



Advanced Cyberinfrastructure to enable Multi-scale and Multi-site Brain Research

Mark Ellisman

*Professor of Neurosciences and Bioengineering,
University of California San Diego,
and Director of the Center for Research in Biological Systems*



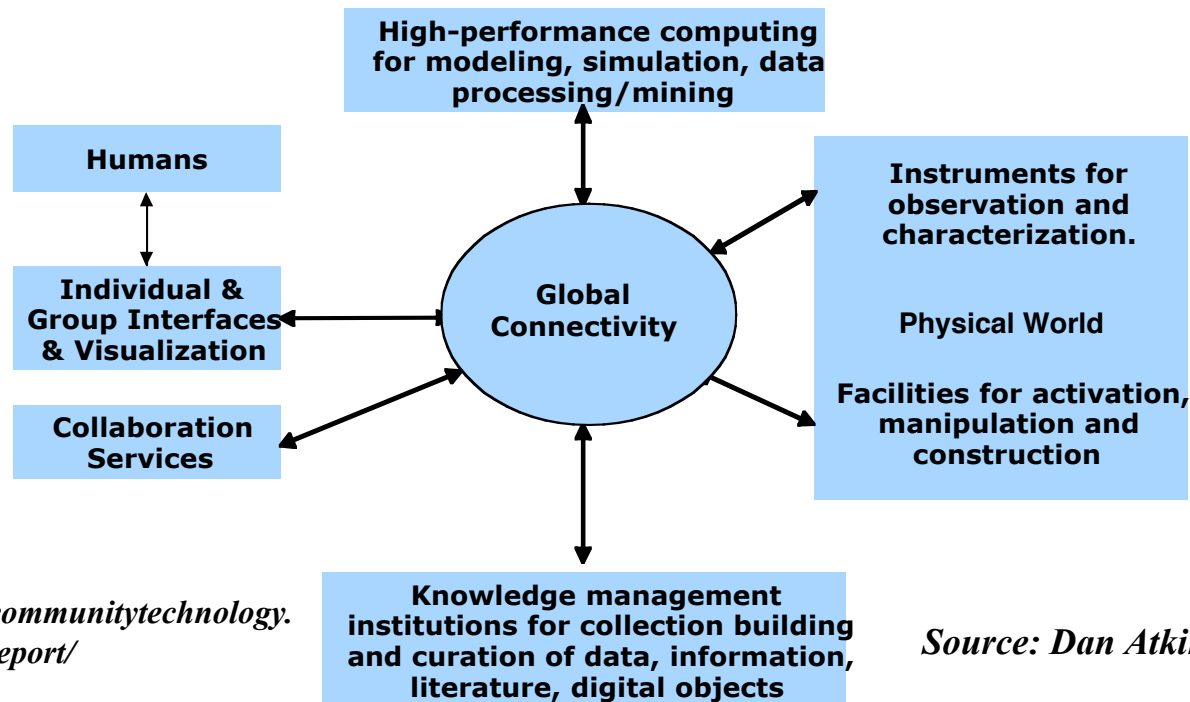
“CYBERINFRASTRUCTURE”

What is a Grid? What do we mean?

- **GRID technologies bring remote resources together**

A broad, systemic, strategic conceptualization

Components of Cyberinfrastructure
(Grid)-enabled science & engineering



http://www.communitytechnology.org/nsf_ci_report/

Source: Dan Atkins

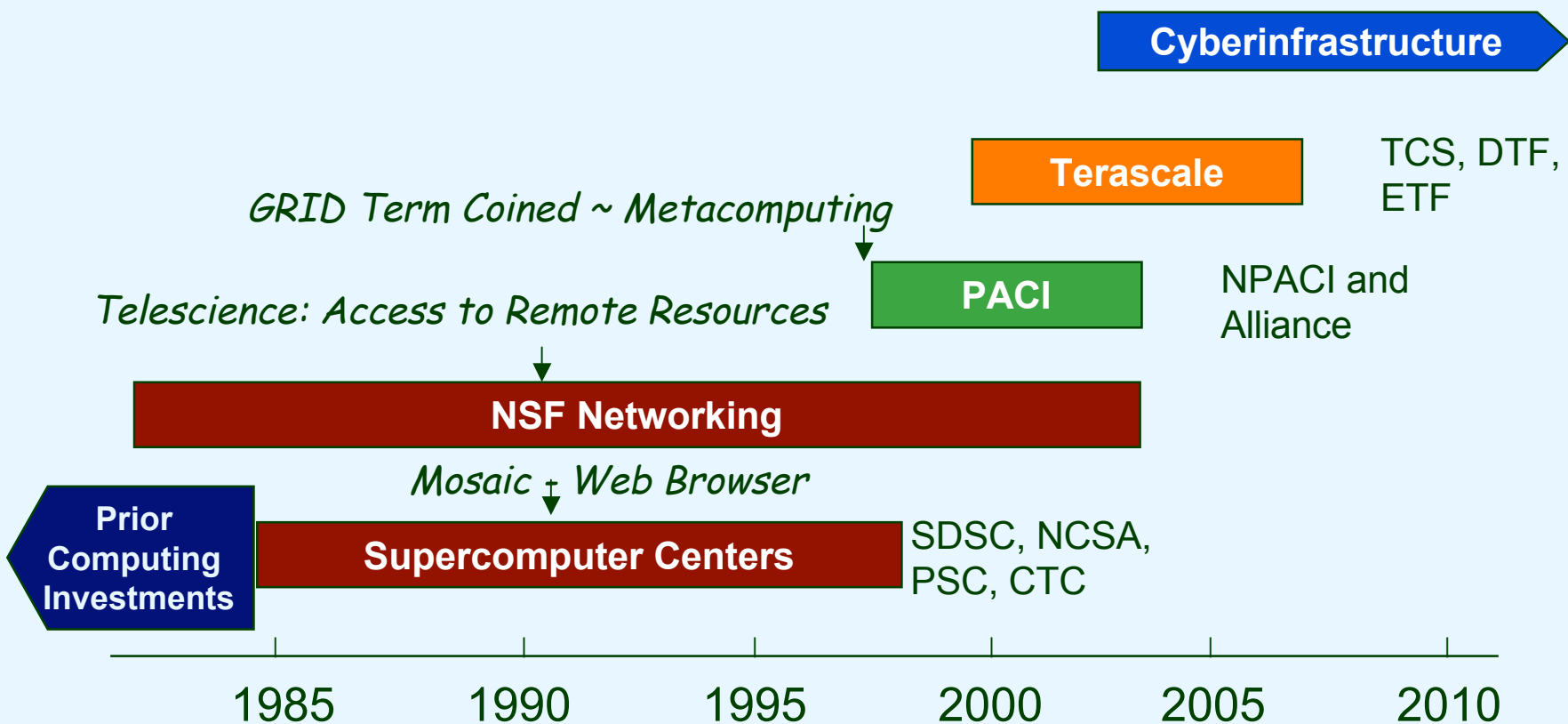
Grid implies global (international) system for collaboration



Evolution of the Computational Infrastructure

Investments in the US Source: Dr. Deborah Crawford

Chair, NSF CyberInfrastructure Working Group (CIWG)

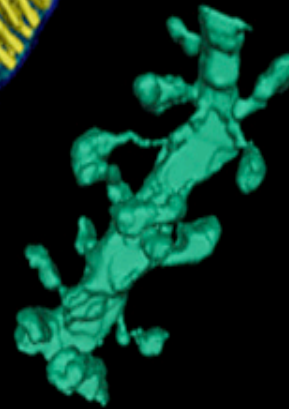
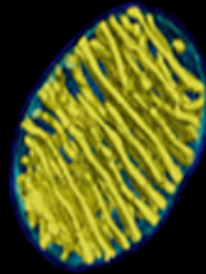
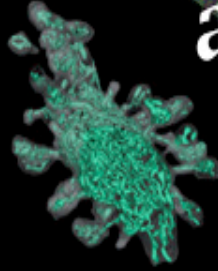
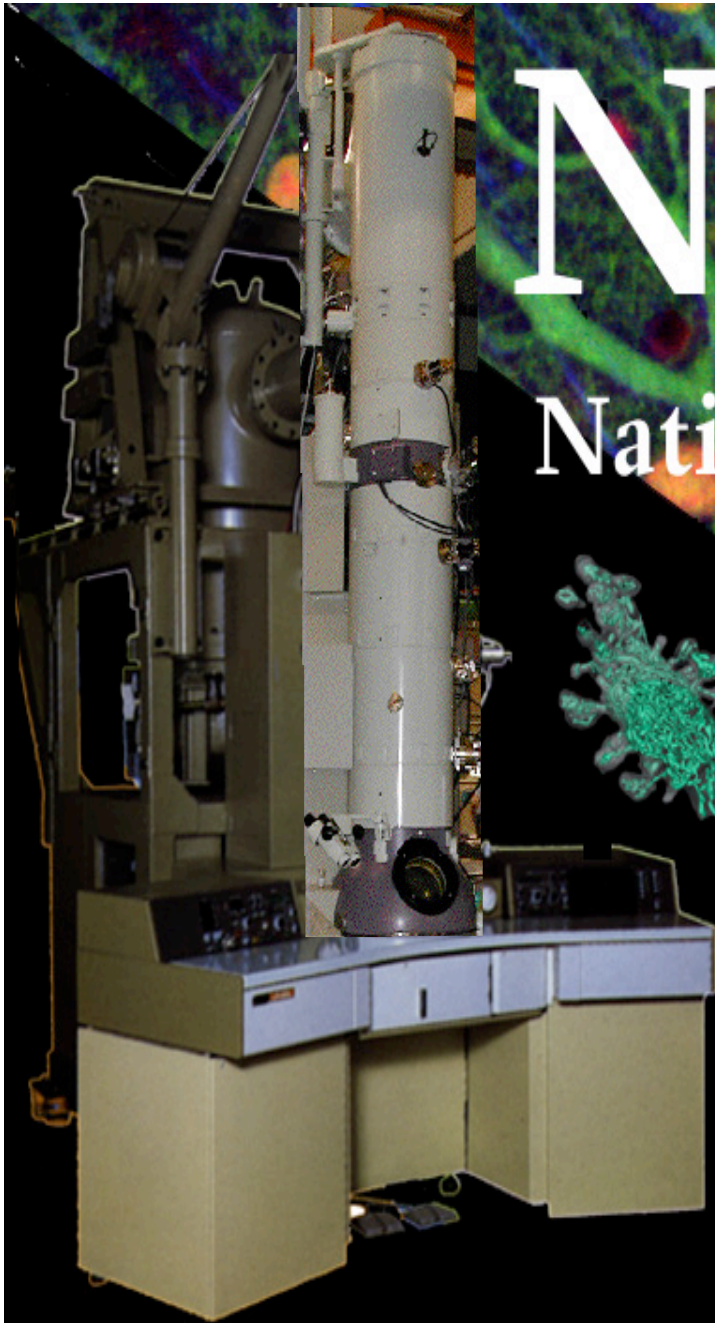


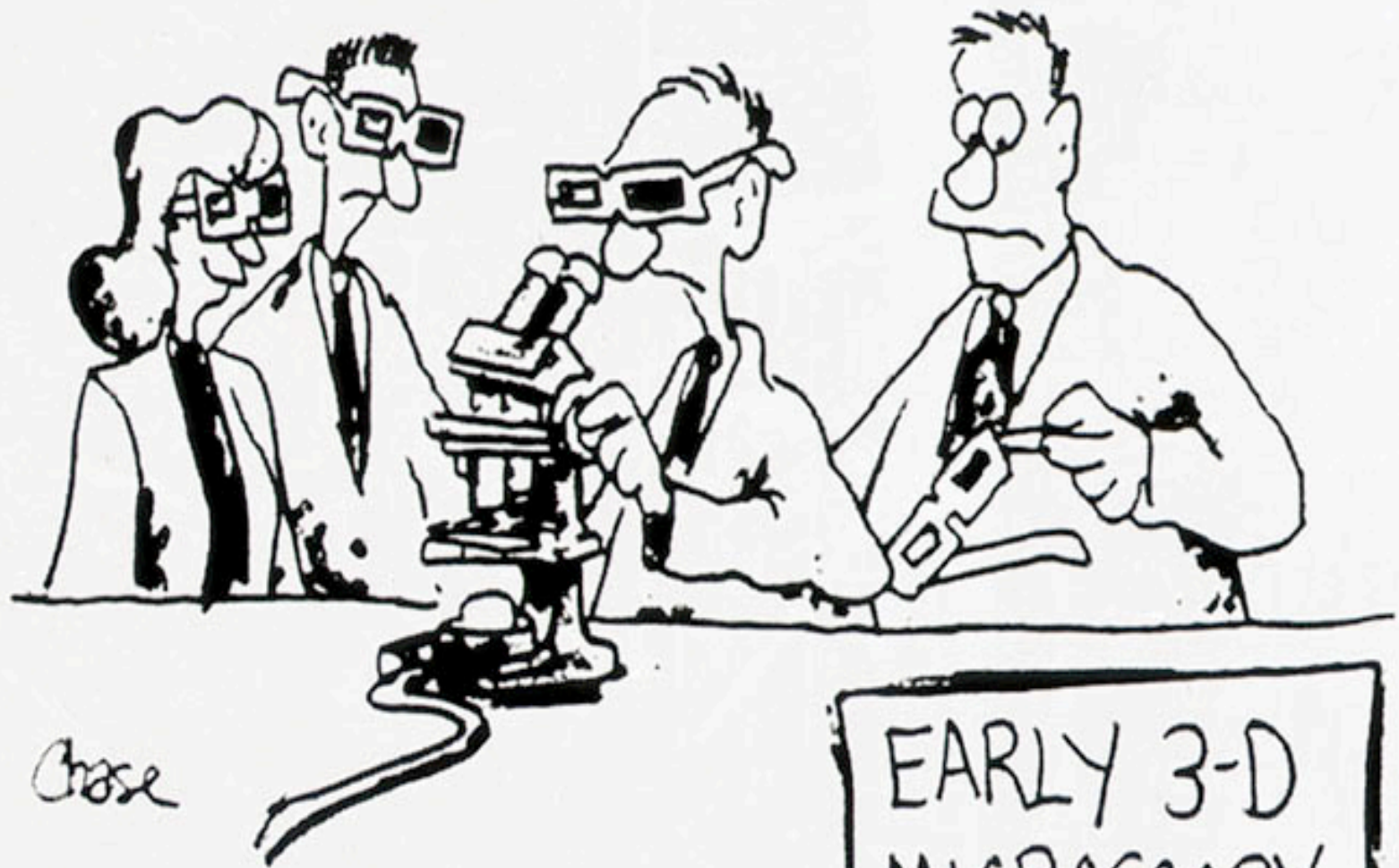
A timeline from the Computational Infrastructure Division of the US National Science Foundation

N C M I R

National Center for Microscopy
and Imaging Research

An NIH sponsored Research Resource





Chase

EARLY 3-D
MICROSCOPY

Ultra High Voltage EM @ Korea Basic Sciences Inst..

- 1.25 Million Electron Volts

High Energy Electron MICROSCOPY

JAPAN

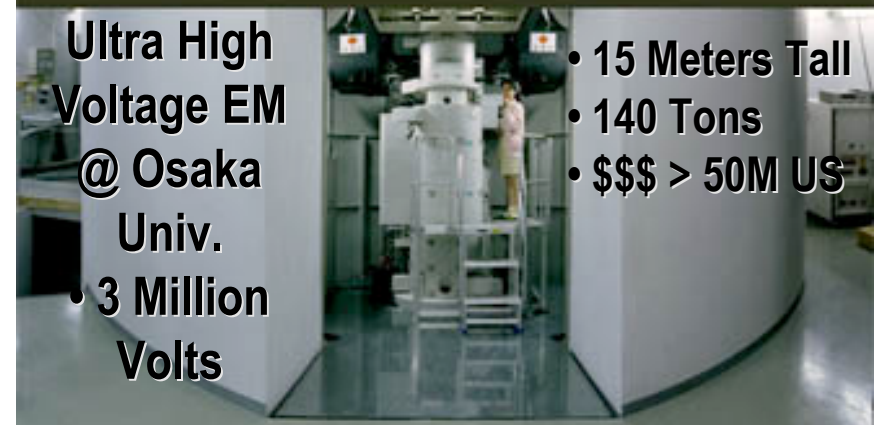


KOREA



Ultra High Voltage EM @ Osaka Univ.
• 3 Million Volts

- 15 Meters Tall
- 140 Tons
- \$\$\$ > 50M US



TELEMICROSCOPY & CYBERINFRASTRUCTURE

REMOTE ACCESS FOR DATA ACQUISITION, GRID COMPUTING AND DISTRIBUTED DATABASES



Server Software

Instrument Interface

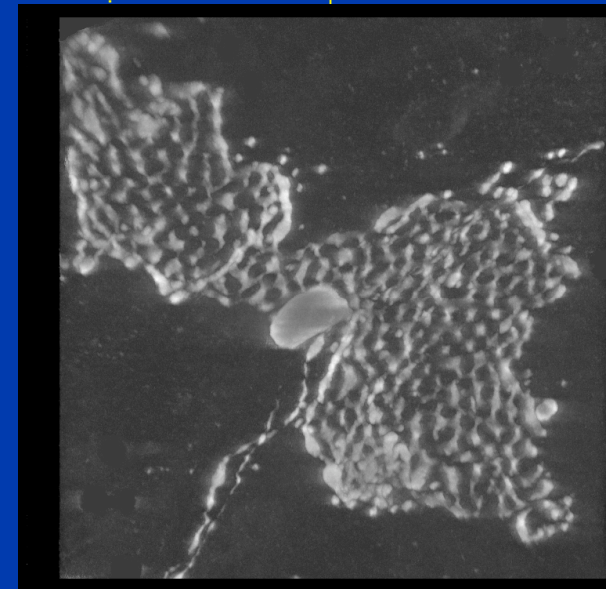
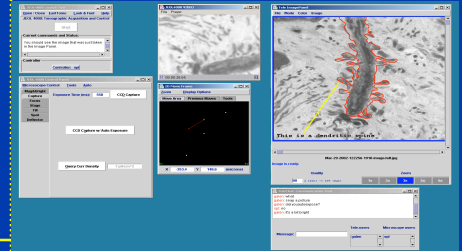
Session Manager Service

Grid Services

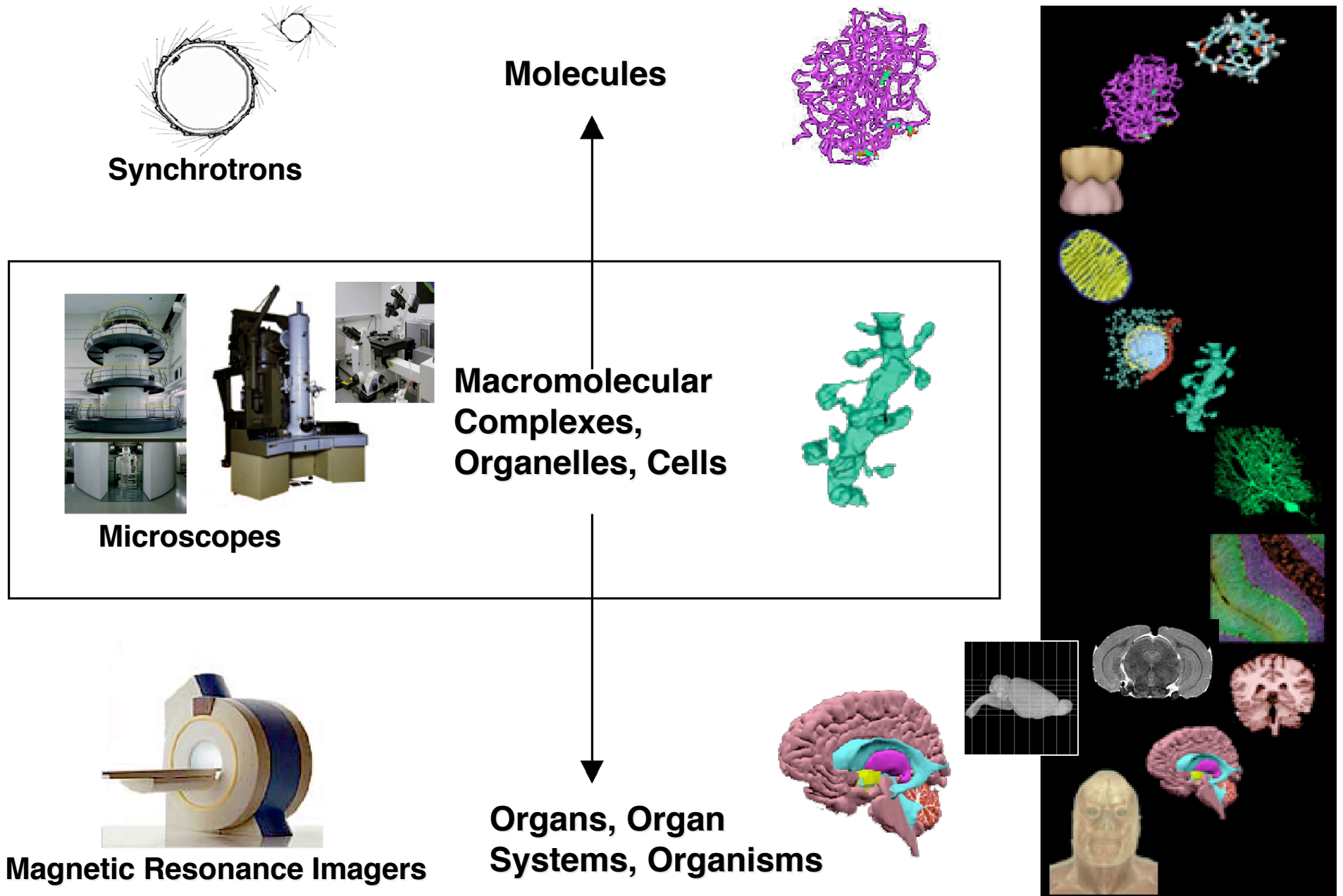
Data Storage

Computation

Web Browser



Synchrotrons, Microscopes and MRI's: Tools for the Nano, "Meso" and Macro Scales of Biological Systems



The Login Page: The Entrance into the Portal

Single login grants authenticated access to all applications, resources, and services

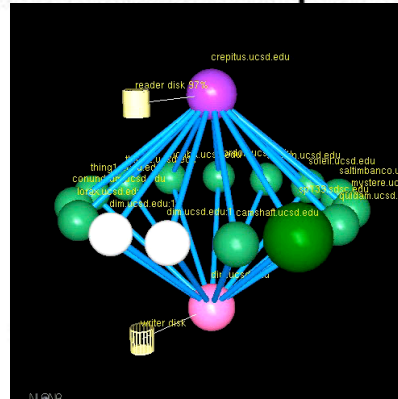
telescience

for advanced tomography applications

Remotely Control Instruments



Distributed Grid Computation



Distribute Data to Storage Resources



Username

Password

Login

[What is Telescience?](#)

[Learn more about the Telescience Portal](#)

[Need a Telescience Account?](#)



Telescience/ BIRN Portal Technology used as SARS Portal for Taiwan

Emergency Response:
Created and functional
in less than 24 hours

Mozilla

File Edit View Go Bookmarks Tools Window Help

https://donor.ucsd.edu/SarsGrid/cgi-bin/srb/Browser/browse.cgi

Home Bookmarks Google

https://donor.ucsd...Browser/browse.cgi

SARS GRID

home | SRB browser | NCHC | help

Hello abel_dev

Menu Action will be performed on Current Collection
Return to [Main Menu](#)

