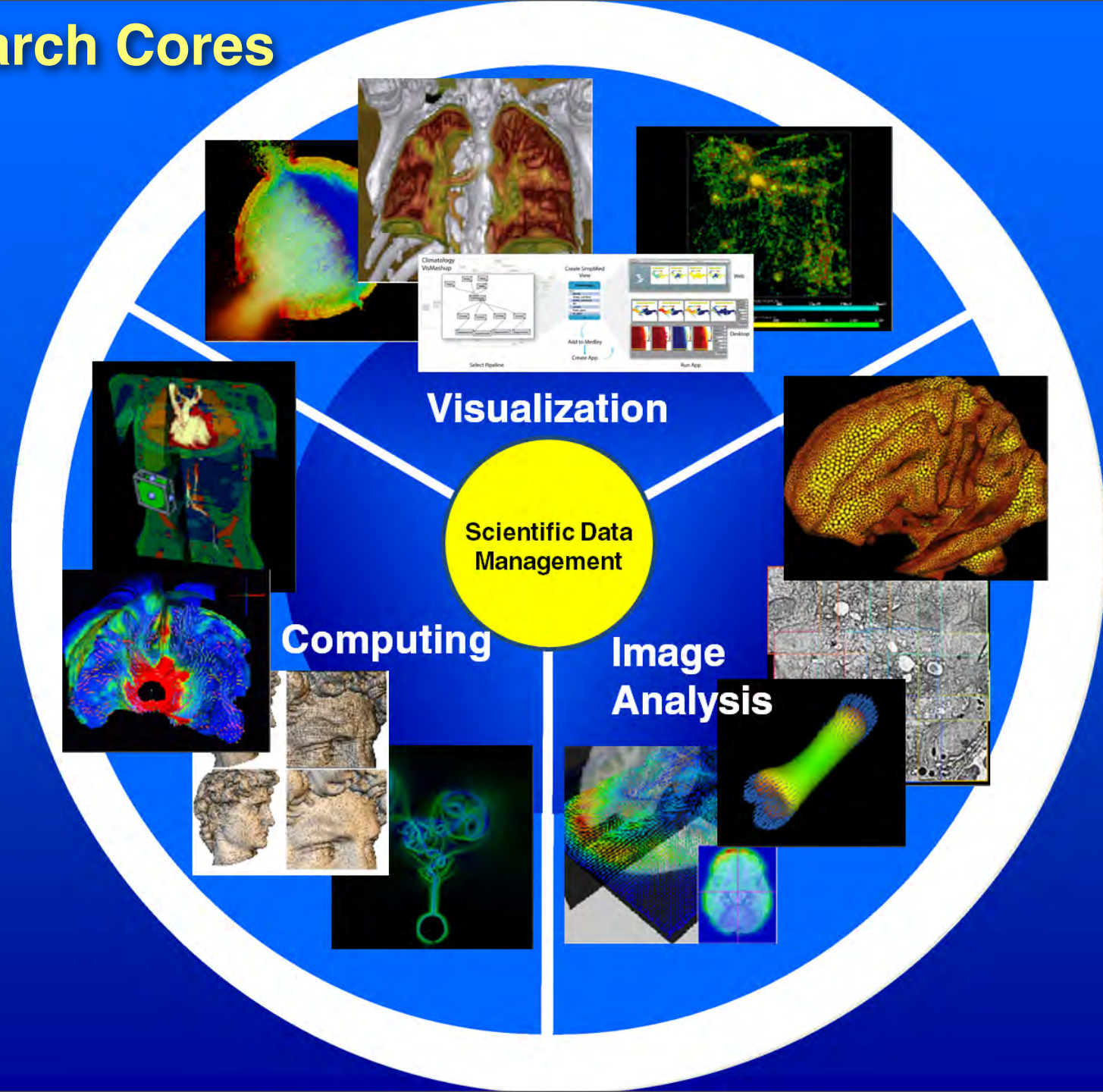
**Chris Johnson**  
**Scientific Computing and Imaging Institute**  
**University of Utah**

