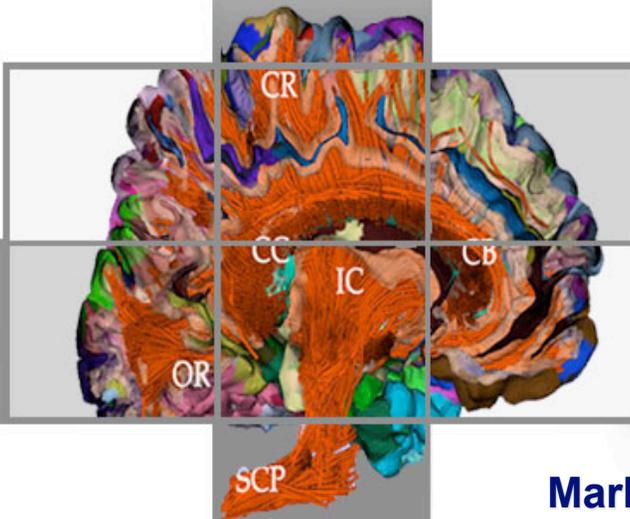


# BIRN

BIOMEDICAL INFORMATICS RESEARCH NETWORK



## The Biomedical Informatics Research Network:

A National Information Infrastructure to Enable and Advance Biomedical Research

**Mark Ellisman, Ph.D.**

**Director, BIRN Coordinating Center**

**and the National Center for Microscopy and Imaging Research**

**University of California San Diego**

**Human Brain Project Annual Meeting**

**April 24-25, 2006**



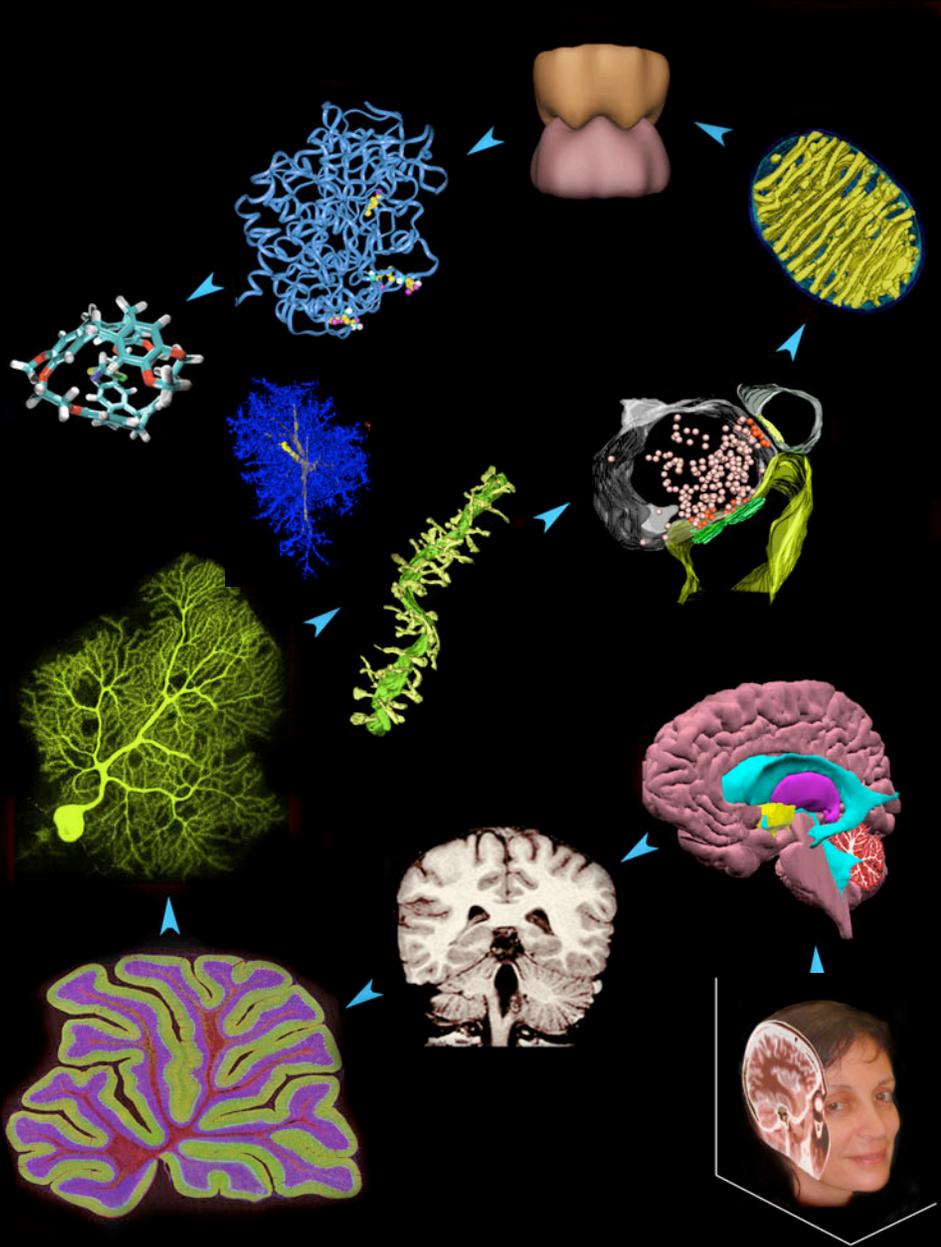
# What is BIRN?

## *The Official Mission Statement:*

“To accelerate Discovery Science by creating and fostering a new biomedical collaborative infrastructure and culture.”

*But really, what is BIRN ?.....*

# Biomedical Informatics Research Network



*A shared biomedical IT infrastructure to hasten the derivation of new understanding and treatment of disease through use of distributed knowledge*

- Collaboration *between groups with different expertise and resources (technical, scientific, social and political)*
- Shared infrastructure to support collaboration (designed to be extensible to other biomedical communities)
- Open access and dissemination of data and tools (i.e. Open Source)
- Bringing transparent GRID Computing to Biomedical Research

# 4th Annual BIRN All-Hands Meeting



October 2004  
Boston, MA

# 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

# Challenges of Large and Distributed Data

Each Brain is Big Data and Comparisons Must be Made Between Many!



The Human Brain Project was one of the first to recognize the magnitude of the challenge of brain data or “neuroinformatics” as it became known, and has allowed us to begin to address it!

## Volume Size by Resolution

(rat brain =  $1.5 \text{ cm}^3$ )

human brain =  $1500 \text{ cm}^3$ )

Voxel Size

Color (3B/p)

Rodent

Human

mm

4.5 KB

4.5 MB

Megabyte =  $10^6$

10  $\mu\text{m}$

4.5 GB

4.5 TB

Terabyte =  $10^{12}$

1  $\mu\text{m}$

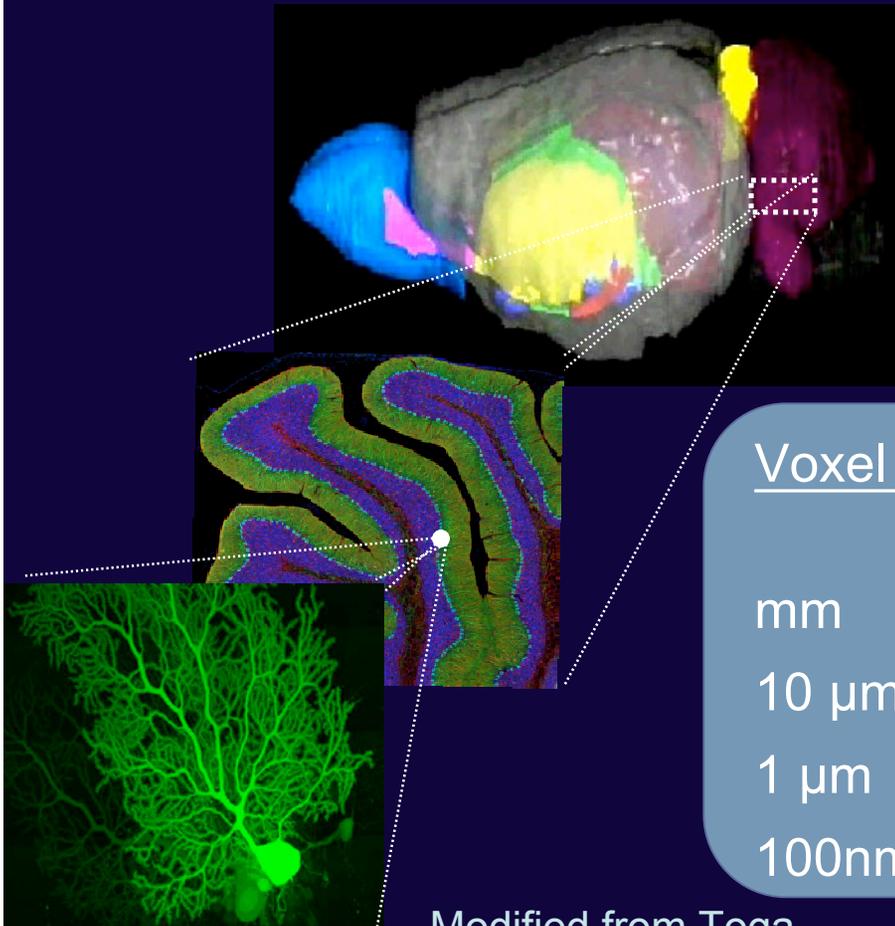
4.5 TB

4.5 PB

Petabyte =  $10^{15}$

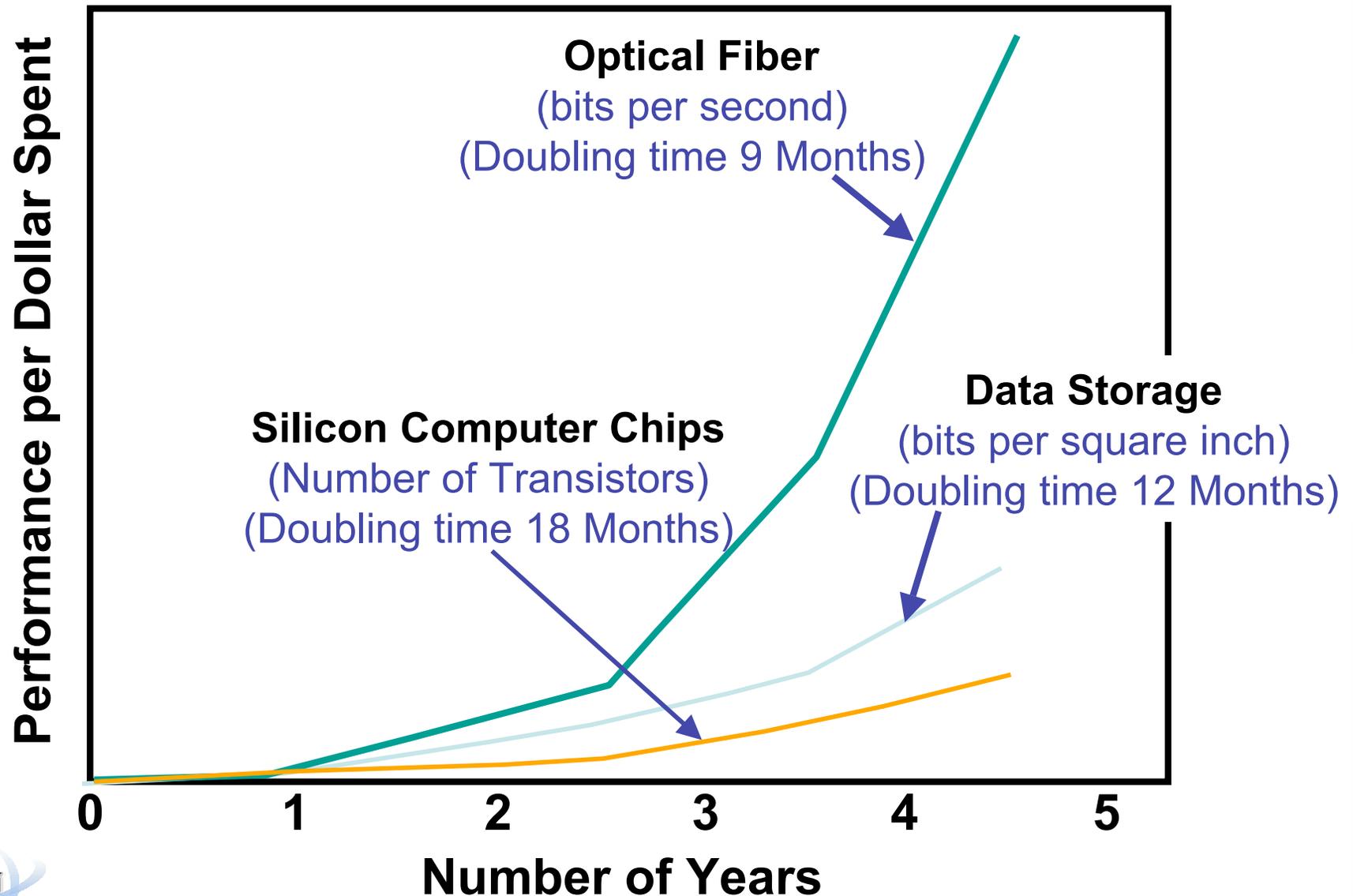
100nm

4.5 PB



Modified from Toga

# Optical Networks Are Becoming the 21<sup>st</sup> Century Cyberinfrastructure Driver



# Origins of IT Infrastructure used to build the BIRN:

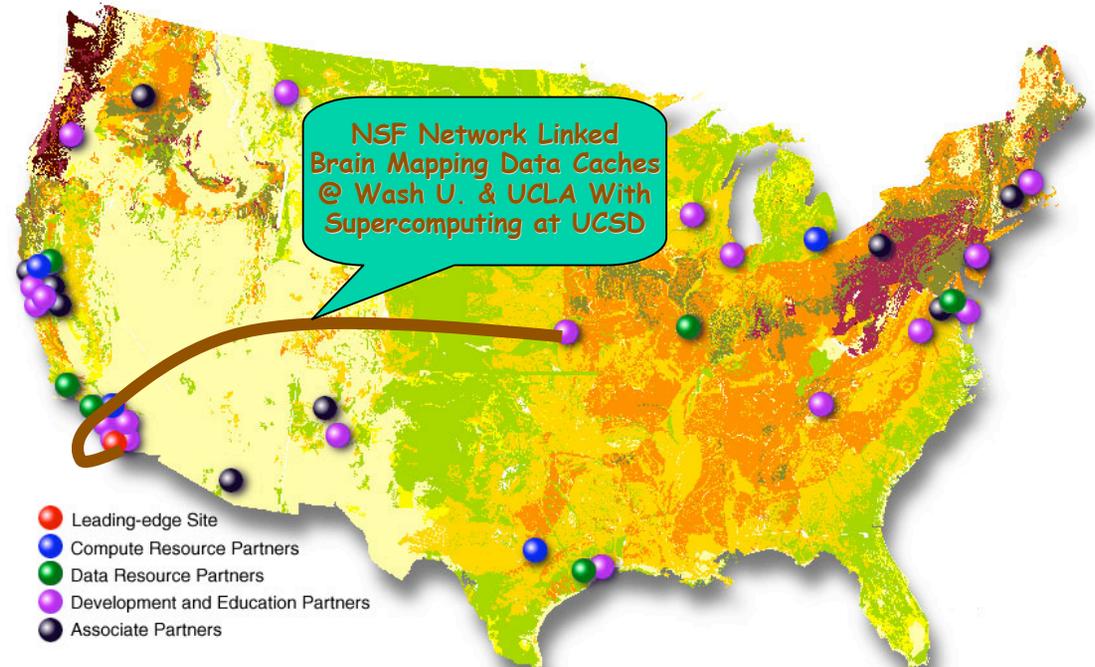
*Initiatives like the NSF - National Partnership for Advanced Computational Infrastructure (NPACI)*

- ~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"***



# What is BIRN?

- 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

# BIRN Coordination and Test Beds

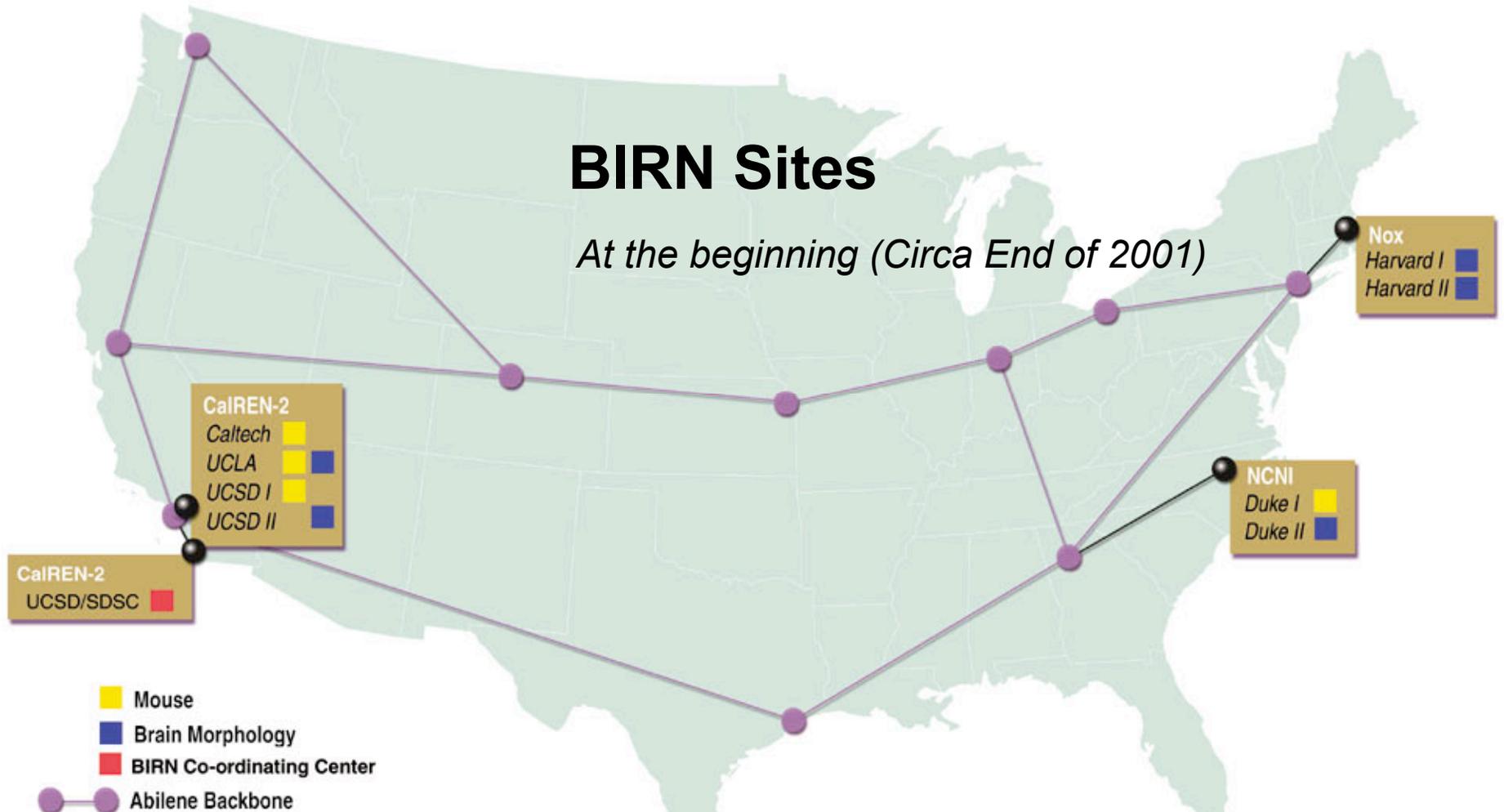
- **BIRN-Coordinating Center**
  - Develops and supports overall information technology (IT) infrastructure linking the testbeds
- **Morphometry BIRN**
  - Studying brain structures related to unipolar depression, mild Alzheimer's disease and mild cognitive impairment
- **Function BIRN**
  - Studying regional brain dysfunctions related to the progression and subtypes of schizophrenia
- **Mouse BIRN**
  - Studying animal models of multiple sclerosis, schizophrenia, Parkinson's disease, ADHD, Alzheimers, Tourette's disorder, brain cancer.

