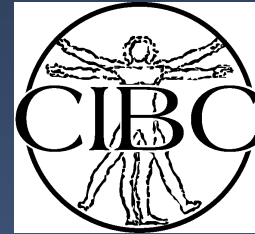


Introduction



# Introduction



## CIBC Workshop 2006



# Welcome! (also from Chris...)

Nora Eccles Harrison Cardiovascular Research and Training Institute

Introduction

Molecular



Cellular

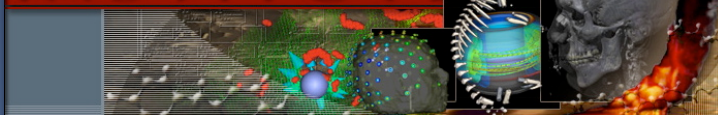


Whole Organ



SCIENTIFIC COMPUTING AND IMAGING  
INSTITUTE

SCI  
INSTITUTE



# Key Center Personnel

Introduction

## PI's

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

## Technical Management

- Jeroen Stinstra
- Dave Weinstein

## Administrative Team

- Deb Zemek
- Greg Jones



# Key Center Personnel

Introduction

## Staff Scientists/PostDocs

- Jeroen Stinstra
- Allen Sanderson
- Jens Krüger

## Software Engineering

- Jeroen Stinstra
- Ayla Hlan

## Developers

- Jeroen Stinstra
- Ayla Khan
- Tom Fogal

## Students

- Josh Blauer (Afib Imaging)
- Darrell Swenson (Meshing/Ischemia)
- Dafang Wang (Inverse problems)
- Josh Cates (Shape statistics)
- Fangxiang Jiao (Brain modeling)

## Media Team

- Erik Jorgensen
- Chems Touati
- Nathan Galli



# NCRR and P41's

The screenshot displays the NCRR website interface. At the top, there is a search bar and navigation links. The main content area features a sidebar with 'Quick Links' and a central section for the 'Center for Integrative Biomedical Computing'. This section includes contact information for the center, a list of research emphasis areas, current research projects, resource capabilities, and a software section. A 'Biomedical Technology Links' sidebar is also visible on the right.

**National Center for**

SEARCH NCRR: [input]

Quick Links

Center for Integrative Biomedical Computing

ON THIS PAGE: Research Emphasis • Resource Capabilities • Publications

SEE ALSO: Imaging Technology • Informatics Resources • Optical and Laser Technology • Technology for Structural Biology • Technology for Systems Biology • Program Information

**Biomedical Technology Links**

- Staff Contacts
- Program Areas
- Resource Directory
- Funding Opportunities
- Application Guidelines

**Center for Integrative Biomedical Computing**

University of Utah  
50 South Central Campus Drive, Room 3490  
Salt Lake City, UT 84112-9205  
[www.sci.utah.edu/cibc](http://www.sci.utah.edu/cibc)

Principal Investigator: Chris R. Johnson, Ph.D.  
801-585-7706 • Fax: 801-585-6513

Additional Contact: Raelynn Potts  
801-585-5883 • Fax: 801-585-6513  
E-mail: [rpotts@sci.utah.edu](mailto:rpotts@sci.utah.edu)

Grant No. P41 RR012553

**Research Emphasis**

The overall goal of the Center for Integrative Biomedical Computing (CIBC) is to develop integrated problem-solving environments that make advanced computational tools available to biomedical scientists. The specific core areas of interest are image processing and geometric modeling, simulation, and visualization. The center also pursues advanced research in technical and biophysical approaches to electrophysiology and bioelectric field problems in cardiology and neurology.

**Current Research**

The focus of research within the CIBC is to develop new approaches to solving problems in image processing; visualization of scalar, vector, and tensor fields; and simulation of electrophysiology and bioelectric fields from the heart and brain.

**Resource Capabilities**

**Methods**

The resource methods are organized by cores, with one core dedicated to each of image processing and geometric modeling, simulations, visualization, and integrated software environments. Within each core, several computational methods either have been implemented or are in the process of being developed.

**Instruments**

None. The center provides software to the biomedical research community.