# The SCI Institute

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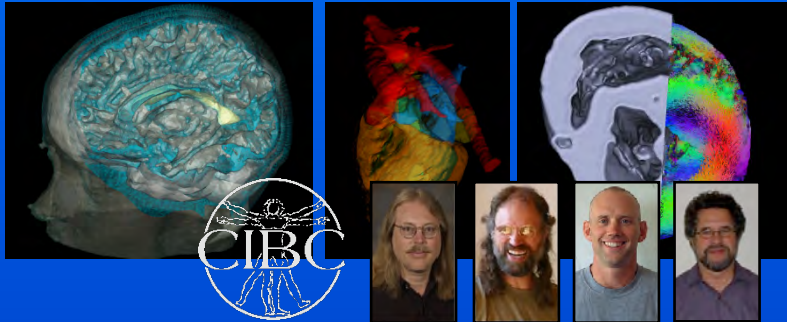
# Research Cores



# Research Centers We Direct



**NIH/NIGMS Center for Integrative  
Biomedical Computing**



**Center for Extreme Data Management,  
Analysis, and Visualization**



**Utah Center for Neuroimage Analysis**



**UTAH** Center for  
Computational Earth Sciences

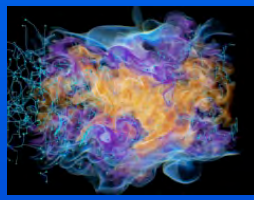
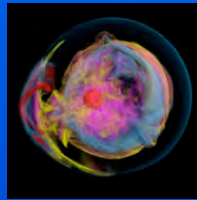


# Research Centers We are Affiliated With

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## SDAV

Scalable Data Management, Analysis  
and Visualization



NIH NAMIC



**IAMCS**  
Institute for Applied Mathematics  
and Computational Science

# SCI Institute - Utah Collaborations

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Architecture	School of Computing	Pharmaceutical Chemistry
Mechanical Engineering	Chemical Engineering	UCAIR Mathematics
Moran Eye Center		TCO CHPC
CVRTI		Neurology
Neurosurgery		ICSE
Bioinformatics		Cardiology
Genetics		Psychology
Nephology		Chemistry
Biology	Brain Institute	Nuclear Engineering EGI
Bioengineering	PCMC Cardiology	Radiation Oncology CTSA
Epidemiology	Radiology	Physiology



# Collaborators

- Lawrence Livermore National Laboratories
- Lawrence Berkeley National Laboratories
- Sandia National Laboratories
- Oak Ridge National Laboratory
- University of California San Francisco
- University of California Davis
- University of California Los Angeles
- Texas A&M University
- University of Texas Health Science Center at San Antonio
- North Eastern University
- University of Arizona
- University of Iowa
- Ohio State University
- University of North Carolina
- Louisiana State University
- Massachusetts Institute of Technology
- University of Texas Austin
- University of Washington
- Northwestern University
- University of Pittsburg
- Stanford University
- University of Oregon
- Imperial College London
- Harvard University
- Duke University
- Medical College of Wisconsin
- John's Hopkins University
- Children's Hospital Boston
- Mayo Clinic
- Cleveland Clinic
- Brigham & Womens Hospital
- Smithsonian Institute
- Kettering Cancer Center
- Kitware
- VisTrails.org
- crowdLabs
- National Resource for Cell Analysis and Modeling
- National Center for Microscopy and Imaging Research



- University of California San Diego
- National Biomedical Computation Resource
- Neuroimaging Informatics Tools and Resources Clearinghouse
- Center for Coastal Margin Observation & Prediction
- DataOne
- Electrical Geodesics Inc
- University of Tennessee
- University of Kentucky
- Yale University
- University of Chicago
- Indiana University
- Utah State University
- Brown University
- University of Southern California
- Princeton Plasma Physics Laboratory
- Science Applications International Corporation
- General Electric Research Labs
- SGI
- Mountain View Data
- Montana State University
- North Carolina State University
- Celera
- General Atomics
- Caltech Computer Science
- Rensselaer Polytechnic Institute
- Argonne National Lab
- Pacific Northwest National Laboratories
- Electrical Geodesics, Inc.
- University of Colorado
- Los Alamos National Laboratories
- Cornell University

