

NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

Address:

National Institute of General
Medical Sciences
National Institutes of Health
45 Center Drive MSC 6200
Room 2AN.12B
Bethesda, MD 20892-6200
Web site: www.nigms.nih.gov

Director:

Jeremy M. Berg, Ph.D.
(301) 594-2172 (phone)
(301) 402-0156 (fax)
Email: bergj@mail.nih.gov

Legislative Contact:

Warren Jones, Ph.D.
(301) 594-5938 (phone)
(301) 480-2802 (fax)
Email: jonesw@nigms.nih.gov

Mission:

The National Institute of General Medical Sciences (NIGMS) supports basic biomedical research that increases our understanding of life and lays the foundation for advances in disease diagnosis, treatment, and prevention. The Institute funds studies on genes, proteins, and cells, as well as on fundamental processes like communication within and between cells, how our bodies use energy, and how we respond to medicines. NIGMS also works to ensure the vitality and continued productivity of basic biomedical research while producing the next generation of scientific breakthroughs and training the next generation of scientists.

NIGMS research training programs recognize the interdisciplinary nature of biomedical research today and stress approaches to biological problems that cut across disciplinary and departmental lines. Such experiences prepare trainees to pursue creative research careers in a wide variety of areas. One special program, the Medical Scientist Training Program (MSTP), provides investigators who can bridge the gap between basic and clinical research by supporting research training leading to the combined M.D.-Ph.D. degree. A report on the careers and professional activities of MSTP graduates is available at: www.nigms.nih.gov/nigms/news/reports/mstpstudy/mstpstudy.html.

NIGMS has taken the lead in a number of NIH Roadmap activities in the “New Pathways to Discovery” and “Research Teams of the Future” themes. The Institute played a key role in initiatives funded in 2004 for biomedical computing, membrane protein production, high-resolution probes for cellular imaging, and curriculum development in interdisciplinary research.

Selected Achievements and Initiatives:

Structural Genomics: The success of genome sequencing projects and recent advances in protein structure determination techniques have ushered in a new field, called structural genomics, that is focused on the large-scale analysis of protein structures and functions based on gene sequences. To stimulate this field and capitalize on the opportunities it presents, NIGMS created the Protein Structure Initiative (PSI), which is designed to organize a large cooperative effort in structural genomics. Through the initiative, NIGMS seeks to develop a public database of protein structures. This database will link sequence, structural, and functional information and will allow scientists to use gene sequences to model the approximate structures of a large number of other proteins. The first aim of the initiative is to determine the structures of several thousand proteins — one or more from most structural “families” — in 10 years.

During the current, five-year pilot phase, major investments in technology and methodology development at the nine PSI research centers are making each step of experimental structure determination more efficient, less expensive, and more likely to succeed. The subsequent production phase of the initiative will begin in 2005. This phase will consist of several large centers that will determine the structures of many proteins very rapidly and efficiently.

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Additional, smaller centers will focus on particularly challenging classes of proteins, such as membrane proteins and proteins from humans, and seek ways to overcome technological barriers to automated protein structure determination.

Pharmacogenetics: Tiny variations in our genes determine whether a medicine helps us, has no effect, or harms us. The study of how genes affect the way people respond to medicines, a field called pharmacogenetics, has already allowed physicians to tailor the doses of certain drugs and to save lives. In 2000, NIGMS spearheaded a multimillion-dollar effort in pharmacogenetics. At the heart of the trans-NIH initiative is a shared online resource called PharmGKB into which participating researchers deposit their data. This knowledge base, which does not identify study participants, is accessible to scientists worldwide. NIH currently funds 12 pharmacogenetics projects and plans to continue at about the same level in 2005.

“Glue” Grants: Many in the scientific community have advised NIGMS that the thorniest biological problems require the expertise of large, multi-faceted groups of scientists. In response, NIGMS created an initiative to “glue” together networks of scientists from diverse fields to tackle these problems. Since 2000, NIGMS has awarded five “glue” grants for investigations into areas that range from cell communication and cell movement to the body’s response to burn and traumatic injury. The anticipated total for all five projects, each of which runs for five years, is more than \$190 million. NIGMS is considering funding additional glue grants, but no more than one per year.

Bioinformatics and Computational Biology: The newest NIGMS component, the Center for Bioinformatics and Computational Biology (CBCB), supports the use of computational modeling, simulation, database applications, and other quantitative techniques to probe biology. In 2004, this center launched a major initiative called MIDAS, for Models of Infectious Disease Agent Study. The first four MIDAS grants, totaling more than \$28 million over five years, will support the creation of powerful computer modeling techniques to analyze and enhance the nation’s ability to respond to infectious disease outbreaks, whether they occur naturally, such as SARS, or are released intentionally in a bioterrorist attack. In the event of a national medical emergency, MIDAS scientists will redirect their work to help government officials determine the best way to deal with the situation.

Also in 2004, CBCB played a leading role in the NIH Roadmap effort to provide the biomedical research community with the computing infrastructure it urgently needs to integrate, analyze, and share data of different types and sources.

Appropriations History

(\$ in thousands)

| | |
|---------|----------------------|
| FY 2001 | \$1,535,378 (+13.4%) |
| FY 2002 | \$1,724,799 (+12.3%) |
| FY 2003 | \$1,847,000 (+7.1%) |
| FY 2004 | \$1,904,838 (+3.1%) |
| FY 2005 | \$1,944,067 (+2.1%) |

Extramural Research Project Grants

(Includes SBIR/STTRs)

| | |
|---------|-------|
| FY 2001 | 4,018 |
| FY 2002 | 4,164 |
| FY 2003 | 4,143 |
| FY 2004 | 4,127 |
| FY 2005 | 4,071 |

Success Rate — Research Project Grants

| | |
|---------|-----|
| FY 2001 | 37% |
| FY 2002 | 38% |
| FY 2003 | 38% |
| FY 2004 | 30% |
| FY 2005 | 25% |

Research Training Positions Supported

| | |
|---------|-------|
| FY 2001 | 4,448 |
| FY 2002 | 4,454 |
| FY 2003 | 4,512 |
| FY 2004 | 4,542 |
| FY 2005 | 4,547 |

Research Centers

| | |
|---------|----|
| FY 2001 | 26 |
| FY 2002 | 35 |
| FY 2003 | 47 |
| FY 2004 | 52 |
| FY 2005 | 54 |