

National Institutes of Health

Panel on Federal Research Funding Sources for Computing
CRA Conference at Snowbird, UT on June 25-27, 2006

Peter Highnam
National Center for Research Resources
National Institutes of Health

Highnam@NIH.gov (301)451-1467

Panel Title: Federal Research Funding Sources for Computing

Panel Description: This workshop reports on federal research funding for computing initiatives. Current developments and expectations for the future will be discussed by participants from NSF-CISE, NIH and NSA.

This talk is a very brief introduction to the NIH for a computational science audience that is unfamiliar with NIH. Materials have been included from public presentations and websites wherever possible.

Point of Contact: Peter Highnam, PhD
Senior Advisor to the Director
National Center for Research Resources
National Institutes of Health
Bethesda, MD
Highnam@NIH.gov
(301)451-1467

Prepared with help from: Carol Bean, Greg Farber, Peter Lyster, Mike Marron

**From “The Networking and Information Technology
Research and Development Program, Supplement to the
President’s Budget for Fiscal Year 2007”**

Agency NITRD Budgets by Program Component Area

FY 2006 Budget Estimates
and

FY 2007 Budget Requests
(Dollars in Millions)



Agency		Total
NSF	2006 Estimate	810.3
	2007 Request	903.7
OSD and DoD Service research orgs. ^{2,3}		543.7
		497.8
NIH		500.6
		490.7
DARPA ¹		368.3
		465.7
DOE/SC ⁴		255.8
		344.7
NSA ⁵		140.5
		117.9
NASA		78.1
		82.0
		64.7

www.nitrd.gov/pubs/2007supplement

Why NIH is on this panel.

About the NIH

The Nation's Medical Research Agency

- The NIH invests over \$27 billion annually in medical research for the American people.
- More than 80% of the NIH's funding is awarded through almost 50,000 competitive grants to more than 212,000 researchers at over 2,800 universities, medical schools, and other research institutions in every state and around the world.
- About 10% of the NIH's budget supports projects conducted by nearly 6,000 scientists in its own laboratories, most of which are on the NIH campus in Bethesda, Maryland.

www.nih.gov/about

www.nih.gov/about/budget.htm

www.nih.gov/about/organization.htm

Unlike NSF, DARPA and so on the NIH has a significant internal research presence.

In NIH terms the internal NIH research is "intramural" and the external NIH-supported research is "extramural."

Most NIH Institutes and Centers have both intramural and extramural research, but some only have extramural research.

The National Institutes of Health

NIH Director

NIA

NIAAA

NIAID

NIAMS

NIBIB

NICHD

NIDCD

NIDCR

NIDDK

NIDA

NIEHS

NIGMS

NIMH

NINDS

NINR

NCI

NEI

NCCAM

NCMHD

NCRR

NHGRI

NHLBI

NLM

FIC

CC

CSR

CIT



www.nih.gov/about/organization.htm

27 Separate Institutes & Centers (IC):

Different missions & priorities

Different budgets

From “The National Institutes of Health FY 2007 President’s Budget”

NATIONAL INSTITUTES OF HEALTH
Summary of Appropriations
(Dollars in millions)

Appropriation	FY 2005 Budget Authority 1/	FY 2006 Appropriation 1/	FY 2007 Estimate 1/
	Includes AIDS	Includes AIDS	Includes AIDS
NCI	4,828	4,793	4,754
NHLBI	2,941	2,922	2,901
NIDCR	392	389	386
NIDDK 2/	1,864	1,855	1,844
NINDS	1,539	1,535	1,525
NIAID 3/	4,403	4,383	4,395
NIGMS	1,944	1,936	1,923
NICHD	1,270	1,265	1,257
NEI	669	667	661
NIEHS	645	641	637
NIA	1,052	1,047	1,040
NIAMS	511	508	505
NIDCD	394	393	392
NIMH	1,412	1,404	1,395
NIDA	1,006	1,000	995
NIAAA	438	436	433
NINR	138	137	137
NHGRI	489	486	483
NIBIB	298	297	295
NCRR	1,115	1,099	1,098
NCCAM	122	121	121
NCMHD	196	195	194
FIC	67	66	67
NLM	315	315	313

officeofbudget.od.nih.gov/pdf/Press_info_final.pdf



NIH Roadmap for Medical Research



- Developed to
 - Increase synergy across NIH
 - Respond to concerns about the perceived “balkanization” of NIH (Congress, IOM report)
- Developed with wide extramural input
- Beyond the scope of a single Institute or Center and benefits all
 - Emerging areas of science
 - High risk/high impact research
 - Enabling science infrastructure