# 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 Cyberinfrastructure is Designed to Accommodate Growth



**10+ Distinct Installations, ~ 100 Individual Machines**

*From the Expanding the BIRN Meeting @ NCRR: 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!*

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

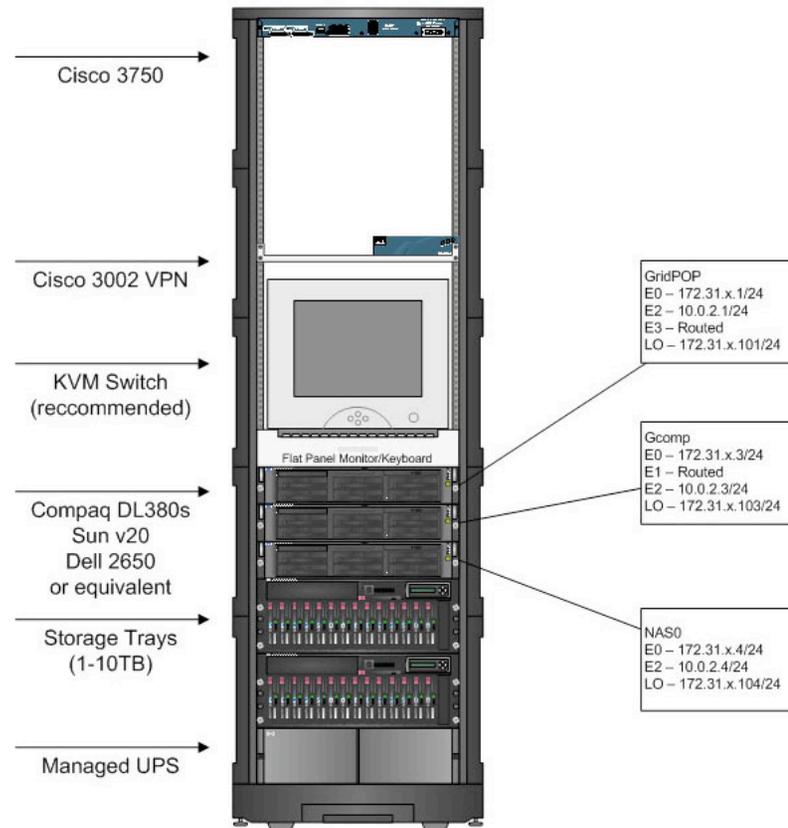
\$120K  
(2001)

< \$20K  
(Today)

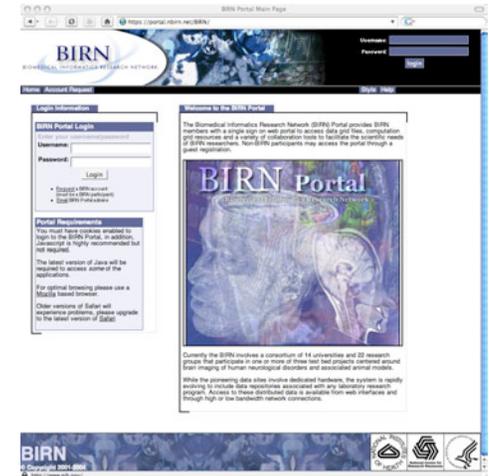
~ \$2K  
(~2010)



- Prescribed hardware jumpstarted BIRN for functionality



- Support for multiple vendors



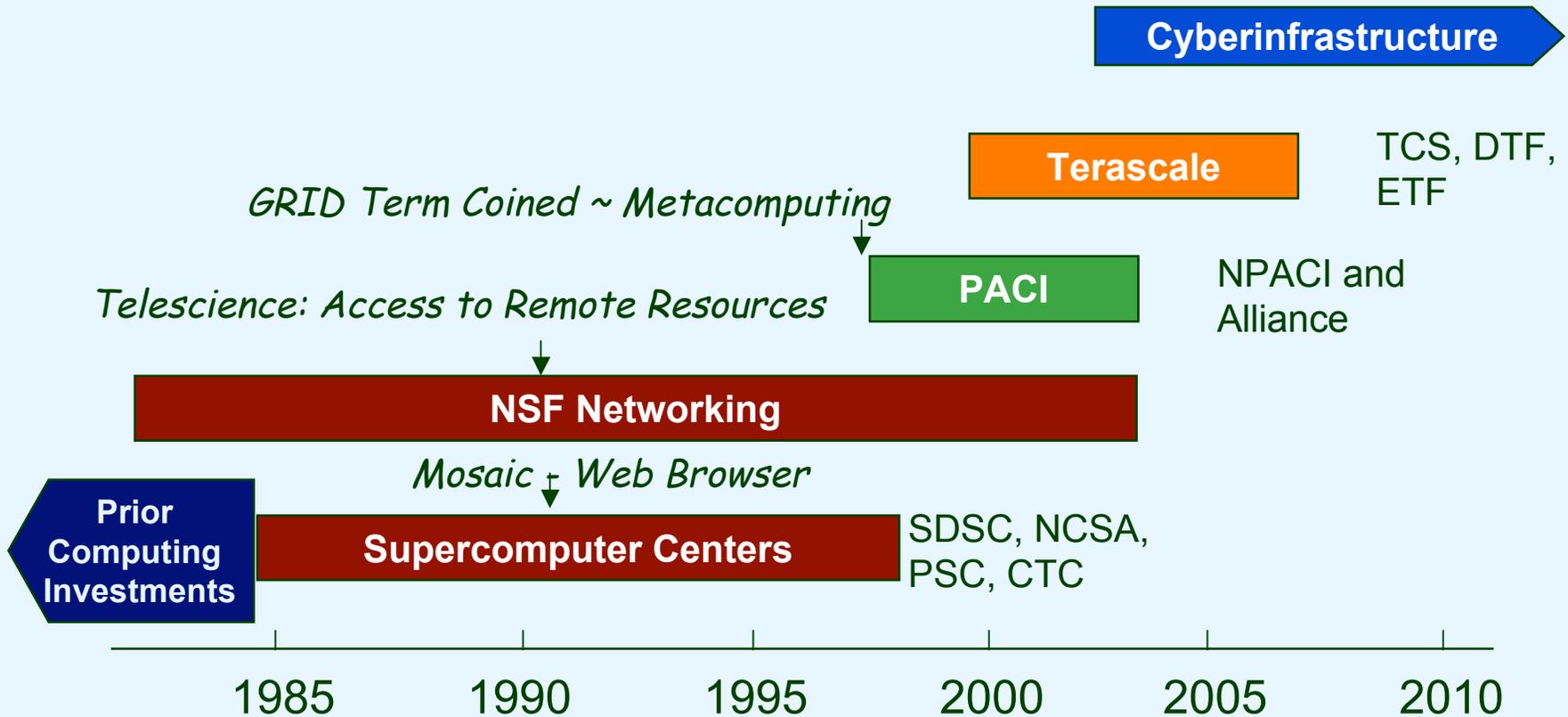
- Software solution for researchers to BIRN “enable” local hardware



# 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*

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

The image displays a collage of several web browser windows, each representing a different project or organization within the Grid infrastructure. The windows are arranged in a layered, overlapping fashion, showcasing a variety of scientific and data-sharing initiatives.

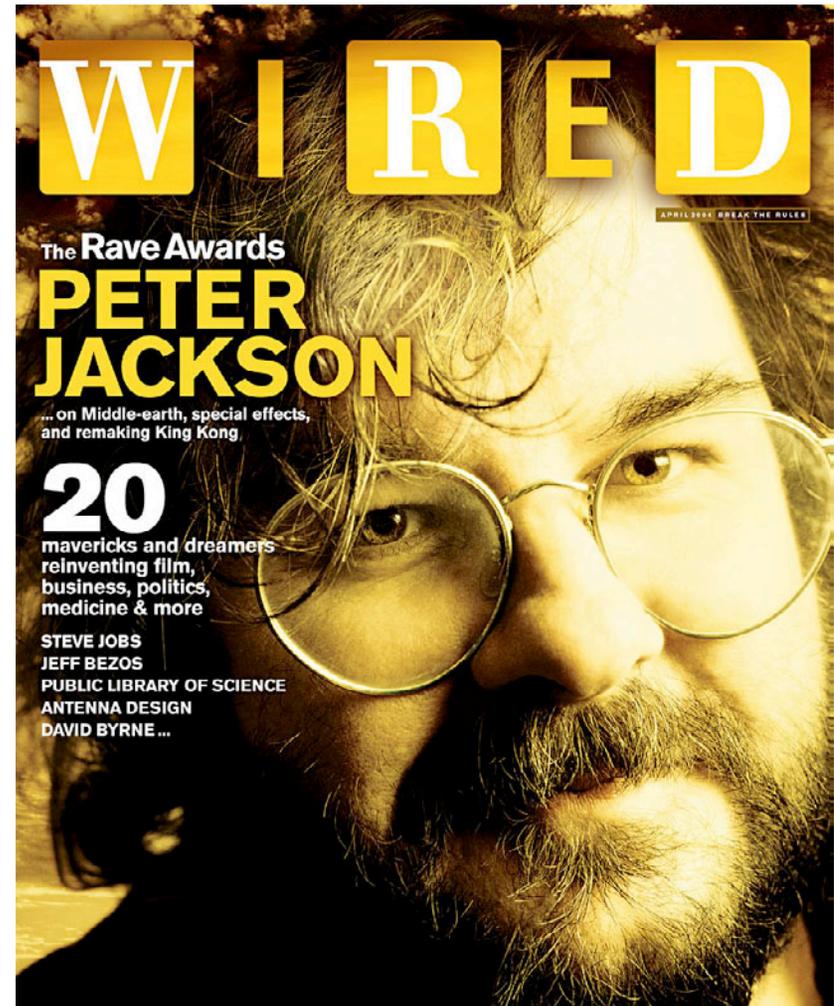
- NEES Consortium, Inc.:** A window showing the homepage of the Network for Earthquake Engineering Simulation, featuring a logo and navigation links.
- GrPhyN - Grid Physics Network:** A window displaying the homepage of the Grid Physics Network, which focuses on developing Grid for context and analysis of distributed, petabyte-scale Virtual Data Grids (VVDGs).
- GEON | CyberInfrastructure for the Geosciences:** A window showing the homepage of the Geospatial Environment for the Oceanic and Nearshore (GEON) project, highlighting its role in providing a virtual infrastructure for the geosciences.
- EGEE - Gateway:** A window displaying the EGEE Gateway, which provides a central point of access to Grid resources and services.
- OSG Home - The Open Science Grid Consortium:** A window showing the homepage of the Open Science Grid Consortium, which aims to provide a common infrastructure for the scientific community.
- TELESCIENCE:** A window displaying the homepage of the Telescope Science Center, which provides a virtual infrastructure for the astronomical community.
- BIRN Slicer Launcher:** A window showing the BIRN Slicer Launcher, which provides a user interface for launching and managing BIRN Slicer applications.
- SEEK Wiki: Eco Grid Community:** A window displaying the homepage of the SEEK Wiki, which provides a central repository for information about the Eco Grid Community.
- Eco Grid Com:** A window showing the homepage of the Eco Grid Community, which provides a virtual infrastructure for the ecological and environmental sciences.
- BIRN Slicer Settings:** A window displaying the settings for the BIRN Slicer, including options for local slicer settings, input data location, and permissions for results.

The collage also includes various other elements, such as logos, navigation menus, and text blocks, all of which contribute to the overall theme of collaborative science and data sharing through the Grid.

This material is based upon work supported by the National Science Foundation under award 0325676. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and 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**