**Software**

The main focus of the center is the research and development of state-of-the-art software for image processing and geometric modeling, simulation, and visualization, including not just individual tools but also integrative problem-solving environments. The target domains for this software are a variety of biomedical research areas that span a wide range of scales, from subcellular to whole organisms. Specific applications include bioelectric fields, genetics, and feature characterization from medical images. Specific software tools, organized by core areas, include the following:

SCI INSTITUTE

CIBC

## CIBC

### Introduction

## Center for Integrated Biomedical Computation

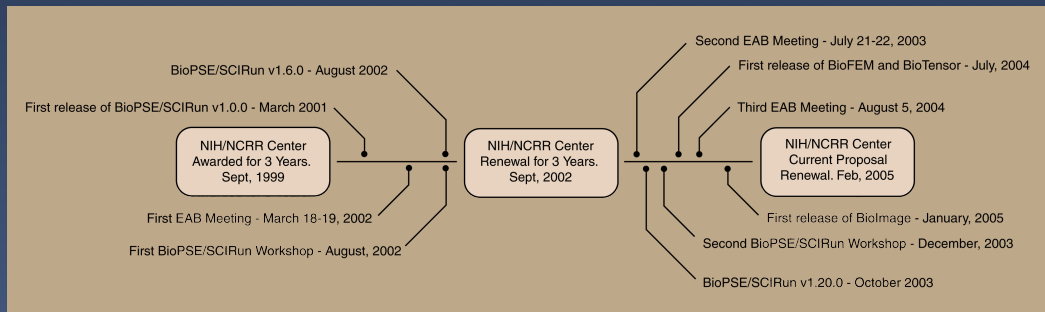
### Goals

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



# History of the Utah NCRR P41

## Introduction



Software development

Applications focus on bioelectric fields

Driven by collaborations

Renewal submission: May, 2009



# CIBC Organization

## Introduction

### Technical Cores

- Image processing and geometric modeling
- Mathematical modeling and simulation
- Visualization
- **Biomedical Problem Solving Environment: BioPSE**





# CIBC Software Goals

Introduction

## Extend SCIRun/BioPSE

- More functionality
- More portability
- More modularity

## Build bridges

- To libraries
- To programs
- To data sources

## Support Collaborations

- Dedicated solutions leading to
- Generalized application programs



# Collaborations

Introduction

## Essential to a P41

- Ensure relevance
- Provide motivation, guidance and feedback
- Metric for success (and renewal)

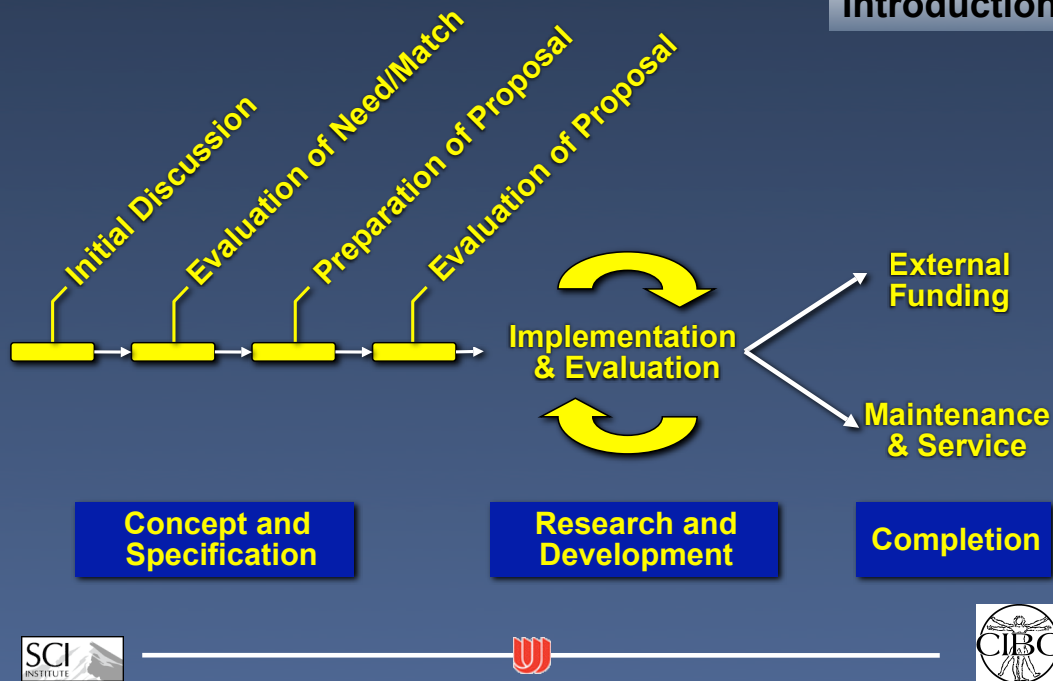
## Challenge a P41

- Cannot receive funding
- Must remain motivated
- Must amplify impact of the Center



