

THE EVOLVING PARADIGM FOR BIOMEDICAL RESEARCH

**Dr. Louise Ramm
Deputy Director
National Center for Research Resources
National Institutes of Health
Bethesda, MD**












Evolving Research Paradigm

- **Much more multidisciplinary**
- **Integrative or Systems approach**
- **More dependent on advanced instrumentation and technologies**
- **Bioinformatics, Internet, and scalable computing resources essential**
- **Virtual laboratories to facilitate access to advanced technologies**
- **Imaging technologies from molecules to organisms**

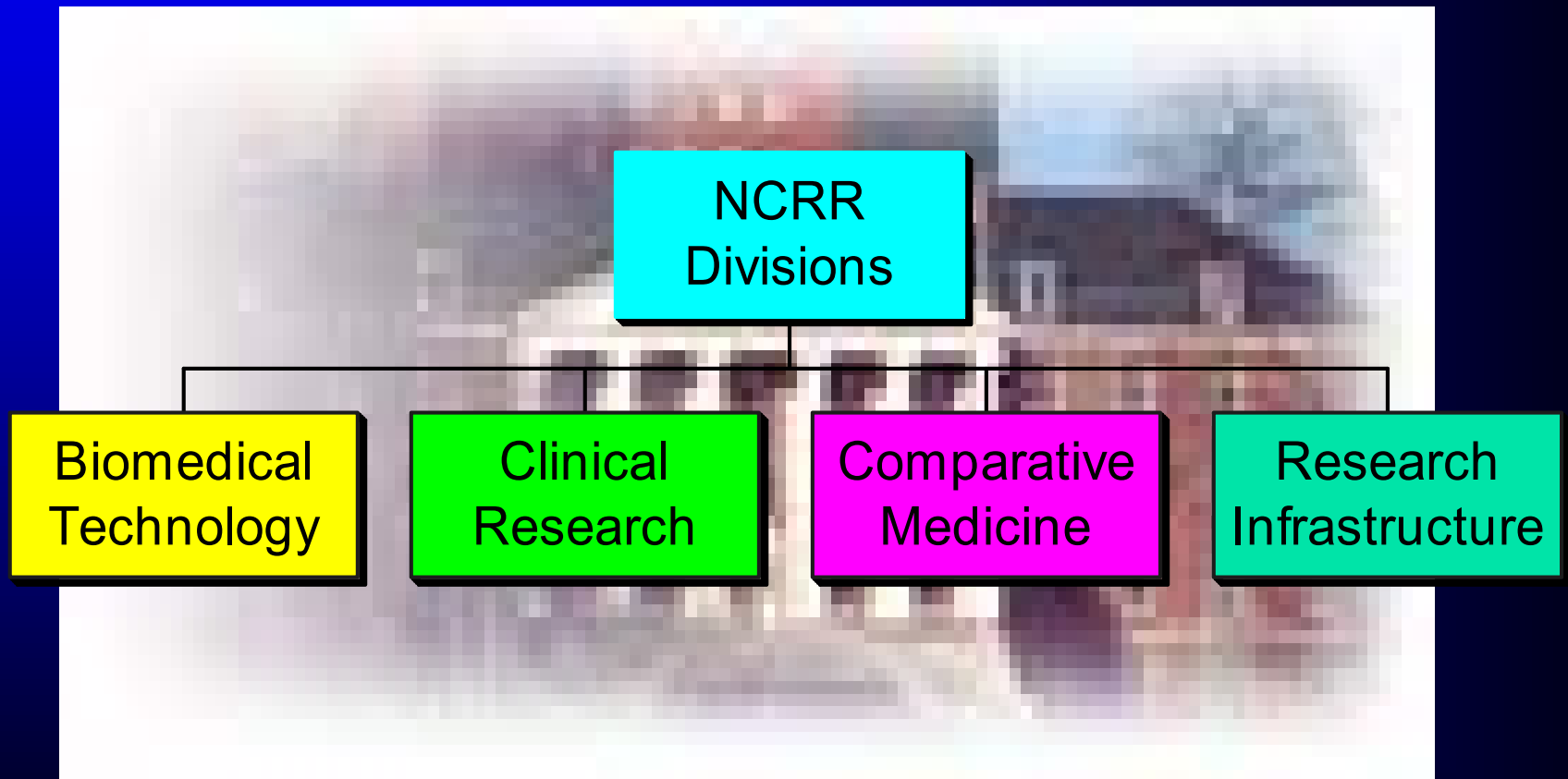
NCRR's Mission: To serve as a “catalyst for discovery” for NIH supported investigation

NCRR creates, develops, and provides a comprehensive range of human, animal, technological, and other resources to enable biomedical research advances. NCRR promotes collaborations within and across scientific disciplines and provides quick, flexible approaches to new and emerging research needs.