Current Location: /home/abel_dev.portal GO			
Recently Visited Locations: /home/abel_dev.portal GO Clear List			
Upload File(s) from Desktop	Download File(s) to Desktop	Set (Recursively) / View Permissions	Browse Im...
Create Sub-Collection	Rename File(s)/Folder(s)	-	Meta-Data
Full Listing	Delete File(s)/Folder(s)	-	Application

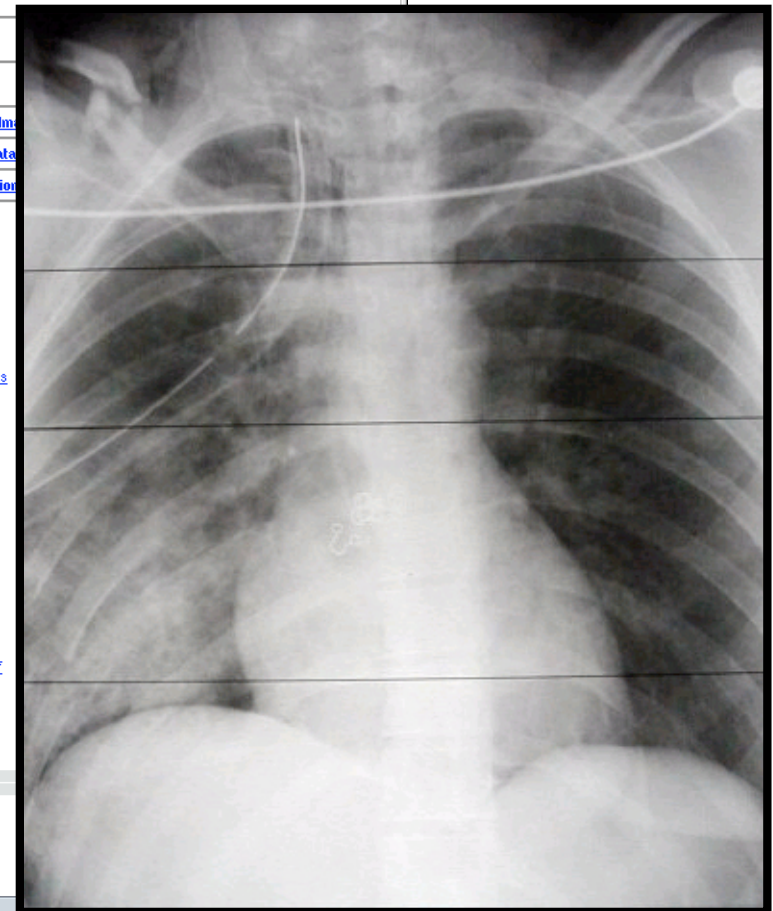
Sub Folders:
- Click on Name to change to that Folder

- [DataCutter](#)
- [TP_r1047](#)
- [TP_r796](#)
- [TP_r798](#)
- [TP_r816](#)
- [archives](#)
- [data](#)
- [documents](#)
- [osaka.tif](#)
- [portal_backups](#)
- [shared_stuff](#)
- [srb](#)
- [test1](#)

Files in Current Folder:
- Click on Image Icon to View Image
- Click on Filename to Download file to Local Desktop

- [oka4.trace](#)
- [osaka3_sub7.jpg](#)
- [subject061.dcm](#)
- [tacoma.tif](#)
- [tacoma2.rgb](#)

Document: Done (8.016 secs)




GridSphere Portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://cleek.ucsd.edu:8080/gridsphere/gridsphere?cid=telescience&JavaScript=enabled

Firefox Help Firefox Support Plug-in FAQ Telescience Portal: L... Telescience Portal NCMIR Intranet UCFY : Login UC University of Califor... RT Ticket submission



Environmental Health Science Data Resource Portal

About the Site Pre Formatted Maps Aerial Imagery and GIS Data Layers Restricted Data

Site Browser

- NIEHS Natural Disaster Response
- About the GIS Site
- Pre-Formatted Maps
- Aerial Imagery and GIS Data Layers
- Restricted Data

Hurricanes Katrina and Rita

NIEHS Katrina/Rita Response Portal

This GIS site is intended to provide tools and information for those who are addressing the consequences of natural disasters such as Hurricanes Katrina and Rita by supporting the decision-making process related to:

- ◆ Identifying sources and routes of contaminants
- ◆ Evaluating the potential for future exposures
- ◆ Assessing human exposures that occurred in the immediate aftermath of the hurricanes
- ◆ Assessing the immediate and longer term health impacts associated with these exposures

This site contains pre-formatted or ready-made maps of potential sources of environmental contaminants in the hurricane-affected areas.

It also contains aerial photography images of the areas affected by Hurricane Katrina and we are compiling aerial images associated with Hurricane Rita. We are also working to provide a functional set of GIS data layers that will allow users to construct maps tailored to individual needs.

We will continually update this site as we obtain and process additional information to meet challenges that arise as recovery proceeds.

Send GIS-related comments and questions: hurricanegis@niehs.nih.gov

NIEHS Home • Accessibility • Disclaimers • Privacy

U.S. Department of Health & Human Services National Institutes of Health NIEHS National Institute of Environmental Health Sciences FIRSTGOV TS telescience powered

Done

Integrated GIS Browser: View High Resolution Satellite Data, part 1

Integrated
Browser to scan
integrated
satellite imagery

The screenshot displays the GridSphere Portal interface in Mozilla Firefox. The browser window title is "GridSphere Portal - Mozilla Firefox". The address bar shows the URL: http://deek.ucsd.edu:8080/gridsphere/gridsphere?gs_action=update&91z_step=3&up=91z&91z_app_name=mapview&cid=workflowdiagram&JavaScript=enablec. The page content includes a sidebar with "Image Controls" (TileDisplay, Remote TileDisplay (LambdaCam), Pre-Formatted Maps, ImageJ Viewer, Aerial Imagery and GIS Data Layers) and a main "Image Workspace" area. The workspace contains a "GIS Browser" section with introductory text and a list of actions: "As we are building this site, try the National Operational Prototype Evaluation GIS Browser for more dynamic control of the various GIS layers". Below this, it lists actions for authenticated users: "browse additional GIS layers" and "selected images to display on any of the various Situation Room TileDisplays". A paragraph explains that the map shows high-resolution aerial photography of the Hurricane Katrina impacted area. A green checkmark icon is followed by the text "Place Image on to Tile Display". The main map area is titled "Hurricane Katrina" and shows a map of the Gulf of Mexico and surrounding land with a purple and orange path indicating the hurricane's trajectory. To the right of the map is a navigation panel with a "Refresh/Query" button, a "Zoom In" radio button (selected), "Pan" and "Zoom Out" radio buttons, and a "Zoom Size" input field. A "contact webmaster" link is also present.

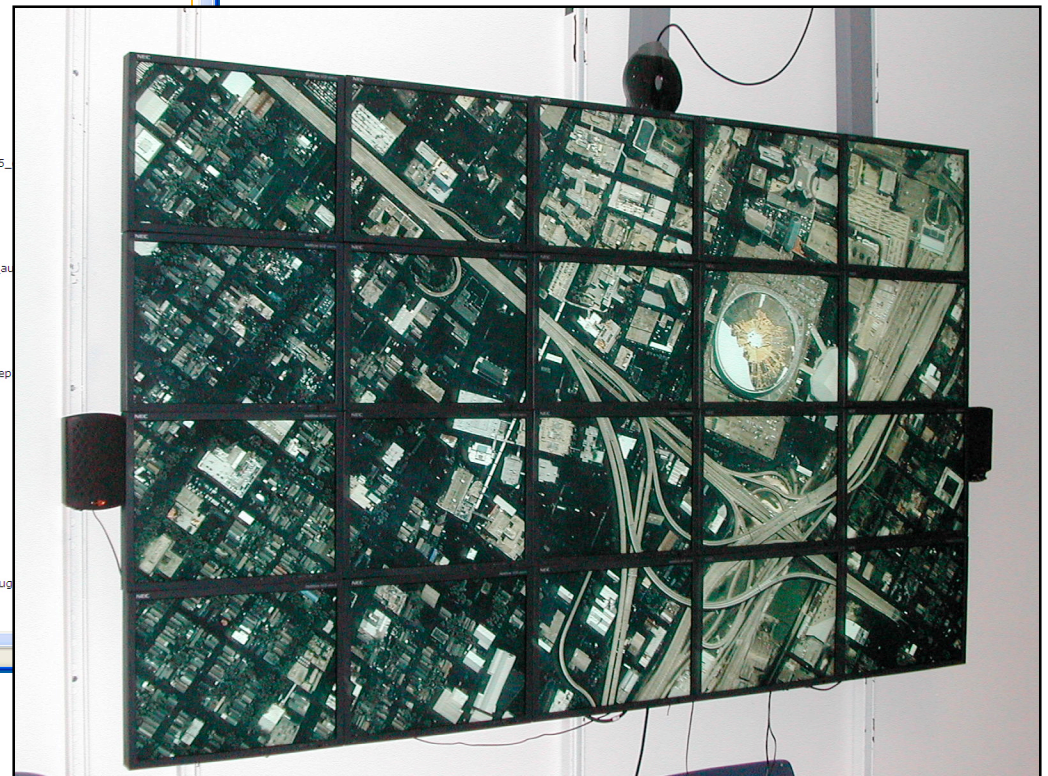
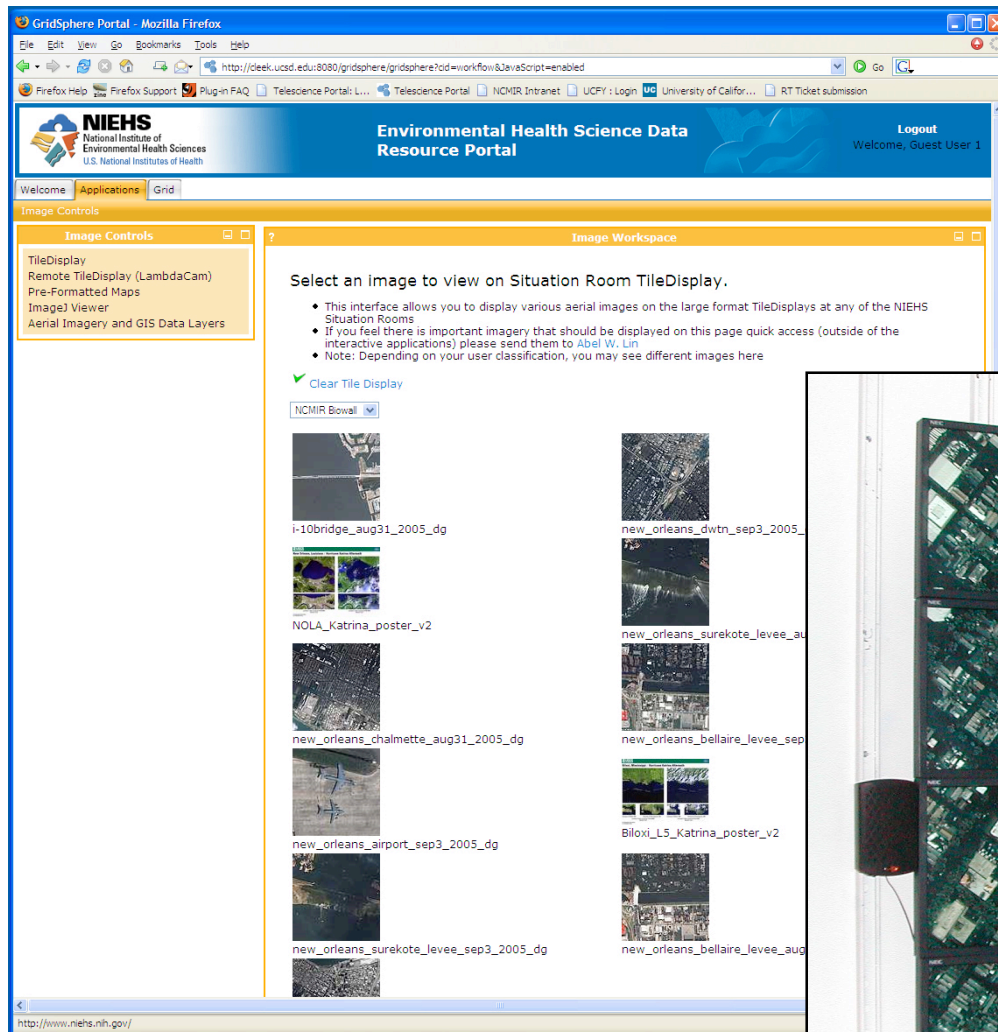
Integrated GIS Browser: View High Resolution Satellite Data, part 2

The screenshot shows a web browser window titled "GridSphere Portal - Mozilla Firefox". The address bar contains a URL: http://deek.ucsd.edu/gridsphere/gridsphere?img_x=429&img_y=364&zoomdir=1&zoomsize=4&imgxy=399.5+299.5&imgext=-90.124531+30.020281+-90.1. The page header features the NIEHS logo and the text "Environmental Health Science Data Resource Portal". Below the header, there are tabs for "Welcome", "Applications", and "Grid". The main content area is titled "Image Workspace" and contains a section for "GIS Browser". The "GIS Browser" section includes a description of the system and a list of features. A red circle highlights the "Place Image on to Tile Display" button. Below the text, there is a map titled "Hurricane Katrina" showing high-resolution aerial photography of the impacted area. The map includes a navigation bar with "Zoom In", "Pan", "Zoom Out", and "Zoom Size" controls. A "Refresh/Query" button is also visible.

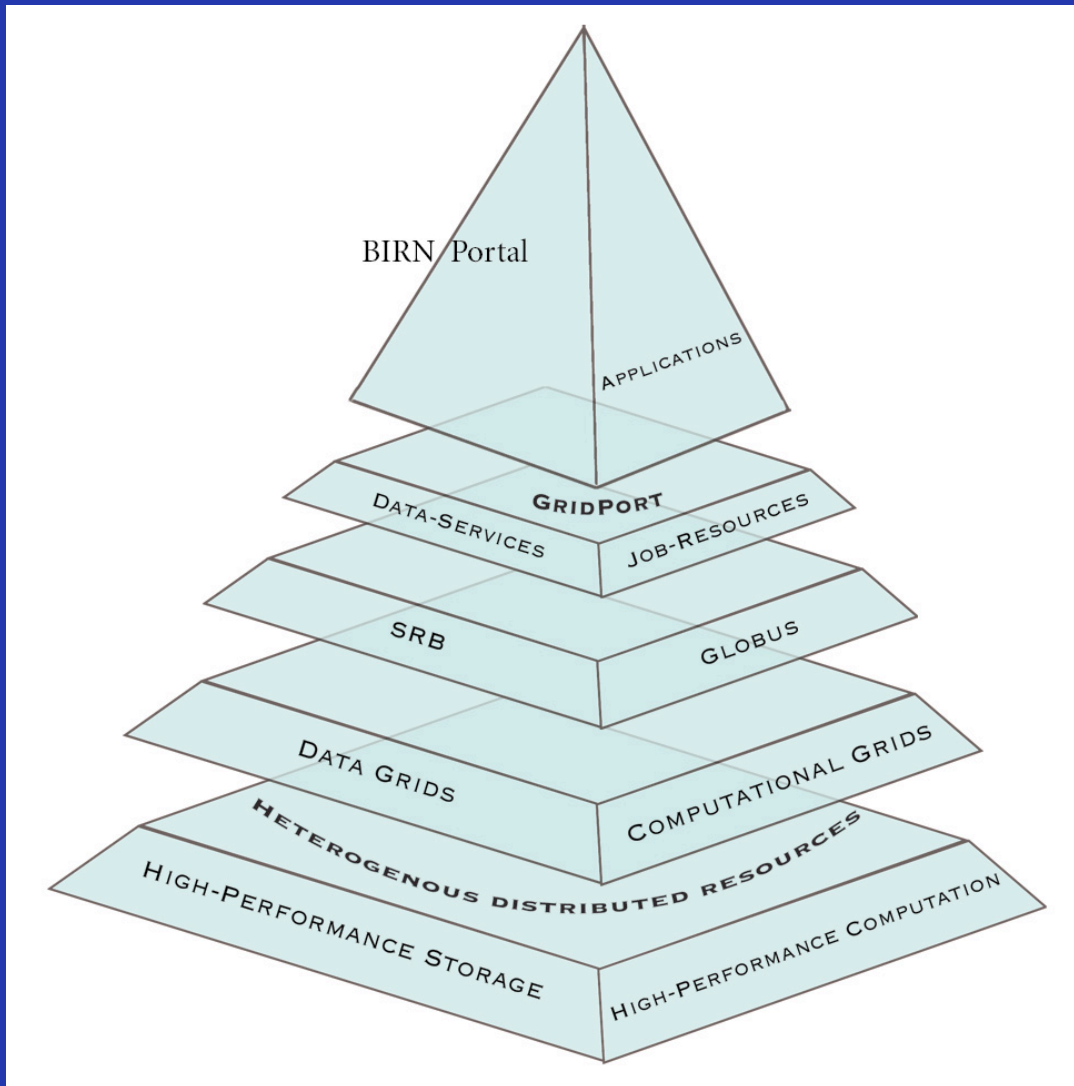
Can also Place
GIS Image on
TileDisplay for
large format
viewing

Launch images to large format TileDisplay visualization end-points

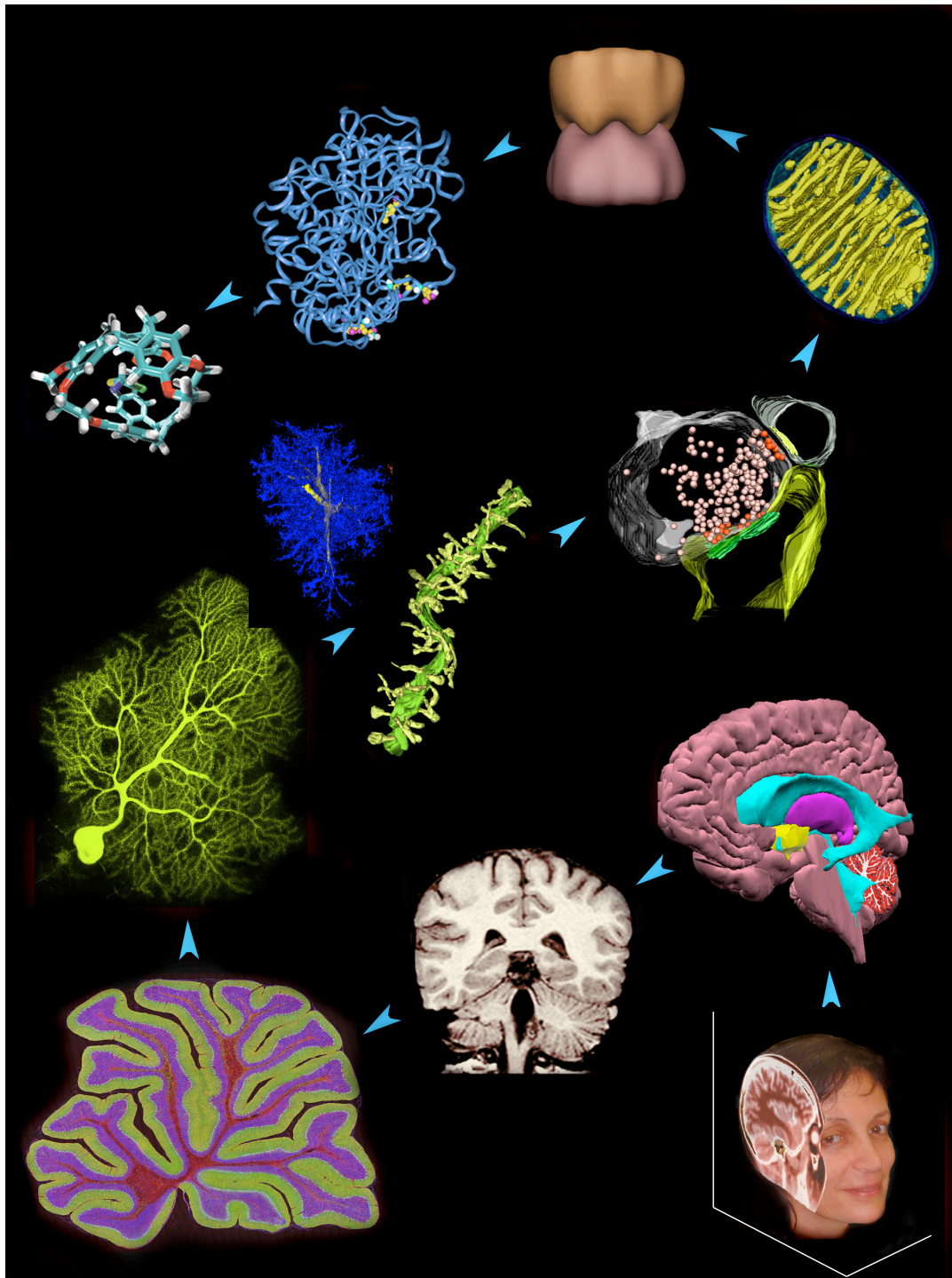
Put images on to various
OptIPuter TileDisplay
Visualization end-points by
simply clicking thumbnails



Layered Architecture



- The Telescience Portal is composed of many “layers”
- Layers are modular, allowing for extension of any layer without great disruption to the entire system
- Every Layer has its own complexity and administration that was previously passed on to the end-user
- Portal centralizes all administrative details of each layer into a single username and pass phrase



Team Science Applied to Stretch Goals

Enable new understanding of the brain by linking data about macroscopic brain function to its molecular and cellular underpinnings

- Federate Distributed Multiscale Brain Map Data***
- Accommodate associated Large Scale Computational Challenges***
- Provide Infrastructure for Construction of more Accurate Models and more Realistic Simulations of Brain Activity***

Origins of IT Infrastructure used to build the BIRN:

Initiatives like the NSF - National Partnership for Advanced Computational Infrastructure (NPACI)

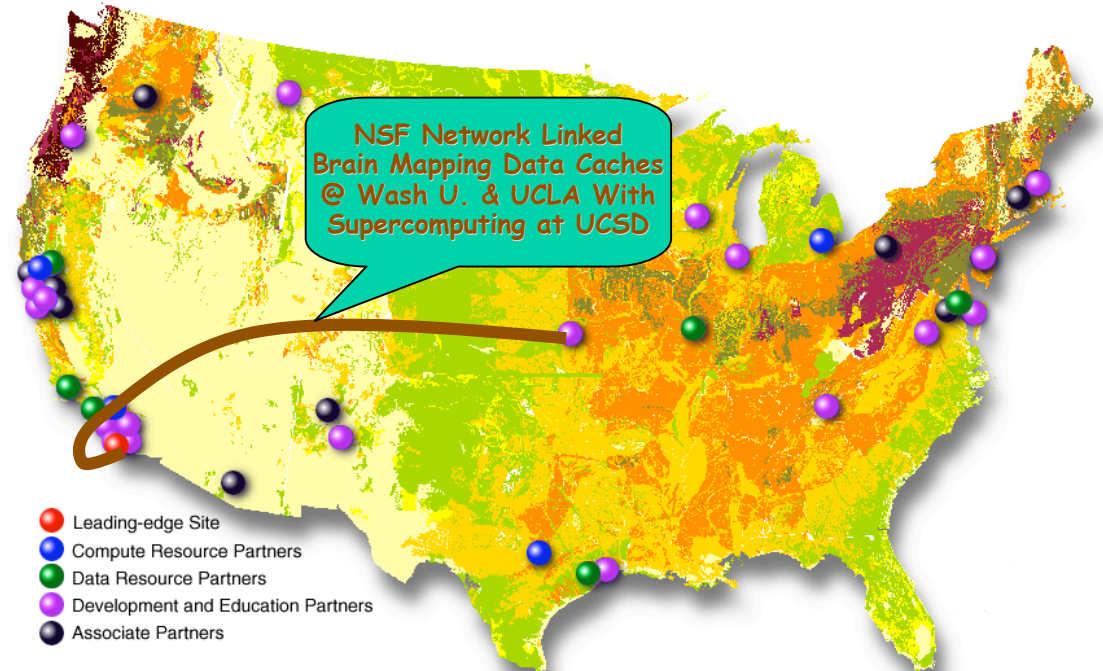
- ~50 partner sites
- Shared compute resources
- High-speed networks
- **Computational science efforts in ...**