# Personalized Medicine



Image & Data Acquisition

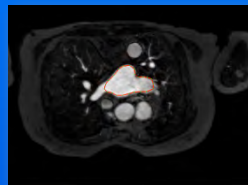


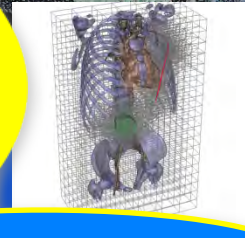
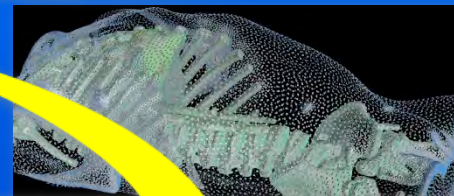
Image Processing



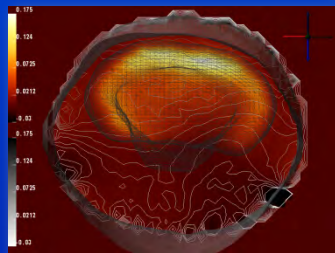
Lab/Clinic



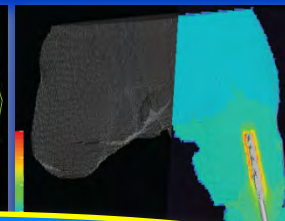
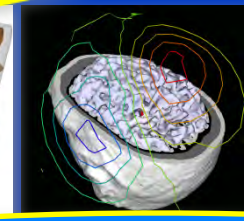
Integrated Software Tools