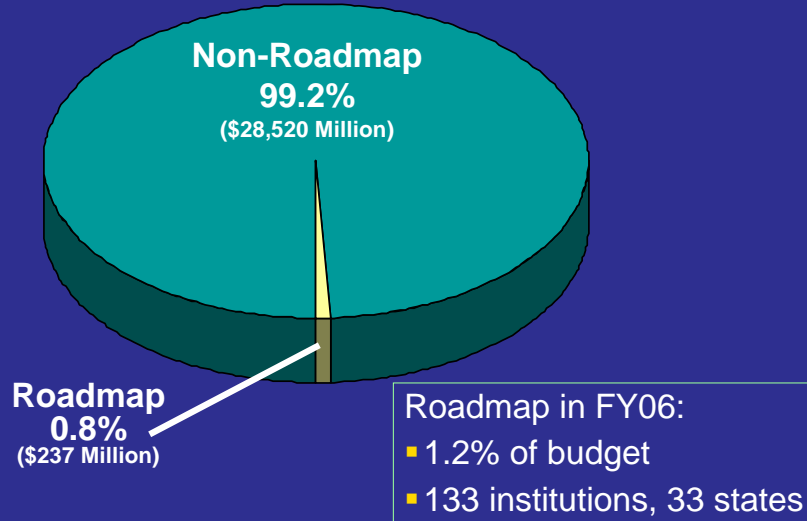
From “NIH at the Crossroads” presentation by Dr Zerhouni, May 31 2006

There is significant computation, or “informatics,” in the NIH Roadmap initiatives.



Roadmap in FY05: 0.8% of Total Budget

FY2005 Request = \$28,757M



From "NIH at the Crossroads" presentation by Dr Zerhouni, May 31 2006

Finding Current Awards

- Internet search for “NIH CRISP” to see searchable grant location database back to 1972 (www.crisp.cit.nih.gov)
- To see the monetary value of the awards found in CRISP, use:
grants2.nih.gov/grants/award/state/state.htm
- To find biomedical research results, use the NLM’s PUBMED www.pubmed.gov

NIH Miscellany

- NIH grant types (there are many):
grants1.nih.gov/grants/funding/funding_program.htm
grants1.nih.gov/grants/funding/ac.pdf
- NIH peer review process:
grants1.nih.gov/grants/peer/peer.htm
- NIH talks and courses online: videocast.nih.gov

Current Examples

National Centers for Biomedical Computing



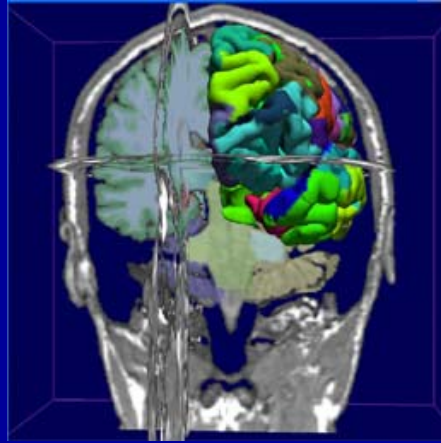
The 2006 All Hands Meeting will be on July 17-19 at the NIH in Bethesda, MD: www.bisti.nih.gov/ahm2006

NIH Point of Contact:

John Whitmarsh, PhD
National Institute of General Medical Sciences
National Institutes of Health
Bethesda, MD
whitmarj@mail.NIH.gov
301.451.6446

NCCR Biomedical Technology Program

- **Biomedical Technology Resource Centers Grants (P41)**
- **Research Center Grants (U24, U54, P20)**
- **Research Project Grants (R01, R21, R21/33)**
- **SBIR (R43, R44) and STTR (R41, R42) Grants**
- **Shared Instrumentation Grants (S10)**



www.ncrr.nih.gov/biotech/btresctr.asp

Stimulates basic research to develop versatile new technologies and methods that help researchers who are studying virtually every human disease.