- *Neuroscience*
- **Molecular Science**
- **Earth Systems Science**
- **Engineering**

- **Enabling Technologies:**

- **Resources (TeraFlops, High Performance Networks, Data Caches)**
- **Metacomputing (Grid Tools - Middleware)**
- **Interaction Environments (Visualization - Science Portals)**
- **Data-Intensive Computing (Databases - Data Integration)**

***The NSF PACI Program Started in 1995
Current Program is "Cyberinfrastructure"***



- Testbed for a biomedical knowledge infrastructure
- Creation and support federated bioscience databases
- Data integration
- Interoperable analysis tools
- Datamining software
- ✓ Scalable and extensible
- ✓ Driven by research needs pull, not technology push

We Began with Standard Hardware

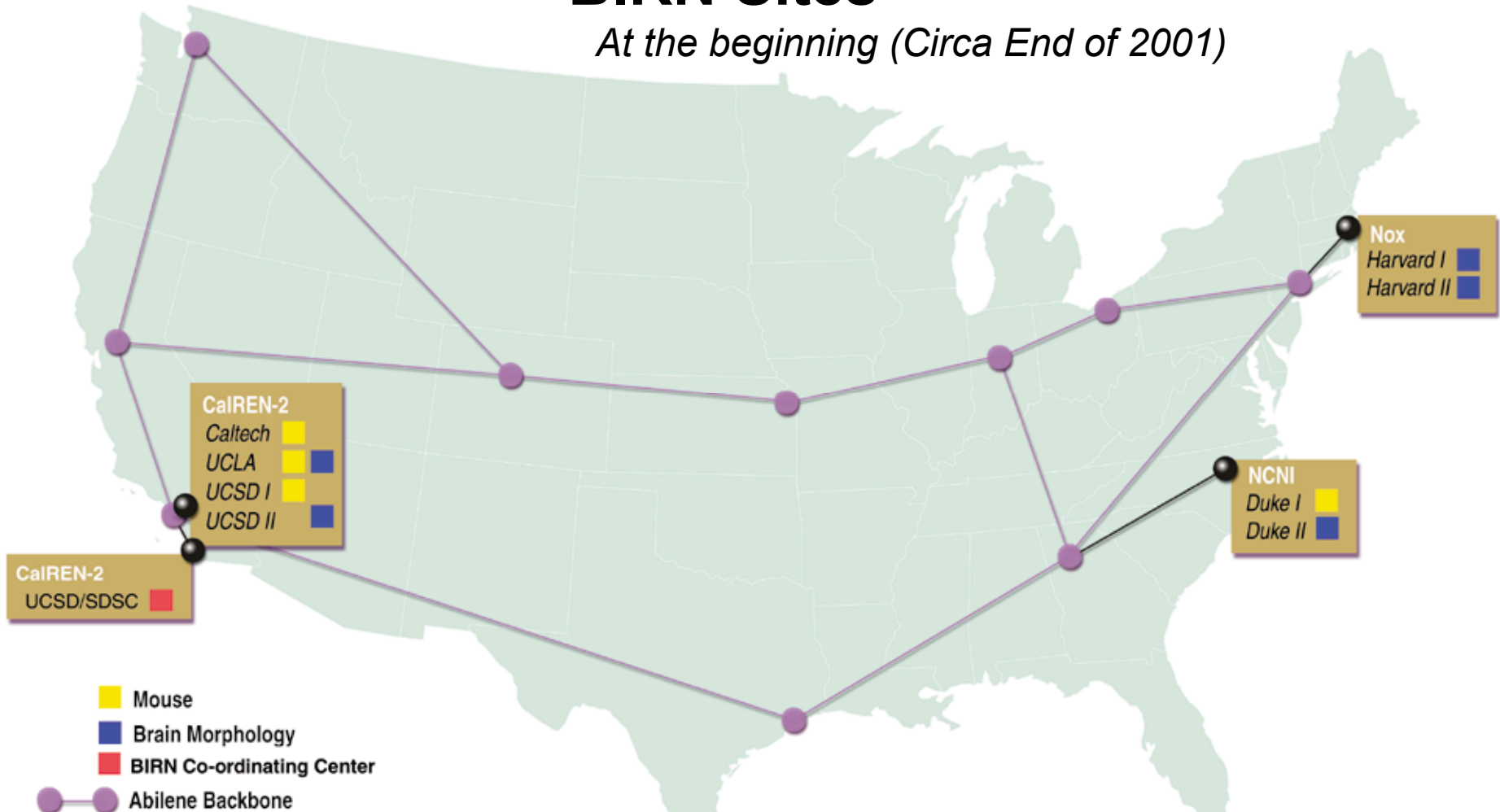


- This jumpstarted BIRN for functionality
- Software footprint is managed from the BIRN Coordinating Center
- Integration of domain tools, middleware, OS, updates, and more
- BIRN expansion/upgrade of existing sites has a more generic (and less expensive) hardware footprint

BIRN Must Accommodate Growth

BIRN Sites

At the beginning (Circa End of 2001)



10+ Distinct Installations, ~ 100 Individual Machines

From the Expanding the BIRN Meeting @ NCCR: December. 6 & 7, 2001)

The BIRN Collaboratory Today

Enabling collaborative research at 28 research institutions comprised of 37 research groups.

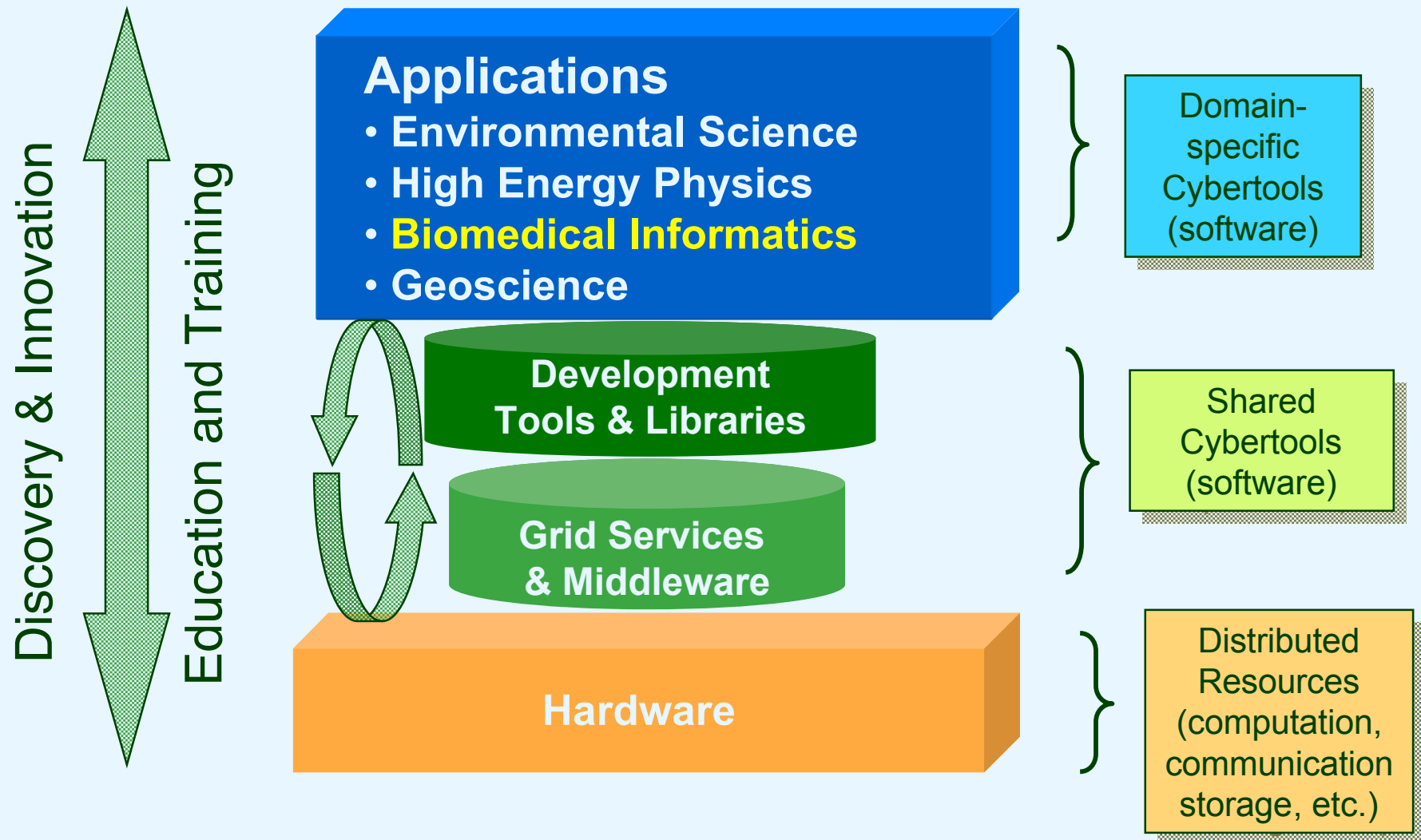


It will no longer matter where data, instruments and computational resources are located!



Integrated Cyberinfrastructure System meeting the needs of multiple communities

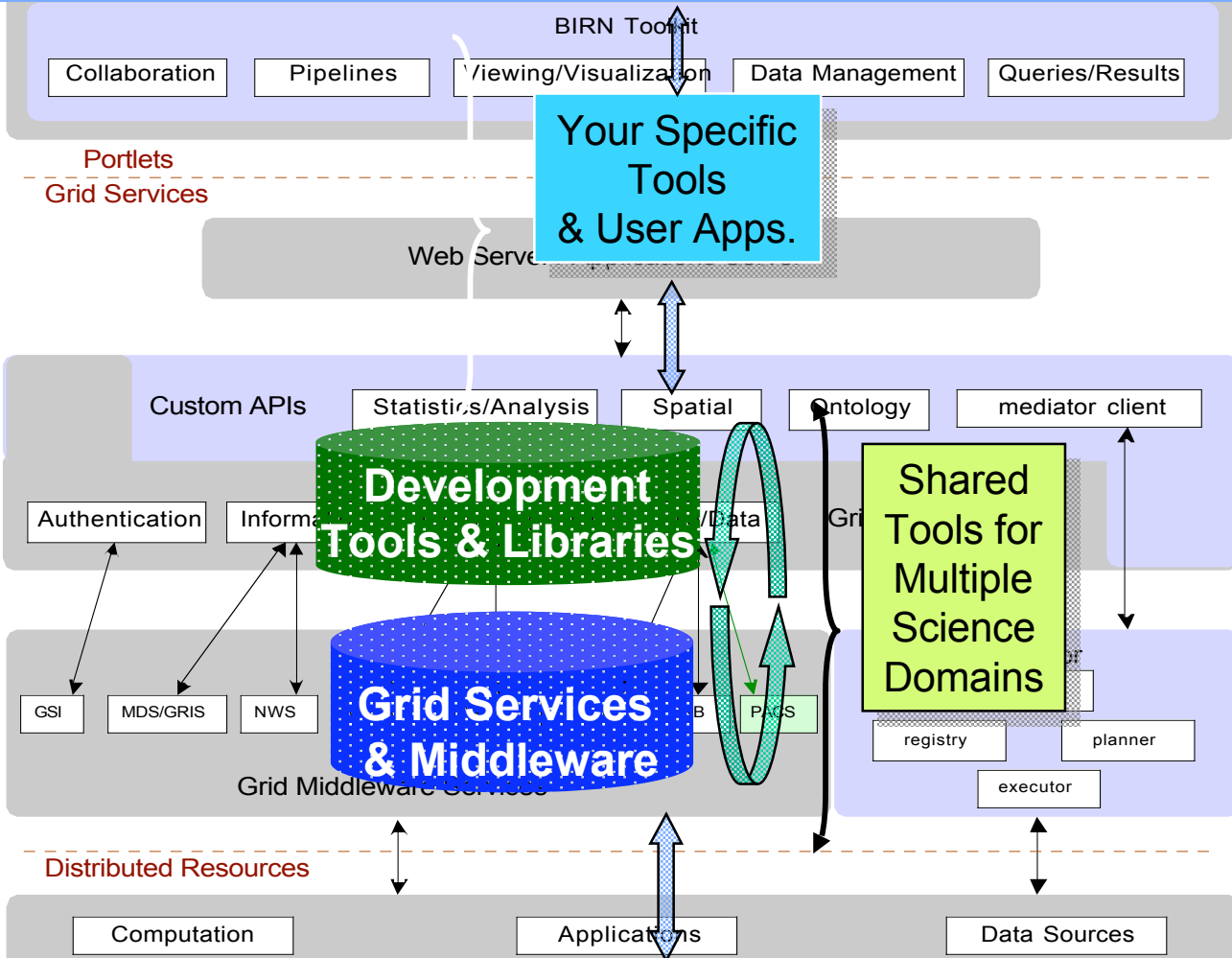
Source: Dr. Deborah Crawford, Chair, NSF **CyberInfrastructure** Working Group



BIRN Core Software Infrastructure

Friendly Work Facilitating Portals

Authentication - Authorization - Auditing - Workflows - Visualization - Analysis



Distributed Computing, Instruments and Data Resources

- BIRN builds on evolving community standards for middleware
- Adds new capabilities required by projects
- Does System Integration of domain-specific tools building a distributed infrastructure
- Utilizes commodity hardware and stable networks for baseline connectivity

Software Problem in a Nutshell

- **Enable Analysis of Distributed Biomedical Data in a National-Scale Production Facility**

Network
Data &

- Data sets are large – Data sets are many
- Enable new queries that integrate multiple sources
- Specialized application codes (from Test Beds) need to work on BIRN-accessible data

CPU

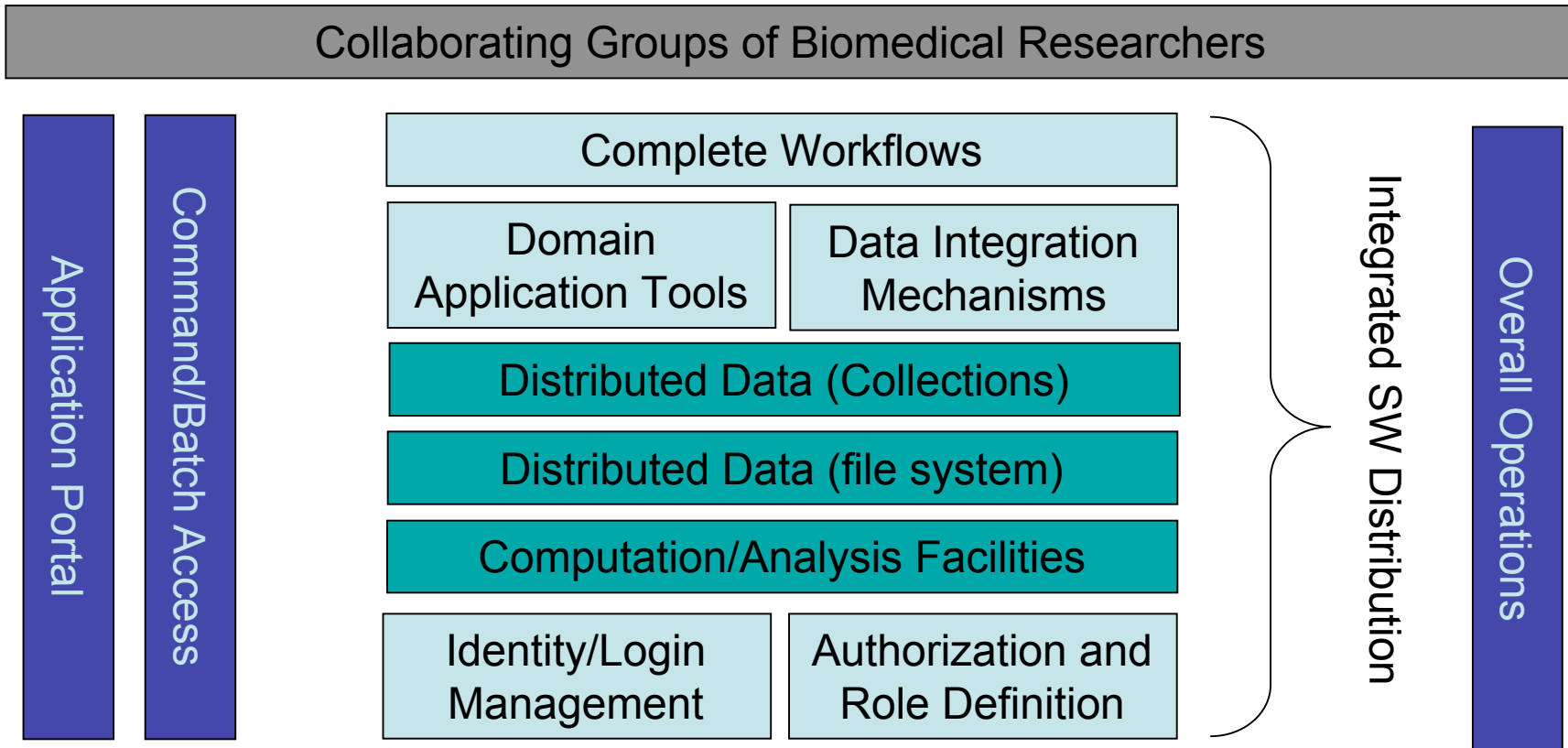
- Some analysis pipelines require significant computation

Security

- Privacy, patient anonymity required
- Institutional ownership of originals

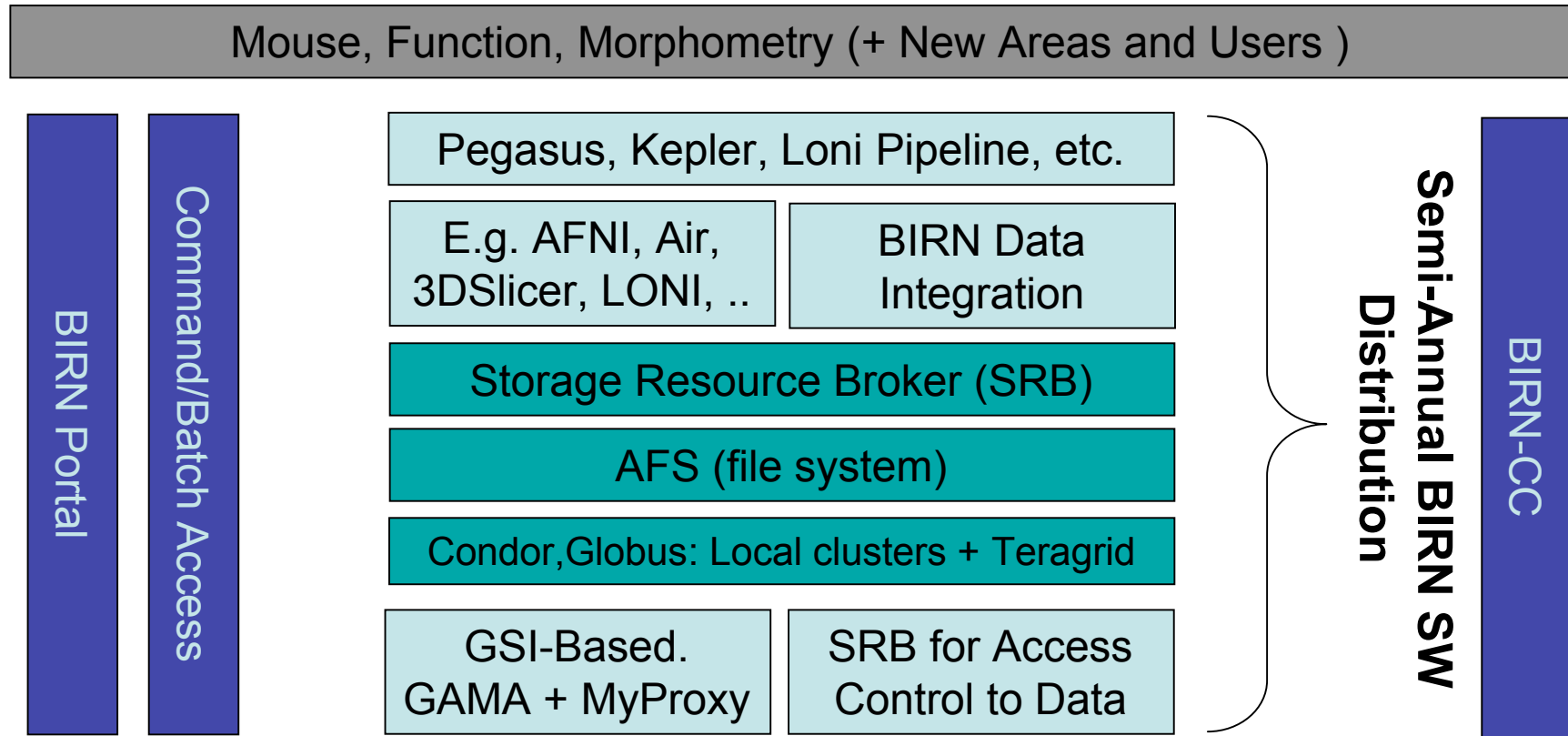
- **Easily Replicate Entire Software Stack**
(Including Centralized Services) for other Groups

Major System Components



Note: Similar Structure to Many Other Grids

Specific Implementations

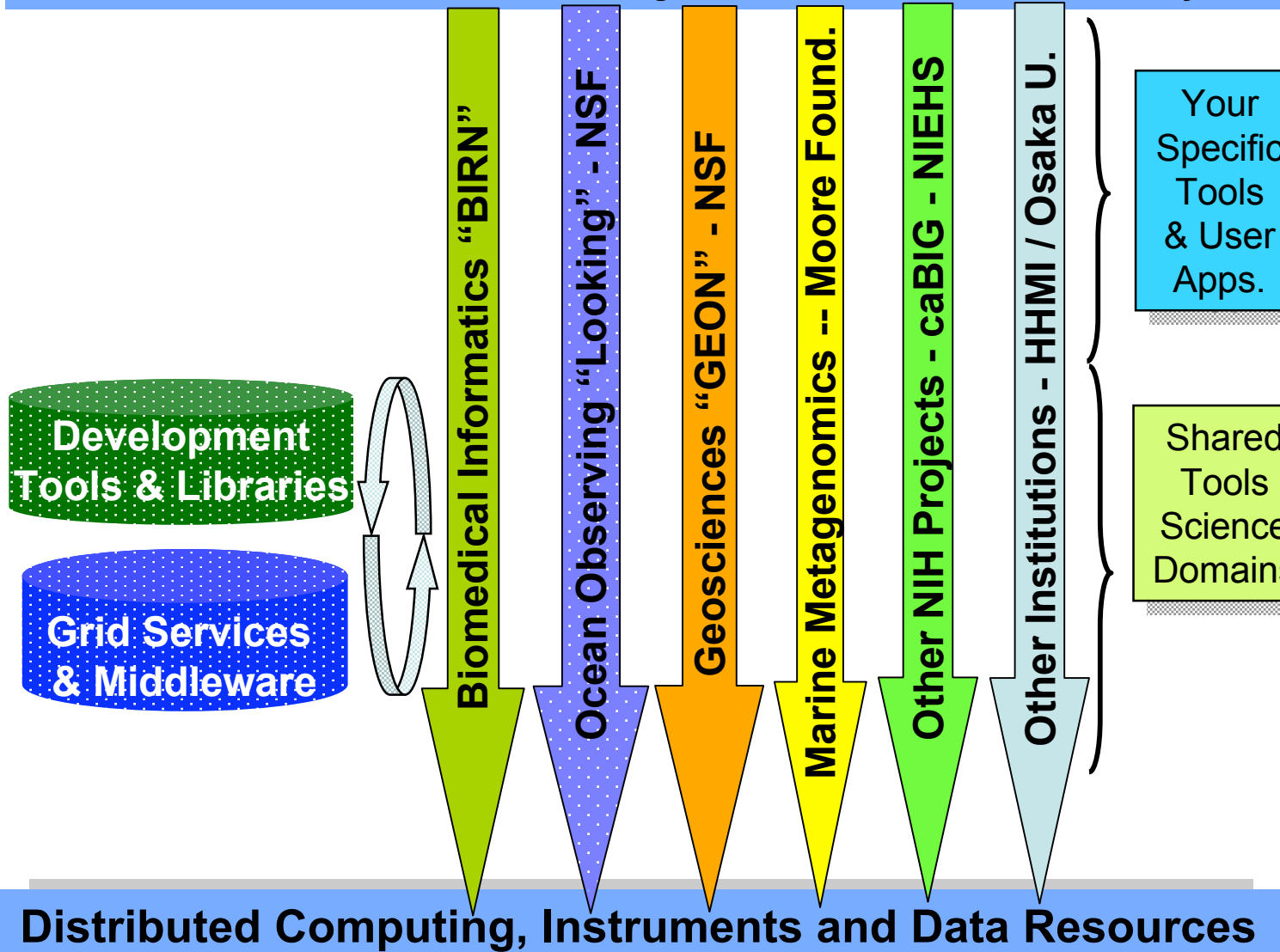


Note: Similar Structure as Many Other Grids

BIRN Core Software Infrastructure

Friendly Work Facilitating Portals

Authentication - Authorization - Auditing - Workflows - Visualization - Analysis



- BIRN CC builds on evolving standards for portals and middleware
- Adds new capabilities required by projects
- Provides system integration of domain-specific tools building a distributed infrastructure
- Utilizes commodity hardware and stable networks for baseline connectivity

The Grid is becoming the backbone for collaborative science and data sharing

The image displays a collage of several web browser windows, each showing a different website related to the Grid computing infrastructure. The windows are:

- NEES Consortium, Inc.:** A website for the Network for Earthquake Engineering Simulation, featuring a logo and a list of upcoming events.
- GEON | CyberInfrastructure for the Geosciences:** A website for the Geosciences Open Environment, with a logo and a list of events.
- EGEE - Gateway:** A website for Enabling Grids for E-science in Europe, with a blue background and a list of links for general info, training, and technical papers.
- Open Science Grid Consortium:** A website for the Open Science Grid, with a yellow and orange header and a list of links for project information, education, and virtual data tools.
- TELESCIENCE:** A website for advanced telemedicine applications, with a white background and a list of links for registration, workflow creation, and data management.
- BIRN Slicer Launcher:** A website for the Biomedical Information Research Network, with a blue and white header and a list of links for data management, analysis, and visualization.
- SEEK Wiki: Eco Grid Community:** A website for the Scientific Ecology and Environmental Knowledge community, with a green and white header and a list of links for community information, meeting notes, and use cases.