Geometry Processing



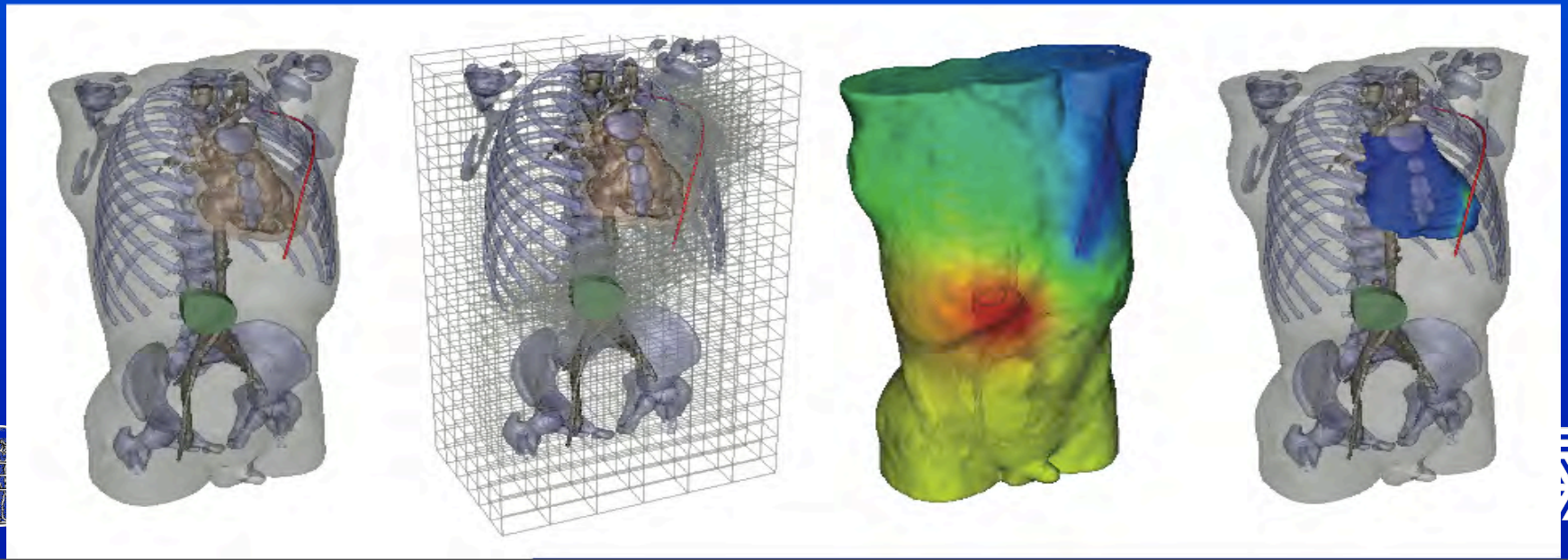
Visualization



Modeling, Simulation & Validation

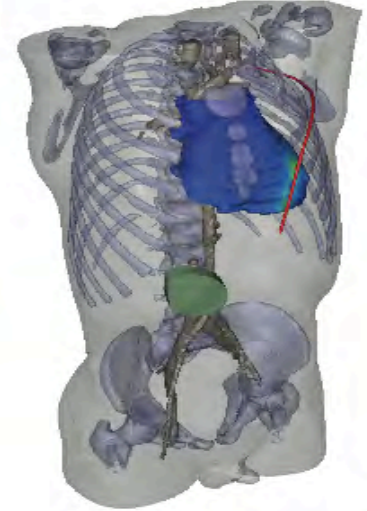
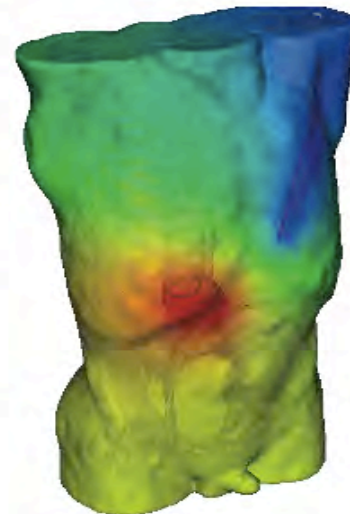