Infrastructure and Related Core Needs for Biomedical Research

-  **Instrumentation**
-  **Information Technologies and networks**
-  **Advanced resource technologies**
-  **Proteomics, glycomics -- an integrated approach**
-  **Structural Biology - synchrotron beam lines, high field NMR**
-  **Resources to facilitate research**
-  **Clinical research**
-  **Animal research**
-  **Research Facilities-- construction and renovation**
-  **Animal research**
-  **Research laboratories**

National Center for Research Resources










Division for Clinical Research

Resources

Resources for Clinical Research

- ☞ National Gene Vector Laboratories**
- ☞ National Disease Research Interchange**
- ☞ Human Islet Cell Resources**
- ☞ Regional Genotyping Resources**
- ☞ Bioinformatics Regional Resources and Institutional cores**
- ☞ BIRN Network; CFnet; MSI-net**
- ☞ Research Subject Ombudsman/Advocate**

General Clinical Research Centers

-  **Institutional resource for both inpatient and outpatient research**
-  **Hosts investigators funded by other NIH components, other Federal, state and local agencies, as well as by the private sector**
-  **Specialized paramedical personnel - e.g., research nurses, dietitians, data managers**
-  **Specialized laboratories**
-  **Human applications laboratories, cell sorting, mass spectrometry, imaging, pharmacogenetics, mass spectroscopy; BAL; cell sorting, DNA extraction, PCR**
-  **Bioinformatics Cores: Computerized database management and analyses, Biostatisticians, Systems Managers, Internet access.**
-  **Treatment & Diagnostic Network for Cystic Fibrosis; BIRN**










NCRR Resources for Patient-Oriented Clinical Research

-  **Investigator Development**
-  **Medical Student program**
-  **Clinical Research Feasibility Funds - pilot research**
-  **Mentored Clinical Research Scholar program (K12)**
-  **Expand K23 program; expand K24 funding**
-  **Loan Repayment program**





Division of Biomedical Technology Research and Research Resources

- **Network of 49 Biomedical Technology Centers (discover, create, and develop technological innovations that have application to a broad spectrum of biomedical research activities)**
- **Shared Instrumentation Program (support to acquire commercially available instrumentation at a cost greater than \$100 K)**

Biomedical Technology Resource Centers

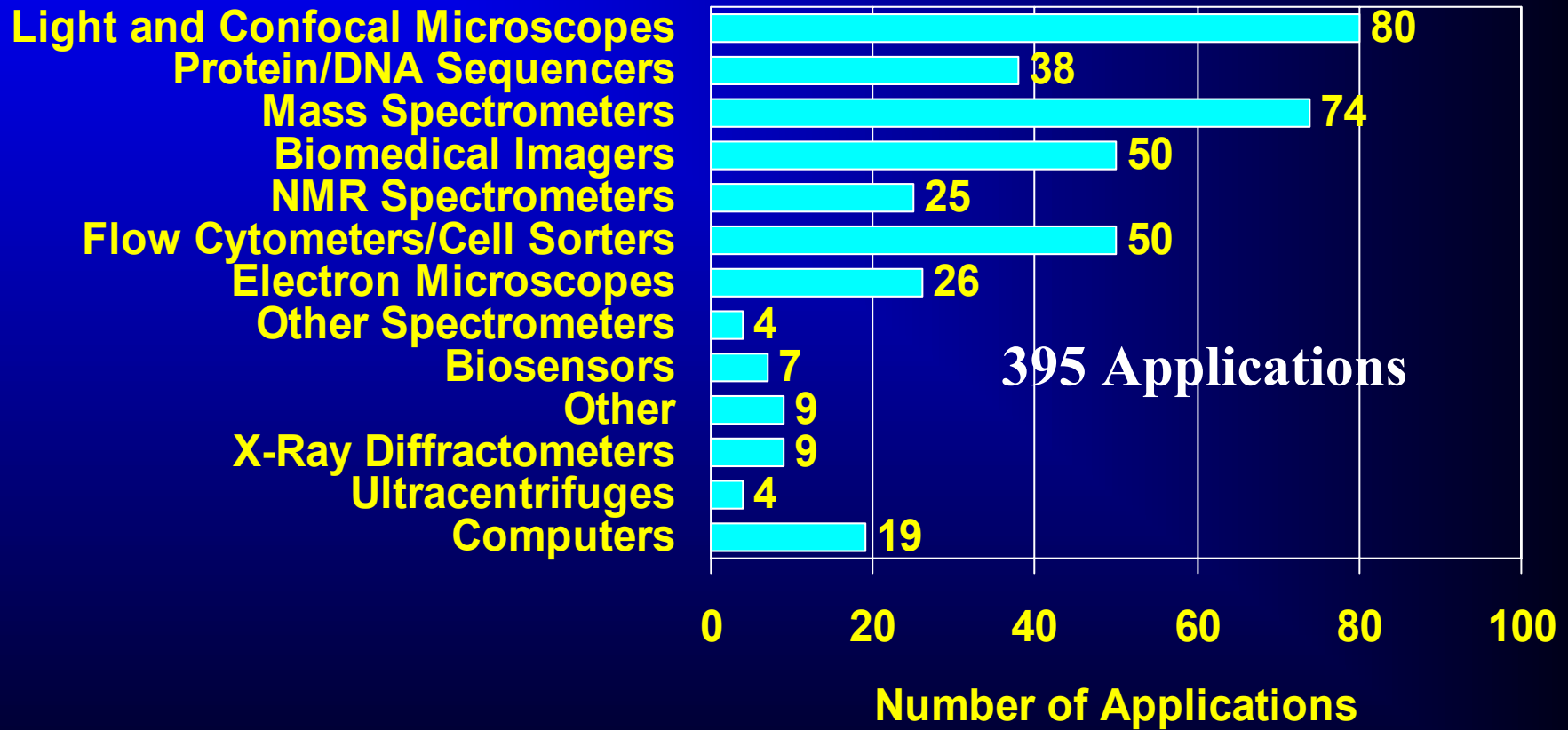
-  **Develop and provide access to advanced biomedical research technologies**
-  **Principal functions:**
 -  **Research and Development, Collaborative Research, Service, Training and Dissemination of technology**
-  **Scope---examples:**
 -  **Structural and functional biology -- "postgenomics"**
 -  **Simulation and computation**
 -  **Integrative technologies**
 -  **Imaging from molecule to organ (e.g., brain research)**
-  **Host institution provides research space for visiting scientists.**