At the bottom of the collage, there is a small text box that reads: "This material is based upon work supported by the National Science Foundation under award 0323676. Any opinions, findings, and conclusions or recommendations expressed here do not necessarily reflect the views of the National Science Foundation (NSF). SEEK-Wiki: Eco Grid Community".

Grid Infrastructure in Action

- **The Grid is already having an impact...**
 - **Many projects in many subjects:**
 - Life sciences
 - Medicine
 - Environment
 - Engineering
 - Materials
 - Chemistry
 - Physics
 - **BIRN embodies the most innovative use of data, metadata & portals**



BIRN cited as successful model of grid computing.

BIRN has the Advantage of having Developed an “End-to-End” Infrastructure: *Built around research projects with geographically distributed data.*

- **Consists of all the components required to effectively share and collaboratively explore data**
 - The BIRN Rack (BIRN site infrastructure)
 - The BIRN Portal
 - The BIRN Virtual Data Grid
 - The BIRN Data Integration Infrastructure
 - The BIRN Computational GRID
- **The system integration, development, deployment and management of this infrastructure is the main focus of activities within the BIRN Coordinating Center**

The BIRN Portal

The screenshot shows the BIRN Portal website. At the top left is the BIRN logo. To the right, there is a navigation bar with links for 'Home', 'Account Request', 'Style', and 'Help'. Below the navigation bar, there is a 'Login Information' section with a 'BIRN Portal Login' form. The form includes fields for 'Username:' and 'Password:', a 'Login' button, and a list of links: 'Request a BIRN account (must be a BIRN participant)' and 'Email BIRN Portal admins'. To the right of the login form is a 'Welcome to the BIRN Portal' section. It contains a paragraph of text: 'The Biomedical Informatics Research Network (BIRN) Portal provides BIRN members with a single sign on web portal to access data grid files, computation grid resources and a variety of collaboration tools to facilitate the scientific needs of BIRN researchers. Non-BIRN participants may access the portal through a guest registration.' Below this text is a large graphic with the text 'BIRN Portal Biomedical Informatics Research Network' and an image of a human head with a brain scan overlay. Below the graphic is another paragraph: 'Currently the BIRN involves a consortium of 14 universities and 22 research groups that participate in one or more of three test bed projects centered around brain imaging of human neurological disorders and associated animal models.' At the bottom of the screenshot, there is a partial sentence: 'While the pioneering data sites involve dedicated hardware, the system is rapidly'.

- Application environment that provides transparent and pervasive access to the BIRN infrastructure (i.e. tools, applications, resources) with a **Single Login** from any Internet capable location

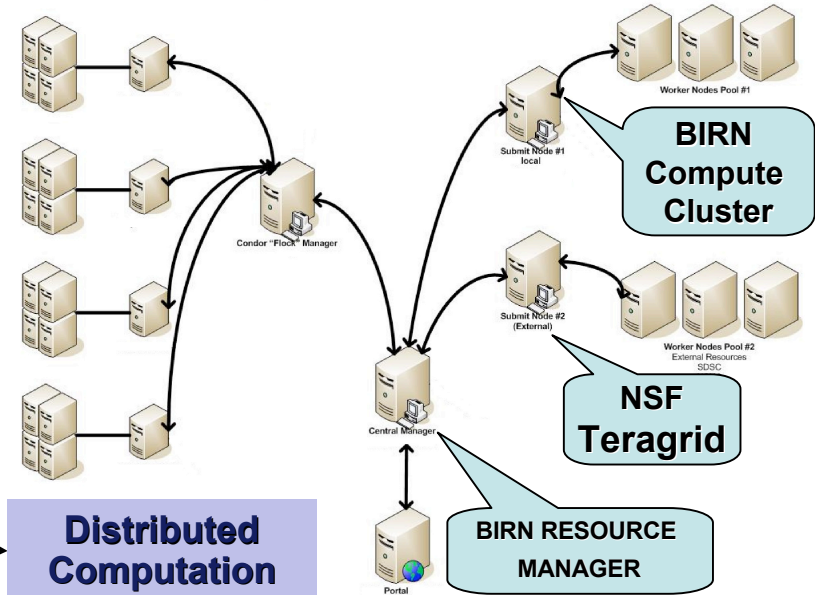
- Provides simple, intuitive access to distributed resources for data storage, distributed computation, and visualization

- Provides a scalable interface for users of all backgrounds and levels of expertise

The BIRN Portal Provides an Intuitive Interface to Software Tools, Data and Computational Resources in the BIRN Collaboratory



The BIRN Portal Launches from any Internet Connected Desktop, Laptop, PDA



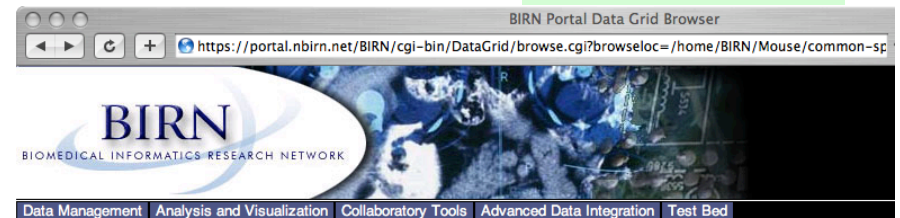
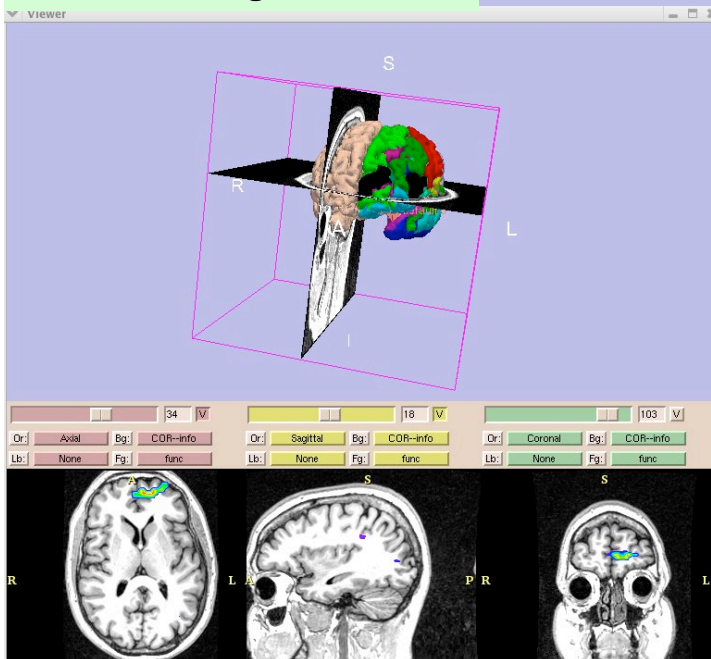
BIRN VIEWERS - eg., SLICER; ImageJ, MBAT

Data Visualization

Distributed Computation

Data Management

Browse Data Grid Files



Browse Data Grid Files

/home/BIRN/Mouse/common-specimen-study/UCLA-BFI/Nissl			
back ..			
020417-2_1_Nissl_001.tif	meta-data	permissions	audit
020417-2_1_Nissl_003.tif	meta-data	permissions	audit
020417-2_1_Nissl_005.tif	meta-data	permissions	audit
020417-2_1_Nissl_007.tif	meta-data	permissions	audit
020417-2_1_Nissl_009.tif	meta-data	permissions	audit

Browser Information

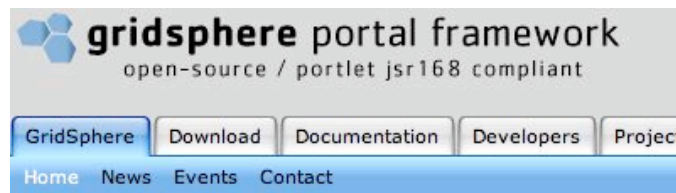
You can download single-files through this interface by simply clicking on the file name or icon.

Data Management

- Browse Files
- Upload Files
- Audit Files
- Access Control
- Meta Data

BIRN is a Leader in Portal Technology

- The BIRN-CC is supporting development of the leading open-source standards-based grid portal
- Application environment that provides transparent and pervasive access to the BIRN infrastructure (i.e. tools, applications, resources) with a Single Login from any Internet capable location
- Support for dynamic collaborative projects



News

7/6/2005 Grid Portlets 1.1 is now available for download!

6/13/2005 Grid Portlets 1.0.3 is now available for download!

5/27/2005 Grid Portal Workshop, hosted by Australian Partnership for

Welcome to the GridSphere



The GridSphere open-source portal developers to create a portlet web application within the GridSphere and documentation and development of portlets using GridSphere.

Get GridSphere 2.0 now!

GridSphere Portal - Mozilla Firefox

http://localhost:8080/gridisphere/gridisphere?cid=projectManagerPortlet&js_action=viewProject&JavaScript=enabled

Apache Tomcat-5.0.28 local-gridisphere GridSphere Portal - dev Biomedical Informatics ...

Logout
Welcome, Then Nguyen

About Us | Welcome | Collaboration

Home My Projects New Project Forum Email

Projects Manager

Home | My Projects | My Activities

Project Overview

Project Info : Analysis, Visualization and Interpretation

Project ID: 4
Project Name: Analysis, Visualization and Interpretation
Public Info: Continued development, integration, and deployment of a suite of freely available software to enable scientific investigation of the morphological bases of dysfunction through increasingly sophisticated image analysis on increasingly large subject populations acquired at multiple research sites.
Private Description: Continued development, integration, and deployment of a suite of freely available software to enable scientific investigation of the morphological bases of dysfunction through increasingly sophisticated image analysis on increasingly large subject populations acquired at multiple research sites.
Accessible: Private
Type: Normal
SRB Group Name: avil_0004
Founded: 10-29-2004 09:31:54
Number of Members: 7

Current Activities

Contract All | Expand All
Activities

Memberships

Memberships
Project Memberships(7)

ID	Username	Role	Started	Status	EmailAlert
56	akolsamy	Owner	10-29-2004	Active	akolsamy@ju.edu
47	nguyen	Member	10-29-2004	Active	nguyen@biuhh.ksc.ucsf.edu

Done

Project Summary

Name: Analysis, Visualization and Interpretation
Members: 7
Access: Private
Type: Normal
Started: Oct 29, 2004

My Membership

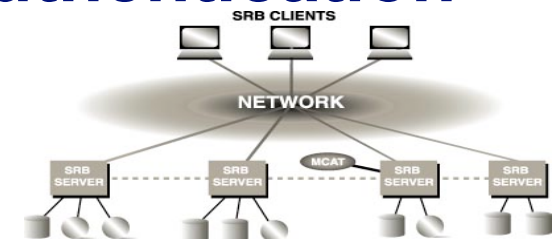
User: then
Email: tnguyen@ncmir.ucsf.edu
Role: Member
Joined: Oct 29, 2004
Status: Active

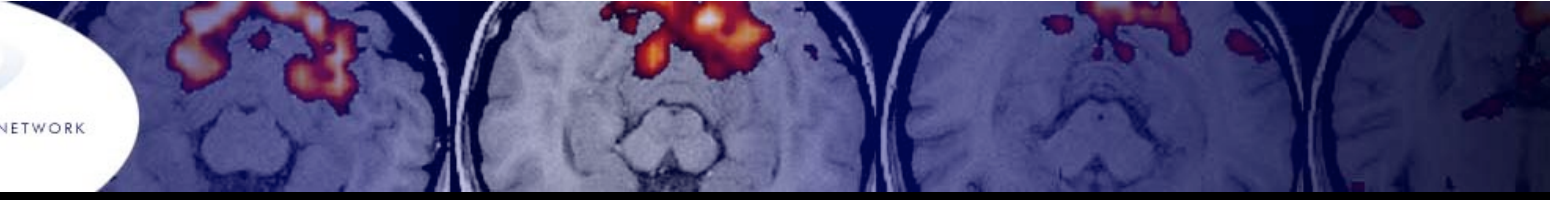
Select Project(15)

<input checked="" type="checkbox"/>	Analysis, Visualization and Interpretation	7
<input type="checkbox"/>	NAHIC	75
<input type="checkbox"/>	Portal Test	2
<input type="checkbox"/>	Too many ways to mess w/ code	1
<input type="checkbox"/>	Test two	2
<input type="checkbox"/>	aa	1
<input type="checkbox"/>	BIRN Neuroimaging Calibration Study, Phase I	7

Benefits of a Data Grid

- **Uniform interface for connecting to heterogeneous distributed data resources**
 - *Allows for any "grid enabled" tool to interact with data no matter where it is located or what it is located on*
- **Allows for the seamless creation and management of distributed data sets**
 - *Distributed data appear as a single managed collection both to users and tools*
- **Access is Managed using GRID Authentication through BIRN Portal**





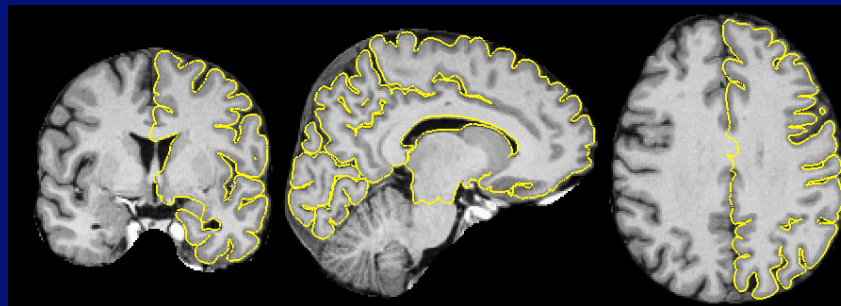
- BIRN Coordinating Center (UCSD)
- BIRN Test Bed Projects
 - Morphometry BIRN
 - Function BIRN
 - Mouse BIRN

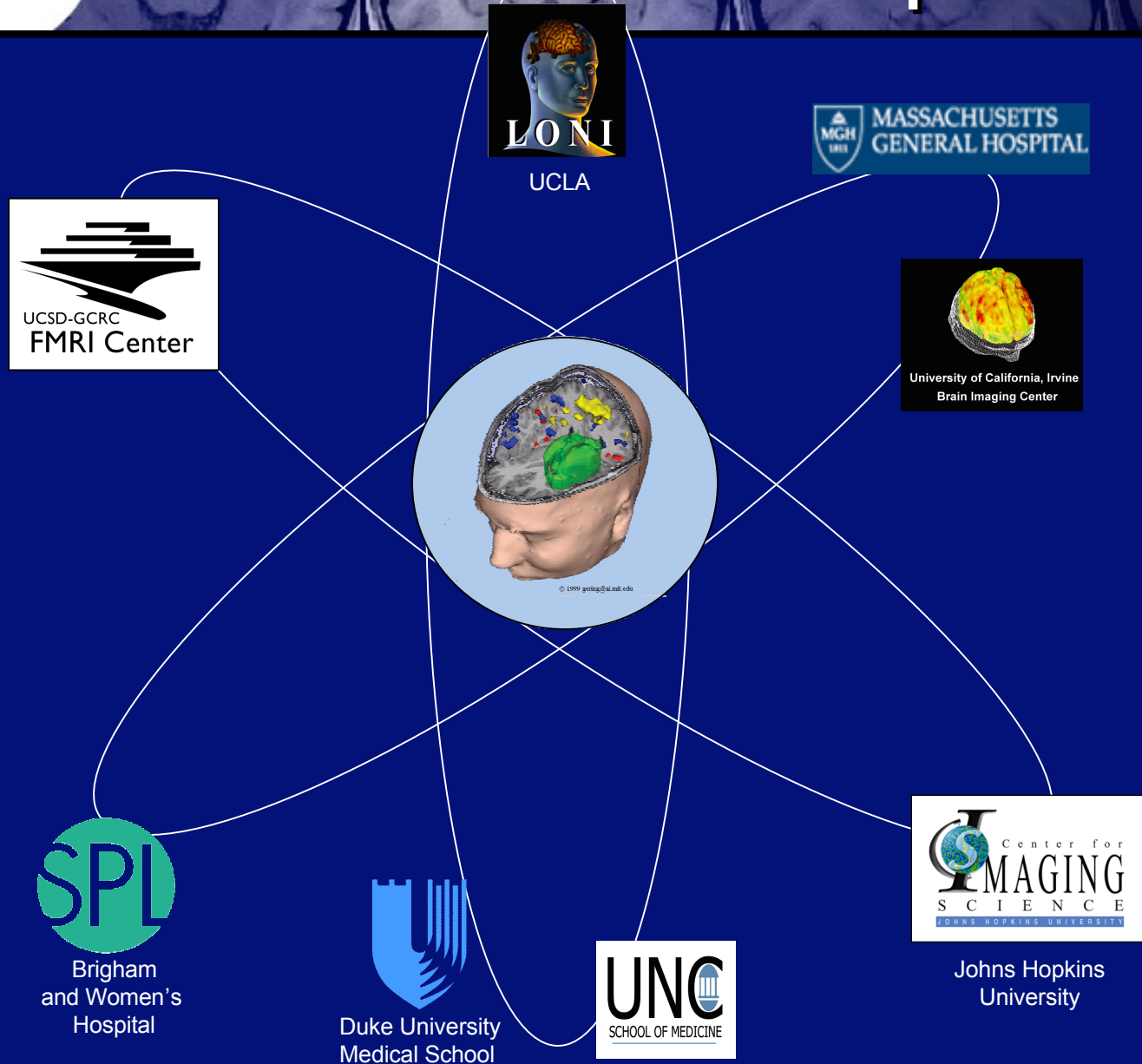
Clinical Aims

- Do structural differences contribute to specific symptoms such as memory dysfunction or depression?
- Do specific structural differences distinguish specific diagnostic categories?

Technological Aims

- Attempt to overcome obstacles to the use of neuroimaging data as quantitative outcome measures for clinical investigation including the issues raised by longitudinal and multi-site studies.