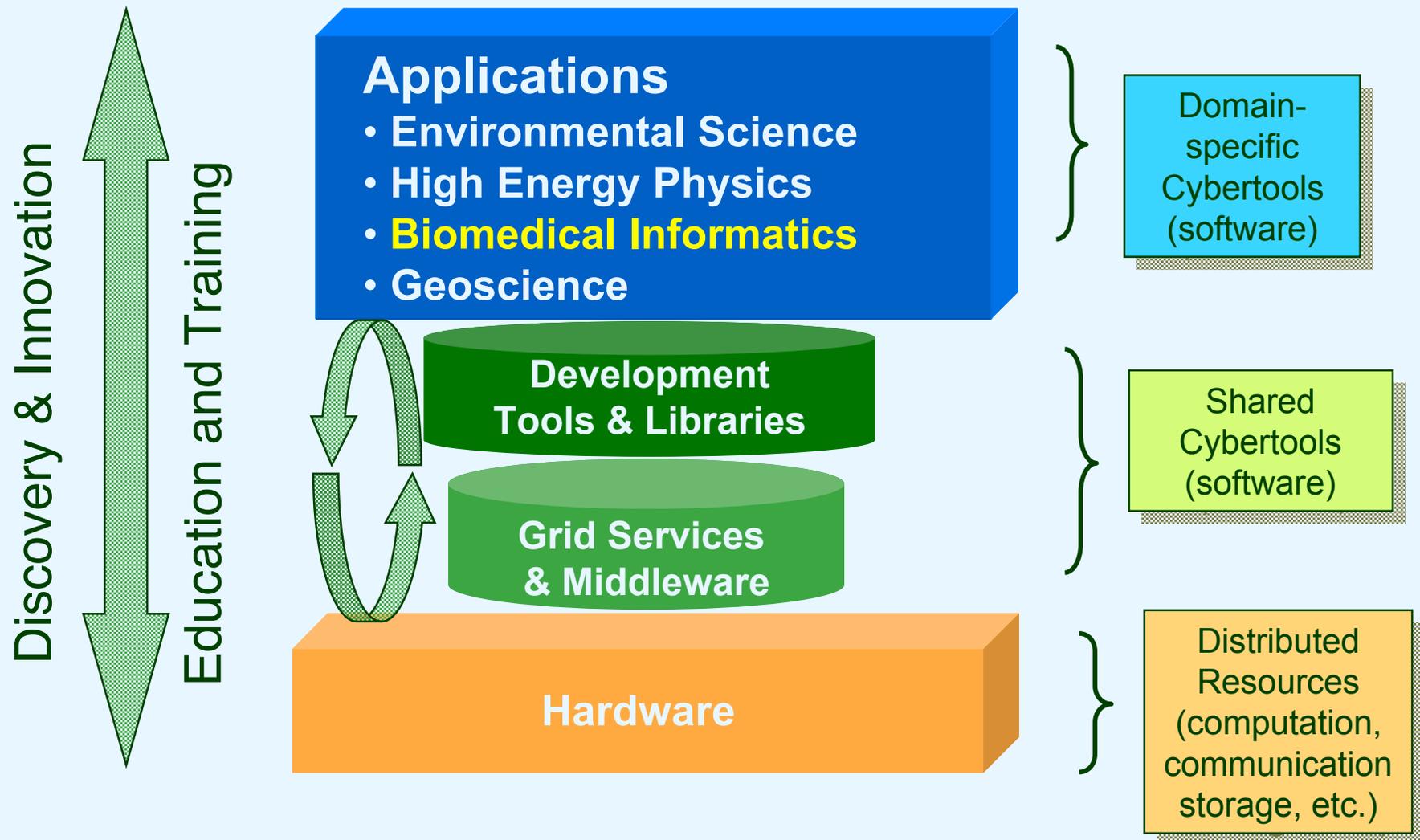


***BIRN cited as successful model of grid computing.***



# Integrated Cyberinfrastructure System meeting the needs of multiple communities

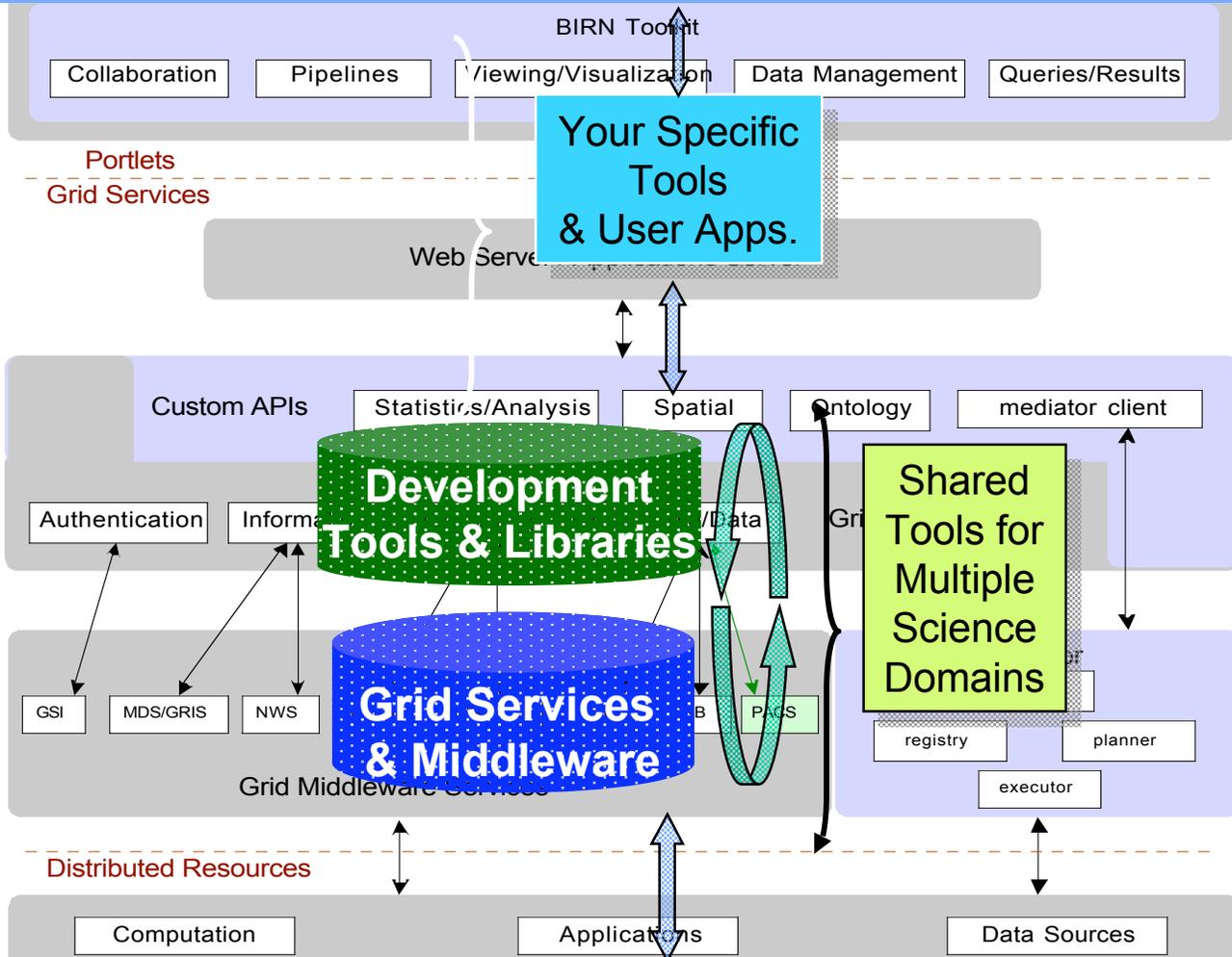
Source: Dr. Deborah Crawford, Chair, NSF **CyberInfrastructure** Working Group



# BIRN Core Cyberinfrastructure

## Friendly Work Facilitating Portals

Authentication - Authorization - Auditing - Workflows - Visualization - Analysis



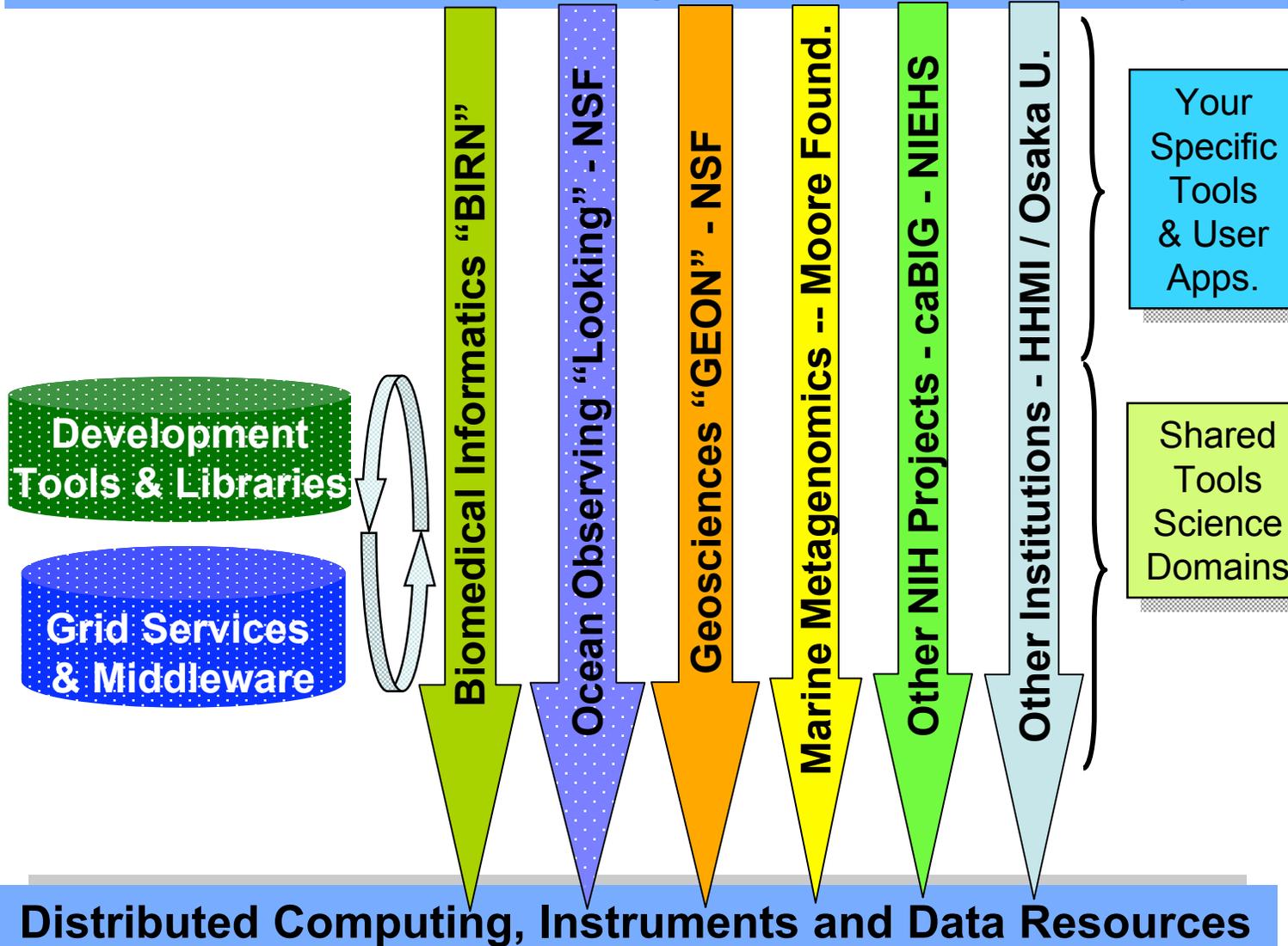
Distributed Computing, Instruments and Data Resources

- 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

# BIRN Core Cyberinfrastructure

## Friendly Work Facilitating Portals

Authentication - Authorization - Auditing - Workflows - Visualization - Analysis



- BIRN builds on evolving community standards for middleware
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- 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

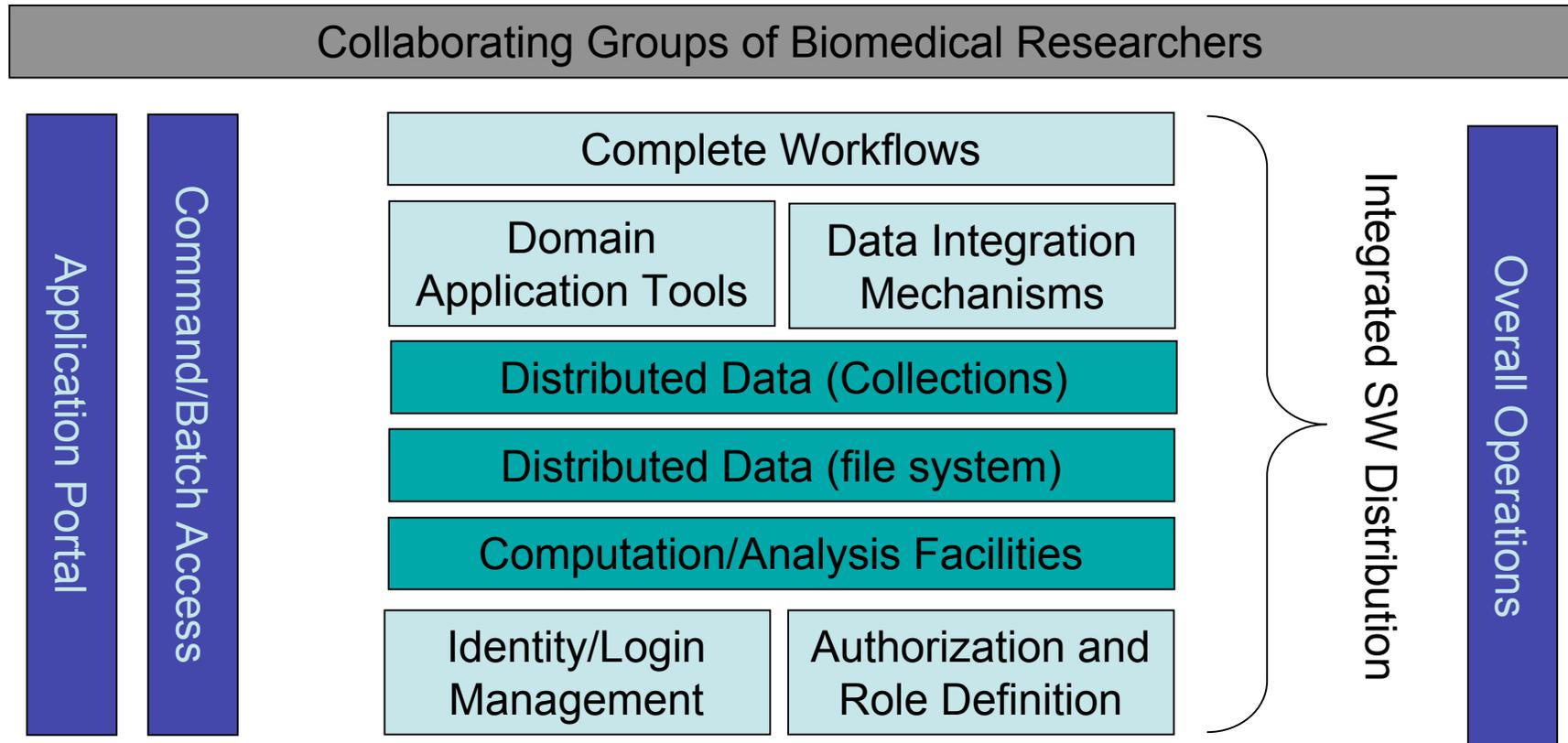
- Some analysis pipelines require significant computation

Security

- Privacy, patient anonymity required
- Institutional ownership of data

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

# Major System Components



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 is a login form with fields for 'Username:' and 'Password:', and a 'login' button. Below the logo is a navigation bar with 'Home' and 'Account Request' links. On the right side of the navigation bar are 'Style' and 'Help' links. The main content area is divided into two columns. The left column has a 'Login Information' section with a 'BIRN Portal Login' form containing 'Enter your username/password', 'Username:', and 'Password:' fields, and a 'Login' button. Below the form are two bullet points: 'Request a BIRN account (must be a BIRN participant)' and 'Email BIRN Portal admins'. The right column has a 'Welcome to the BIRN Portal' section with a paragraph of text and a large graphic titled 'BIRN Portal Biomedical Informatics Research Network' showing a 3D brain model. Below the graphic is another paragraph of text.

**Username:**   
**Password:**

[Home](#) [Account Request](#) [Style](#) [Help](#)

**Login Information**

**BIRN Portal Login**

Enter your username/password

**Username:**

**Password:**

- [Request a BIRN account](#) (must be a BIRN participant)
- [Email BIRN Portal admins](#)

**Portal Requirements**

You must have cookies enabled to login to the BIRN Portal, in addition, Javascript is highly recommended but not required.

The latest version of Java will be required to access some of the applications.

For optimal browsing please use [Mozilla](#), [Netscape](#) or [Internet Explorer](#).

There are known problems with Safari that prevent proper authentication with the portal, as a result, Safari users will have to chose an alternative browser to access the BIRN Portal.

**Welcome to the BIRN Portal**

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.

**BIRN Portal**  
Biomedical Informatics Research Network

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.

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

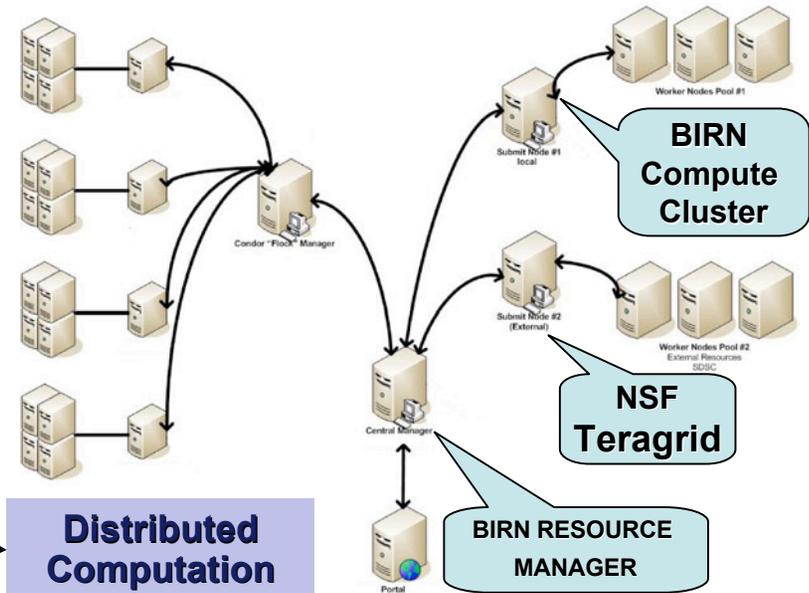
- Provides simple, intuitive access to distributed resources for data storage, distributed computation, and visualization

- 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**



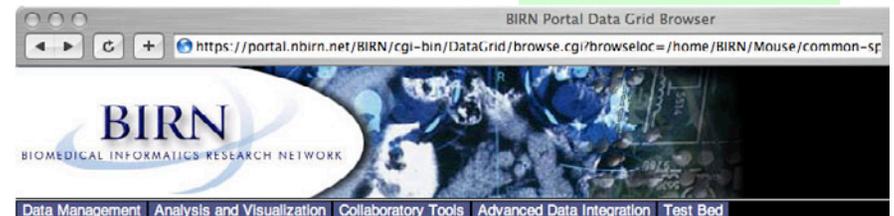
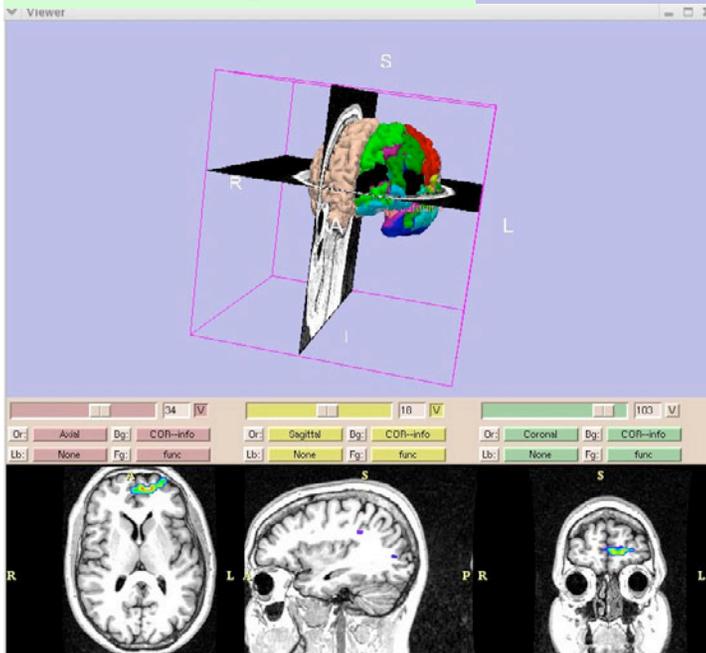
**BIRN VIEWERS - eg., SLICER; ImageJ, MBAT**

**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!

**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  
SIB Group Name: awl\_2004  
Founded: 10-29-2004 09:31:54  
Number of Members: 7

**Current Activities**

Contract All | Expand All  
Activities

**Memberships**

ID	Username	Role	Started	Status	Email/alert
56	aklasmry	Owner	10-29-2004	Active	aklasmry@psu.edu
63	nguyen	Member	10-29-2004	Active	nguyen@biomh.bionet.edu

**My Membership**

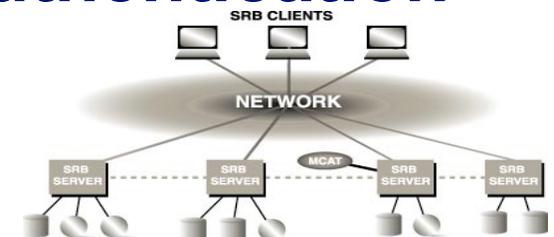
User: then  
Email: nguyen@biomh.uscd.edu  
Role: Member  
Joined: Oct 29, 2004  
Status: Active

Select Project(15)

Analysis, Visualization and Interpretation	7
NAMEC	75
Portal Test	2
Too many ways to mess w/ code	1
Test two	2
aa	1
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**



# Guide Community Database Development

Welcome **guest**  
You are connected to **site1\_mbrn**

**About Us** | Resources | Test Beds | Publ

**Query Assessments**

Welcome **guest** to the Morphometric BIRN Public Alzheimer

The site currently provides the following features;

- building a fairly generic assessment query and navigating
- multi-site queries
- exporting the full set of search results in comma separated
- viewing visits (both scan and clinical) of a selected
- downloading the structural MRI image series for the
- Univariate and Bivariate statistics via BIRN Portal in

To build an assessment query please click Query assessment

You need to use **Previous** button instead of your browser

Stats: Univariate Analysis
Statistics

[Export CSV](#)

Subject ID	Site ID	MMSE	Demographics			Diagnosis	CVLT	VFT	Left Hippocampus	Right Hippocampus
			MMSE Score	Age	Gender					
009007669326										
Visit: 2	Seq: 1	SITE1	25					.66	13	
Visit: 1	Seq: 1	SITE1		75	F	14	Alzheimer			2377.0 2480.0
009015726375										
						Control		.93	22	3760.0 3650.0
						Alzheimer		.41	7	3565.0 3435.0
						Control		.93	19	4774.0 4495.0
						Alzheimer		.8	9	2852.0 2979.0
						Control				3313.0 3466.0
						Alzheimer		.39	4	2932.0 2907.0
						Alzheimer		.75	14	2961.0 3335.0
						Control		1	15	3754.0 4260.0
						Control		.93	22	3990.0 4152.0
						Alzheimer		.84	6	3267.0 3386.0
						Alzheimer		.59	5	

**Subject:** 009007669326 [Show Detail](#)

**Clinical Visits**

Visit ID	Visit Date
2	

**Segments**

Segment ID	Protocol	Protocol Version
1	AD_BATTERY	1

**MRI Scan Visits**

Visit ID	Visit Date
1	

**Segments**

Segment ID	Protocol	Protocol Version
1	SPGR	1

**Scanner Info**

**Make:**GENERAL ELECTRIC **Model:**

You can export the image series for this scan as an AFNI brik. The image series is retrieved from the SRB, converted to an AFNI brik from DICOM and tarred and gzipped for transfer efficiency.

