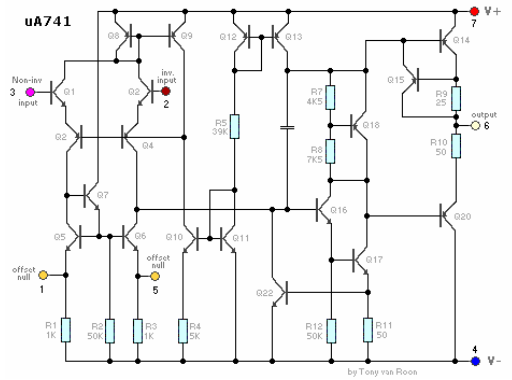
BIRN

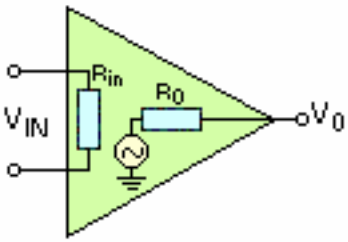
Biomedical Informatics Research Network

a testbed for a biomedical knowledge infrastructure

NCRR



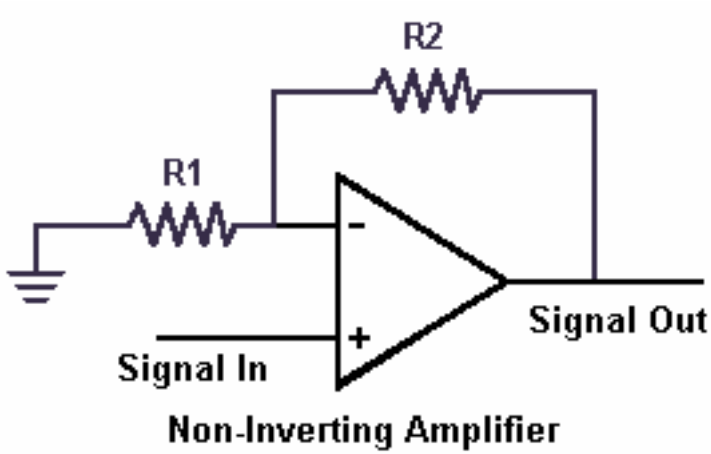
The Ideal Amplifier



R_{in} = Infinity

R_0 = Zero (0)