H. J. SIMPSON

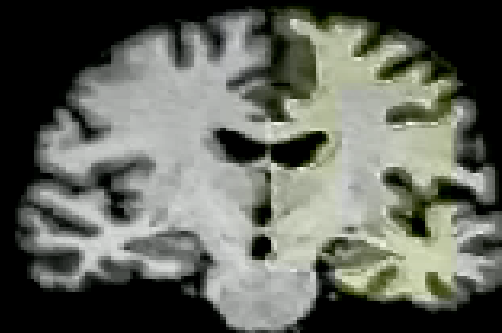
- High-resolution structural images can be used as an identifier.
 - Reconstruction of face from raw anatomical data might be able to be used to identify subject
 - Some members of BIRN require/desire unaltered raw data
- BIRN has received approval from local IRBs to allow for the sharing of raw anatomical data from prospective subjects with current authorized BIRN members (i.e. fBIRN Human Phantoms)
- BIRN must conform to multiple overlapping regulations
 - Common Rule
 - HIPAA
 - State Law



Cortical Thickness Estimation with Sub-Voxel Accuracy



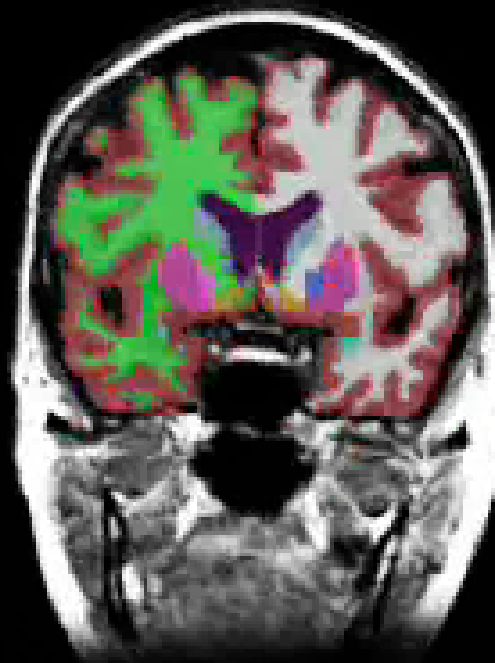
Gray-white boundary



Pial surface

From Anders Dale / Mass General Hospital - Harvard

Automated Whole-Brain Segmentation

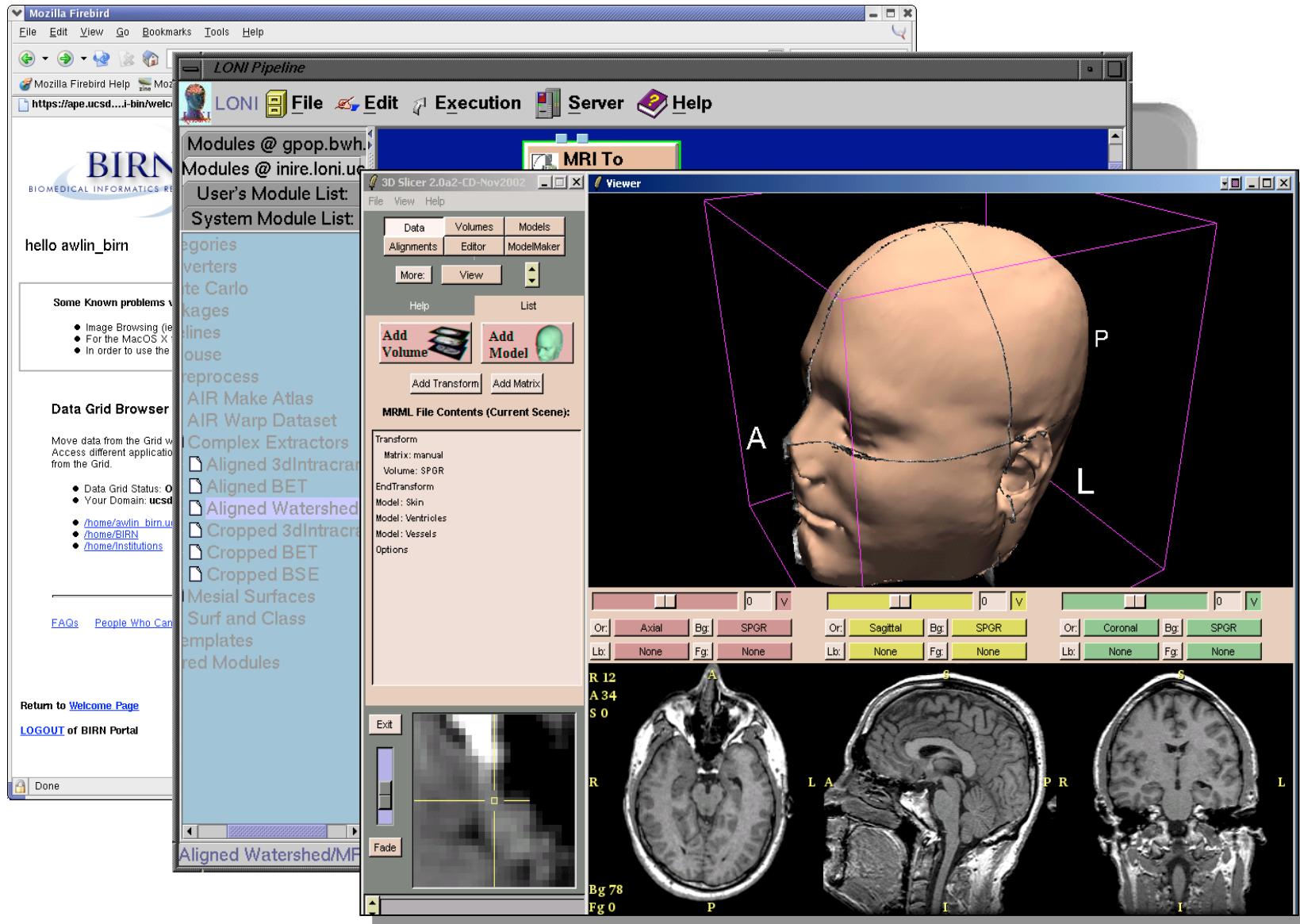


Part of Free Surfer

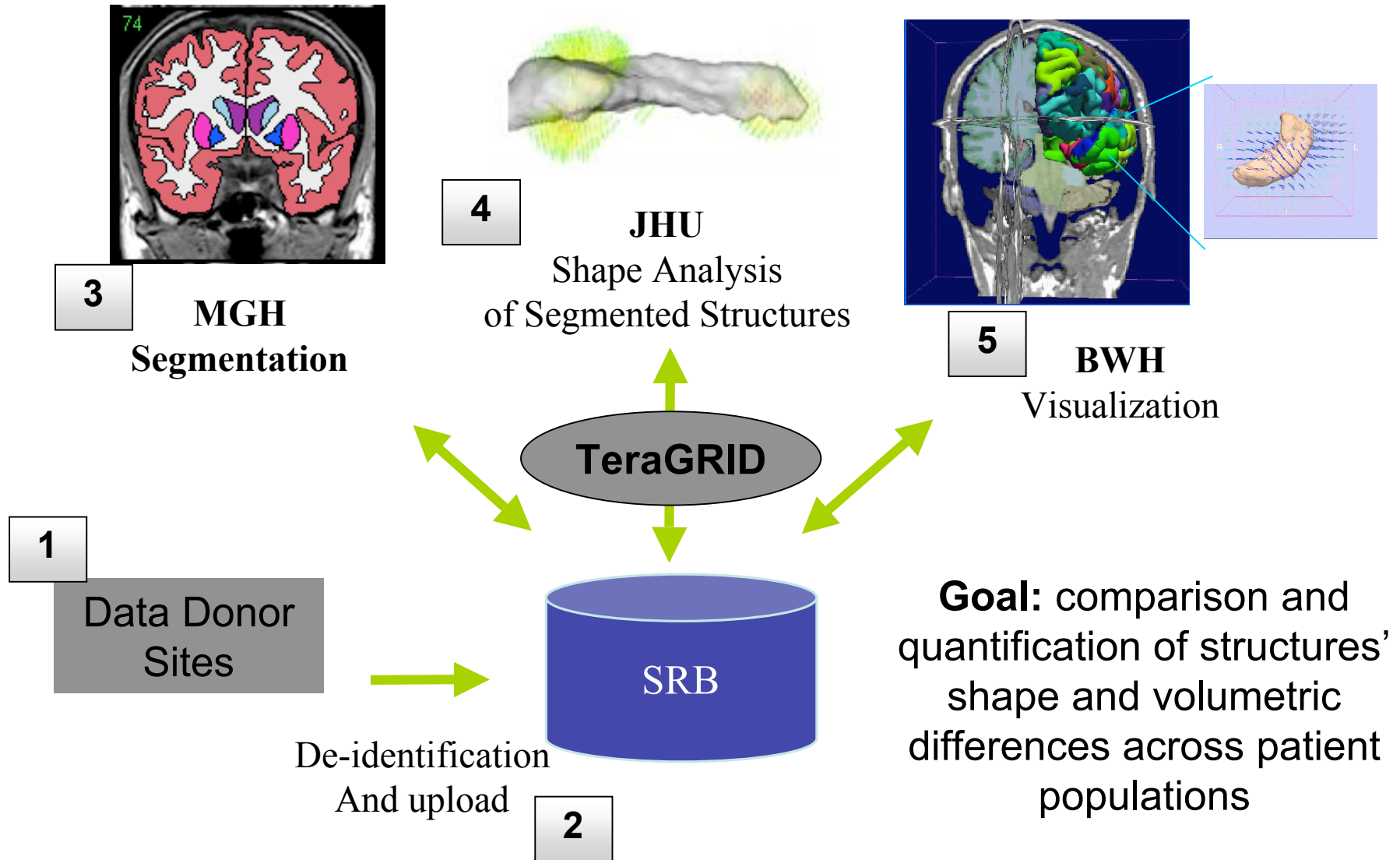
By Bruce Fischl
and
Anders Dale
(MGH)

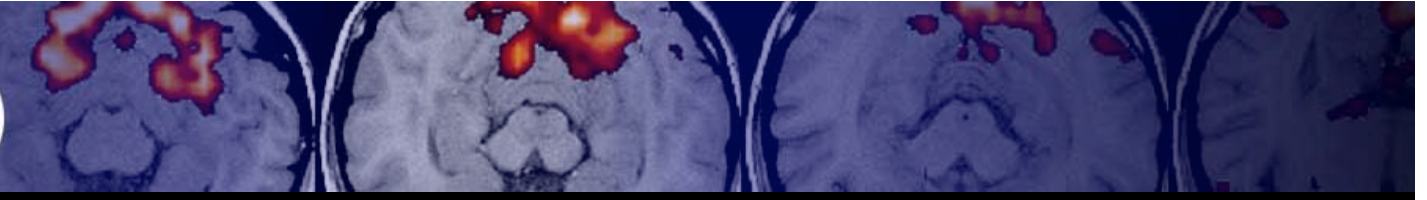
- | | | |
|---------------------|------------------|---------------------|
| ● Cerebellar cortex | ● LH cerebral WM | ● Cerebral cortex |
| ● Cerebellar WM | ● Hippocampus | ● Misc. |
| ● 4th ventricle | ● LH pallidum | ● Lateral ventricle |
| ● RH cerebral WM | ● Thalamus | ● Caudate |

BIRN Portal: Launches Scientific Workflow



2. BIRN Pipeline is launched from the BIRN Portal, displaying the 3D Slicer 3DNI settings





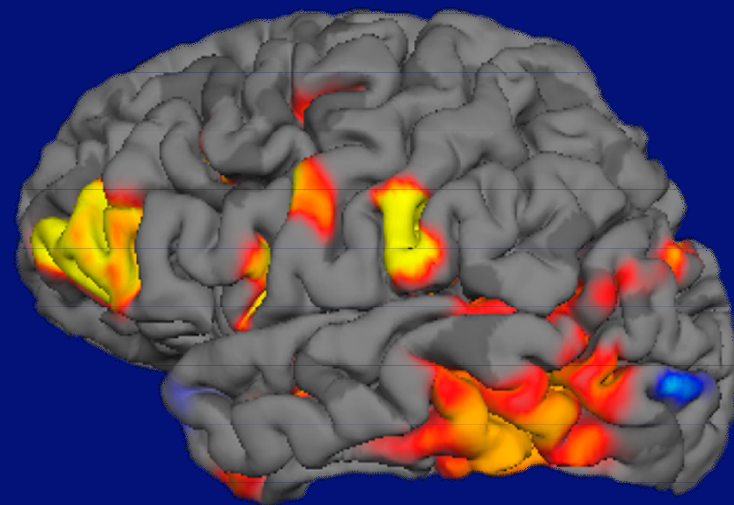
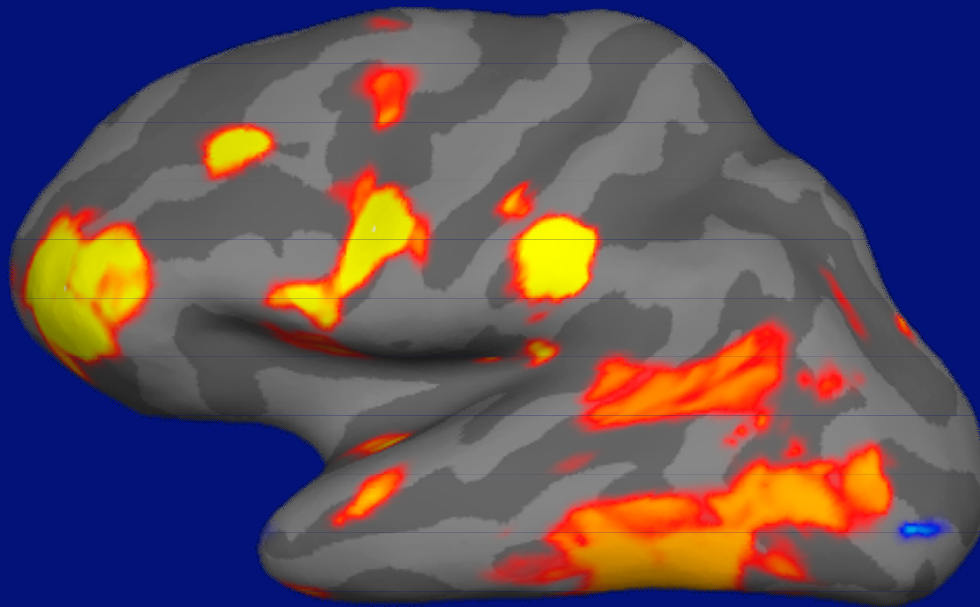
- A team of eleven universities studying regional brain dysfunctions related to the progression and treatment of *schizophrenia*.
 - Prefrontal Cortex (executive dysfunction)
 - Temporal Lobe (auditory processing)

Clinical Aims

- Is Frontal and Temporal Lobe Dysfunction the Cause of Schizophrenia?
- How can Treatment Reverse this Dysfunction?

Technological Aims

- Integration of 4D Data from Multiple Sites - Acquired with Different Non-Invasive Imaging Devices
- Integration of Information Obtained with Different Brain Activation Tasks.



MGH
MASSACHUSETTS
GENERAL HOSPITAL

Stanford

UCSD-GCRC
FMRI Center

UNC
SCHOOL OF MEDICINE

Brain Imaging and Analysis Center

The University of New Mexico
Health Sciences Center

University of California, Irvine
Brain Imaging Center

Duke University
Medical School

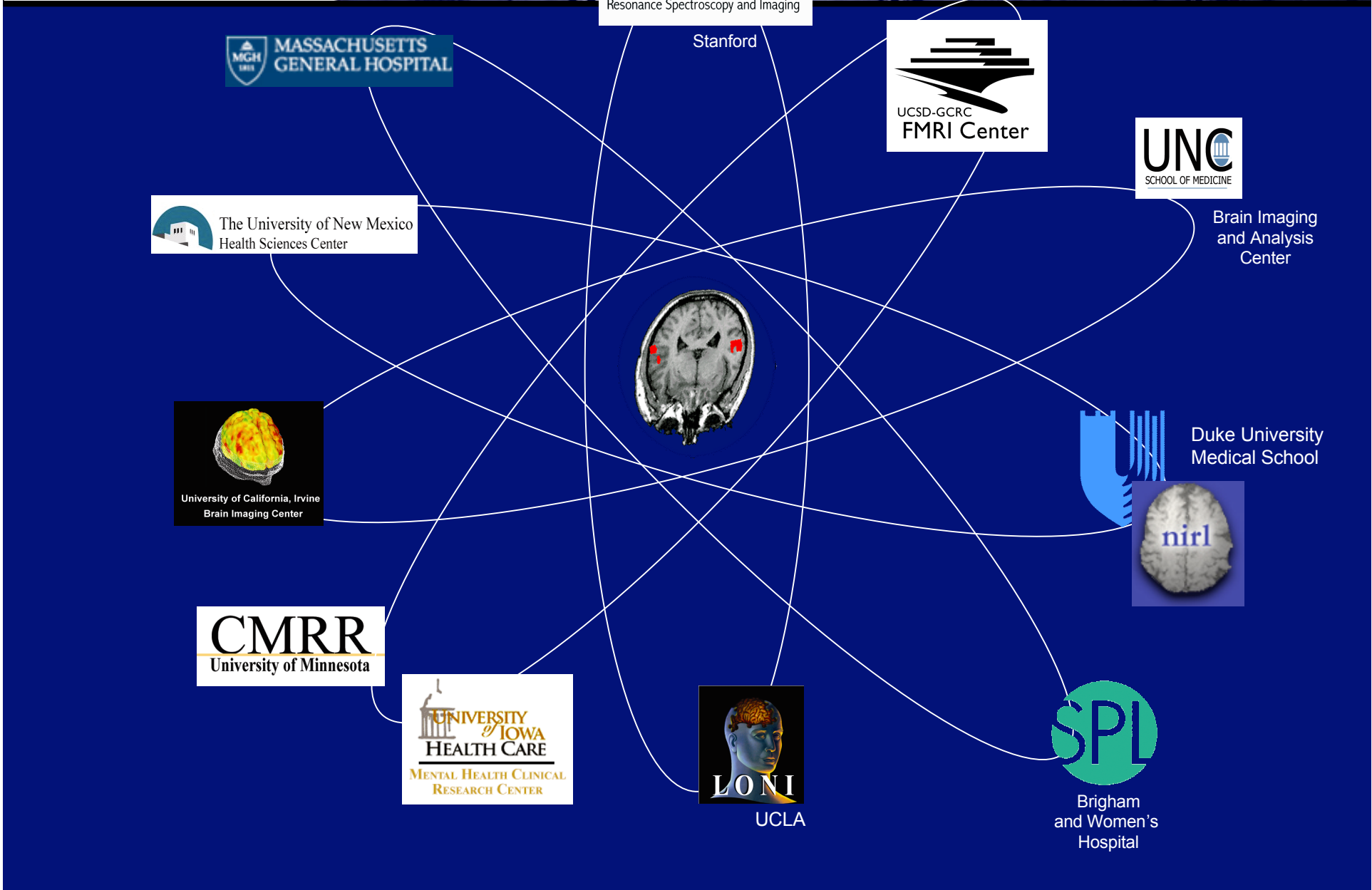
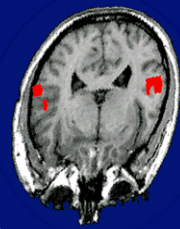
nirx

CMRR
University of Minnesota

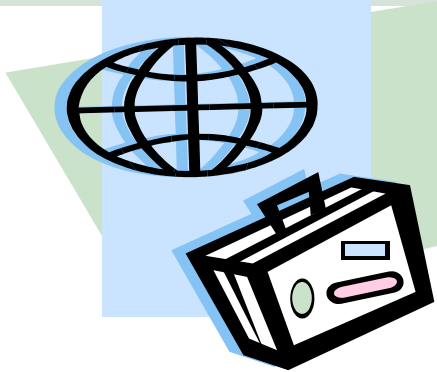
UNIVERSITY
of IOWA
HEALTH CARE
MENTAL HEALTH CLINICAL
RESEARCH CENTER

LONI
UCLA

SPL
Brigham
and Women's
Hospital



Traveling Humans Study



- Subjects traveled around the country to be scanned at all Function BIRN sites
- Unique dataset: (Subject) x (site) interactions can be measured for the first time

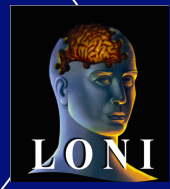
Studying animal models of disease across dimensional scales to test hypothesis with human neurological disorders

- Experimental Allergic Encephalomyelitis (EAE) mouse models (both chemically induced and transgenic) exhibit episodic weakness and demyelination characteristic of **Multiple Sclerosis (MS)**
- Dopamine Transporter (DAT) knockout mouse for studies of schizophrenia, **attention-deficit hyperactivity disorder (ADHD)**, Tourette's disorder, and substance abuse
- Using an alpha-synuclein mouse to model the symptoms/pathology of **Parkinson's Disease**
- **Cancer** animal models consortium with astrocytoma mouse model: NCI supported with Terry Van Dyke @ Duke