This operation may take upto a minute (usually around 30 seconds or less),so please be patient. If you hit a cached result either requested earlier or by another user, this operation may take significantly less time.

After the download, the file needs to be saved to your local machine and needs to be expanded using the tar utility

```
tar xzvf <filename>
```

After this, you should see the **BRIK** and **HEAD** files.

[Download as AFNI BRIK](#)
[Browse Image Data](#)

[Back to Search Results](#)

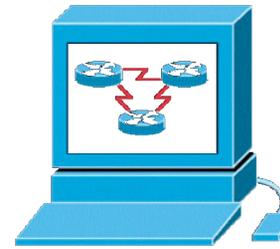
# The BIRN Coordinating Center is Supporting and Evolving the Deployed Infrastructure



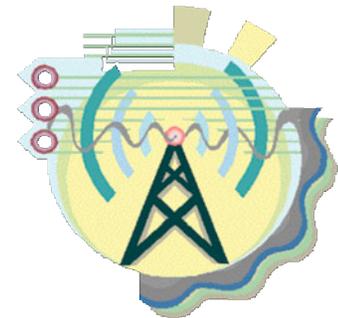
**HELP DESK**



**MONITORING**



**NETWORKING**



**COMMUNICATIONS  
INFRASTRUCTURE**



**TRAINING**

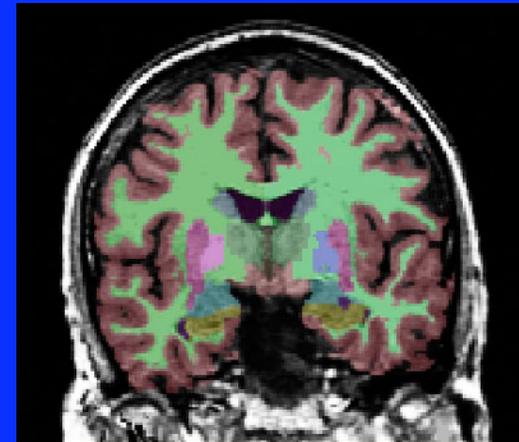


**ASSESSING TECHNICAL OPTIONS  
FOR BIRN TO BUILD WORKING  
SYSTEMS**

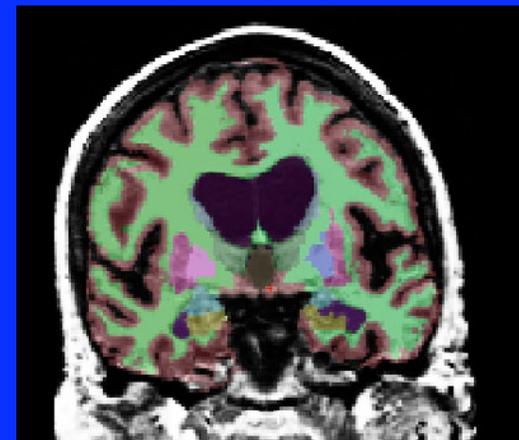


**SCALABLE  
SOFTWARE  
DISTRIBUTION**

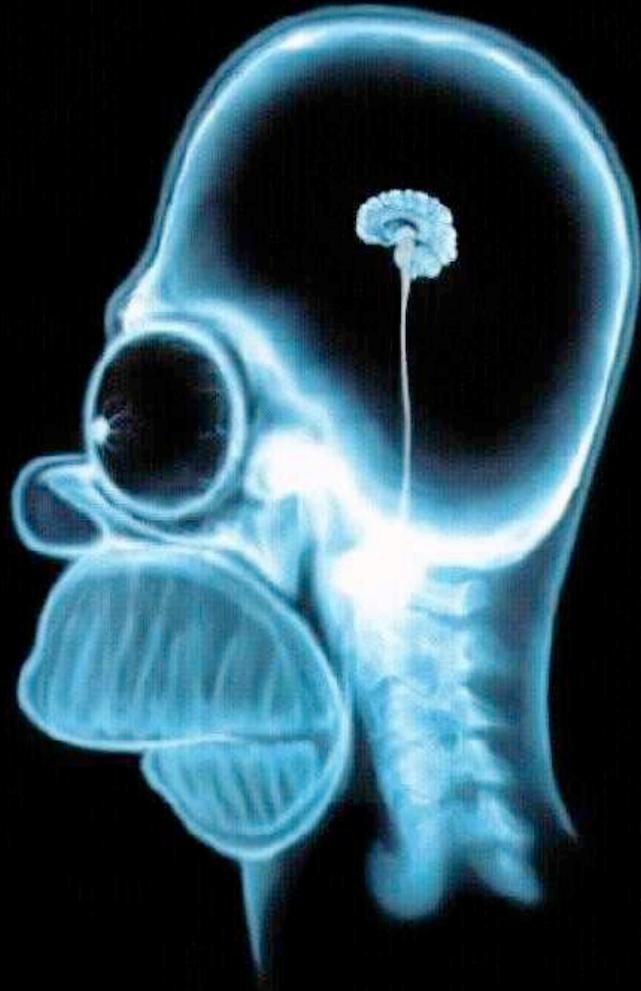
- **Anatomical Correlates of Psychiatric Illnesses**
  - Unipolar Depression, Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI)
- **Site and Platform Independent Acquisition and Analysis for Pooling Data**
  - Multi-Site Clinical Studies
  - Increase Statistical Power for Rare Populations or Subtle Effects
- **Advanced Image Analysis and Visualization**
- **MGH, BWH, Duke, UCLA, UC San Diego, Johns Hopkins, UC Irvine, Wash U, MIT**



Normal Elderly Control



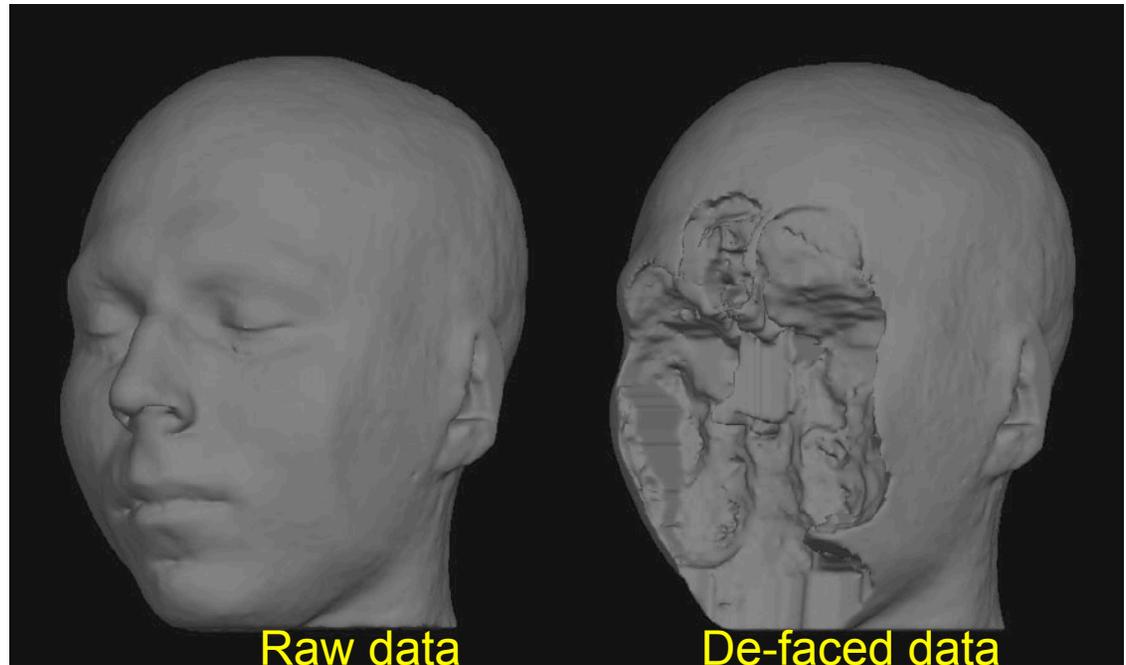
Alzheimer's Individual



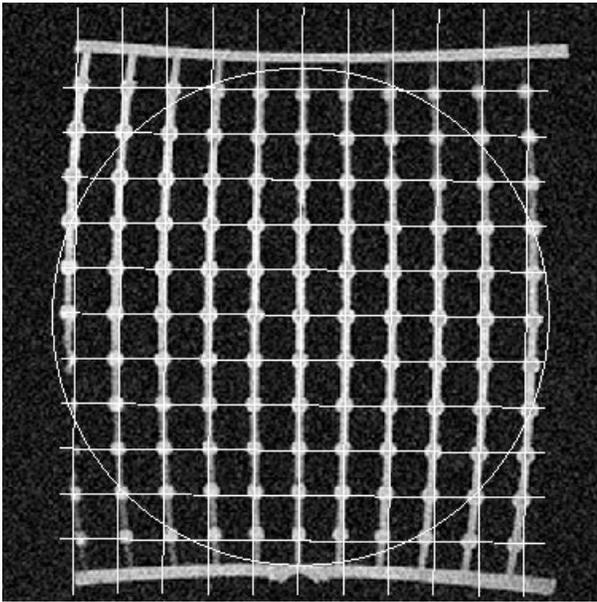
H. J. SIMPSON

# De-identification and Upload Pipeline

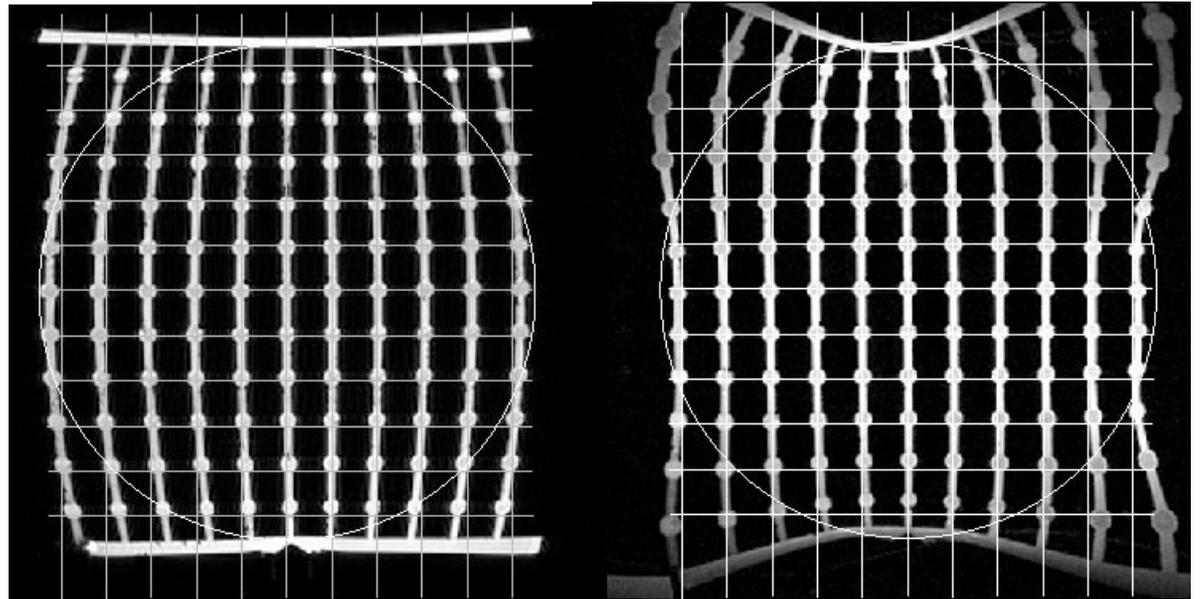
- Robust automated methods for bulk MRI de-identification and upload to database (diverse inputs, sharable outputs, common package)
- De-facing: automated de-facing without brain removal
- Pipeline: image formats, BIRN ID generation, defacing, QA, upload



# MRI Distortions due to Gradient Non-Linearities



**Siemens Whole-Body  
Symphony/Sonata**  
Max displ. 2.5/3.2mm



**GE Whole-Body  
CRM NVi/CVi**  
Max displ. 4.2/8.6mm

**Siemens Head-Only  
Allegra/AC-44**  
Max displ. 5.7/20.2mm

# Multi-site Structural MRI Data Acquisition & Calibration

- Develop acquisition & calibration protocols that improve reproducibility, within- and across-sites
- Common acquisition protocol, distortion correction, evaluation by scanning human phantoms multiple times at all sites

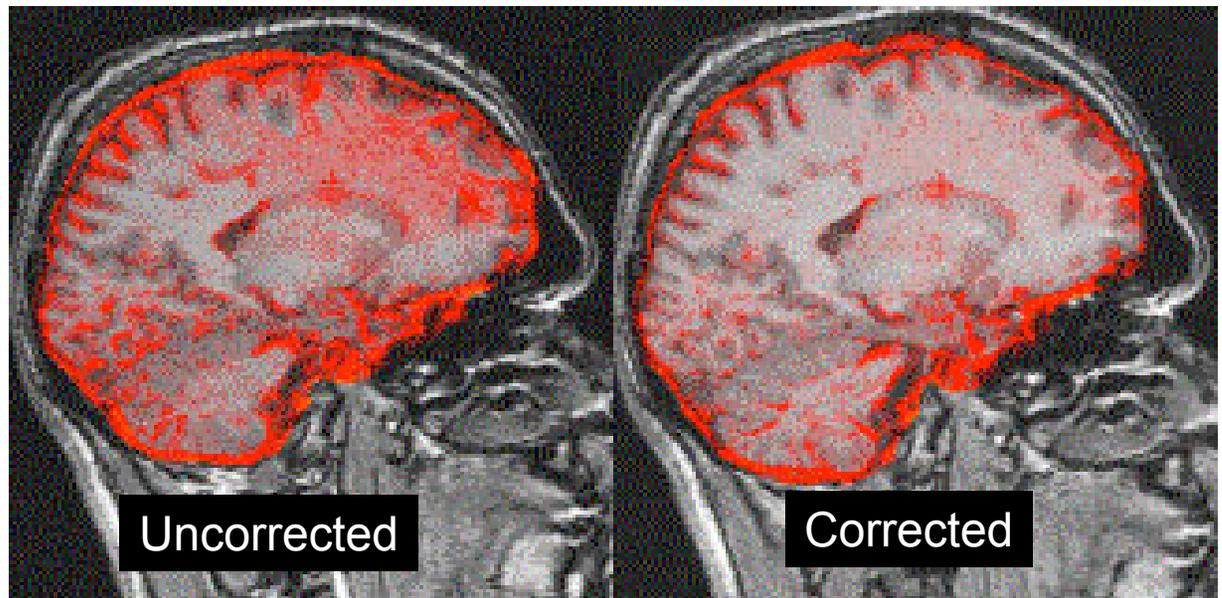
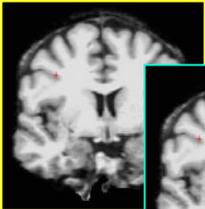


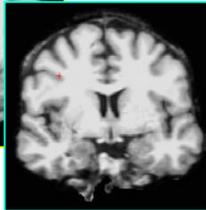
Image intensity variability on  
same subject scanned at 4 sites