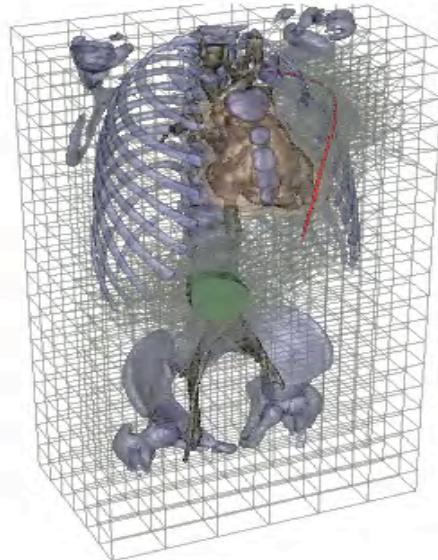
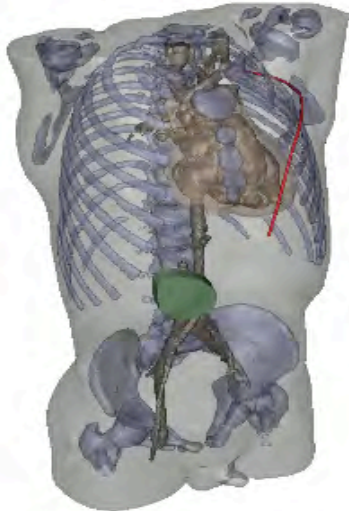
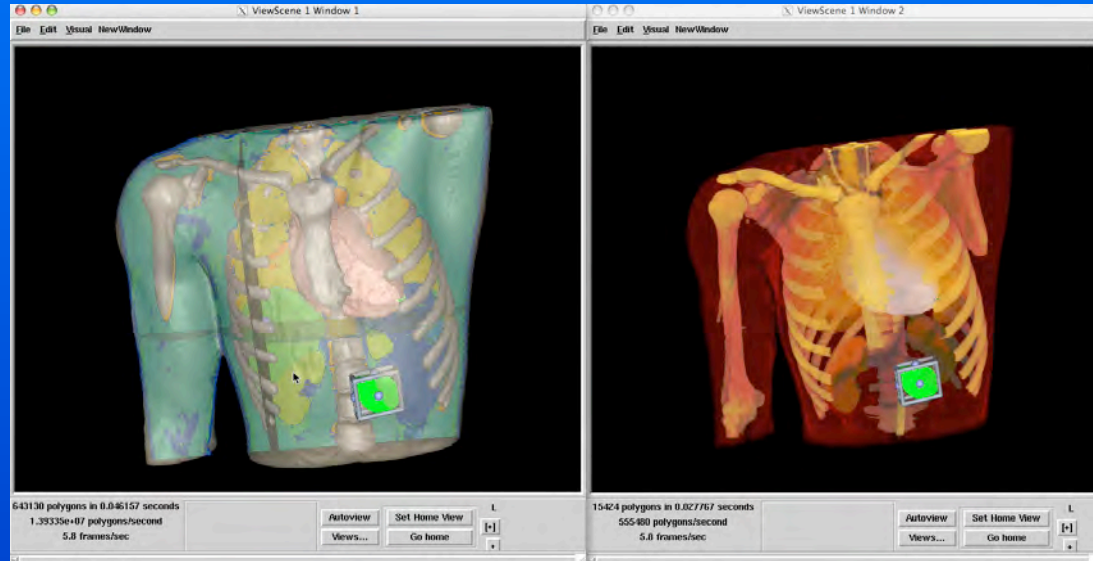
# Personalized Medicine: Cardiac Defibrillation