Provides access to state-of-the-art technologies and instruments that enable both basic biomedical research and clinical investigations of a multitude of health issues.

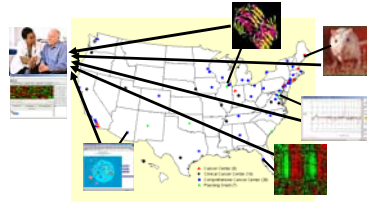
NIH Point of Contact:

Michael Marron, PhD
National Center for Research Resources
National Institutes of Health
Bethesda, MD
Marron@NIH.gov
301.435.0755



Cancer Biomedical Informatics Grid™ (caBIG™)

- Common, widely distributed infrastructure permits research community to focus on innovation
- Shared vocabulary, data elements, data models facilitate information exchange
- Collection of interoperable applications developed to common standards
- Raw published cancer research data is available for mining and integration



www.caBIG.NCI.NIH.gov

NIH Point of Contact:

Mary Jo Deering, Ph.D
Director for Informatics Dissemination
NCI Center for Bioinformatics
National Cancer Institute
National Institutes of Health
6116 Executive Blvd
Rockville, MD
deeringm@mail.nih.gov
301-496-3458

Nature 440
(23 March 2006)

MILESTONES IN SCIENTIFIC COMPUTING

PRE 1960s>>

1946 ENIAC, widely thought of as the first electronic digital computer, is formally unveiled. Designed to compute ballistics during the Second World War, it performs calculations in a variety of scientific fields including random-number studies, wind-tunnel design and weather prediction. Its first 24-hour forecast takes about 24 hours to do.



1951 Marvin Minsky, later of the Massachusetts Institute of Technology (MIT), builds SNAC, the first machine to mimic a network of neurons.

1954 John Backus and his team at IBM begin developing the scientific programming language Fortran.

1956 Building on earlier experiments at the University of Manchester, UK, and elsewhere, MANIAC at the Los Alamos National Laboratory in New Mexico becomes the first computer to play a full game of chess. In 1996, IBM's Deep Blue computer will defeat world chess champion Garry Kasparov.



1959 John Kendrew of the University of Cambridge, UK, uses computers to build an atomic model of myoglobin using crystallography data.

1960s>>

1962 Charles Mohr and Wesley Clark at MIT's Lincoln Laboratory design the Laboratory Instrument Computer (LINC) for researchers at the National Institutes of Health. It is the first lab-based computer to process data in real time.



1963 In California, the Rancho Arm becomes the first artificial robot arm to be controlled by a computer.

1966 Cyrus Levinthal at MIT designs the first program to represent and interpret protein structures.

1967 ARPANET — the predecessor of the Internet — is proposed by the US Department of Defense for research networking.

1969 Results of the first coupled ocean-atmosphere general circulation model are published by Syukuro Manabe and Kirk Bryan, paving the way for later climate simulations that become a powerful tool in research on global warming.

1970s>>

1971 Computing power shows its potential in medical imagery with a prototype of the first computerized tomography (CT) scanner.



1971 The Protein Data Bank is established at Brookhaven National Laboratory in Upton, New York.

1972 Hewlett Packard releases the HP-35, the first hand-held scientific calculator, rendering the engineer's slide rule obsolete.

1980s>>

1976 At Los Alamos, Seymour Cray installs the first Cray supercomputer, which can process large amounts of data at fast speeds.



1983 Danny Hillis develops the Connection Machine, the first supercomputer to feature parallel processing. It is used for artificial intelligence and fluid flow.

1985 After receipt of high-end computer academics, the US NSF Foundation establishes supercomputing centers.

1989 Tim Berners-Lee, particle physicist, later Genevieve develops the — to help physicists collaborate on research —



1990 The widely used bioinformatics program Basic Local Alignment Search Tool (BLAST) is developed, enabling quick database searches for specific sequences of amino acids or base pairs.