# Reproducibility Effects: Alignment of Surfaces

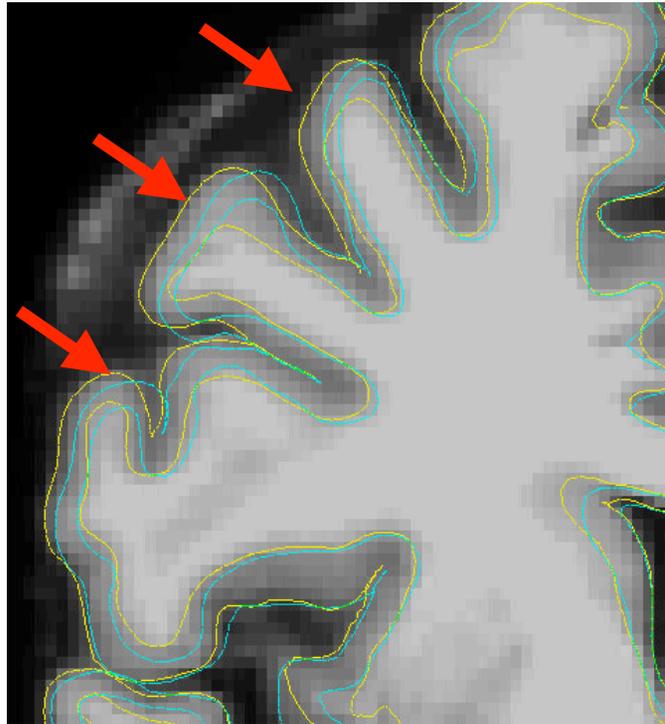
Siemens



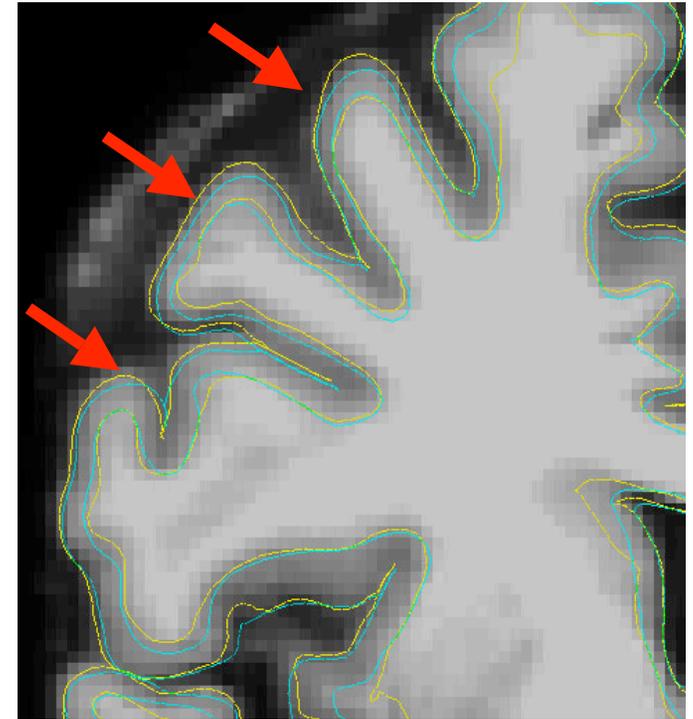
GE



Same Subject  
Co-registered



**CORTICAL ESTIMATES:  
NO DISTORTION CORRECTION**



**CORTICAL ESTIMATES:  
DISTORTION CORRECTION**

⇒ Distortion correction does improve cortical surface co-registration

# Cortical Thickness Estimation with Sub-Voxel Accuracy



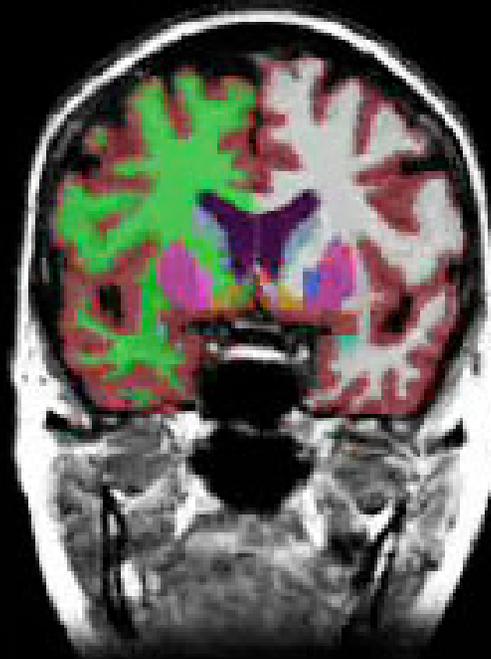
Gray-white boundary



Pial surface

From Anders Dale / Mass General Hospital - Harvard

# Automated Whole-Brain Segmentation



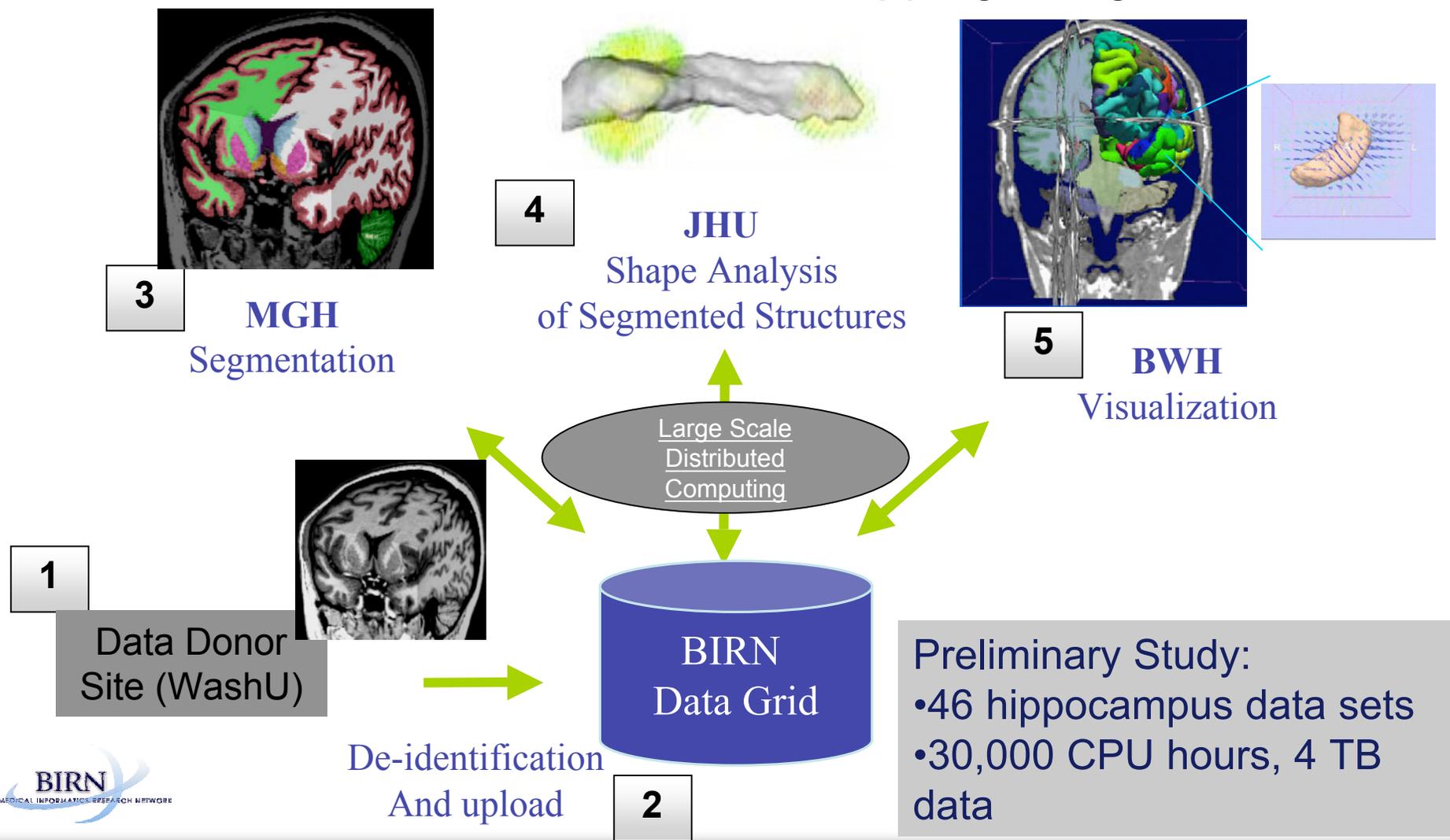
Part of Free Surfer

By Bruce Fischl  
and  
Anders Dale  
(MGH)

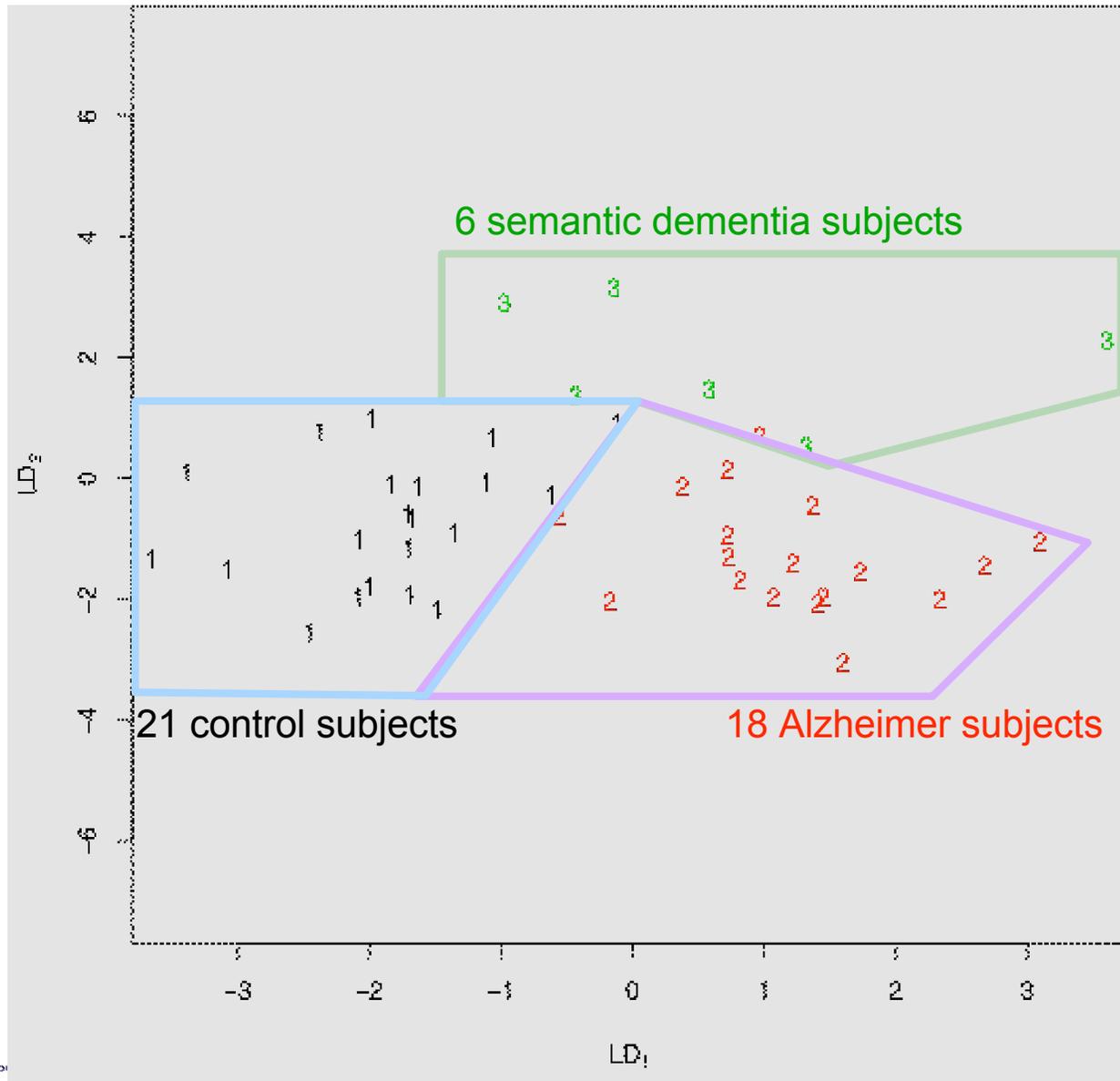
- |                     |                  |                     |
|---------------------|------------------|---------------------|
| ● Cerebellar cortex | ● LH cerebral WM | ● Cerebral cortex   |
| ● Cerebellar WM     | ● Hippocampus    | ● Misc.             |
| ● 4th ventricle     | ● LH pallidum 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

# Morphometry BIRN: Semi-Automated Shape Analysis Overview

Large Deformation Diffeomorphic Metric Mapping using the TeraGrid

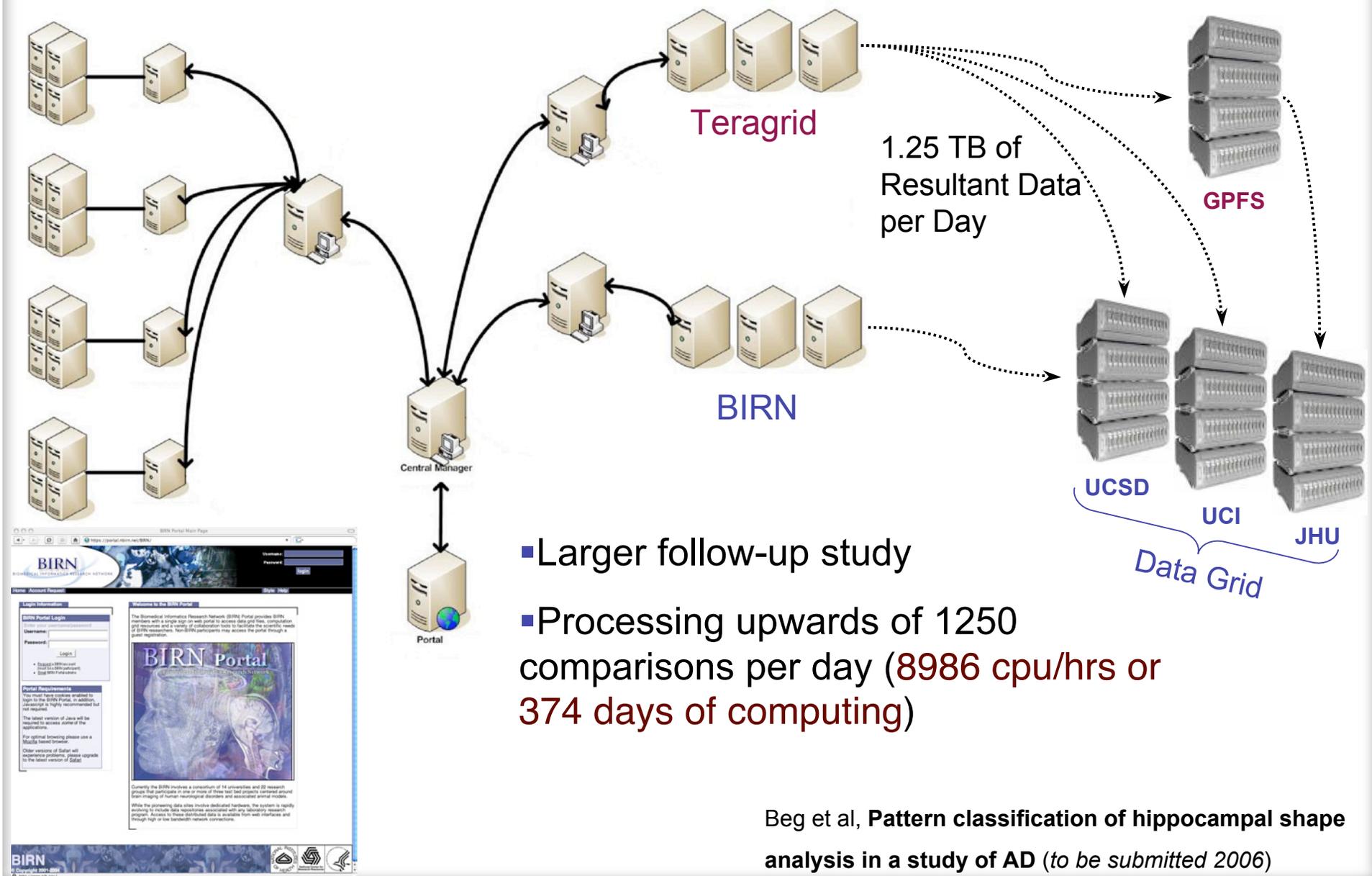


# SASHA: Shape Analysis Pipeline Results



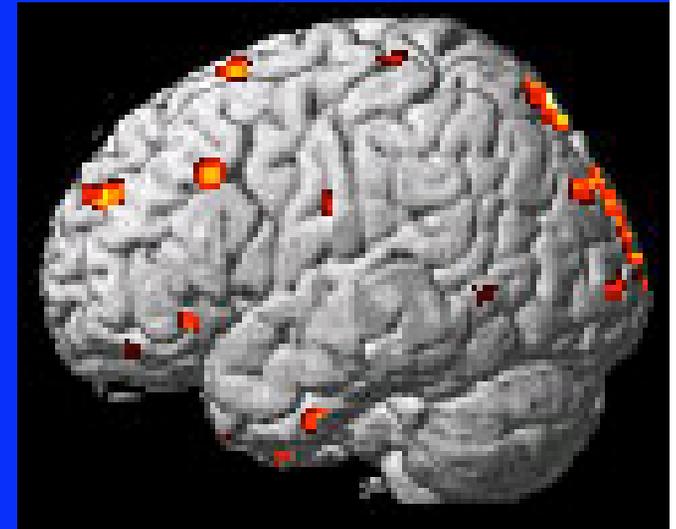
*Shape-derived metrics can be used to detect class-specific information*