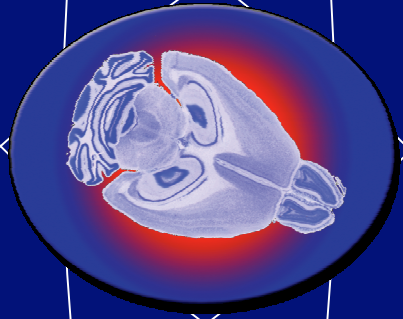
Univ. of Tennessee
Memphis



Caltech



UCLA



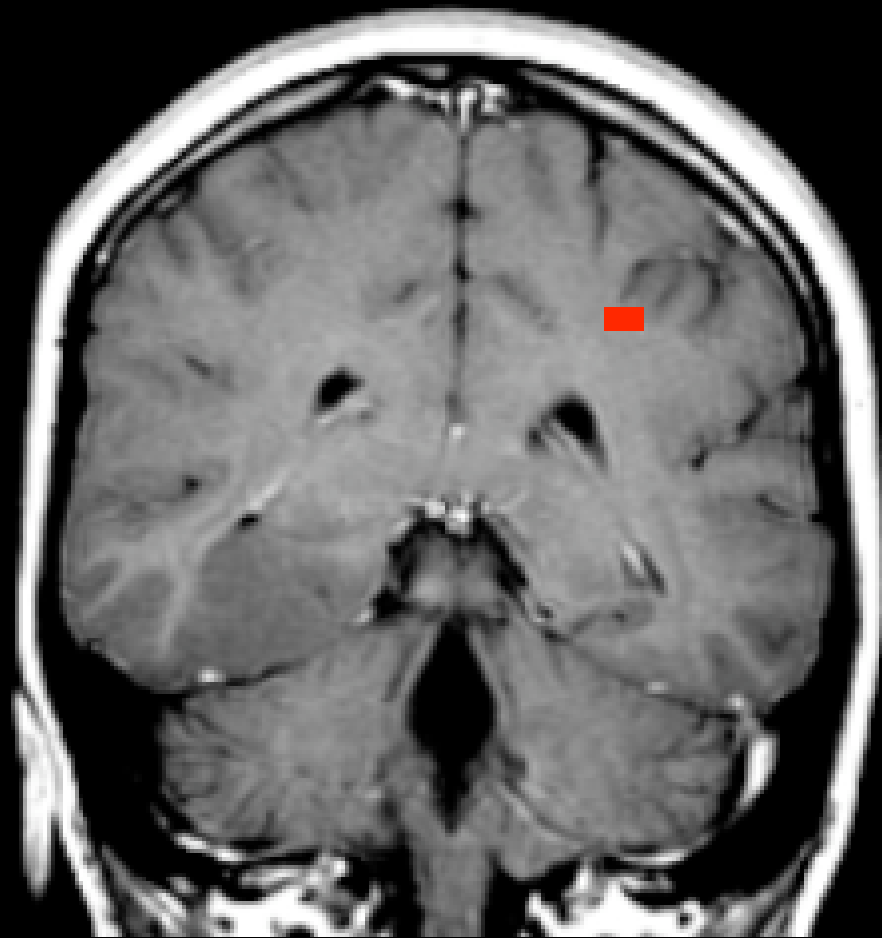
UCSD

Drexel -
Philadelphia, Penn



Duke Center for
In Vivo Microscopy

Advanced Imaging - Correlating Human and Mouse



5mm³

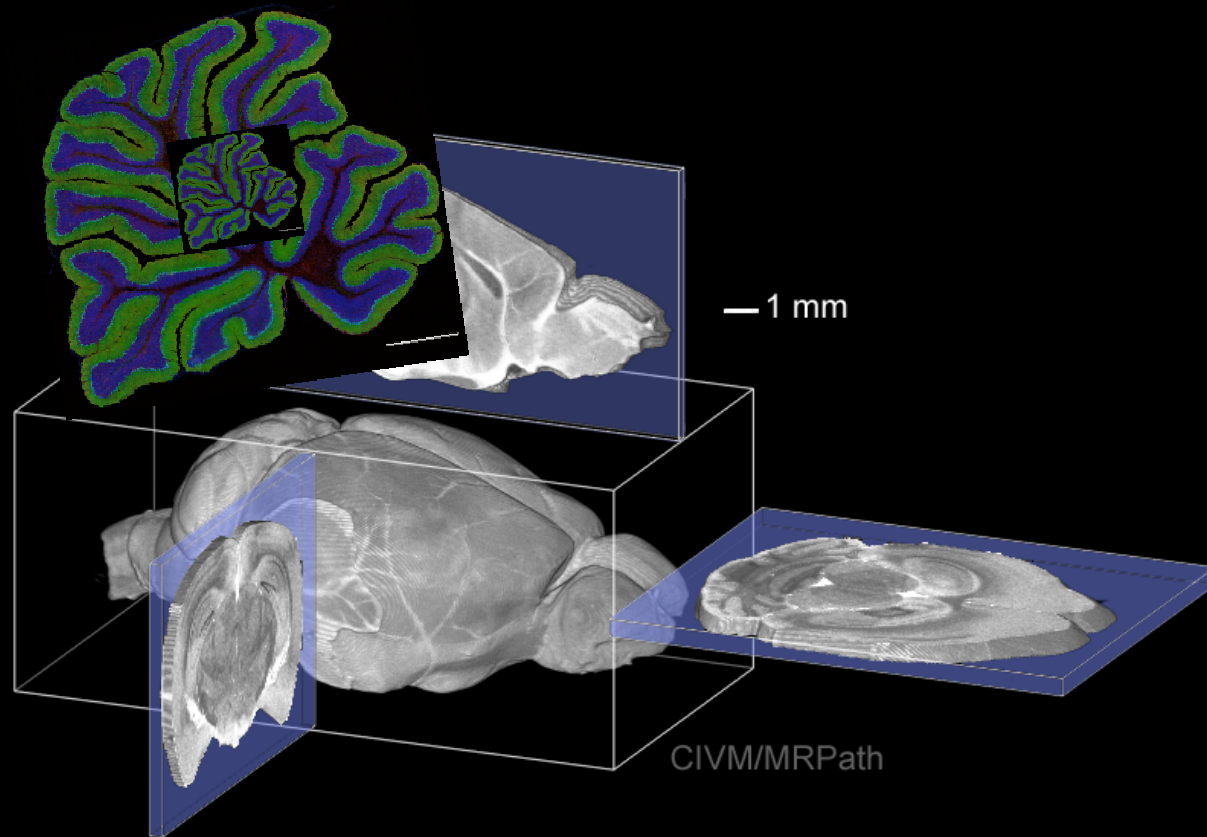


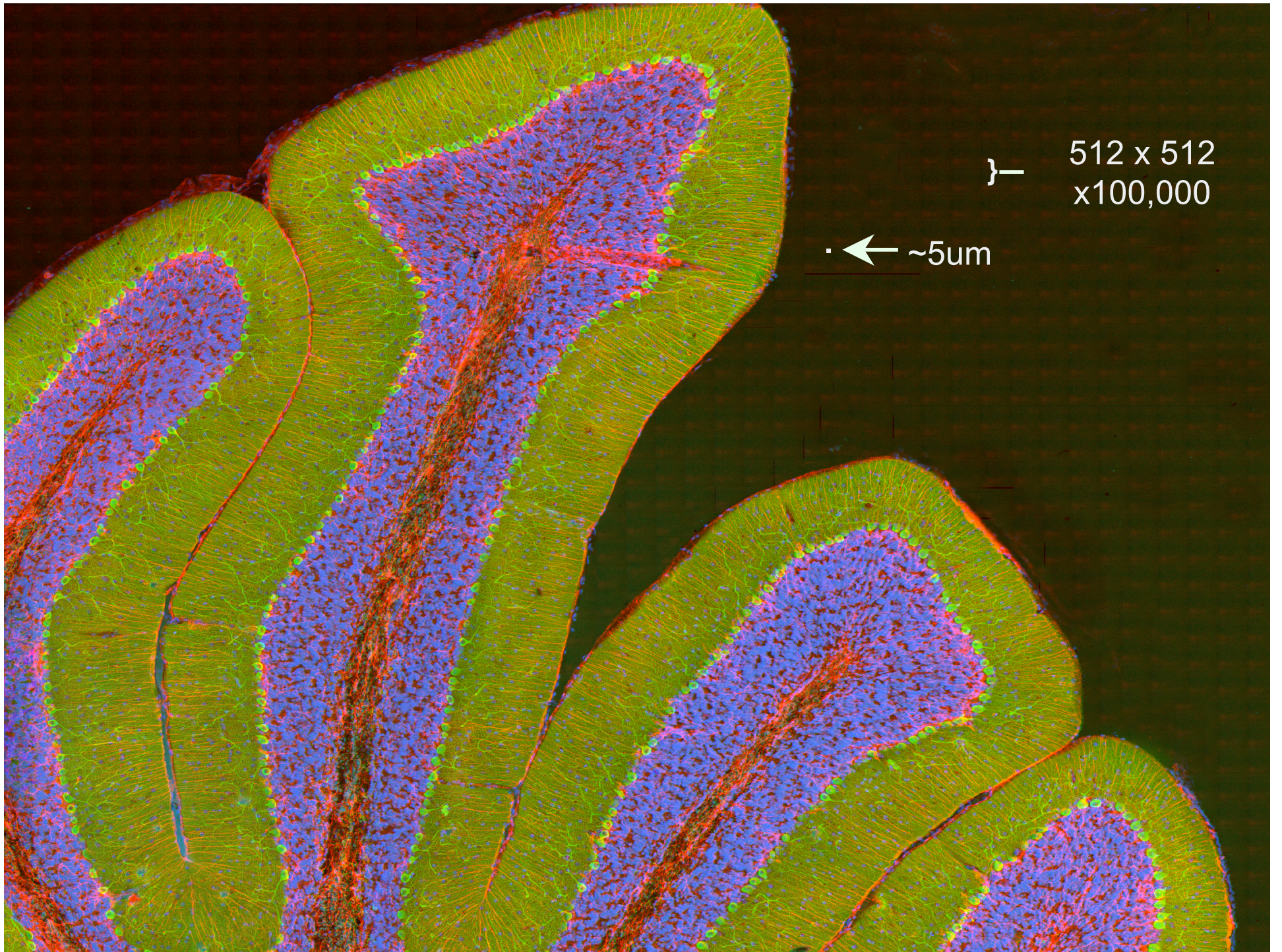
25um³

*Center for in vivo Microscopy
J.A. Johnson - Duke Univ.*

Integration of Multi-resolution data

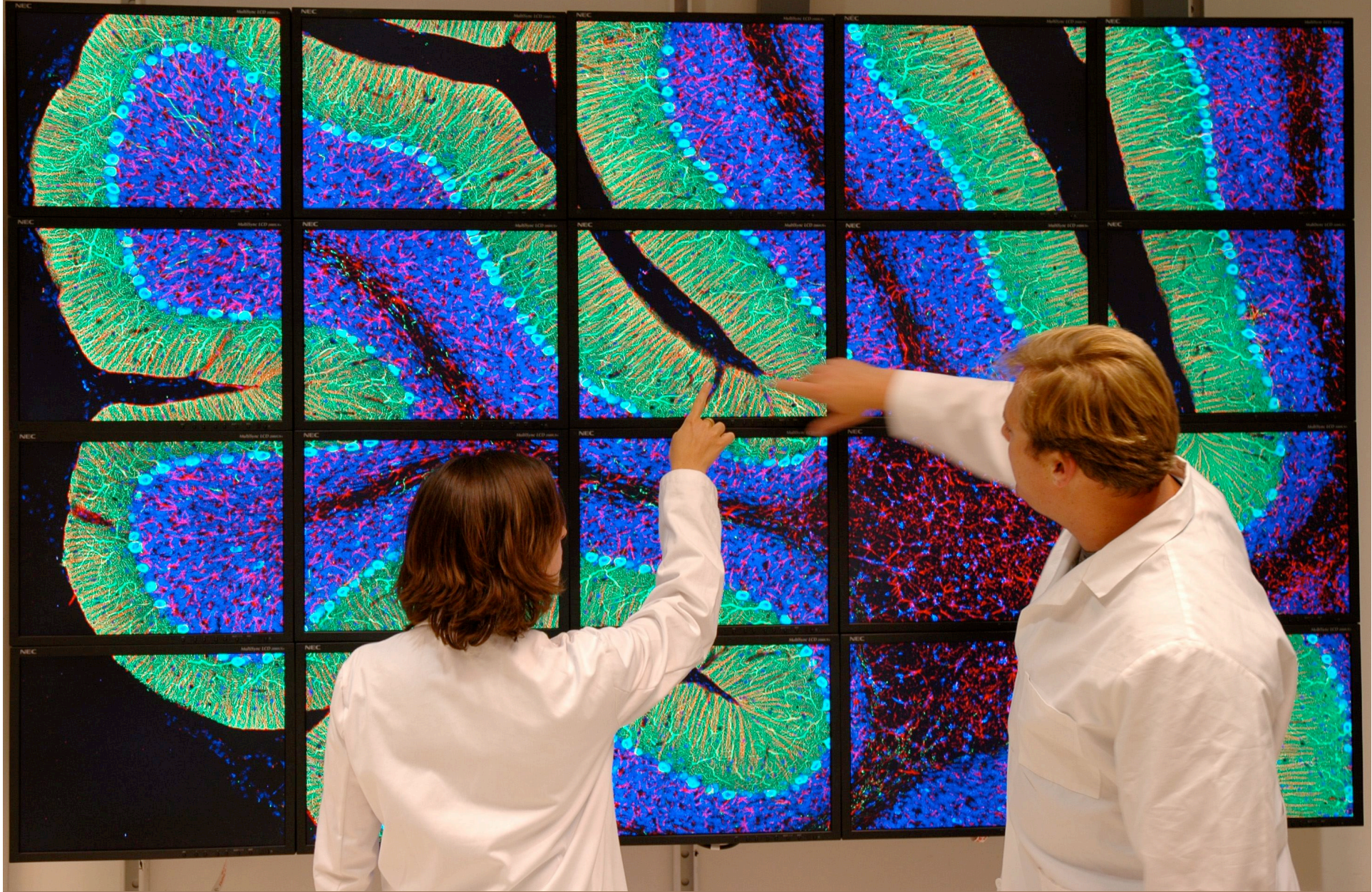
Mouse BIRN - Duke, Caltech, UCLA, U. Tenn. Memphis, Drexel, UCSD

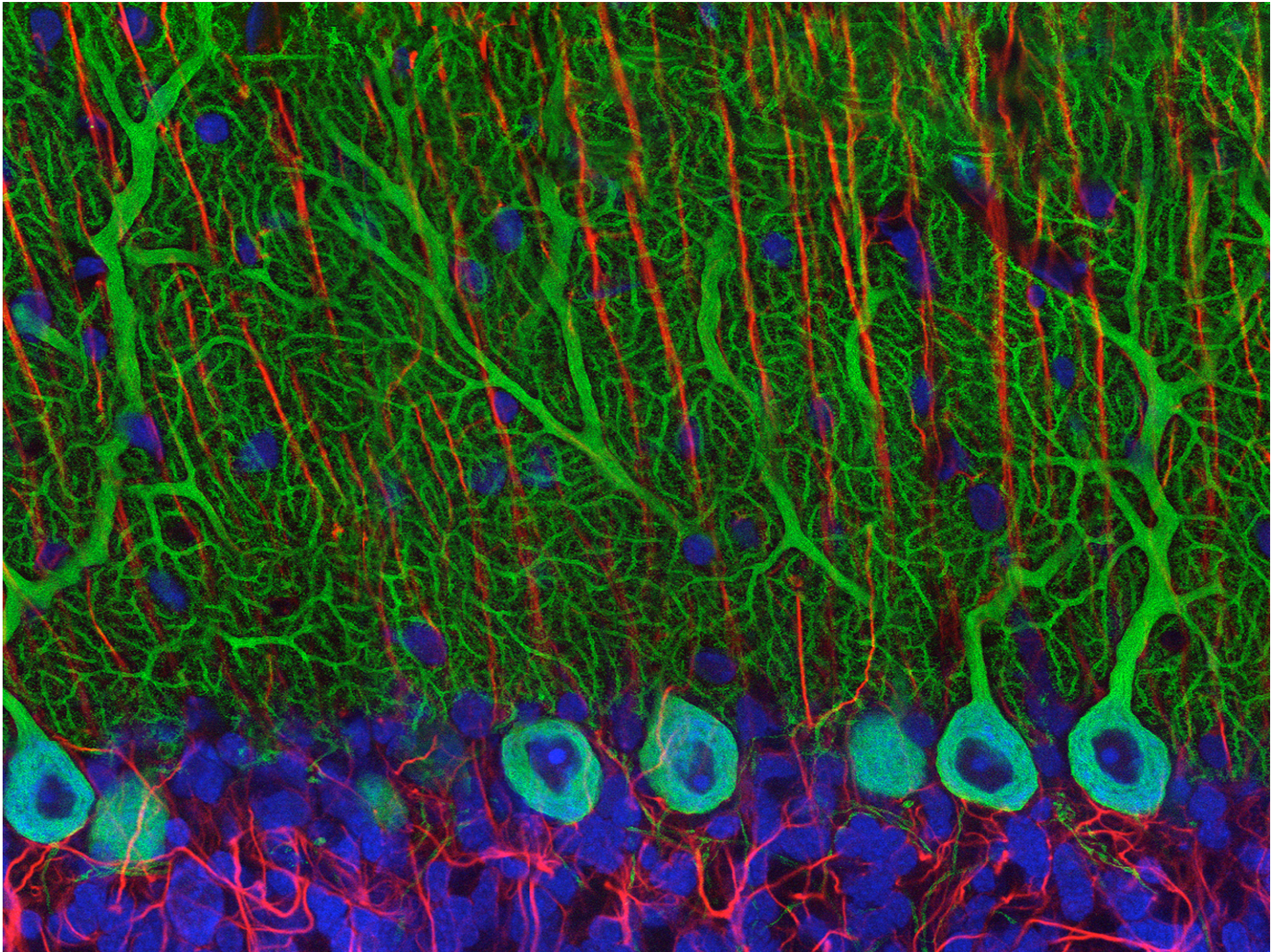




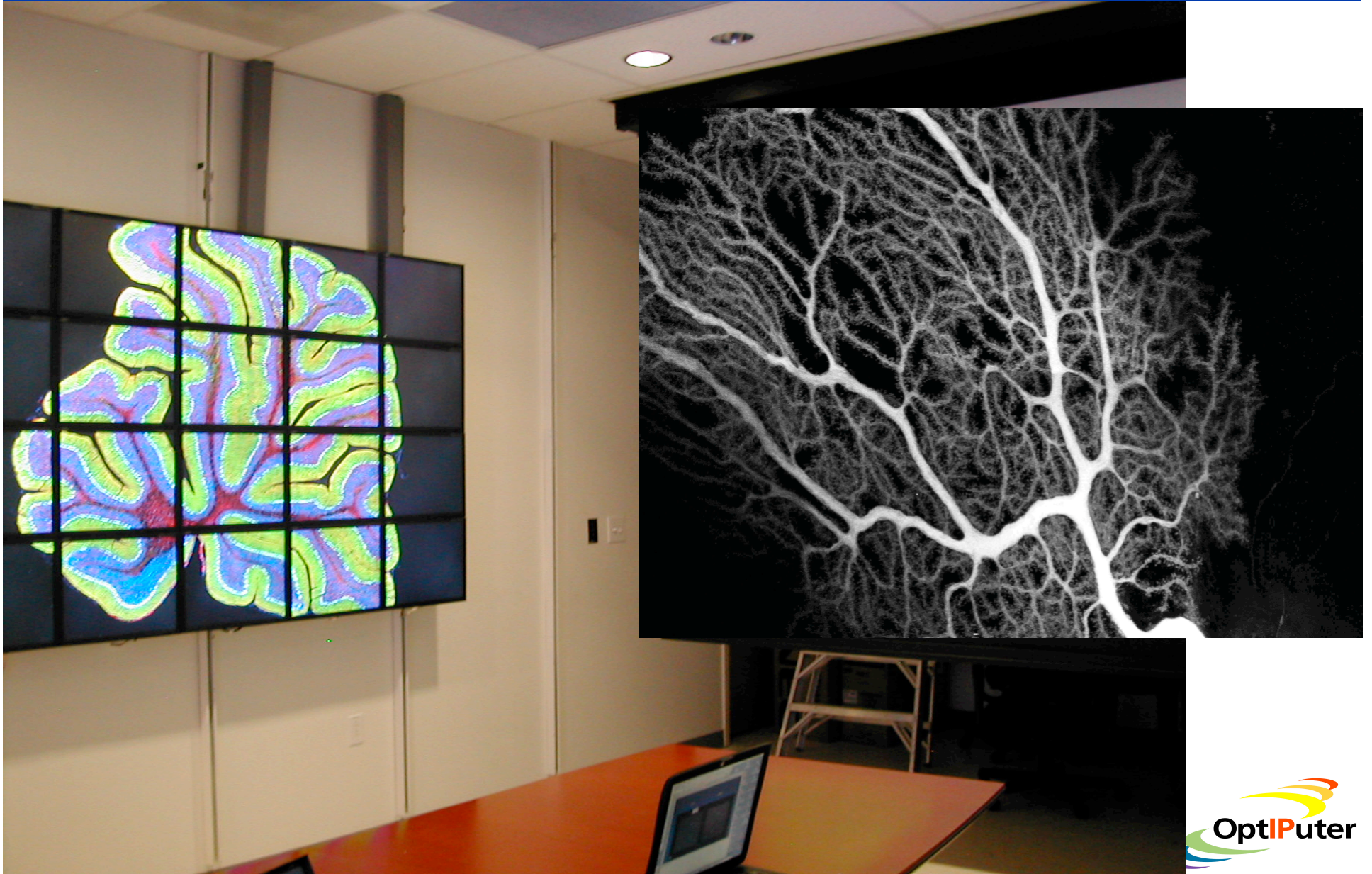
512 x 512
x100,000

← ~5um

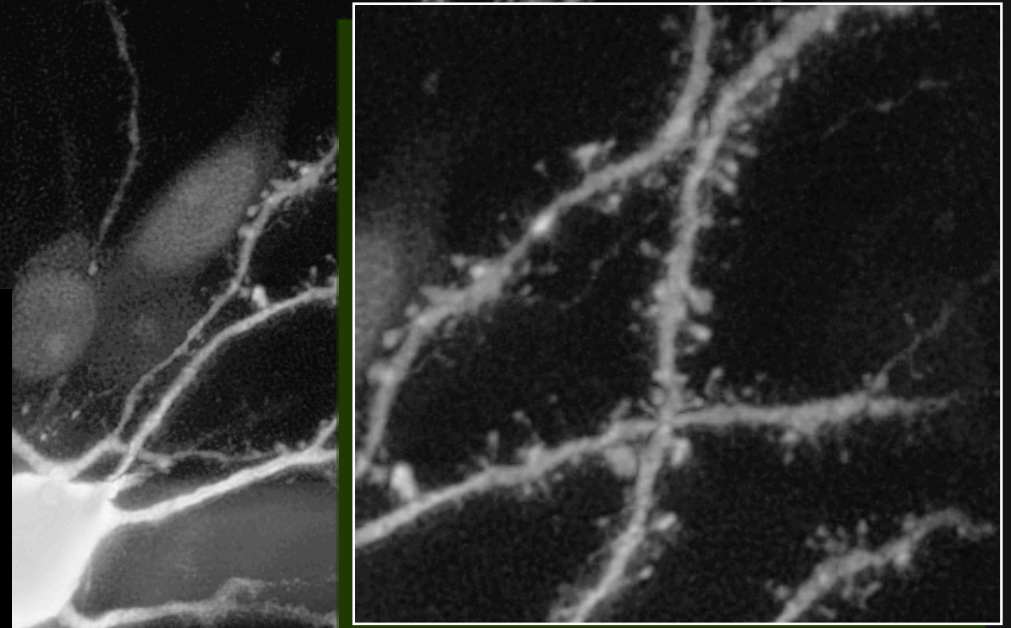
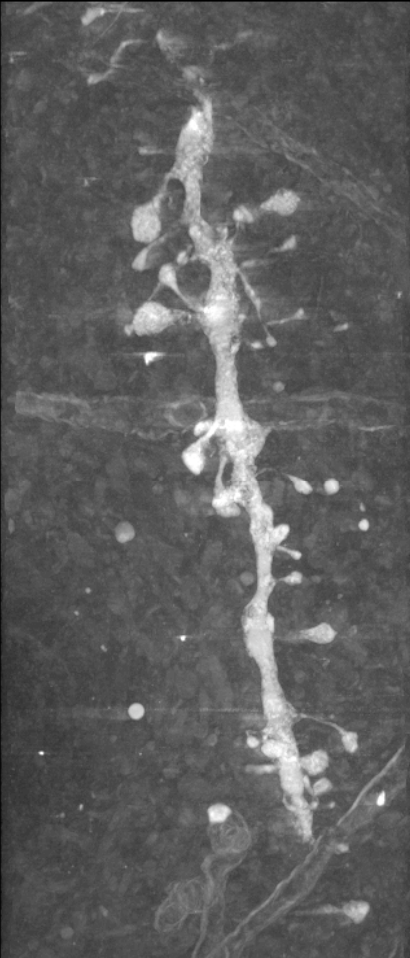




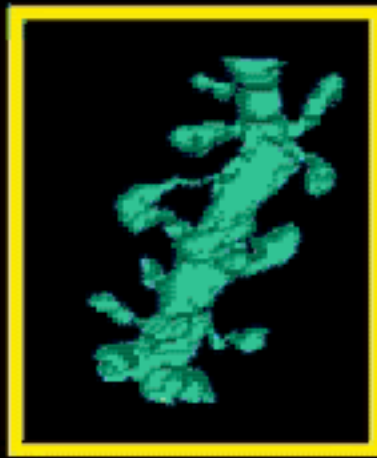
OptIPuter Visualization Environments at NCMIR



Single Cell Reconstructions



Hiroyuki Hakoziaki: BioRad Radiance,
deconvolution with Autoquant

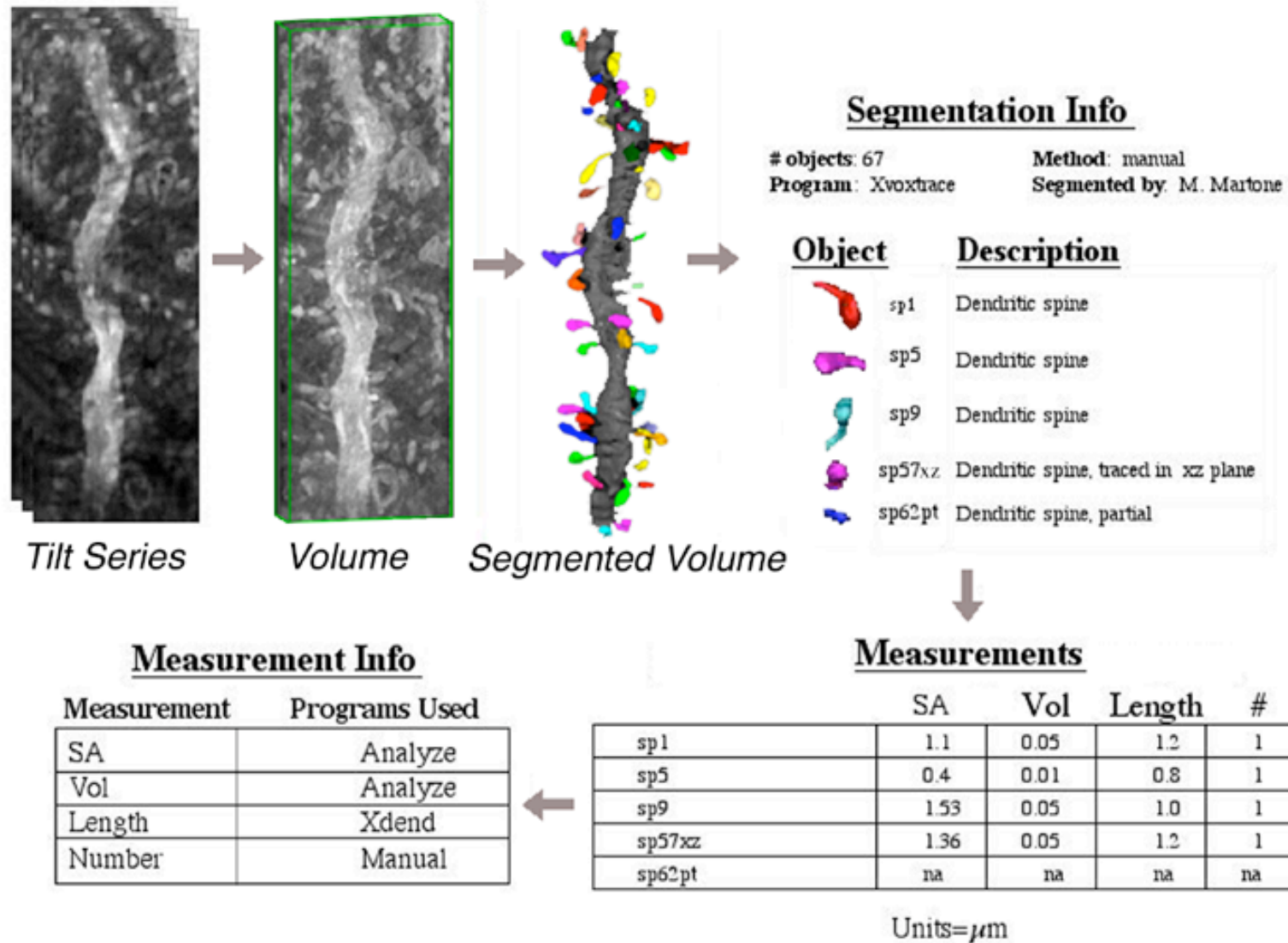


NCMIR

NATIONAL CENTER for
MICROSCOPY and
IMAGING RESEARCH

at San Diego, an NIH supported resource center

Data Modeling and Deposition in the Cell Centered Data Base (CCDB)