1996 George Woltman combines disparate databases and launches the Great Internet Merasenne Prime Search. It has found nine of the largest known Merasenne prime numbers (of the form 2ⁿ-1), including one that is 9,152,052 digits long.

21st CENTURY>>

1996 Craig Venter develops the shotgun technique, which uses computers to piece together large fragments of DNA code and hastens the sequencing of the entire human genome.

1998 The first working quantum computers based on nuclear magnetic resonance are developed.



2001 The National Virtual Observatory project gets under way in the United States, developing methods for mining huge astronomical data sets.

2001 The US National Institutes of Health launches the Biomedical Informatics Research Network (BIRN), a grid of supercomputers designed to let multiple institutions share data.



2005 The IBM Blue Gene family of computers is expanded to include Blue Brain, an effort to model neural behaviour in the neocortex — the most complex part of the brain.

2007 CERN's Large Hadron Collider in Switzerland, the world's largest particle accelerator, is slated to come online. The flood of data it delivers will demand more processing power than ever before.

Jacqueline Ruttimann

www.ncrr.nih.gov/biotech/btbirn.asp
www.nbirn.net
www.nature.com

NIH Point of Contact:

Greg Farber, PhD
National Center for Research Resources
National Institutes of Health
301.435.0778
FarberG@mail.NIH.gov

NIH Blueprint

National Institutes of Health

for Neuroscience Research

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- ▶ [Neuroinformatics Update](#)
- ▶ [Contact Us](#)

What's New?

- ▶ [News Release: Knockout Mouse Repositories](#)
- ▶ [Neurodevelopment - Request for Information](#)
- ▶ [Neurodegeneration Workshop Report](#)

What is the NIH Neuroscience Blueprint?

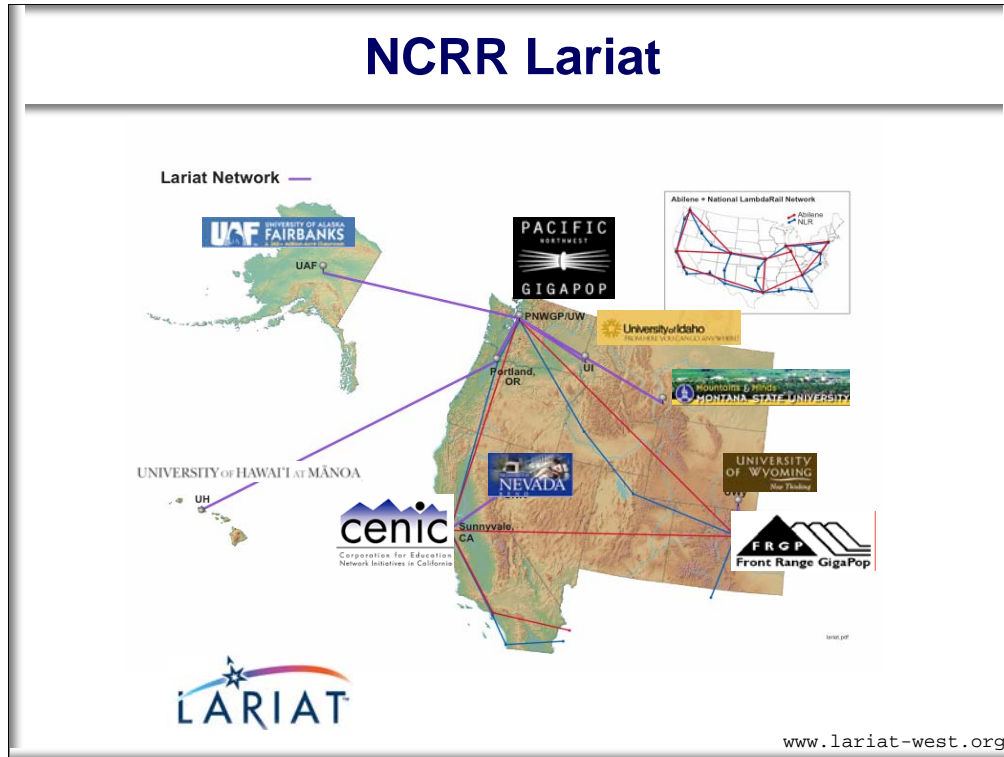
The Blueprint is a framework to enhance cooperative activities among fifteen NIH Institutes and Centers that support research on the nervous system. By pooling resources and expertise, the Blueprint can take advantage of economies of scale, confront challenges too large for any single Institute or Center, and develop research tools and infrastructure that will serve the entire neuroscience community. "Best practices" developed at a single Institute or Center will be implemented more widely; planning will be coordinated at the early concept stage; resources established by one Institute or Center may be opened to neuroscientists supported by others; and new working groups can focus on diseases and cross-cutting scientific issues for which such groups do not already exist.