# SASHA: Large Scale Distributed Computing

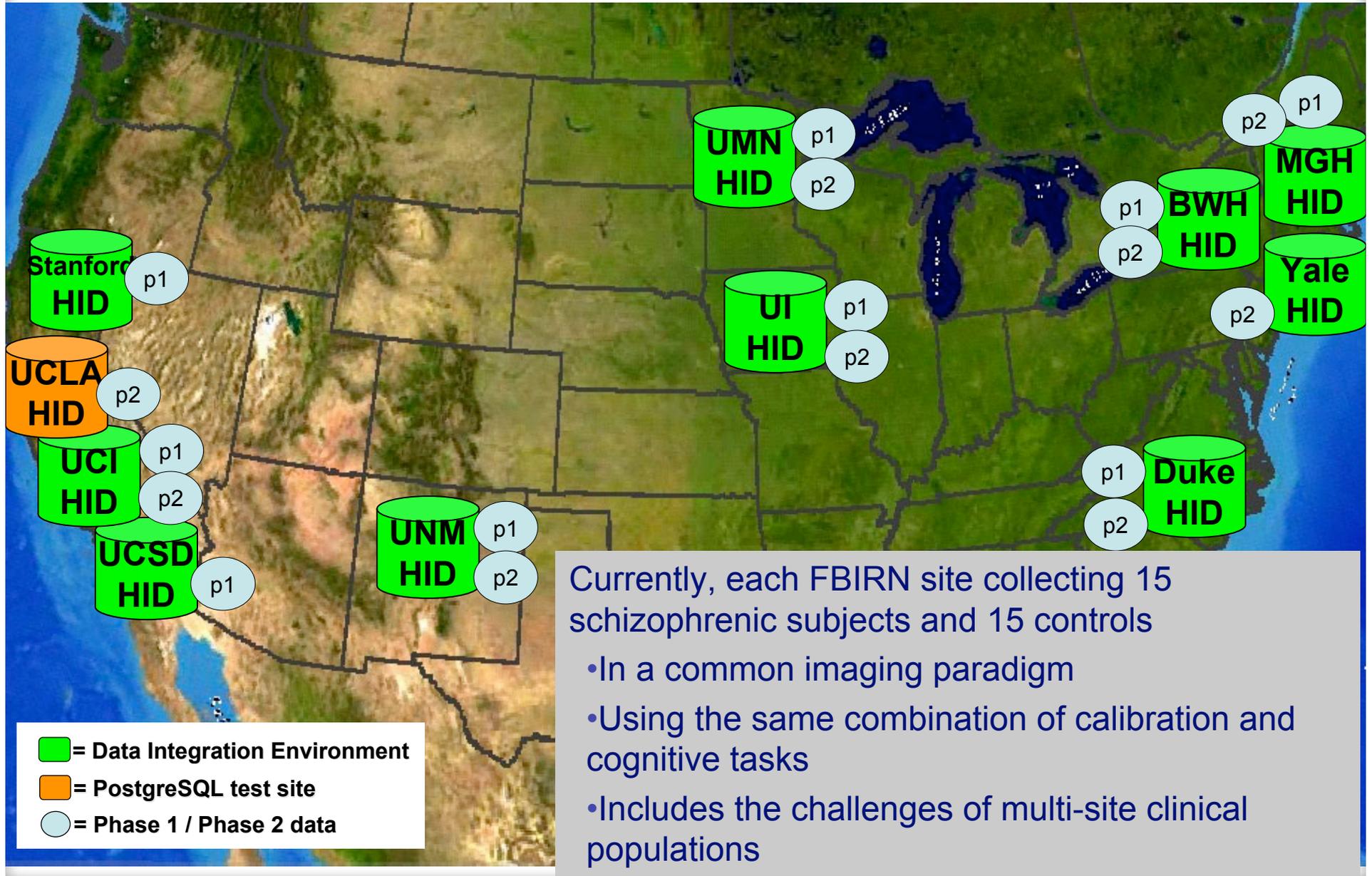


# Function BIRN Overview

- **Calibration Methods for Multi-Site fMRI**
  - Study Regional Brain Dysfunction and Correlated Morphological Differences
  - Progression and Treatment of Schizophrenia
- **Human Phantom Trials**
  - Common Consortium Protocol
  - 5 Subjects Scanned at All 11 Sites
  - Add'l 15 Controls, 15 Schizophrenics Per Site Per Year
- **Statistical Techniques**
  - Identify Cross-Site Differences
  - Develop Corrections to Allow Data Pooling
- **Develop Interoperable Post-Processing**
- **UC Irvine, UCLA, UC San Diego, MGH, BWH, Stanford, U. Minnesota, U. Iowa, U. New Mexico, Duke/U. North Carolina, MIT**

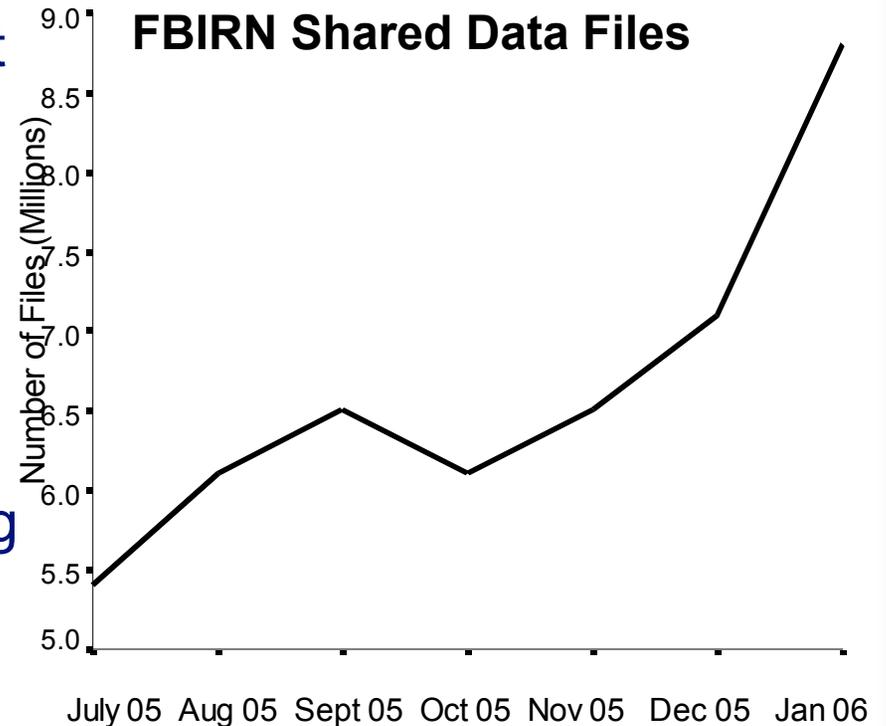


# Function BIRN Federated Data



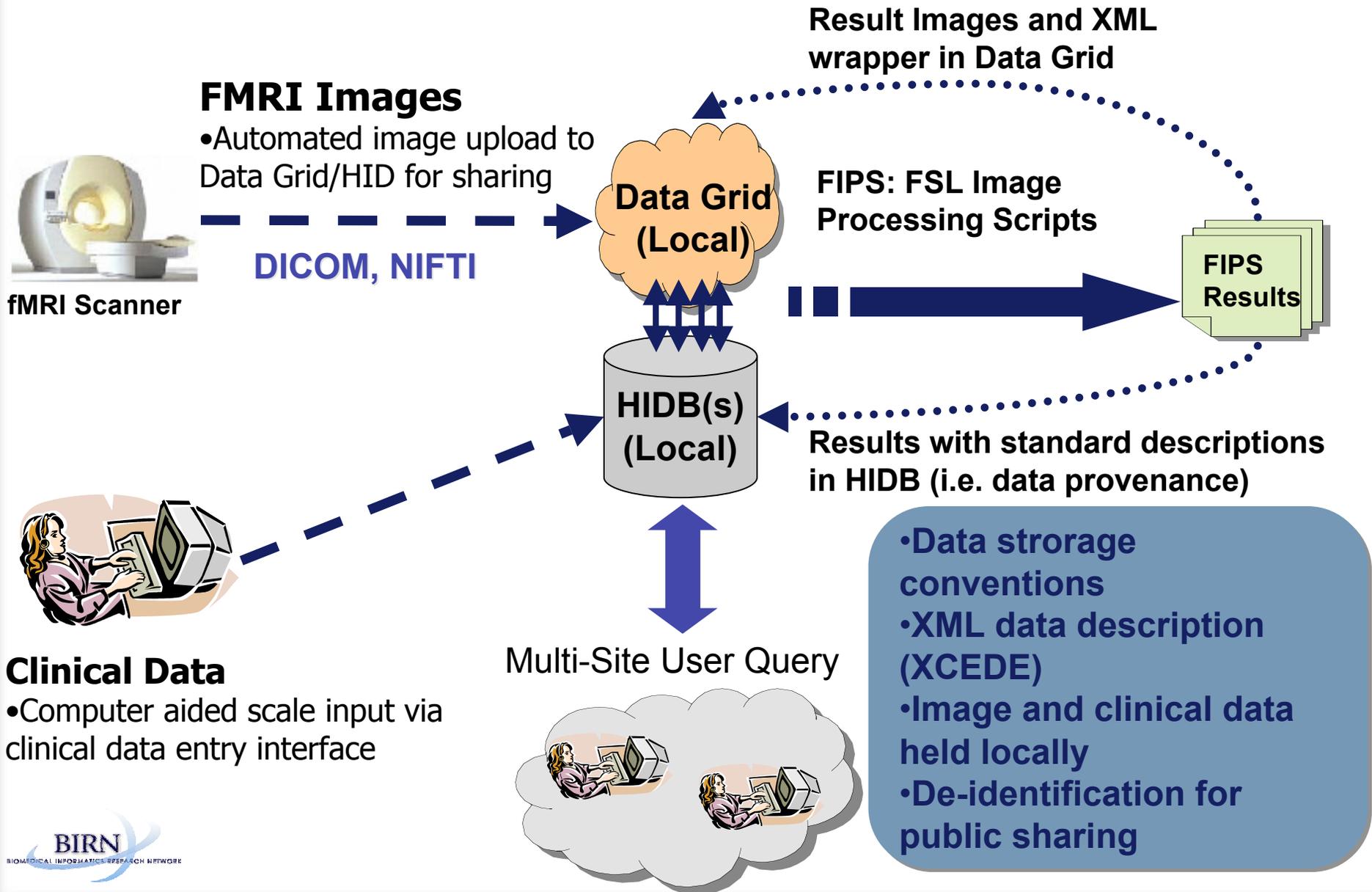
# Phase II Study: Image Data Volume

- 21,038 raw image files per subject
- 2.4 GB of raw image data per subject
- 25 GB to 40 GB of processed image data per subject (depending on hypotheses tested)

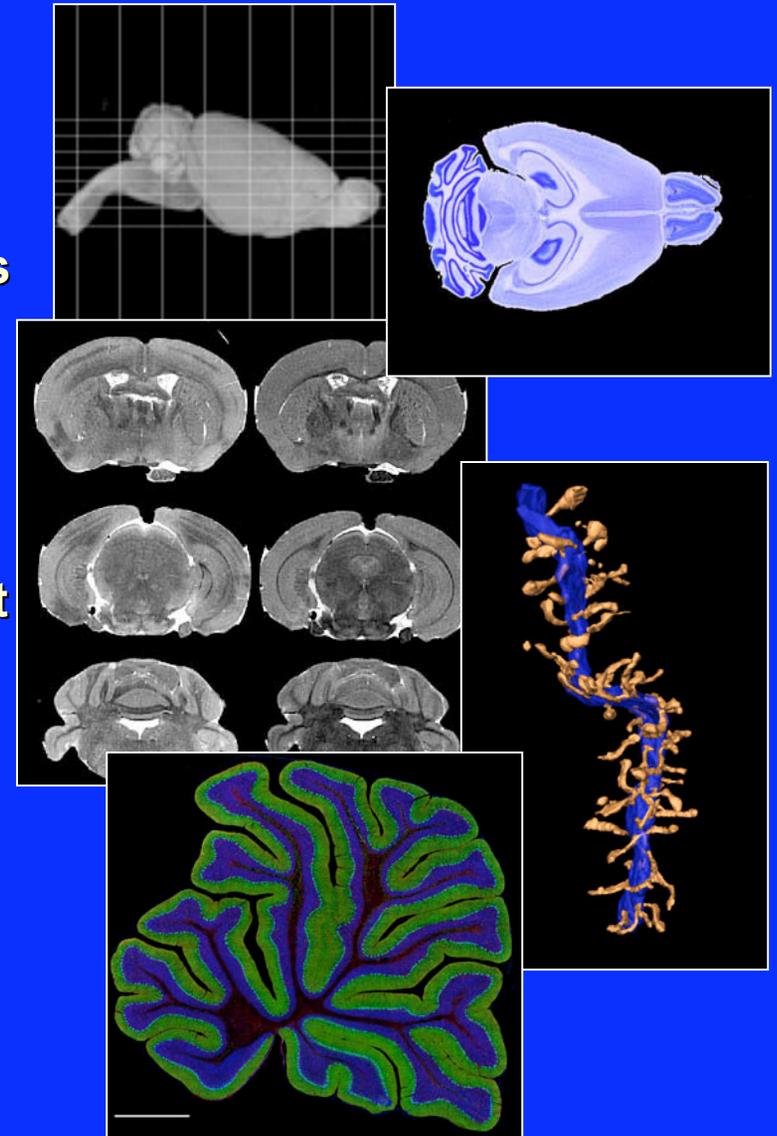


- **10 million slices** of functional imaging data in Phase II
- **7 Terabytes** of image data for all of the Phase II analyses (conservative estimate of 25 GB/subject)

# Function BIRN Analysis Infrastructure

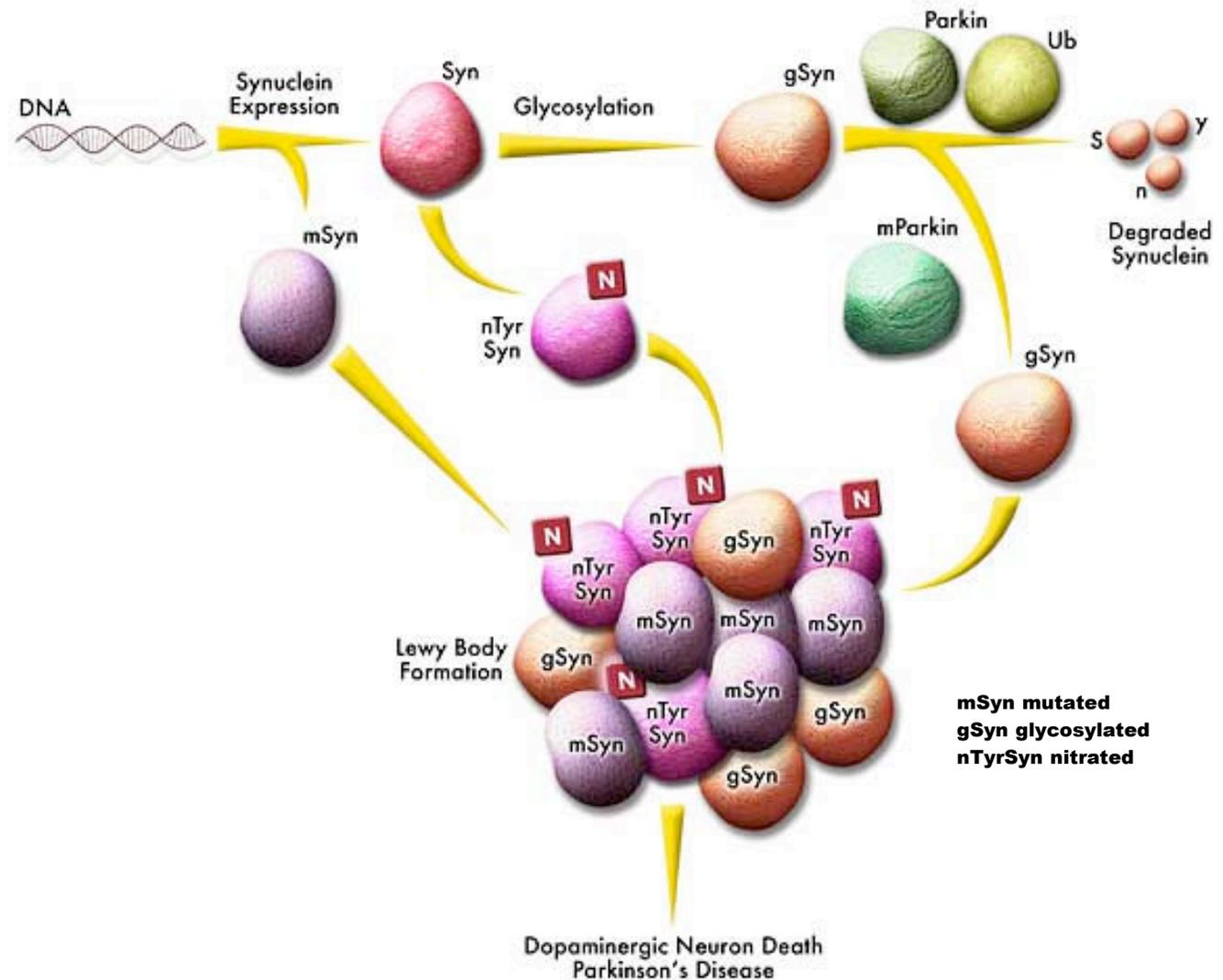


- **Studying animal models of disease across dimensional scales to test hypothesis with human neurological disorders**
  - Experimental Allergic Encephalomyelitis (EAE) mouse models characteristic of **Multiple Sclerosis (MS)**
  - **Alzheimer's** mouse model with beta amyloid over expression
  - Dopamine Transporter (DAT) KO mouse model of **schizophrenia**, attention-deficit hyperactivity disorder (ADHD),
  - 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
- Cal Tech, Drexel, Duke, **UCLA**, UCSD, Univ. Tenn. Memphis



# Parkinson's Disease and $\alpha$ -synuclein

- A member of the synuclein family of synaptic proteins without clearly defined role(s)
- A major component of Lewy bodies
- Mutation(s) of the  $\alpha$ -SYN gene are associated with familial Parkinson's Disease
- Mutations may have multiple paths leading to protein aggregation