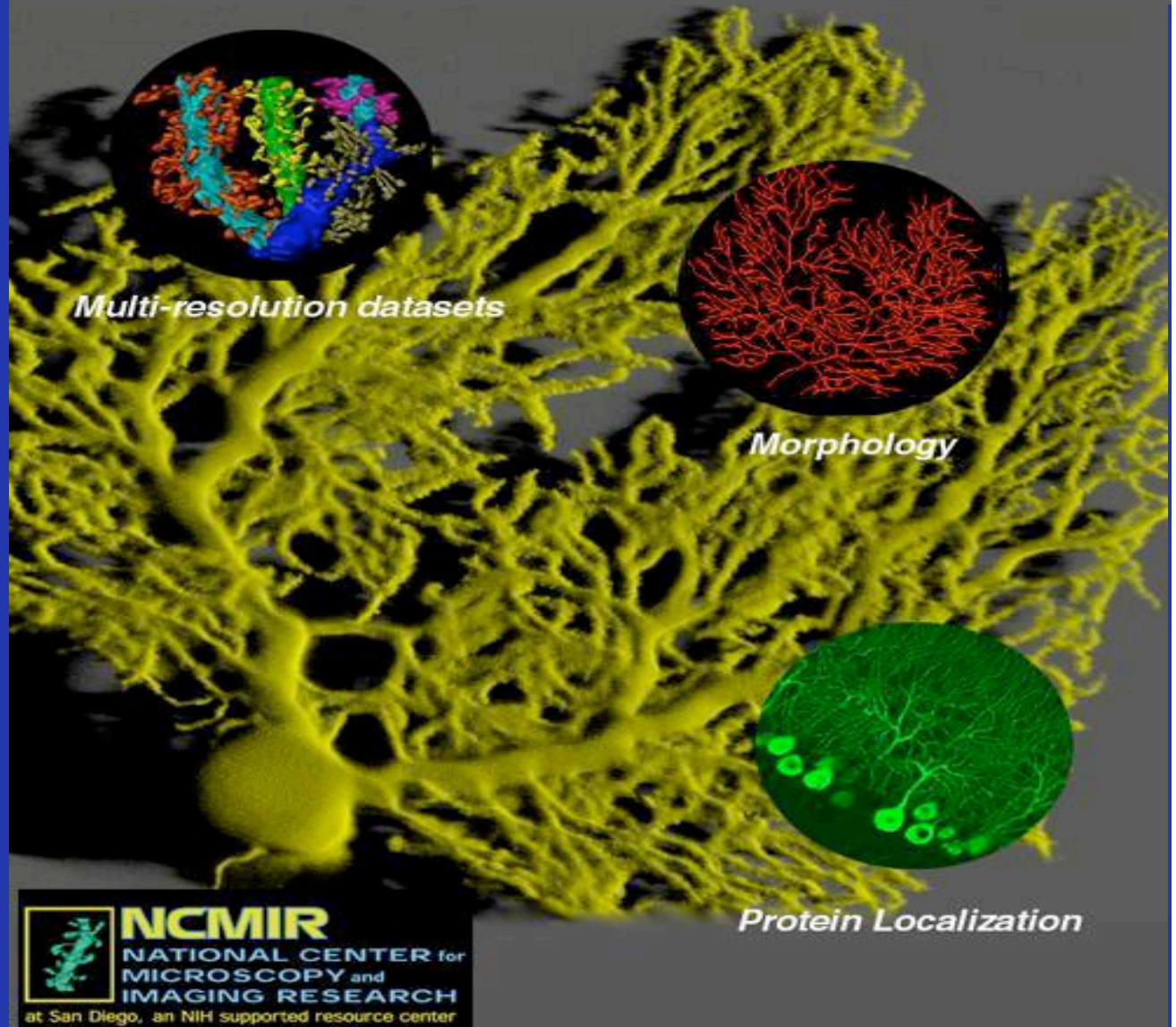


from Maryann Martone, Amarnath Gupta, Bertram Ludaescher, Naoko Yamada and Mona Wong

- A Federated Distributed Database for Neuroscience
- A Multimode & Multiscale “DataGrid”
- Interoperates with Gene and Protein databases & “brain map” databases of brain anatomy

From:
Maryann Martone, Amarnath Gupta,
Bertram Ludaescher, Naoko Yamada,
Yujun Wang, Julia Sun, and Mona
Wong

The Cell Centered Database “CCDB”



Google is not a portal

Carrot juice cures piles

Google Search: carrot juice cures piles - Netscape

File Edit View Go Bookmarks Tools Window Help

http://www.google.co.uk/search?hl=en&ie=UTF-8&q=carrot+juice+cures+piles&btnG=Go

Mail AIM Home Radio My Netscape Search Bookmarks

Google Web Images Groups News more »

carrot juice cures piles Search Advanced Search Preferences

Search: the web pages from the UK

To help protect your security, Internet Explorer has restricted this file from showing active content that could access your computer. Click here for options...

We the Swill Children

Community Building Amongst the Riff Raff

The Lord of the Flies

It is likely that most readers of the Journal have gone dumpster diving or at least have considered it, thus, basic technique involved is not our topic here, as it has been well covered elsewhere.

...

We talked to other dumpster divers, but at first there wasn't much trading. Maybe, we posited, some divers were uncomfortable with having to enter the housing cooperative due to its usual weird energy. But there was loads of food. Too much, in fact, for we had **piles upon rotting piles** of molding, fly-infested food (the Horror). FNB couldn't cook and serve it all, so we tried to have regular food giveaways where we simply set boxes of food out on the street at an advertised time and place.

...

We would meet back at Calypso and, after a good score, celebrate with wine, pie, chocolate, smoothies and all manner of fruit that was minutes out of the dumpster and thus at the peak of ripeness (if it survived being consumed onsite). We had contests for eating pills—vitamins and herbal remedies—and stuffing as many grapes in our cheeks as possible, then doing impressions of some famous actor. **Bloated carrot juice bottles** were flung to explosive effect.

We made lists of the things we found and photographed some of the more absurd items. We tried to name our merry enterprise: The Gleaners, Dumpster Share, Dumpster Liberation Front, Dumpster Mafia and the Swill Children, but nothing really stuck. We involved siblings and parents, especially when The Cleaners and I—a French documentary by Agnes Varda about people harvesting from the waste stream—came to our town's art house cinema. In case some of us hadn't built up the necessary enzymes, we had colloidal silver to **cure the occasional** upset stomach.

...

[Back to Summaries](#) | [Back Issues Index](#)

[home](#) | [subscribe](#) | [ef! contacts](#) | [about ef!](#) | [pgp key](#) | [links](#) | [email us](#)

Earth First! Journal
PO Box 3023, Tucson, AZ 85702
520-620-6900 (voice)
413 254 0057 (fax)
collective@earthfirstjournal.org

What Ken Peach expected

What he did not expect

Carrot juice cures piles

1,680

Google Search: carrot juice cures piles - Netscape

http://www.google.co.uk/search?hl=en&ie=UTF-8&q=carrot+juice+cures+piles&btnG=Google+Search&meta...

Google

carrot juice cures piles Search

Search: the web pages from the UK

Web Results 1 - 10

Preparation H
www.preparationh.co.uk Treatment for Piles and advice on symptoms and conditions

Cure Piles Quickly
www.avatrol.co.uk Guaranteed to work oral capsule steps piles quickly.

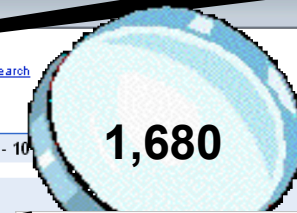
Home Remedy for Hemorrhoids, Piles Home Remedies
... This is a permanent cure for bleeding piles. Drink a juice of turnip leaves, spinach, watercress, and carrots (equal quantity). ...
www.fatfreekitchen.com/home-remedy/hemorrhoids-piles.html - 27k - Cached - Similar pages

Constipation Home Remedies, Home Remedy for Constipation
... Mix 1/2 cup olive oil with 1/2 cup orange juice and drink to cure constipation. ... Juice Laxative: Mix 1 cup tomato juice, 1/4 cup carrot juice, and 1/2 cup ...
www.fatfreekitchen.com/home-remedy/constipation.html - 28k - Cached - Similar pages

AYURVEDA
... Four to five drops of carrot juice in the nostrils checks ... The daily use of carrot develops blood ... skin diseases like eczema, itches boils and pimples are cured. ...
www.urday.com/veg.htm - 32k - Cached - Similar pages

Welcome to Herbs & Spices, bengal gram, cardamom, carrot
... boiled in 1 glass eliminates strangury & cures other kidney ... Taking one glass of carrot juice and lettuce in equal ... or soup or hot decoction of carrot twice a ...
www.hashmi.com/carrot.html - 12k - Cached - Similar pages

Compare Prices and Read Reviews on The Juiceman's Power of Juicing ...
... parsley, watercress and potatoes make up this powerful potion of pure cure! ... Try carrot, apple and ginger ... little knob of ginger to any of your vegetable juice mix ...



Home Remedy for Hemorrhoids, Piles Home Remedies - Netscape

http://www.fatfreekitchen.com/home-remedy/hemorrhoids-piles.html

Home Remedy of Hemorrhoids or Piles

FatFreeKitchen.com
Caring For Your Health
A Better Way Award Site

Home | About Us | Recipe List | Site Map | Disclaimer

Home Remedy Topics

Home Remedy of Hemorrhoids or Piles

Hemorrhoids or piles is inflammation of the veins inside or just outside the rectum. The piles may be internal or external. In the internal piles, there is bleeding. In the external piles, there is no much bleeding. If the veins burst, then piles bleed.

Symptoms of Hemorrhoids or Piles

The patient of hemorrhoids or piles may have one or all of the following symptoms.

- ♦ Pain at passing stools.
- ♦ Irritation after passing a stool.
- ♦ Discomfort, itching, and pain in and around rectum.
- ♦ Bleeding at passing stool.
- ♦ Large piece of flesh out the rectum.

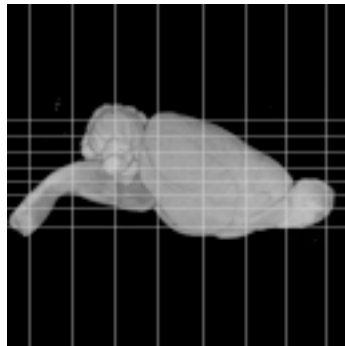
Causes of Hemorrhoids or Piles

The main cause of hemorrhoids or piles is continued chronic constipation. The exerted force for passing the stool out causes pressure on the sitting. It may be also due to prolonged standing or sitting, strenuous work, obesity, and mental

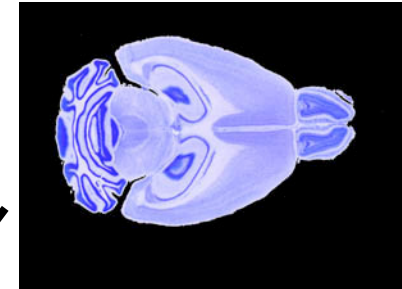
13. Drink a juice of turnip leaves, spinach, watercress, and carrots (equal quantity).

Drink a juice of turnip leaves, spinach, water cress and carrots (equal quantity)

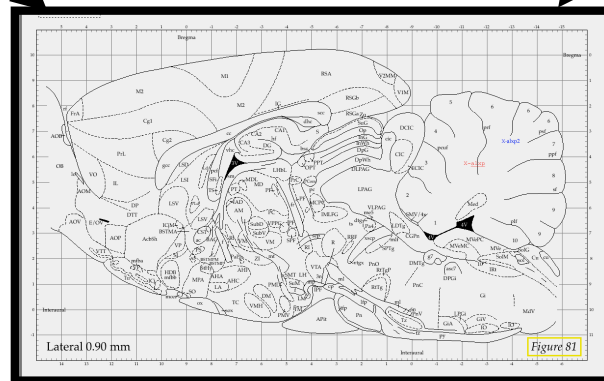
BIRN Data Integration: *An example of federation of Multi-scale, Multi-modal data from Mouse BIRN*



1. Create databases at each site



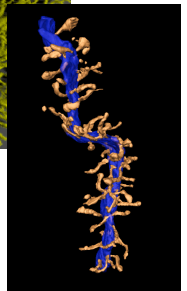
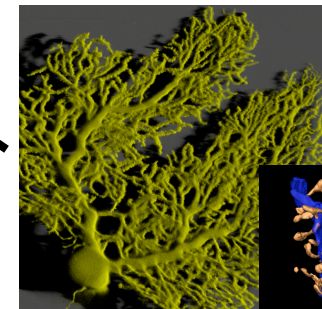
2. Create conceptual links to a shared **“ONTOLOGY”**



4. Use **integration engine “Mediator”** to navigate and query across data sources



3. Situate the data in a **common spatial framework**



DATA MODELS: Frameworks to Integrate Databases

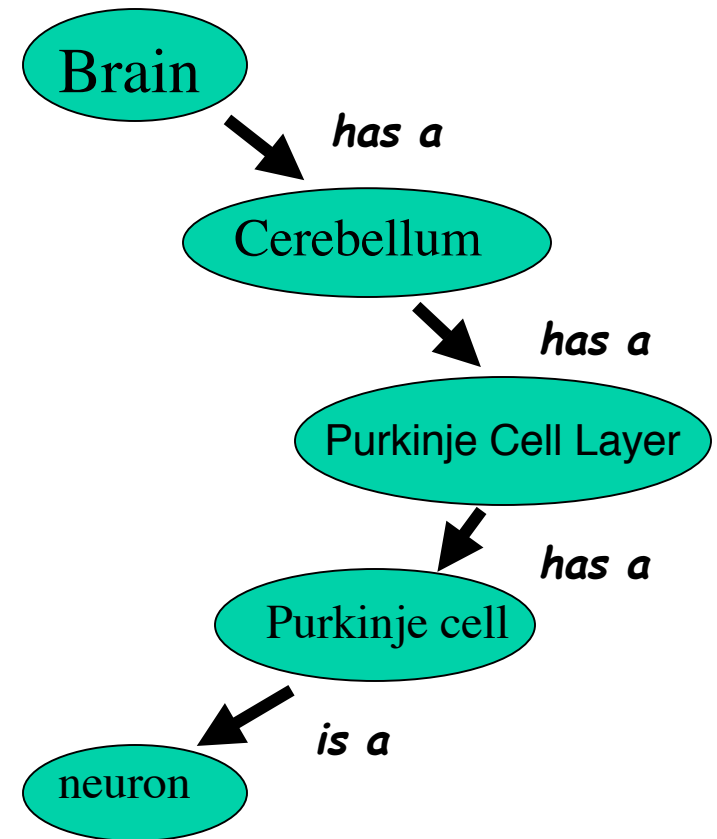
BIRN uses "Integrated Views" based on "Ontologies"

What is an **Ontology**?

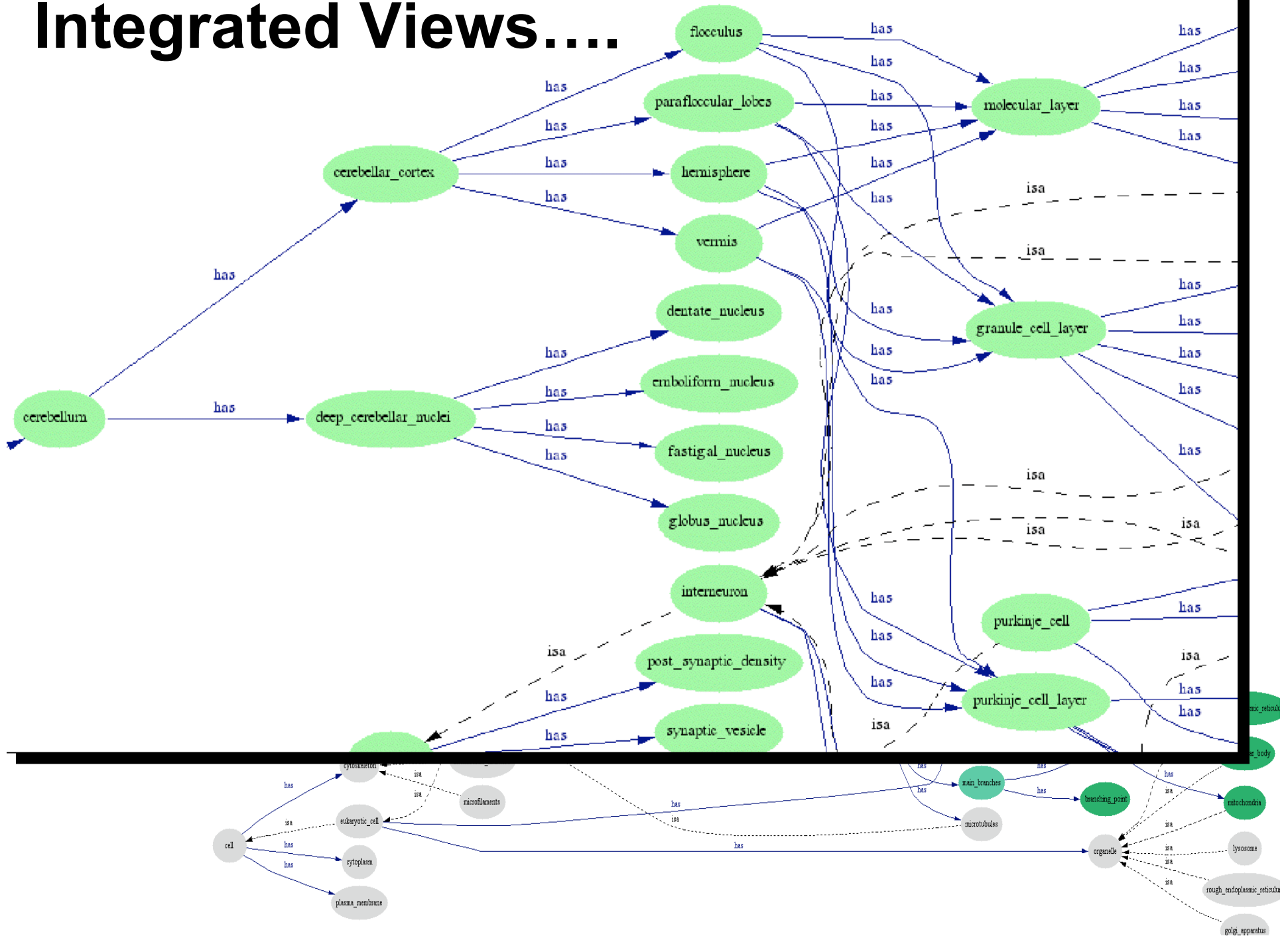
- a way to represent and communicate a shared understanding of a field
- representation of **terminological knowledge**
- explicit specification of a conceptualization
- concept **hierarchy** ("**is-a**")
- further **semantic relationships** between concepts ("is part of", "causes", etc.)

Examples:

- NCMIR ANATOM
- GO (Gene Ontology)
- UMLS (Unified Medical Language System)
- CYC



Integrated Views....



Atlas-based Spatial Reference Systems: *Multi-Scale and Multi-Modal Data are Connected through Ontologies*

Update user-defined area -

Geometry name:
cerebellum

Attached data:

URL	http://www.myurl.com
File path	
Database Name	ccdb
Database ID	33

More boxes

Annotation:
Purkinje neuron

Save

Close

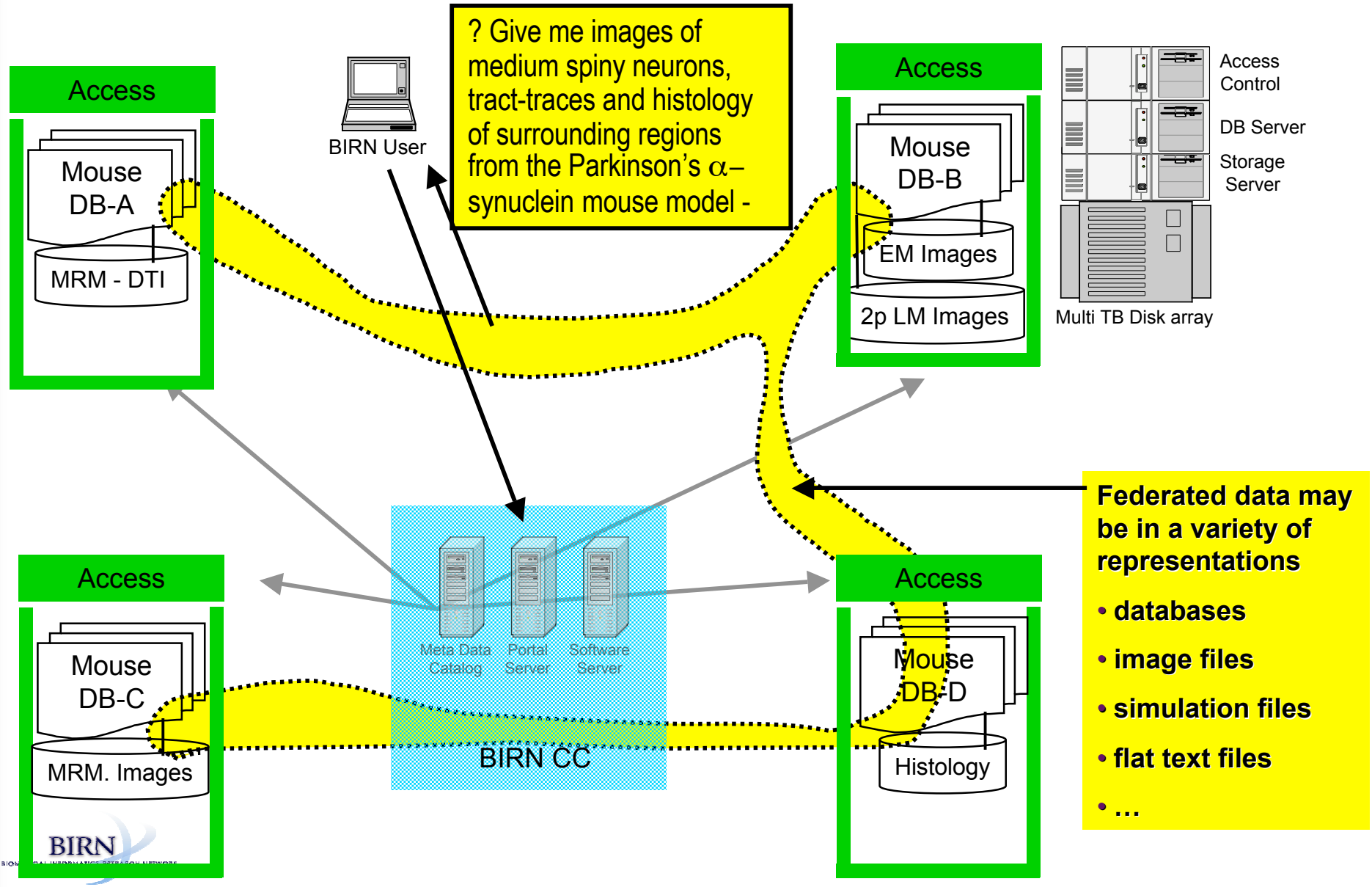
UMLS ID

Registering My Data
or use "KNOW ME"
tool

Location, Location and Location..... and a Unique Identifier

Figure 81

BIRN Data Integration Environment Bridges Data Models When Users Explore Distributed Data



The BIRN Smart Atlas: *An Example of a Data Grid-based GIS-like tool for spatial integration of multiscale distributed brain data. *Runs from BIRN Portal*

The screenshot displays the BIRN Smart Atlas software interface. The main window shows a brain atlas with a grid overlay. A yellow arrow points to a specific location on the grid, which is magnified in a smaller window below. This magnified view shows a neuron reconstruction with a blue cell body and various colored processes. A yellow arrow points from this neuron reconstruction to a grayscale micrograph of the neuron. The micrograph is labeled with coordinates: "(Behind Bregma: -0.22mm) (Ventral to Bregma: 4.633mm)".