$V_0 = A_v V_{in}$



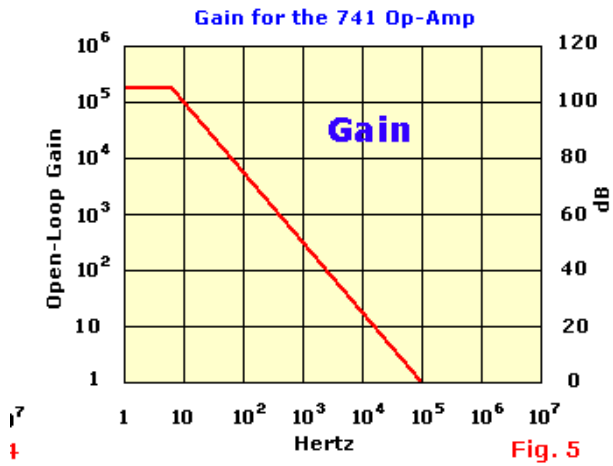
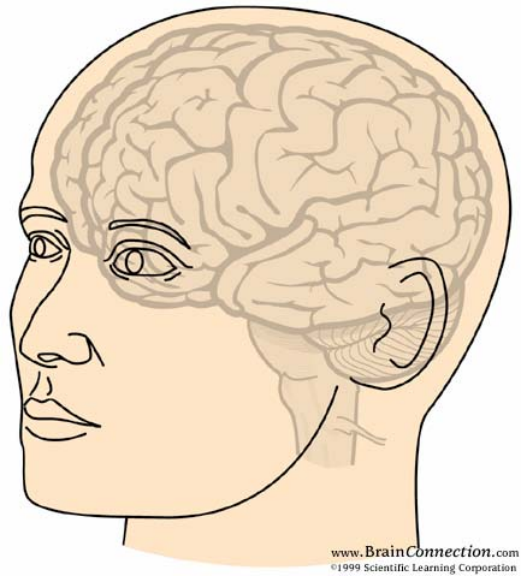
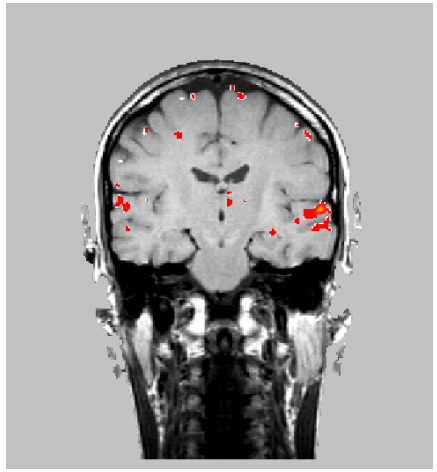
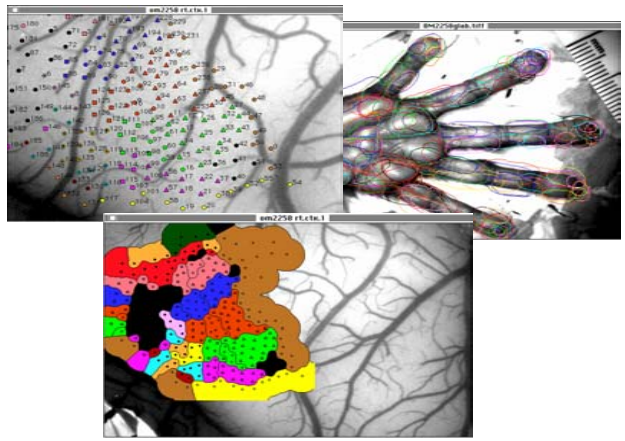


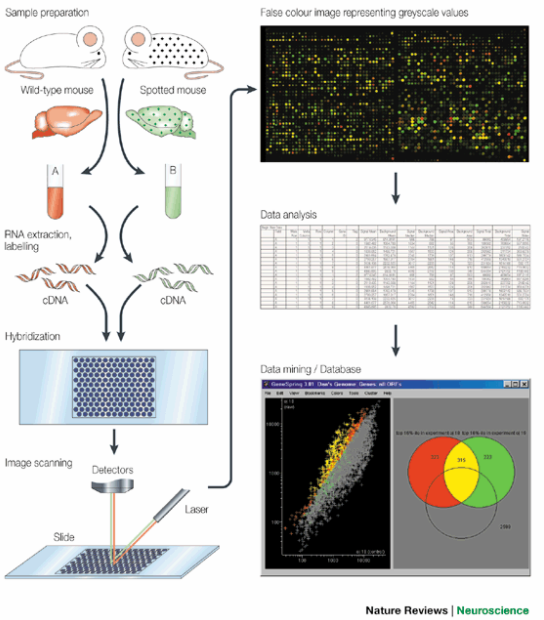
Fig. 5

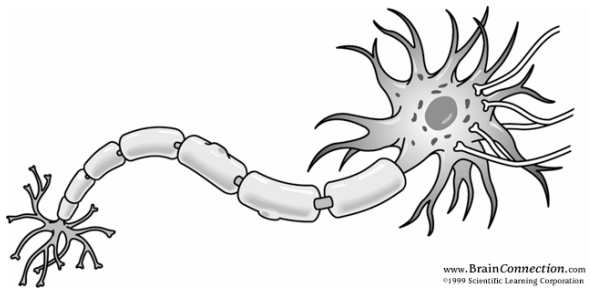


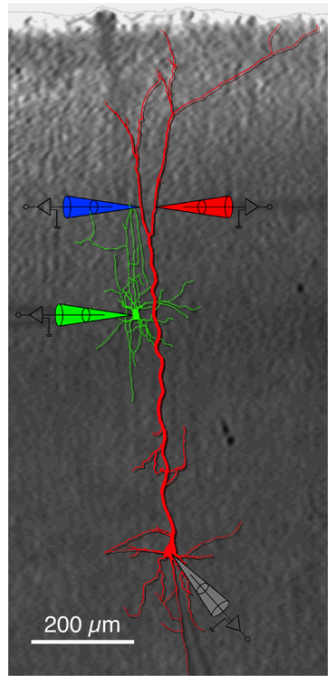




Appropriate scale?