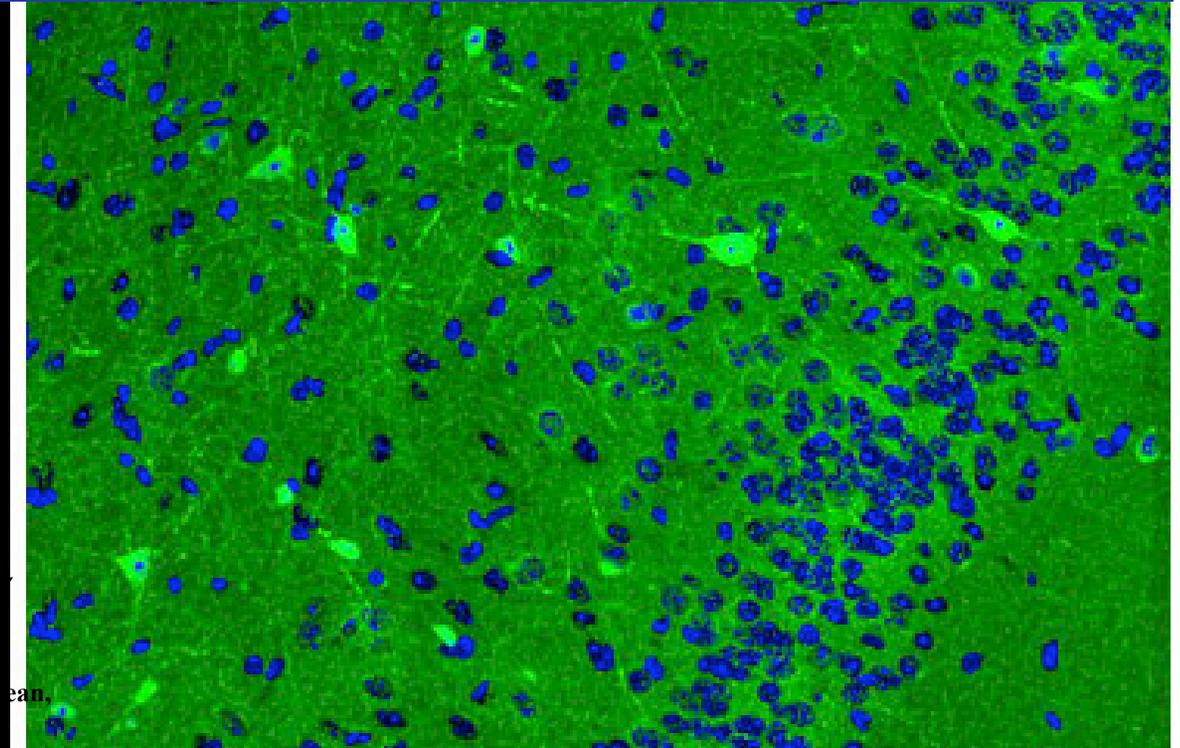
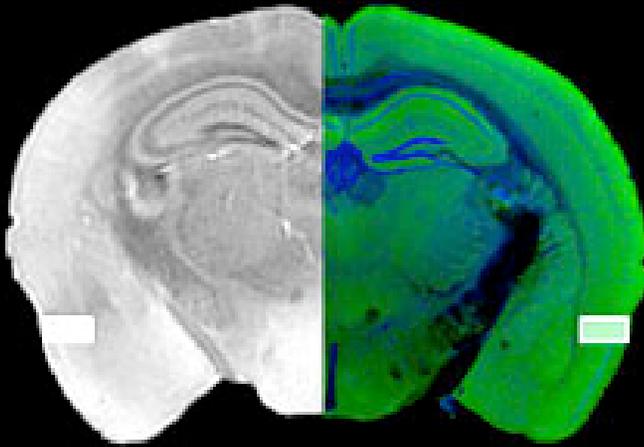


*If you drive expression in vivo will aggregates form?*

# Parkinson's Disease Model:

## Overexpression of alpha-synuclein in transgenic mice

MR Microscopy  
Duke Univ - J.A. Johnson

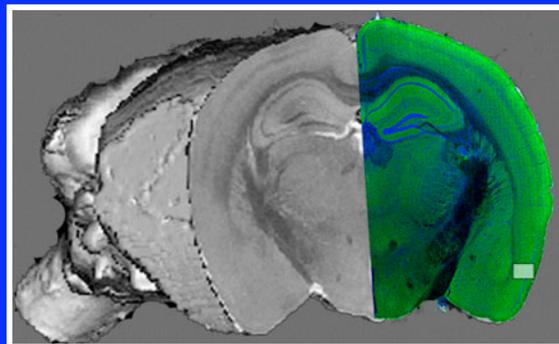
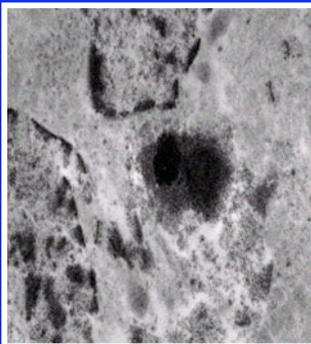
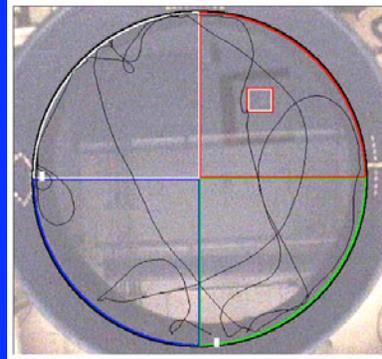


- **transgenic mice over-expressing human  $\alpha$ -SYN:**
  - exhibit motor deficit.
  - have  $\alpha$ -SYN IR inclusions in neuronal cell bodies, neurites and glial cells in cerebellum, hippocampus, and cortical regions.

# Multimodal studies of PD animal models

## Behavior

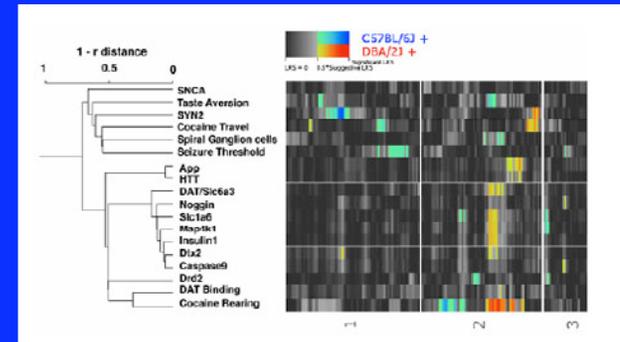
*Assessment of cognitive and motor function*



## Imaging

*Correlation of large-scale mapping of immunolabeling and MRI studies*

*Ultrastructural studies using EM*



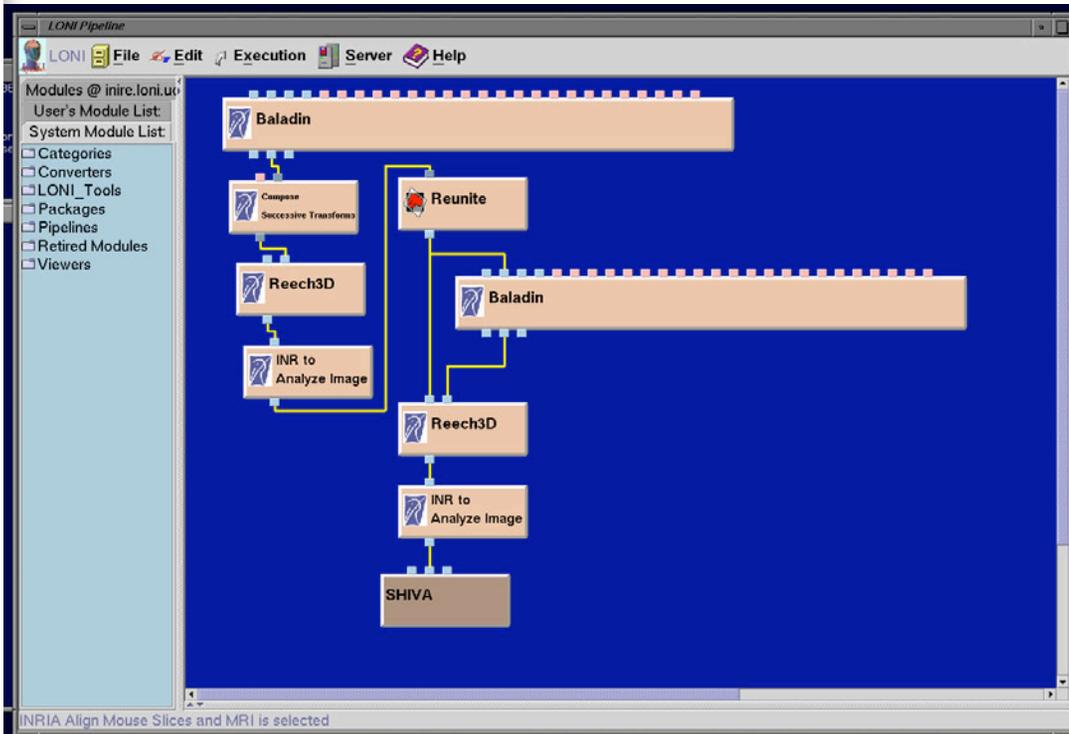
## Chemistry & Genetics

*Protein expression*

*Analyses using Web QTL*

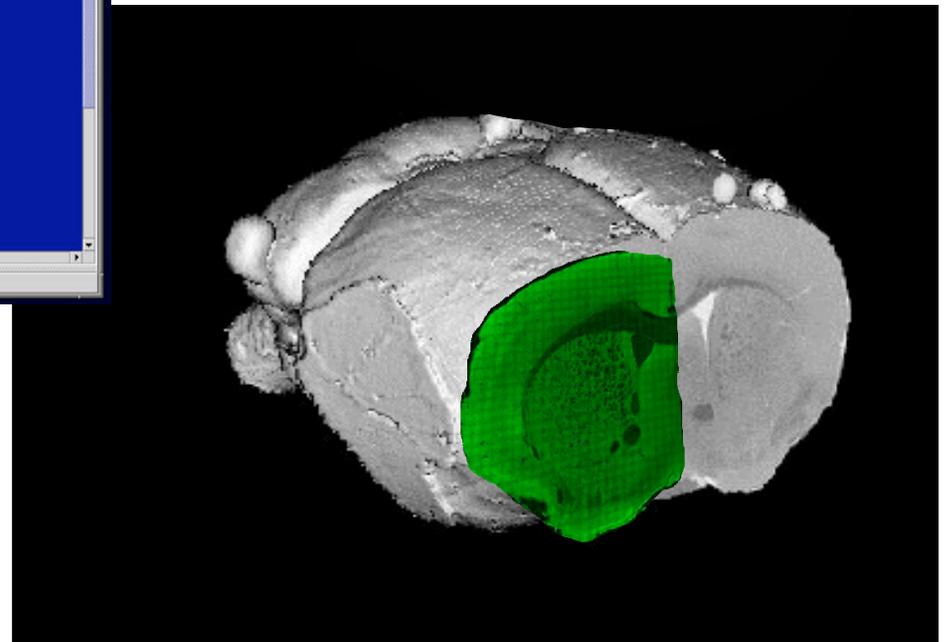
*Ligand binding studies*

# Spatial Registration of Data



Processing stream for spatial registration of brain volumes using the LONI pipeline

Volume and slice data brought into register in order to correlate cellular and subcellular changes with non-invasive imaging



# Google helps find answers to your questions but it's not a data integration environment

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

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. Bloating 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 Gleaners 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](#)

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Earth First! Journal  
PO Box 3023, Tucson, AZ 85702  
520-620-6900 (voice)  
413 254 0057 (fax)  
[collective@earthfirstjournal.org](mailto: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 Advanced Search Preferences

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 stops piles quickly.

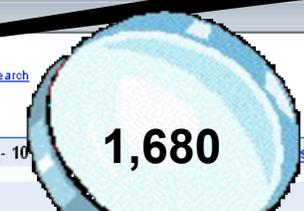
Home Remedy for Hemorrhoids, Piles Home Remedies  
... This is a permanent cure for bleeding piles. Drink a juice of turnip leaves, spinach, watercress, and carrots (equal quantity). ...  
www.fatfreekitchen.com/home-remedy/hemorrhoids-piles.html - 27k - Cached - Similar pages

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.

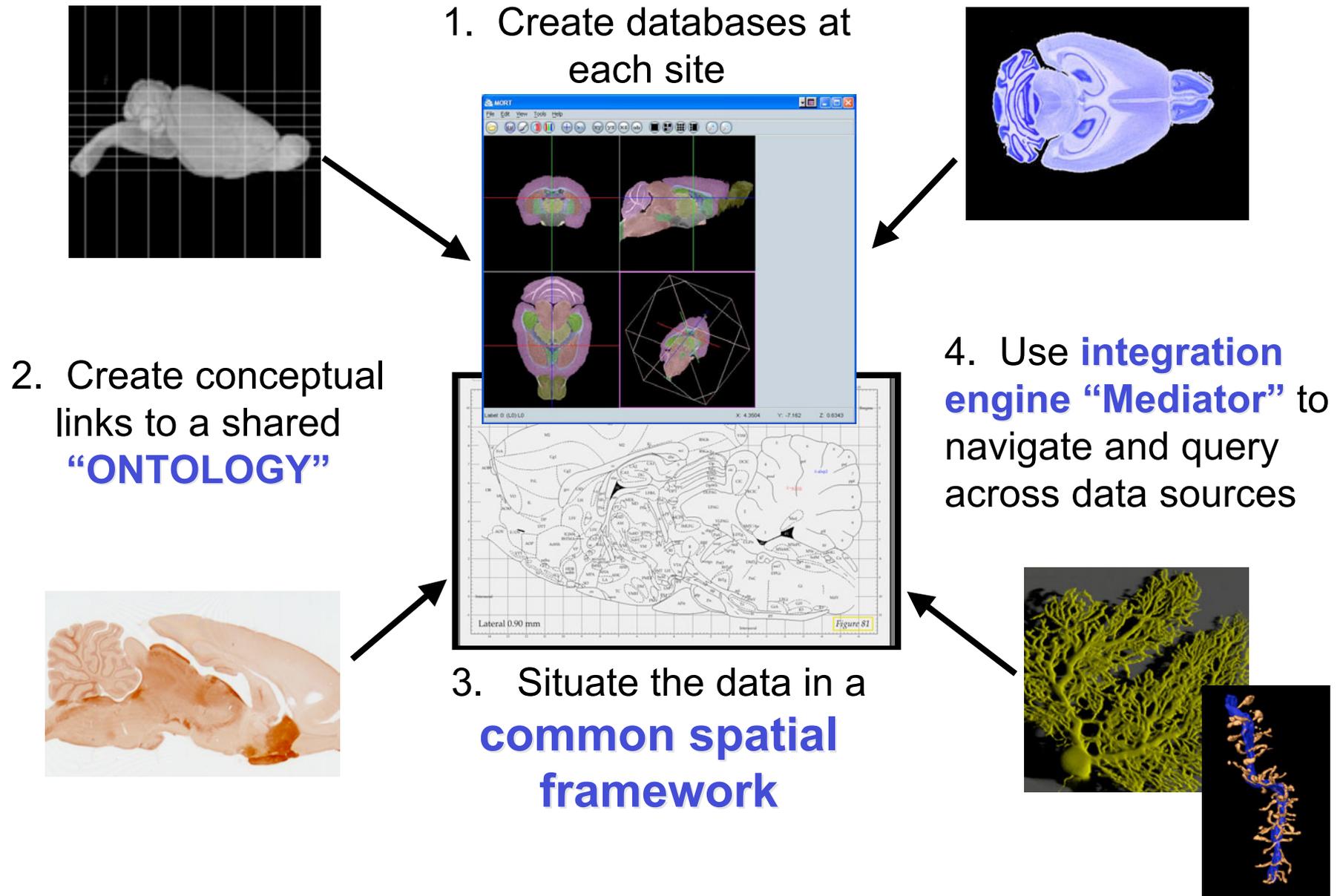
Causes of Hemorrhoids or Piles

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*



# DATA MODELS Provide Frameworks to Integrate Databases:

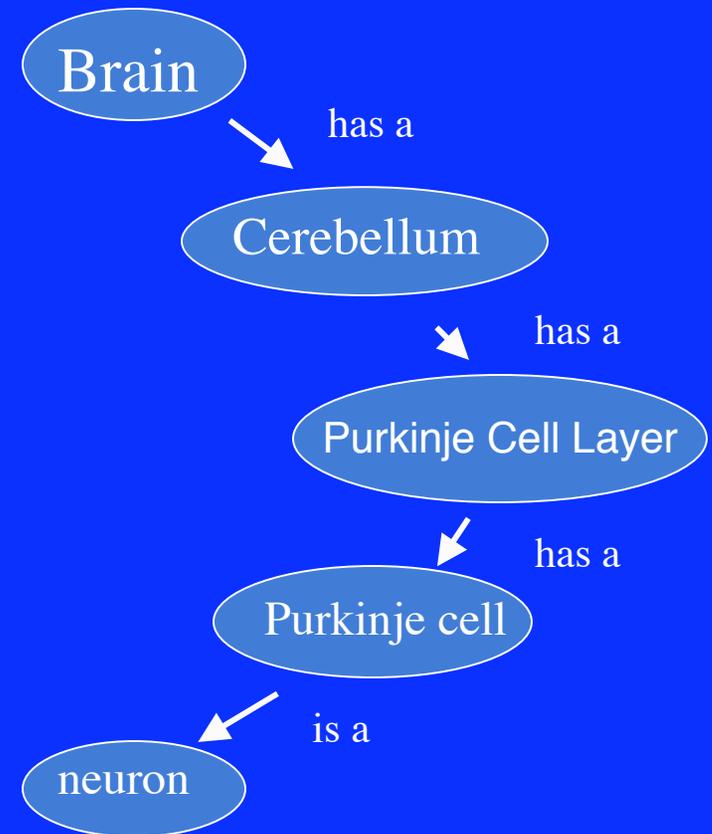
*We are using "Integrated Views" based on "Ontologies"*