Shared Instrumentation Grant Program








-  **Provide funds (\$100-500K) for "off-the-shelf" instrumentation**
-  **Too expensive to purchase with research project grant funding**
-  **Shared by at least 3 NIH-supported investigators. (Now up to about 15)**
-  **Applicant institution encouraged to provide access via centralized facility with technical support. No NIH matching**

Shared Instrumentation Grant Program

Applications by Instrument, FY2004



"High End" Instrumentation Program

-  **Complements existing Shared Instrumentation Grant Program for equipment requests between \$100K to \$500K**
-  **\$22M in FY 2004**
-  **Eligibility: same as for SIG program**
-  **Application:**
 -  **Minimum request \$750,000**
 -  **Maximum request \$2.0 million. If equipment needed costs more, must have funds available before award made. No IDCs; one year award**
-  **Match: none required**

New "High End" Instrumentation Program

Mass Spectrometers - combinations of electrospray ionization with Fourier transform ion cyclotron resonance (FTICR) mass spectrometry Range (\$1.0 - \$1.2 M)

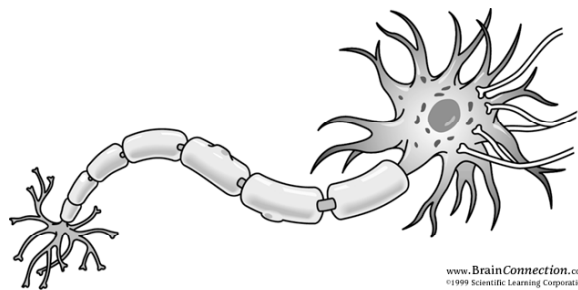
**Electron Microscopes - IVEM with field emission illumination for high resolution Range (\$1.5-\$2.0 M)
Cryoelectron microscopy Range (\$3.0 - \$4.5M)**

Imaging equipment - PET, CAT, MRI; higher field MRI (3T to 8T); MR spectroscopy/functional imaging Range (\$1.2-\$10 M)

Nuclear Magnetic Resonance - three dimensional structures. NMRs up to 900MHz. Range (\$1.5-\$10 M)

Pilot Testbed for Imaging Research Biomedical Imaging Research Network (BIRN)