NCRR

NCRR Informatics

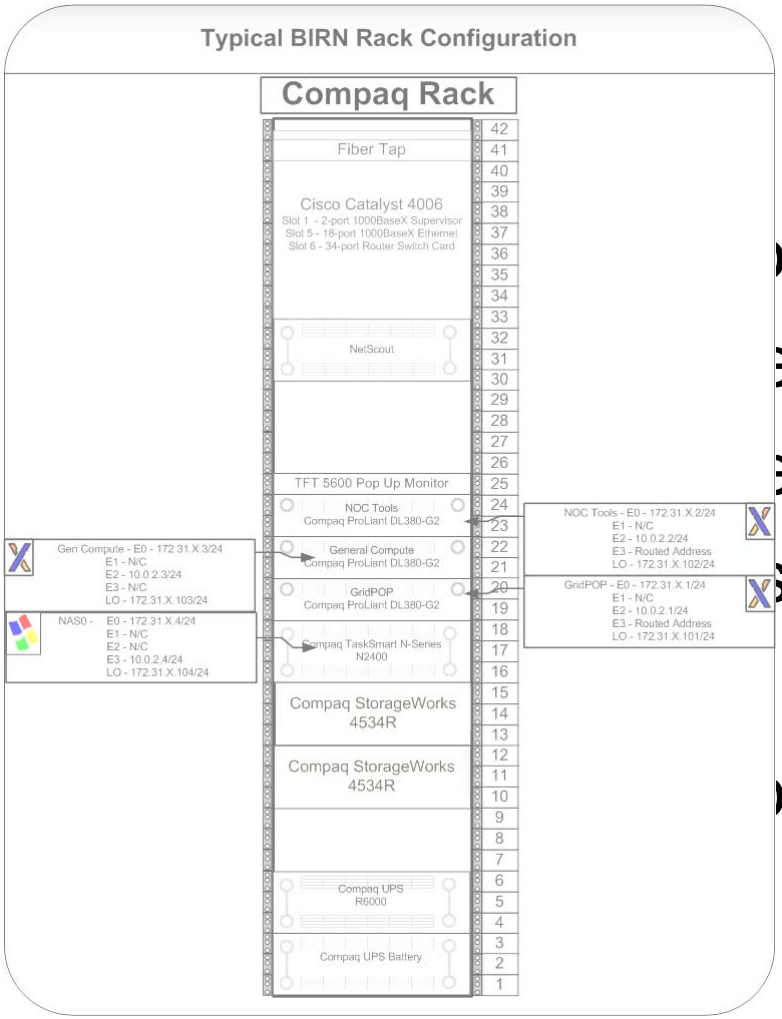
- Resources
- Collaboratories
- BIRN

NCRR

The Challenge

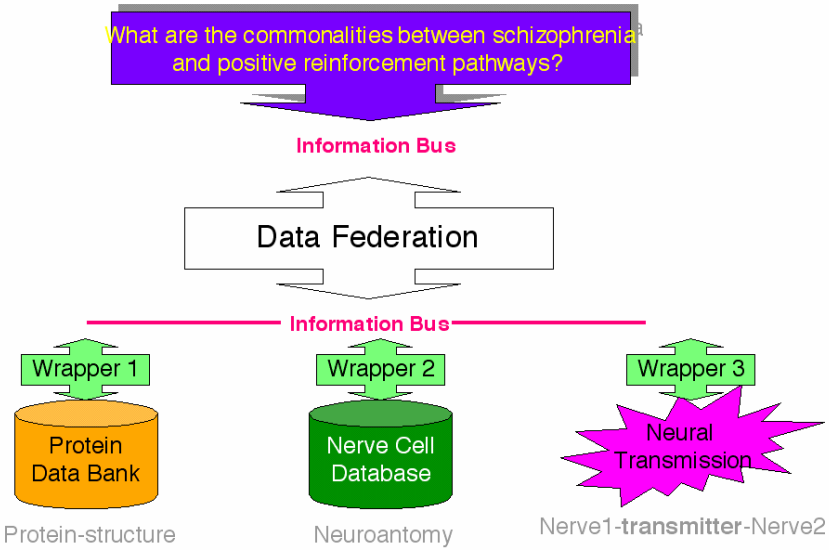
- Cross-disciplinary work is becoming increasingly important in biomedical research
- Complexity within each discipline will require more biomedical research to be done through collaboration
- Integration of results will be necessary for translation to clinical practice
- Technology can help but requires significant commitment to building infrastructure, purchasing equipment and hiring qualified personnel