## What is an Ontology?

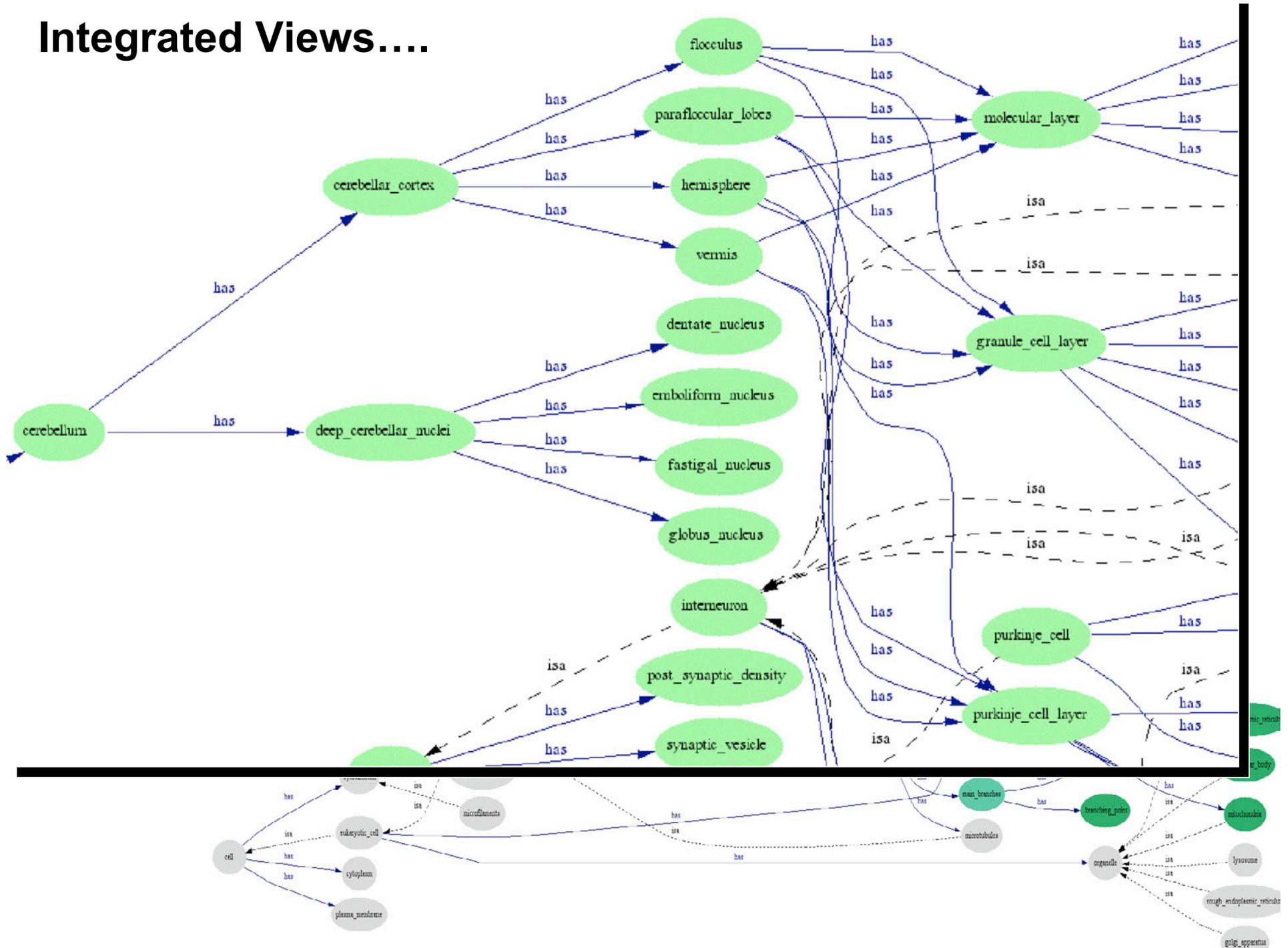
- Way to communicate a shared understanding of a field
- representation of **terminological knowledge**
- explicit specification of a conceptualization
- concept **hierarchy** ("is-a")
- further **semantic relationships** between concepts ("is part of", "causes" etc.)

## Examples:

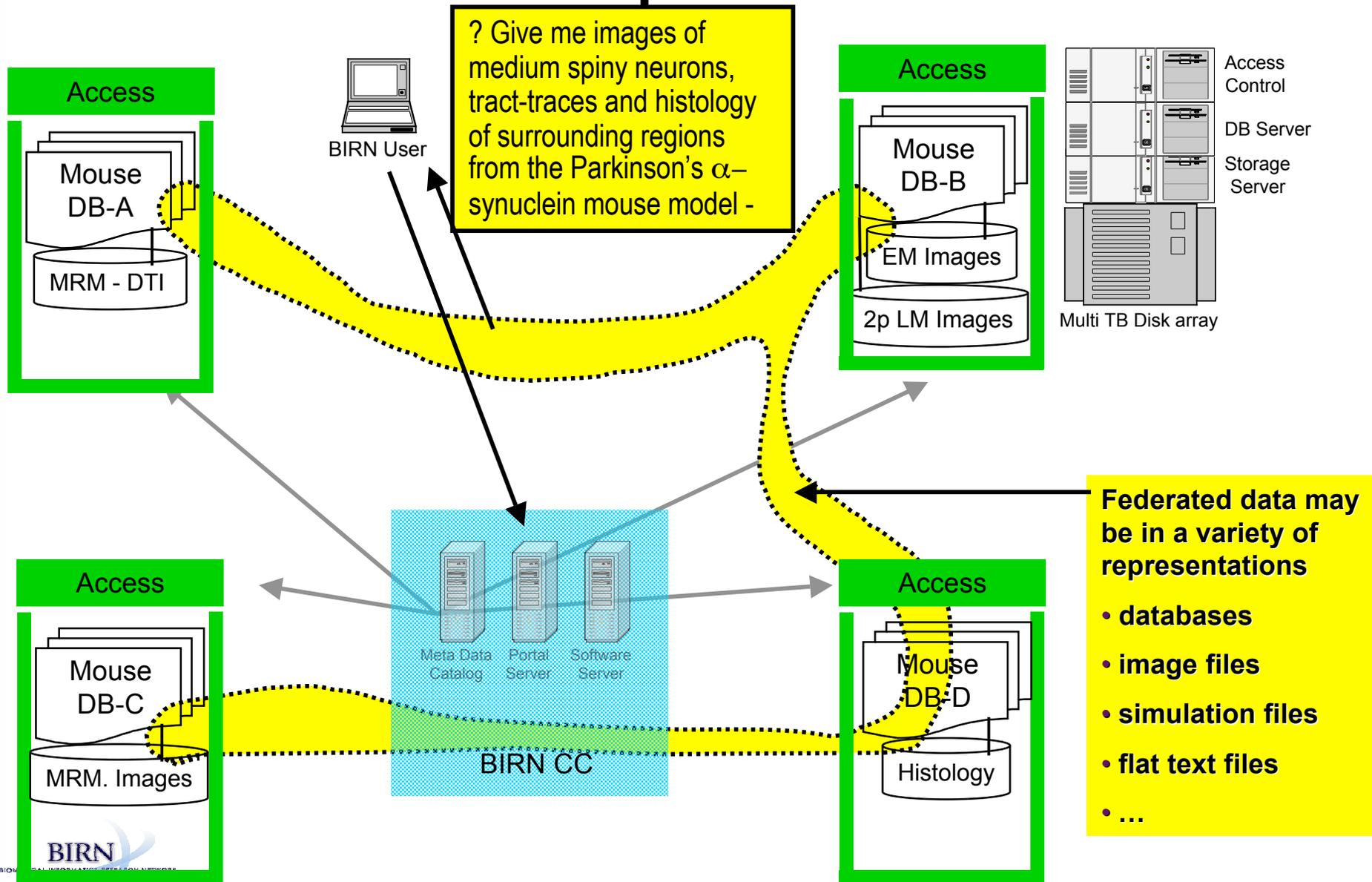
- GO (Gene Ontology)
- NeuroNames
- Foundational model of anatomy
- Mouse Anatomy (Edinburgh)



# Integrated Views....



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



# 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

# 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 MRI slice with a yellow grid overlay. A yellow arrow points from a specific location on the grid to a detailed neuron reconstruction. Another yellow arrow points from the neuron reconstruction to a high-magnification grayscale image of the neuron. The interface includes a menu bar (File, Tools, Help), a toolbar, and a 'Feature Layers' dropdown menu set to 'inside\_filter'. On the left, there is a 'Figure: 33' panel with buttons for 'Query UMLS', 'Show Cells', and 'Load Image', and a list of checked data sources: 'c\_033\_mouse\_pi', 'c\_033\_mouse\_p', 'c\_033\_mouse\_la', and 'c\_033\_mouse\_bi'. A 'Data Source:' field is visible below the list. The 'Related Image List' panel on the right shows three image thumbnails and a table of properties.

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...

(Behind Bregma: -0.22mm) (Ventral to Bregma: 4.633mm)

# Cell Centered Database

- Databases for cellular imaging data
- Store and manage cell level information from tissue, cultured cells, and subcellular fractions
- Models the entire process of reconstruction, from specimen preparation to segmentation and analysis.

Display record

http://ccdb.ucsd.edu:80/servlet/SearchRecord?imagebas

CELL CENTERED DATABASE™ NATIONAL CENTER FOR MICROSCOPY AND IMAGING RESEARCH

Logout to Home | Help

**Record Summary**

**Record ID**

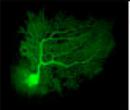
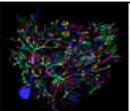
- 1 [ALXP](#)
- 2 [e1cb4a5](#)
- 3 [e1cb4a1](#)
- 4 [e1cb4a3](#)
- 5 [e1cb3anew](#)
- 6 [pccor10](#)
- 7 [pccor10\\_dc](#)
- 8 [e4cb2a2](#)
- 9 [e4cb3a1](#)
- 10 [e1cb3a1](#)
- 11 [e1cb10a2](#)
- 12 [e1cb10a3](#)
- 13 [cere14](#)
- 14 [071202tjd](#)
- 15 [T071502](#)
- 16 [102003b](#)

**Searched:** .Project ID is ALL .Project Description is ALL .Leader is ALL .Title is ALL .Scientific Name is ALL .Strain is ALL .Experimenter is ALL .Species is ALL .Cell is ALL .Structure is ALL .Organ is ALL .Age Class is ALL .Instrument is ALL .Microscopy Type is ALL .Record ID is ALL .[Region is cerebellum](#) .Reconstruction Type is ALL

[New Search](#)  
[Back to Search Results](#)  
[Questions?](#)

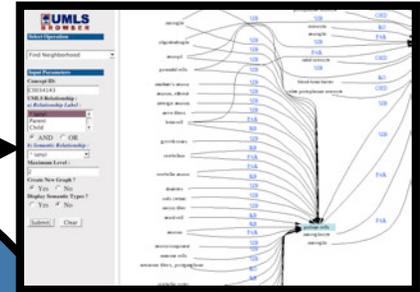
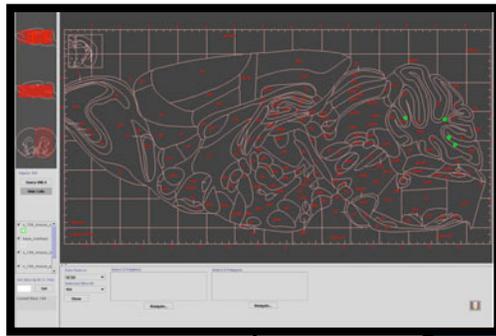
**Record: e1cb4a5**

[Details](#) | [Protocol](#) | SenseLab Neuron DB: [Purkinje Neuron](#)

<b>Record ID (Image Base Name)</b>	e1cb4a5
<b>Project ID</b>	P1170
<b>Leader</b>	Maryann Martone
<b>Description</b>	NeuroLucida tracing of filled Purkinje neurons
<b>Species</b>	mouse
<b>System</b>	CNS
<b>Product Type</b>	optical section series
<b>Organ</b>	brain
<b>Region</b>	cerebellum
<b>Cell type</b>	Purkinje Neuron
<b>Structure</b>	Dendritic Tree
<b>Volume Name</b>	e1cb4a5/e1cb4a5.pic
<b>Volume</b>	 <a href="#">Animation</a> (*currently it does not work for Mozilla (Macintosh)) <a href="#">Downloads (52M/PIC)</a> <a href="#">Reconstruction Image Description</a> <a href="#">Submit Evaluation</a> <a href="#">List Evaluation</a>
<b>Segmented File</b>	 <a href="#">Downloads (ASCII)</a> <a href="#">List &amp; Measurement</a> <a href="#">Downloads (TXT)</a>

Know Me Ontology Browser

Smart Atlas

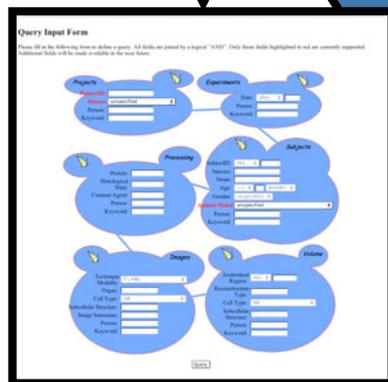
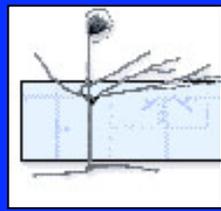


Integration Engines

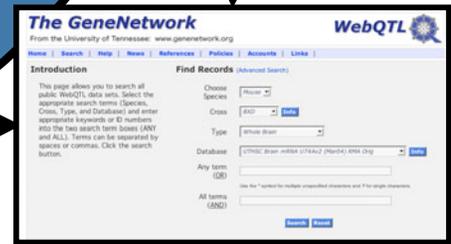
Spatial and Semantic Mark up

Data

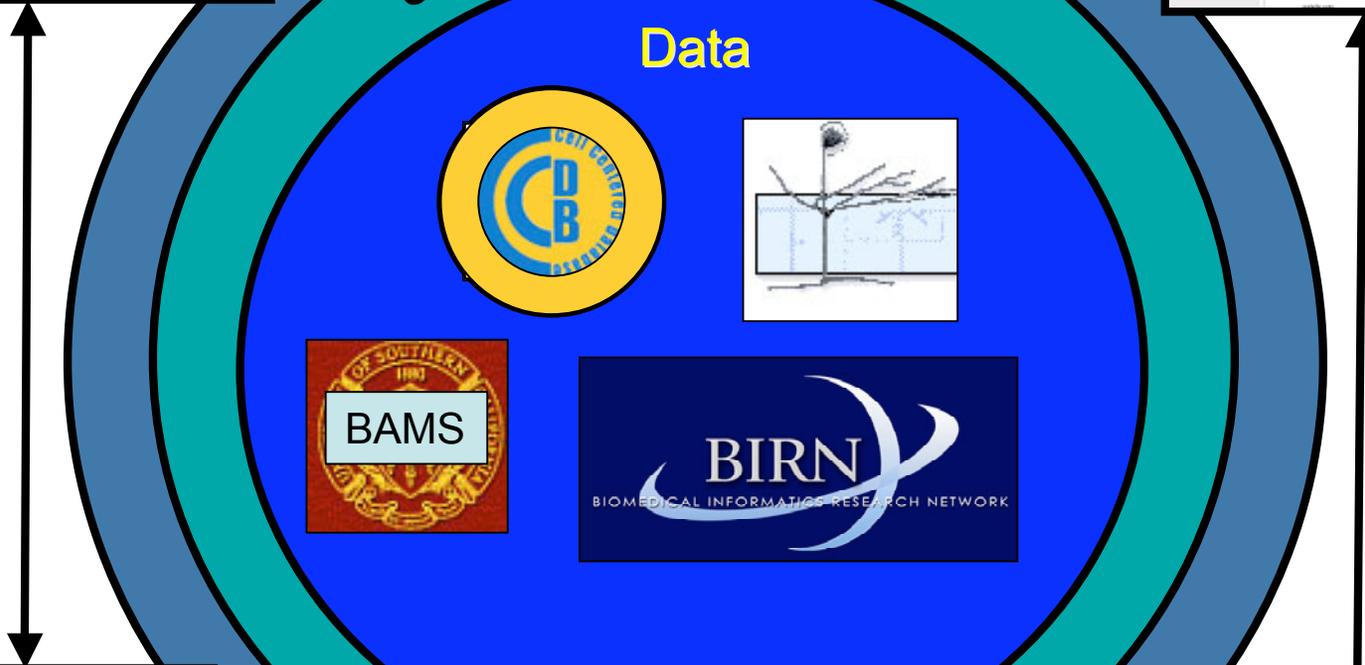
Knowledge



Web Forms



Genomic Data







# 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.

- 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

# http://www.nbirn.net

The screenshot shows the homepage of the Biomedical Informatics Research Network (BIRN). The browser window title is "Biomedical Informatics Research Network - Home Page" and the address bar shows "http://www.nbirn.net/". The page features a header with the BIRN logo, a "BIRN Portal Login" section with fields for "Username:" and "Password:", and a "Search This Site" box. A navigation menu includes "About Us", "Resources", "Test Beds", "Publications", "Contact Us", "Site Map", and "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**

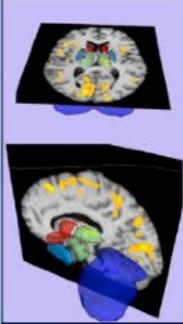
The BIRN currently consists of three "test bed" projects that are conducting structural and functional studies of neurological disease:

- [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](#)