# Collaboration Lifecycle

Introduction



# Collaboration Management

Introduction

## Create collaboration hierarchy

- Primary and secondary

## Link to cores

- Identify common needs across collaborations
- Match software to users (functionality, interface, platform)

## Communicate

- Identify key people
- Create PI-led collaboration teams
- Establish regular meetings/visits

# Current Primary Collaborators

## 1) Mouse skeleton phenotyping and small-animal image reconstruction

- **Mario Capecchi laboratory, UofU**
  - Charles Keller, CCRI, UTHSCSA

## 2) Microscopy Image Analysis and Visualization

- NCMIR project, UCSD

## 3) Multiscale electrophysiological modeling

- Craig Henriquez laboratory, Duke

## 4) Epilepsy Detection: Combined EEG, Source Localization and MR Imaging

- Scott Makeig (UCSD), Greg Worrell (Mayo Clinic)
- Simon Warfield (Harvard)

## 5) CT imaging of brain vessels in mice children

- **Charles Keller, CCRI, UTHSCSA**, Children's Hospital Boston



# Secondary Collaborators

## Introduction

### Bioelectric Fields

- David Isaacson (RPI)
- Dirar Khoury (Baylor)
- Cameron MacIntyre (Cleveland Clinic)
- Bruno Taccardi (UofU)
- Simon Warfield (SPL/Brigham and Womens)

### Image-based Anatomy

- John Bridge (UofU)
- George Chen (MGH)
- Robert Marc (UofU)
- Vasilis Ntziachristos (MGH)
- Stephen Wong (SPL)
- Chi-Bin Chein (UofU)
- Paul Thompson (UCLA)



# Secondary Collaborators

Introduction

## Multiscale Tissue Modeling

- Alonso Moreno (UofU)
- Chuck DiMarzio (NEU)

## Technical Exchange

- Mark Ellisman (UCSD)
- Ron Kikinis (SPL)
- Les Loew (UCHC)
- CF Westin (SPL)
- Carsten Wolters (Münster)
- Al Johnson (Duke)
- Andrew McColloch (UCSD)



# Software from the Center

Introduction

**SCIRun**  
SCIRun is a Problem Solving Environment (PSE), for simulation, modeling, and visualization of

**Seg3D**  
Seg3D is an open source interactive segmentation tool that mixes powerful ITK

**map3d**  
map3d is a scientific visualization application written to display and edit complex, three-dimensional geometric models and scalar, time-based data associated with those models.

**Teem**  
Teem is a collection of libraries written by Gordon

**ImageVis3D**  
*Beta 0.02*





# Purpose of the Workshop

Introduction

Describe our software

Use our software

Improve our software

Develop relationships



Introduction

# Workshop Logistics



# Schedule Today

Introduction

## Workshop outline:

### Thursday 4 December (Seg3D/ImageVis3D workshop):

8:30 - 9:00	Breakfast
9:00 - 9:30	<b>Welcome to SCI</b> (Rob MacLeod)
9:30 - 10:10	<b>Strategies for Effective Segmentation</b> (Ross Whitaker)
10:10 - 10:45	<b>Segmentation using Seg3D</b> (Josh Blauer)
10:45 - 11:05	- Break -
11:05 - 12:00	<b>Lab1: Seg3D Tutorial</b> (Jeroen Stinstra, Josh Blauer, Allen Sanderson)
12:00 - 12:30	<b>Case Study: Development of an Electrical Stimulation Device for Osseointegrated Amputee</b> (Brad Isaacson)
12:30 - 1:30	- Lunch Break -
1:30 - 2:30	<b>ImageVis3D and Scientific Visualization</b> (Jens Kruger)
2:30 - 3:00	- Break -
3:00 - 4:00	<b>Lab2: ImageVis3D Tutorial</b> (Jens Kruger, Tom Fogal)
4:00 - 4:30	<b>Demo: map3d</b> (Rob MacLeod)
4:30 - 4:50	<b>Installing/Downloading SCI Software</b> (Ayla Khan)
4:50 - 5:00	<b>Requests for additional topics on Friday</b> (Jeroen Stinstra)
7:00	Dinner