HW/SW Infrastructure



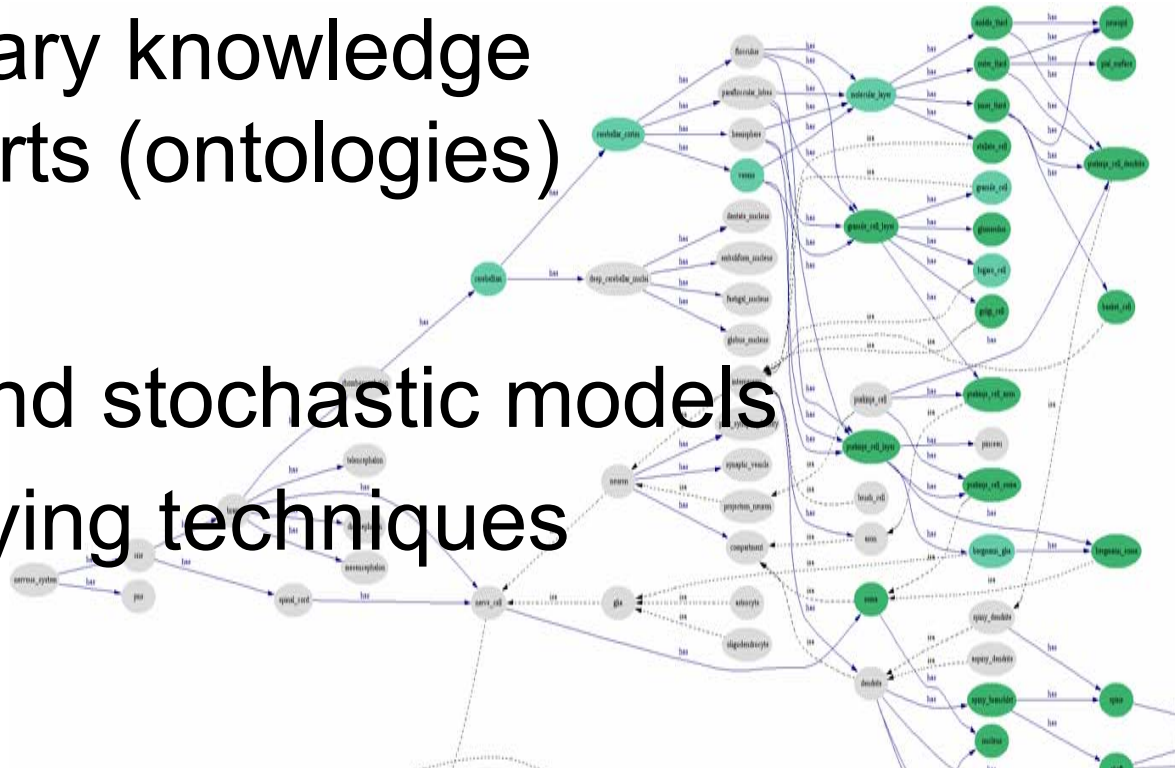
- ɔrking
- eware
- exchange
- security, ownership and integrity
- ization and UIs
- ɔoration and workflow tools