Image-Based Modeling, Simulation, and Visualization Pipeline

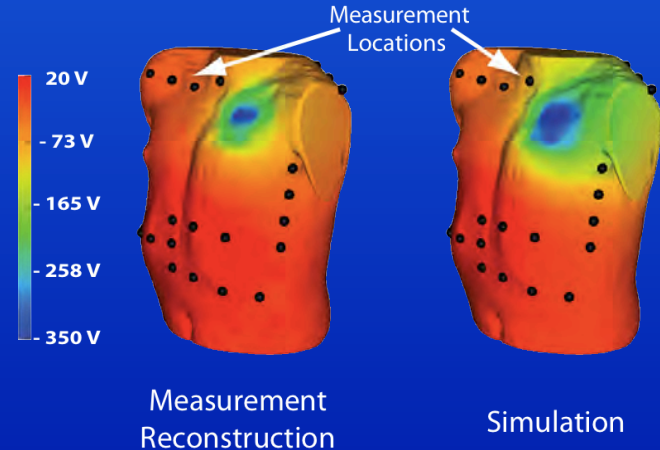
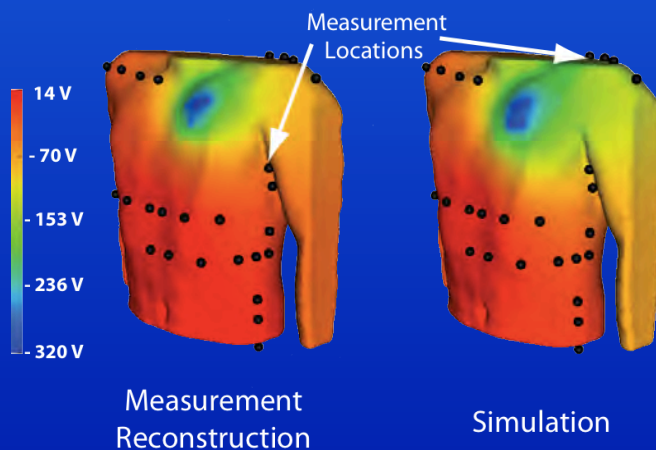
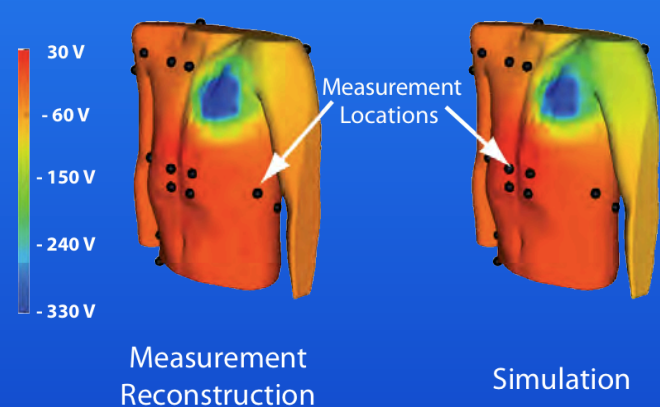
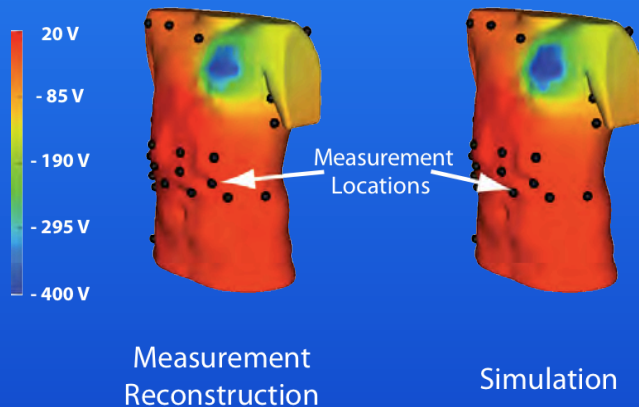
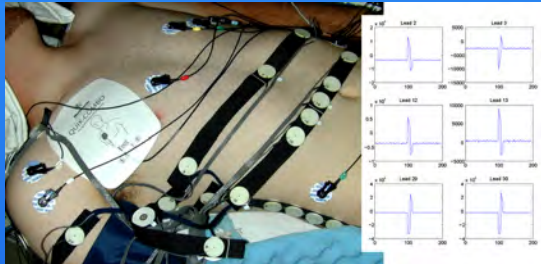