On the left side of the interface, there is a panel for "Figure: 33" with buttons for "Query UMLS", "Show Cells", and "Load Image". Below this is a list of data sources with checkboxes:

- c_033_mouse_pi
- c_033_mouse_pi
- c_033_mouse_la
- c_033_mouse_bi

At the bottom of the left panel, it says "Data Source: Select 0 Polygons".

On the right side, a "Related Image List" window is open, showing a list of images:

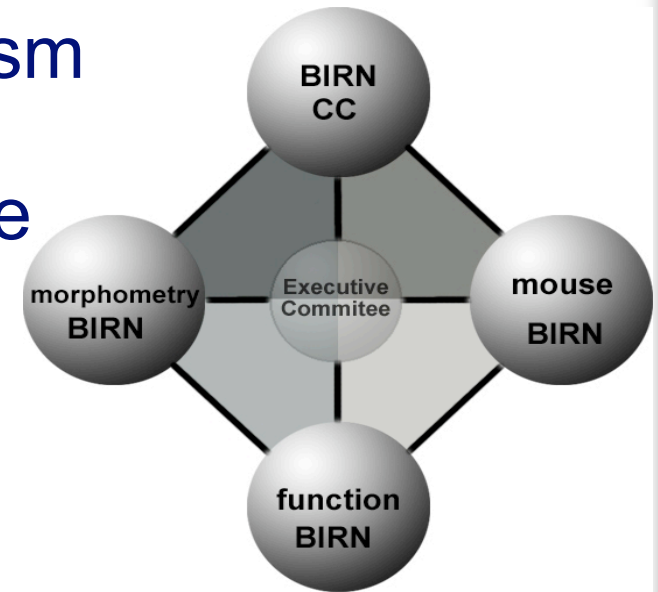
- DUKE_MOUSE_IMAGE_33[Duke CIVM]
- UCLA_LONI_MOUSE_IMAGE_33[UCLA_LONI]
- UCLA_LONI_MOUSE_IMAGE_BW_33[UCLA_LONI]

Below the list is a table with the following data:

Property	Value
IMAGE_NAME	DUKE_MOUSE_IMAGE_33
IMAGE_SOURCE	Duke CIVM
IMAGE_TYPE	ARCIMS_IMAGE_SERVICE
SOURCE_FULLNAME	2;http://geo.sdsc.edu/rectify/n14886_atlas_267;...
DESCRIPTION	Magnetic resonance imaging from Common Sp...

BIRN is a Growing Consortium

- NDAR - National Database for Autism Research for the support of clinical and translational research within the autism research community
- Non-Human Primate - Linking imaging, behavior, and molecular informatics in non-human primate pre-clinical models of disease
- UK e-Science - Fostering collaborations with European cyberinfrastructure community

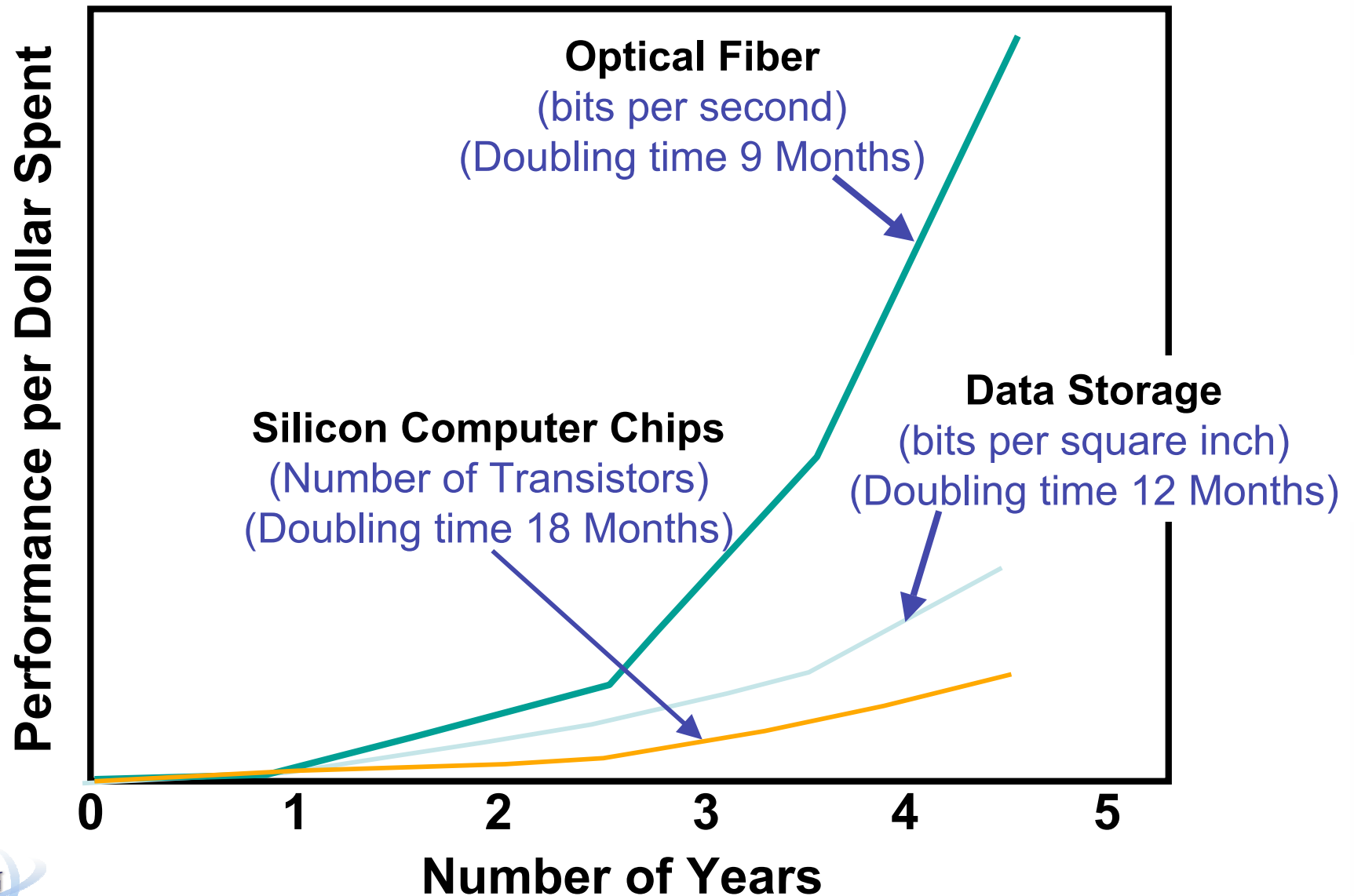


The BIRN Collaboratory Today

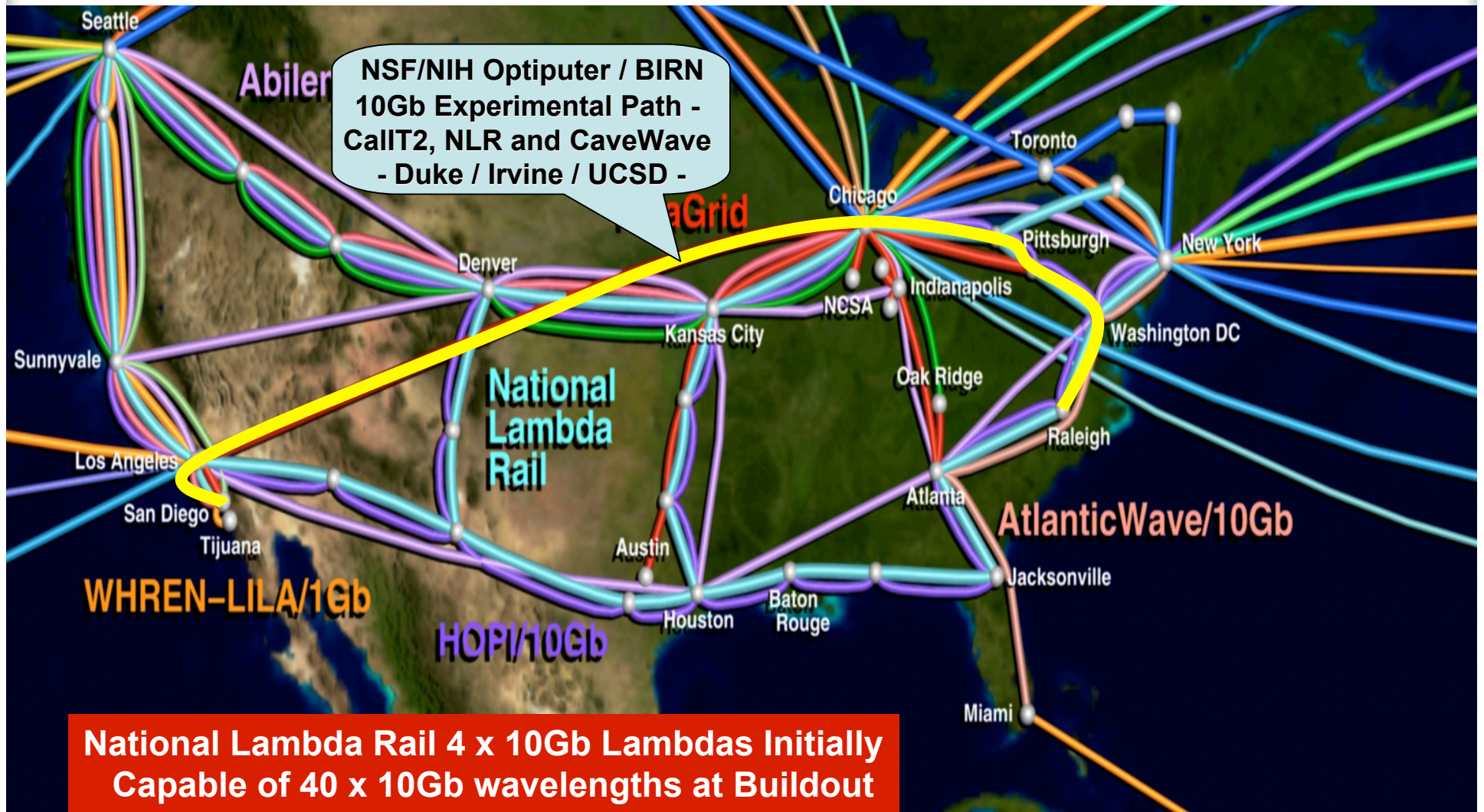
Enabling collaborative research at 28 research institutions comprised of 37 research groups.



Optical Networks Are Becoming the 21st Century Cyberinfrastructure Driver



Building Bridges: NIH Research and Infrastructure Projects & NSF Advanced Network Research and Infrastructure Projects



Removing Barriers to BIRN: Decreasing Cost of Entry & Increasing Scalability

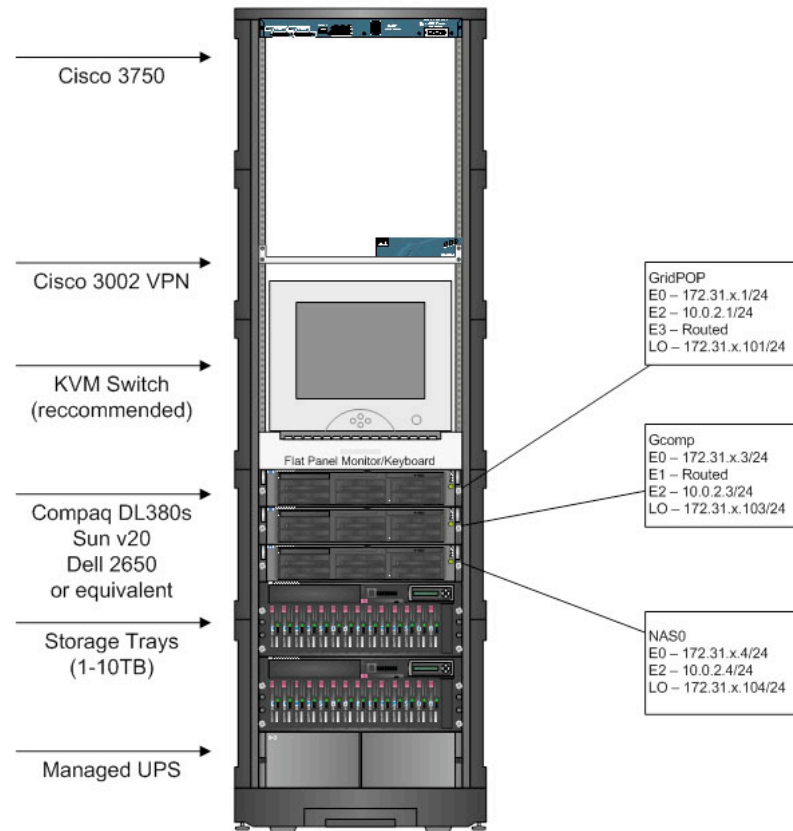
\$120K
(2001)

< \$20K
(Today)

< \$5K
(~2011)



- Prescribed hardware jumpstarted BIRN for functionality



- Support for multiple vendors



- Software solution for researchers to BIRN “enable” local hardware



BIRN is a Stable & Rapidly Evolving National Research Infrastructure

- ✓ Supporting collaborative activities of advanced biomedical research & clinical research centers in the US - Serving as a model for programs everywhere.
- ✓ Ensuring a stable, robust, shared network environment across > 35 institutions today - High Bandwidth Connectivity via Internet2.
- ✓ Developing hardware and software infrastructure for managing distributed data - creation of the BIRN Data GRID.
- ✓ Providing secure and audited access to distributed data - deployment of a Uniform BIRN Security Model.
- ✓ Exploring data using "intelligent" query engines that can make inferences upon locating "interesting" data - development of the BIRN Data Integration Environment.
- ✓ Integrating BIRN with middleware projects in academia & industry - facilitating the use of Computational GRID infrastructure.
- ✓ Providing simple and intuitive access to a shared processing, visualization and analysis environment - BIRN is a leader in GRID Portal technology.
- ✓ Changing the use pattern for research data from the individual laboratory/project to shared use.
- ✓ Promoting large-scale collaboration among research scientists across institutional boundaries

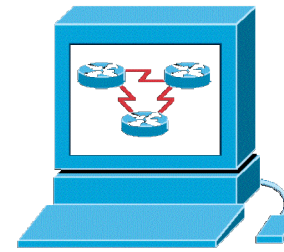
The BIRN Coordinating Center is Supporting and Evolving the Deployed Infrastructure



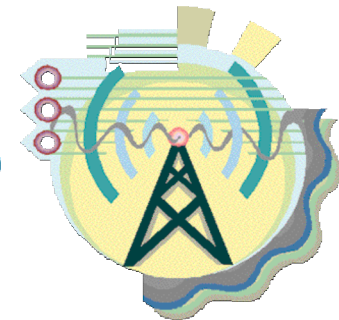
HELP DESK



MONITORING



NETWORKING



**COMMUNICATIONS
INFRASTRUCTURE**



TRAINING



**ASSESSING TECHNICAL OPTIONS
FOR BIRN TO BUILD WORKING
SYSTEMS**



**SCALABLE
SOFTWARE
DISTRIBUTION**

5th Annual BIRN All-Hands Meeting



More than 200 BIRN members from across the nation participated in presentations, brain-storming workshops, and problem-solving discussions at the BIRN All Hands Meeting.



October 2005
La Jolla, CA



http://www.nbirn.net

Biomedical Informatics Research Network - Home Page

http://www.nbirn.net/

BIRN
BIOMEDICAL INFORMATICS RESEARCH NETWORK

BIRN Portal Login

Username:
Password: GO

Search This Site

About Us Resources Test Beds Publications Contact Us Site Map Help!

BIRN is...

The [Biomedical Informatics Research Network \(BIRN\)](#), a [National Institutes of Health \(NIH\)-National Center for Research Resources \(NCRR\)](#)-sponsored initiative, is establishing a distributed information technology infrastructure to improve biomedical research.

This evolving "cyberinfrastructure" will enable researchers throughout the United States to collaborate on large-scale studies of human disease with unique, multi-resolution tools.

[More >](#)

Research Focus

The BIRN currently consists of three "test bed" projects that are conducting structural and functional studies of neurological disease:

[Function BIRN](#) - studying regional brain dysfunctions related to the progression and treatment of schizophrenia.

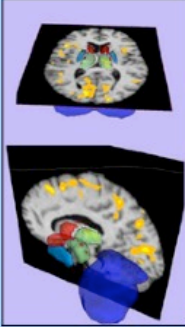
[Morphometry BIRN](#) - examining unipolar depression, mild Alzheimer's disease and mild cognitive impairment.

[Mouse BIRN](#) - studying animal models of multiple sclerosis, schizophrenia, Parkinson's disease, ADHD, Tourette's disorder, brain cancer.

These projects and the overall information

Hot Topic

3D Slicer



The Function, Morphometry, and Mouse BIRNs are working to develop images like these: generated from subject populations, collected across different imaging modalities and sites, applying the strengths of various analysis and visualization packages. This kind of detail will allow researchers to better understand aspects of brain function and dysfunction.

News

October 6, 2003
The newest BIRNing Issues, volume 2, issue 1, is online ([PDF](#)).

July 17, 2003
The **New York Times** ran an **article** in their science section that included the **BIRN Project** and the **Morphometry BIRN Test Bed**. Read the text ([PDF](#)).

July 17, 2003
An updated **BIRN-CC Project Schedule** has been released. View the document as a [PDF](#) or [Microsoft Project](#) file.

July 10, 2003
Minutes of the first BIRN Steering Committee meeting are available to BIRN participants via [PDF](#) or from the new [Steering Committee section](#) of the Web site.

June 27, 2003
The June 2003 *BIRNing Issues* is now posted on the Web. ([PDF](#))

Events

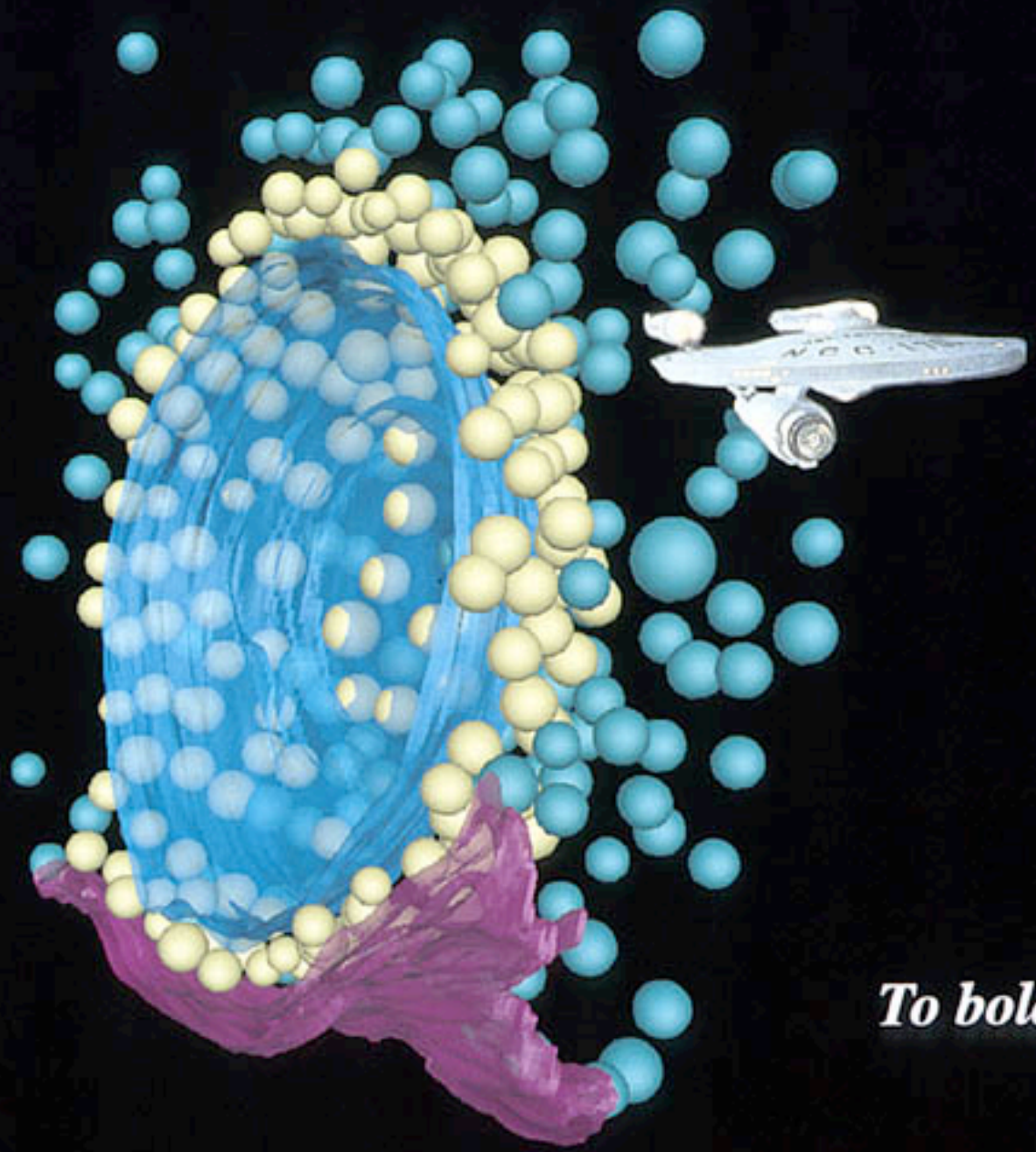
2003 All Hands Meeting, October 8-10 at UCSD.

The 2003 All Hands Meeting was extremely productive.

Review details, take our post-event survey, and view the pictures: [AHM 2003](#)

- Breaking down the barriers
 - Mistrust
 - Open sharing of information
 - Who gets credit
 - Commercial products
 - Governance
- Incorporating processes for multi-site studies and sharing of human data
 - HIPPA Compliance
 - Patient confidentiality
 - Institutional Review Board (IRB) approvals
- Developing guidelines - for sharing data & authorship
- Integrating new participants
- Providing an architecture to allow for technology improvements with the existing infrastructure
- Guaranteeing security versus ease of use





To boldly go...