NCRR



Knowledge Base Infrastructure

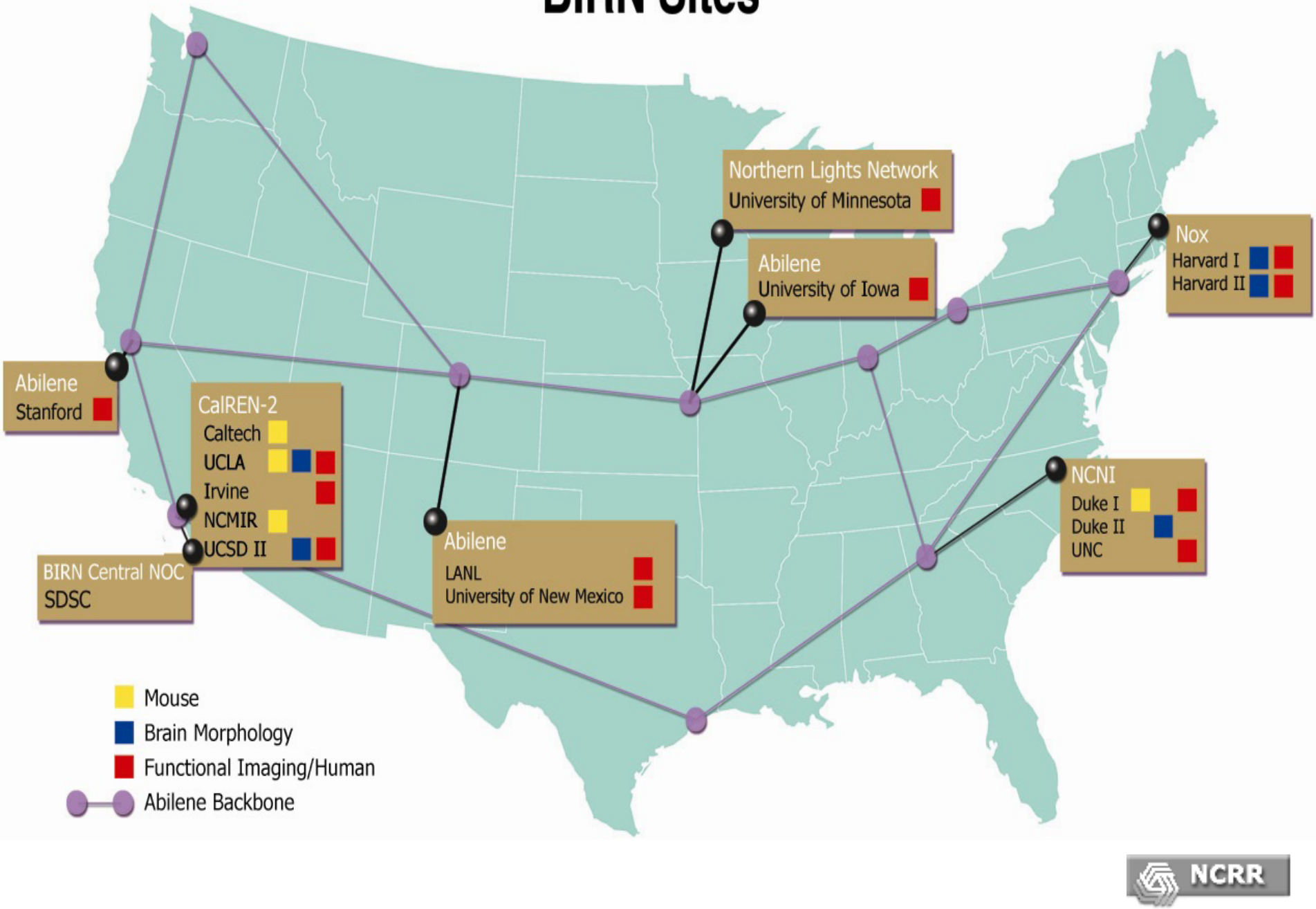
- Cross-disciplinary knowledge acquisition efforts (ontologies)
- DB wrappers
- Non-discrete and stochastic models
- Improved querying techniques



BIRN Coordinating Center

- Best practices aggregator
- Center for training and experience exchanges
- Expert-level technical support
- High-level project management
- Oversight bodies point of contact

BIRN Sites



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What is the long-term impact?