# Personalized Medicine: Cardiac Defibrillation

## Image-Based Modeling, Simulation, and Visualization Pipeline



# Defibrillation Simulation Results



# Mario Capecchi - Nobel Prize 2007

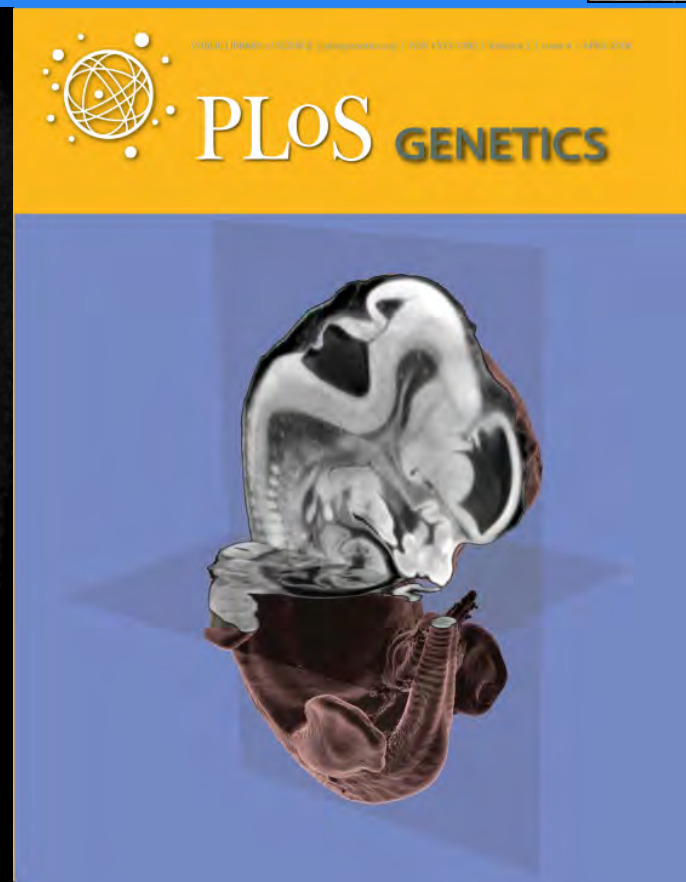
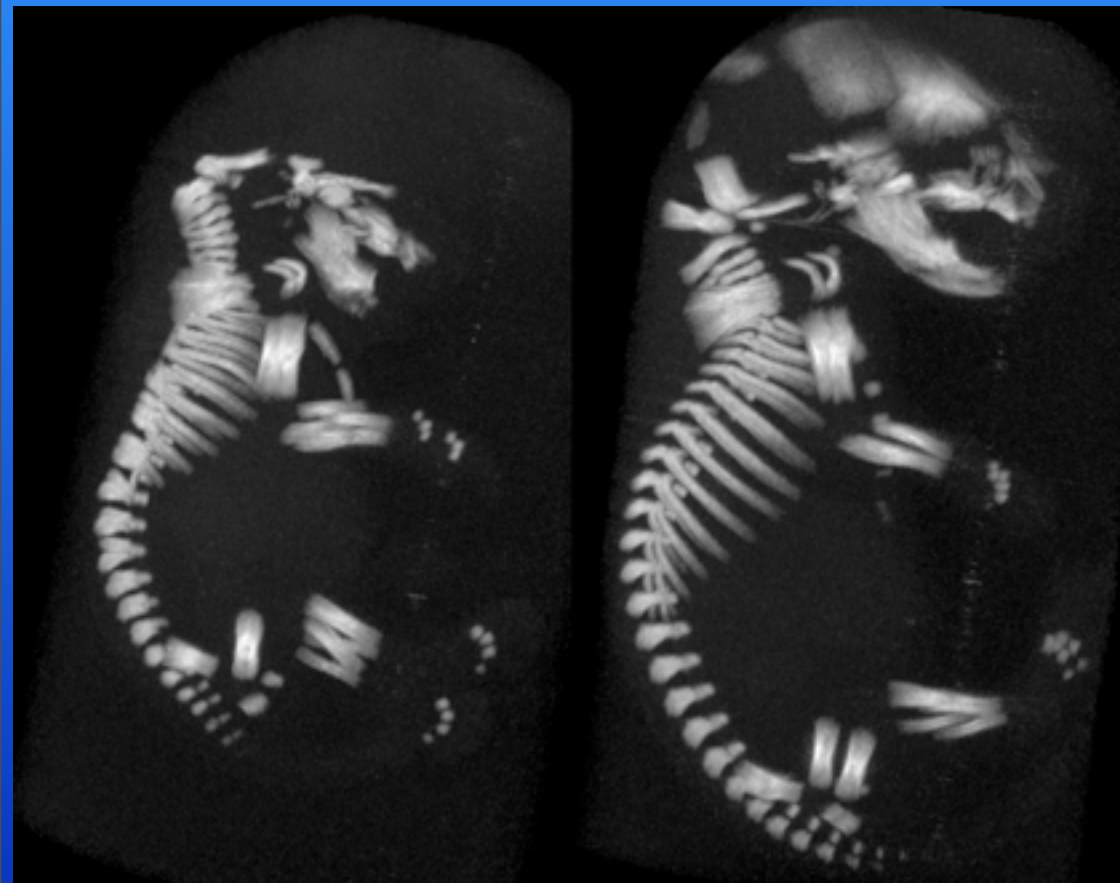


Mario R. Capecchi, Ph.D., distinguished professor of human genetics and biology at the University of Utah's Eccles Institute of Human Genetics has won the 2007 Nobel Prize in Physiology or Medicine.

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Scientific Computing and Imaging Institute, University of Utah