# Schedule Tomorrow

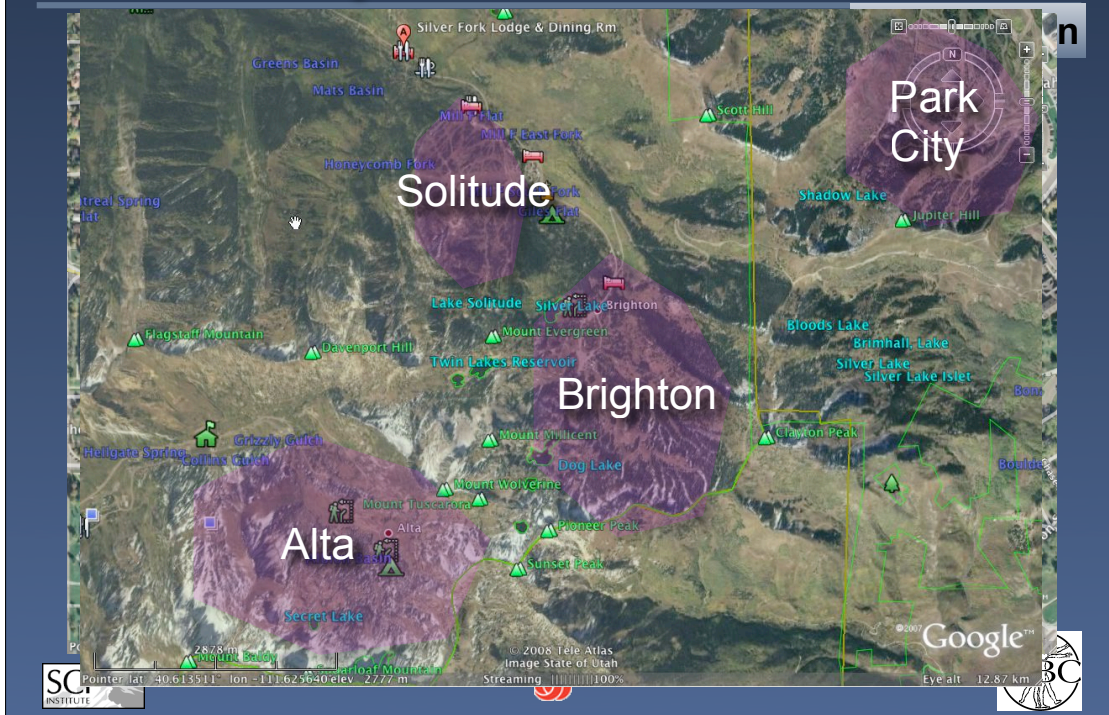
Introduction

## Friday 5 December (SCIRun workshop):

8:30 - 9:00	Breakfast
9:00 - 9:30	<b>General introduction into SCIRun and Scientific Computing Part 1</b> (Dave Weinstein)
10:00 - 10:30	- Break -
10:30 - 11:00	<b>General introduction into SCIRun and Scientific Computing Part 2</b> (Dave Weinstein)
11:00 - 12:00	<b>Lab3: SCIRun Basics Visualization</b> (Ayla Khan, Dave Weinstein, Jeroen Stinstra, Tom Fogal, Allen Sanderson)
12:00 - 1:00	- Lunch Break -
1:00 - 1:40	<b>Case study: Current challenges in Pediatric Defibrillation</b> (Matt Jolley)
1:40 - 2:10	<b>Introduction into Meshing and Simulation using SCIRun</b> (Jeroen Stinstra)
2:10 - 2:30	- Break -
2:30 - 4:00	<b>Lab4: SCIRun Simulation</b> (Jeroen Stinstra, Ayla Khan, Darrell Swenson, Tom Fogal, Allen Sanderson)
4:00 - 5:00	<b>Additional topics</b> (by request)



# Workshop Dinner Plans



# Silver Fork Lodge

## Introduction





# Dinner Transportation

Introduction

From SCI

- 6:15 pm

From Guesthouse??

Return from Silverfork

- 9:00

- to Guesthouse and SCI



# Memo (to self)

Introduction

Please turn cell  
phones/pagers on  
vibrate





# Schedule Today

Introduction

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