The NIH mission is to uncover new knowledge that will lead to better health for everyone.

Mouse BIRN

- Duke, UCLA, Cal Tech, UCSD
- Schizophrenia, ADD and MS models
  - DAT knockout mouse
  - EAE mouse
- *In Vivo* MR microscopy
- Cryosectioned whole brains
  - Conventional histology
  - Gene expression
- Electron microscopy
  - 3D subcellular data
  - Protein localization
  - Supramolecular image data

Finding 2. Critical, long-term research, technology and policy issues need to be addressed if we are to realize the potential of information technology to improve the practice of health care.

Knowledge repositories are an important research topic, including techniques for integrating data from multiple sources. Stronger forms of authentication are needed, both for persons accessing data and for assuring the integrity of information. Methods are needed to protect patients' privacy while allowing valuable medical research and necessary reimbursement tasks to be performed.

Finding 4. IT potential to improve health care will not be realized without development of a larger cadre researchers and practitioners who operate at the nexus of health and computing/communications.

Finding 5. DHHS has relied on other agencies to fund IT research.

- PITAC

Transforming Health Care
Through Information Technology

Open Issues

- Large data sets
  - ISCAR - information storage, curation, archiving, and retrieval
  - Bandwidth issues (QoS)
  - Quality control of data only analyzed by machine (audit requirements)
- When to develop, and when to opt for COTS systems
- Fostering collaboration
  - Reward structures in government and academic institutions
  - IP issues
  - Integrity (source and immutability)
  - Free text sharing
- Data sharing issues (ownership, privacy,etc.)

nature REVIEWS

OPINION Sharing gene expression data: an array of options

Nature Reviews Neuroscience 2, 435-438 (2001)

Daniel H. Geschwind is at the Department of Neurology, University of California, Los Angeles

Reasons given for sharing:

- can't use all of the data anyway
- increase confidence from independent verification
- increase input from non-biologists

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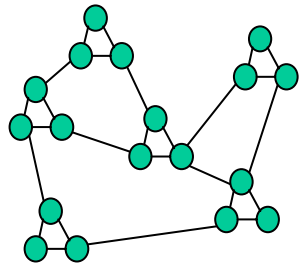
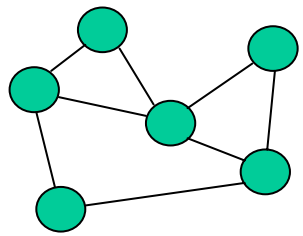
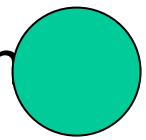
Open Issues

- Federated DB / Knowledge Engineering
  - Knowledge acquisition
  - Integration of knowledge sources
  - Accessing legacy systems
  - Knowledge distillation
- High-level management of projects
  - Waning days of individual investigator
  - □□□Degree of centralization required
  - Role of standards
  - Business/sociological input
  - Project subdivision and optimization
- Scaling (within and across disciplines)







There are all these highfalutin metaphors for the genome project, like "The Holy Grail," but *it's really a public works project that serves a hundred thousand researchers around the world*, and we have to keep that in perspective. With that said, if we're going to be engaged in public works projects of this sort for the next quarter century, as I believe we will, the we should make them as efficient as possible. *It's more efficient to build roads and bridges by organizing large construction companies. But once built, they're there for everybody to drive on … The Human Genome Project is just road building. These are very important roads.*

- Eric Lander, Ph.D.

Director of Whitehead-MIT
Center for Genome Research

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Brain Morphology BIRN

- MGH & BWH (Harvard)/Duke/UCLA/ UCSD
- Neuroanatomical correlates of neuropsychiatric illness
  - MCI, mild AD, Unipolar depression
- Data pooling and shared techniques

Functional Imaging BIRN

- UC Irvine, New Mexico, Iowa, Minnesota, UCLA, MGH, Duke, North Carolina, Stanford, UCSD
- Neurofunctional manifestations of schizophrenia
- Data pooling and shared techniques

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Transforming Health Care
Through Information Technology

Data Mining

"Discovering unknown patterns or trends from a body of data which is not otherwise apparent"

-www.netpilgrim.com