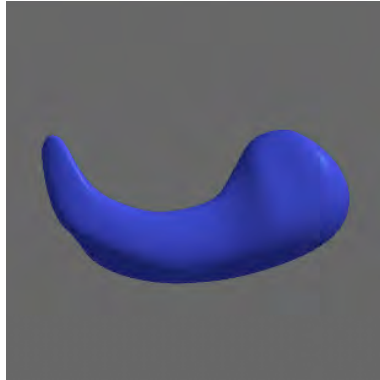
# Image-Based Phenotyping



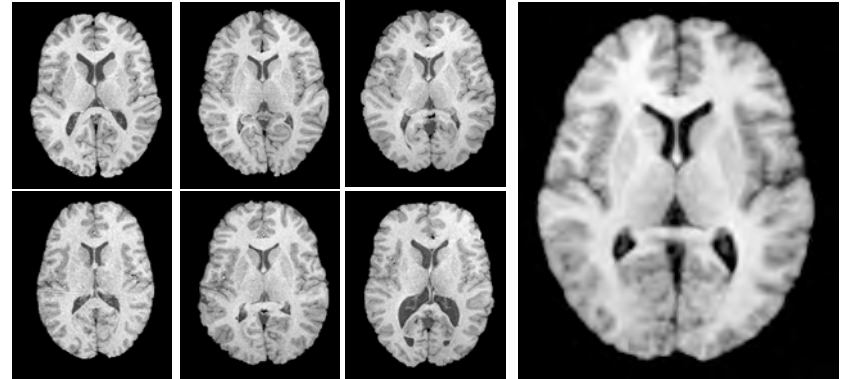
J.T. Johnson III, M.S. Hansen, I. Wu, L.J. Healy, C.R. Johnson, G.M. Jones, M.R. Capecchi, C. Keller.  
“Virtual Histology of Transgenic Mouse Embryos for High-Throughput Phenotyping,”  
In PLoS Genetics, Vol. 2, No. 1, pp. 471-477. April, 2006.



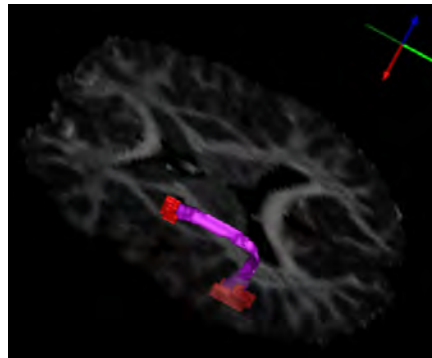
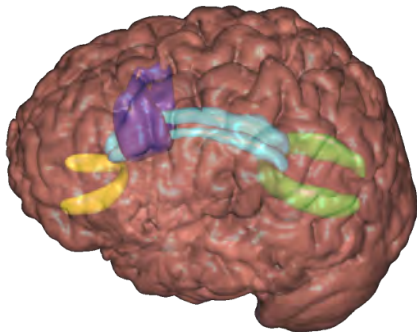
# Statistics of Shape, Connectivity, and Function



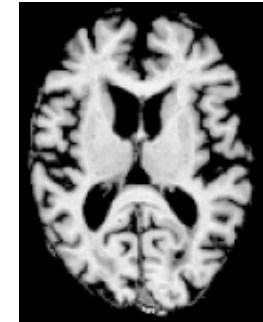
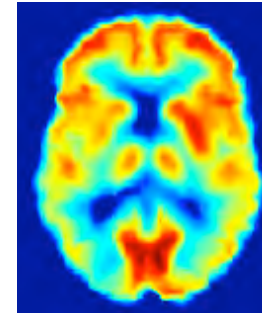
**Computational Statistics  
in Nonlinear Spaces**



**Anatomical shape averaging  
and variability**



**Diffusion Tensor Image Analysis  
Autism project**



**Combined PET + MRI analysis  
Alzheimer's disease project**

# Atrial Fibrillation Ablation

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Nassir Marrouche, M.D.  
Director, Comprehensive  
Arrhythmia Research and  
Management Center: CARMA



# Atrial Fibrillation Ablation

Nassir Marrouche, M.D.  
Director, Comprehensive  
Arrhythmia Research and  
Management Center: CARMA



# **Creating Successful Collaborations is Hard!**

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**Learning the application language(s)**

**Learning different working models**

**Learning different funding agencies and mechanisms**

**Issues of data, model, code ownership versus open source**

**Issues concerning joint publication**

**The role of software development**

# More Information

**[www.sci.utah.edu](http://www.sci.utah.edu)**

**[crj@sci.utah.edu](mailto:crj@sci.utah.edu)**