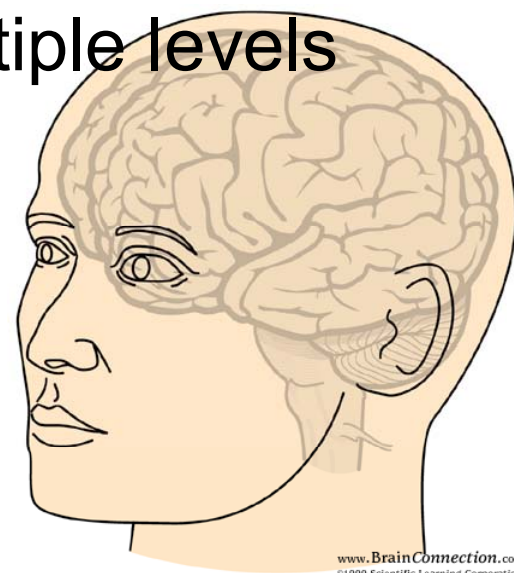
- 📁 Enhance access to 4T-8T MR and other imaging modalities for neuroscience studies**
- 📁 Enhance telecommunications and telemedicine efforts for GCRC sites, co-located with NCRR Imaging centers**
- 📁 Partners include NIH Institutes, NSF, SDSCC, UCSD**
- 📁 Bioinformatics tools and data fusion for PET, MEG, CAT, EEG, MRI**
- 📁 To be extended to all NCRR Resource Sites for full range of biomedical studies along with wireless access for investigator outreach**



www.BrainConnection.com
©1999 Scientific Learning Corporation

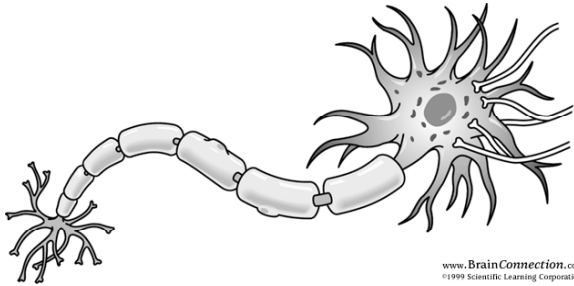
BIRN Beginning

- Stand-alone technical teams
- Inter- and intra- individual multi-modal statistical representations
- Characterization of disease at multiple levels
- Tiered community access to data



www.BrainConnection.com
©1999 Scientific Learning Corporation

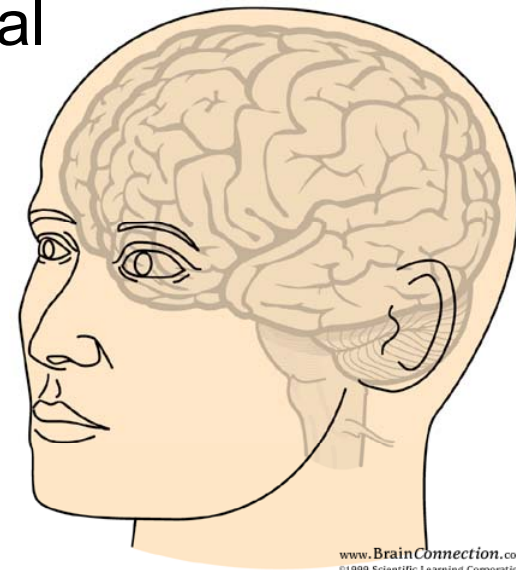




www.BrainConnection.com
©1999 Scientific Learning Corporation

BIRN Future

- Addition of new sites in a rapid, well-defined fashion
- Cross-species integration of data
- Characterization of treatment at multiple levels
- Expand model to other areas of biomedical research



www.BrainConnection.com
©1999 Scientific Learning Corporation

Division of Comparative Medicine

- **Network of 8 National Primate Research Centers (a special environment to maintain nonhuman primates (20,000, 30 species)**
- **The NIH Chimpanzee Management Program to house and maintain chimpanzees owned by NIH for biomedical research**
- **Supports models and resources for biomedical research such as *C. elegans*, zebrafish, and mutant mice**

Biorepositories

Examples



Bloomington Drosophila Stock Center



Collections of mutations



Caenorhabditis Genetics Center



Over 1600 strains available



National Resource for Cephalopods



**Provides live, healthy squids and other cells,
tissues and organ systems**



Yeast Genetic Stock Center



**Collection of over 5,000 genetically defined strains; distributes
updates of the genetic map of *S. cerevisiae***



National Swine Resource and Research Center



**Deposit, maintain, preserve and distribute swine models
for studies of human diseases**

Induced Mutant Resource

The Jackson Laboratory

- 📁 Established in 1992 to address concerns about cost, health, and distribution of induced genetic mutant mouse strains**
- 📁 Validates 100 new genetic mutants per year**
- 📁 Advisory Committee sets priorities for models to be incorporated**
- 📁 Investigators pay production cost of model(s) requested**
- 📁 Resource is cost-effective approach for health research; provides access to important models and saves duplication of effort**

Induced Mutant Resources



National Network:



The Jackson Laboratory



University of California at Davis



Taconic Farms



Harlan Sprague Dawley



University of North Carolina



Data Core: The Jackson Laboratory



tracks mutants, phenotypes

**"As for the Future,
your (NCRR's) task is not to
foresee, but to enable it."**

**... Antoine de Saint-Exupery
The Wisdom of the Sands**



<http://www.ncrr.nih.gov>