Contact us by email at: blueprint@mail.nih.gov

neuroscienceblueprint.nih.gov/

NCRR Lariat



There are significant communities that do not have ready access to the Internet and to the tools and resources that we often assume to be uniformly available.

This is an important limitation for research and for health care.

Lariat has addressed this challenge in six northwestern states: Alaska, Hawai'i, Idaho, Montana, Nevada, Wyoming.

Also see: Supporting Connectivity for Biomedical Research (Joint meeting with Internet2 and TATRC):

www.esi-bethesda.com/ncrrworkshops/connectivity/index.aspx

NIH Point of Contact:

Michael Sayre, PhD
National Center for Research Resources
National Institutes of Health
Bethesda, MD
SayreM@mail.NIH.gov
301.435.0962

Modeling of Infectious Disease Agent Study (MIDAS)

MIDAS is a collaboration of research and informatics groups to develop computational models of the interactions between infectious agents and their hosts, disease spread, prediction systems, and response strategies. The models will be useful to policymakers, public health workers, and other researchers who want to better understand and respond to emerging infectious diseases. If a disease outbreak occurs, the MIDAS network may be called upon to develop specific models to aid public officials in their decision-making processes.



MIDAS is an NIGMS Program with a research network built using the U01 mechanism; started May 2004.

Scientific Director: Dr Irene Eckstrand
Program Director: Dr James Anderson
Informatics Advisor: Dr Peter Highnam

www.NIGMS.NIH.gov/initiatives/midas

www.epimodels.org

Multi-disciplinary

Large scale distribution computation, with the NSF-supported supercomputing centers

Large complex highly stochastic simulation models

NIH Point of Contact:

Irene Eckstrand, PhD
National Institute of General Medical Sciences
National Institutes of Health
Bethesda, MD
eckstrai@mail.nih.gov
301.594.0943

Opportunities?

Finding Opportunities, I

- NIH Guide for Grants and Contracts
grants1.nih.gov/grants/guide/index.html
- Biomedical Information Science and Technology Initiative (BISTI)
www.BISTI.NIH.gov
- Bioengineering Consortium (BECON)
www.BECON.NIH.gov
- NIH Roadmap
NIHRoadmap.NIH.gov
- And, increasingly:
www.Grants.gov

The **NIH Guide for Grants and Contracts** is the official publication for NIH medical and behavioral research grant policies, guidelines and funding opportunities.

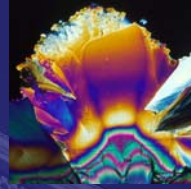
BISTI and BECON are trans-NIH organizations that track activities, opportunities and so on that are particularly relevant to computing.

Finding Opportunities, II

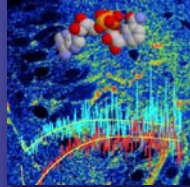
- Visit websites for each of the NIH institutes and centers. For “IXY”:
`www.IXY.NIH.gov`
- Join NIH public mailing lists:
`list.NIH.gov`
- Communicate with NIH Program Directors; many of the computational people are listed on the BISTI site.

Current BISTI Announcements

- Innovations in Biomedical Computing Science and Technology (R01/R21)
- Innovations in Biomedical Computational science and Technology (SBIR/STTR)
- Collaborations with National Centers for Biomedical Computing (R01/R21)
- Continued Development and Maintenance of Software



NIH *Transforming medicine through discovery*



From "NIH at the Crossroads" presentation by Dr Zerhouni, May 31 2006