

DEPARTMENT OF HEALTH AND HUMAN SERVICES

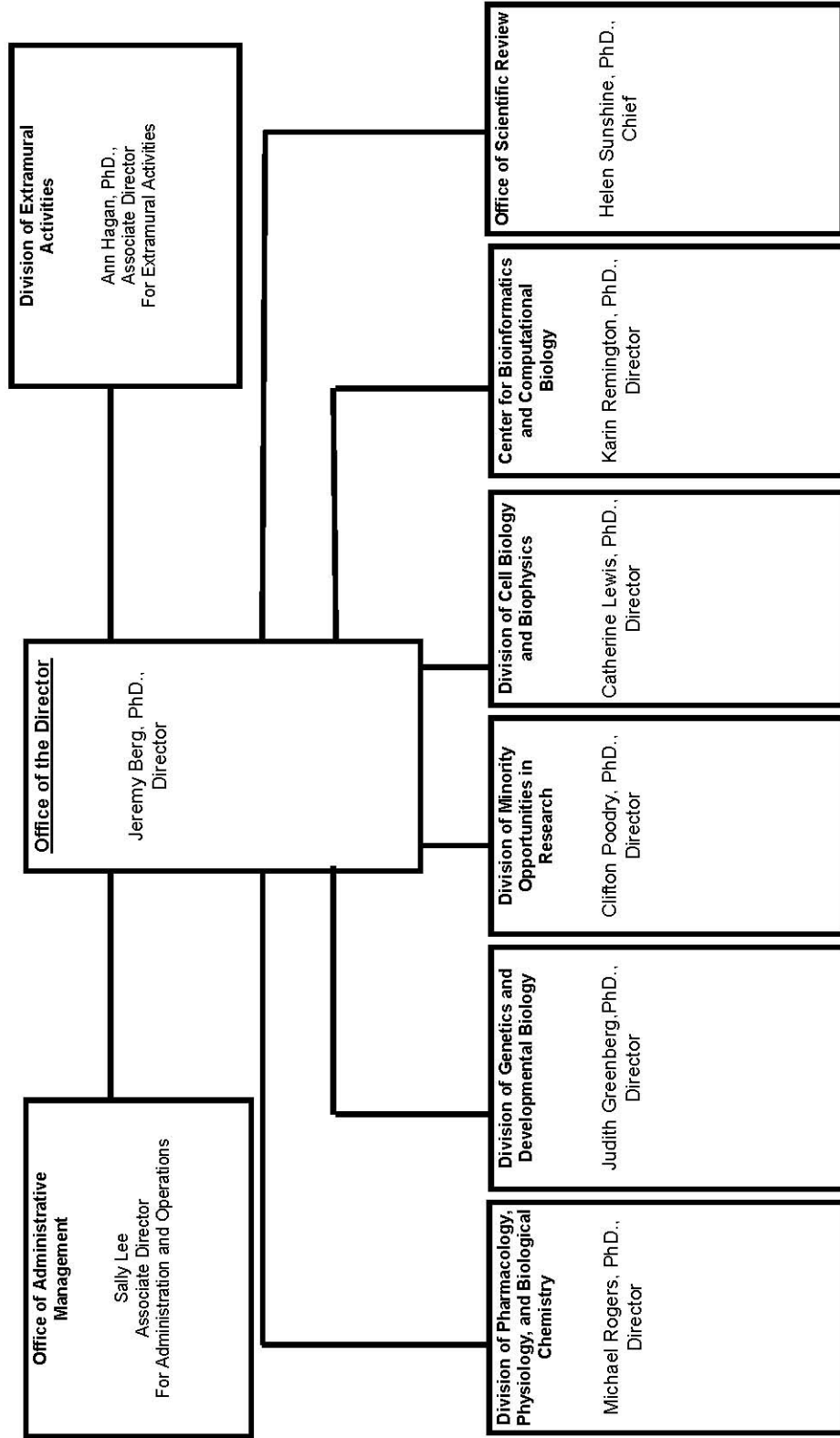
NATIONAL INSTITUTES OF HEALTH

National Institute of General Medical Sciences

<u>FY 2009 Budget</u>	<u>Page No.</u>
Organization chart.....	2
Appropriation language.....	3
Amounts available for obligation .....	4
Budget mechanism table.....	5
Budget authority by program.....	6
Major changes in budget request.....	7
Summary of changes.....	8
Budget graphs .....	10
Justification narrative.....	11
Budget authority by object.....	21
Salaries and expenses.....	22
Authorizing legislation.....	23
Appropriations history.....	24
Detail of full-time equivalent employment (FTE).....	25
Detail of positions.....	26
New positions requested.....	27

NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences

Organization Structure



**NATIONAL INSTITUTES OF HEALTH**

National Institute of General Medical Sciences

For carrying out section 301 and title IV of the Public Health Services Act with respect to general medical sciences [~~\$1,970,228,000~~] **\$1,937,690,000** (Department of Health and Human Services Appropriation Act, 2008)

**National Institutes of Health  
National Institute of General Medical Sciences**

**Amounts Available for Obligation 1/**

Source of Funding	FY 2007 Actual	FY 2008 Enacted	FY 2009 Estimate
Appropriation	\$1,935,618,000	\$1,970,228,000	\$1,937,690,000
Pay cost add-on	190,000	0	0
Rescission	0	-34,420,000	0
Subtotal, adjusted appropriation	1,935,808,000	1,935,808,000	1,937,690,000
Real transfer under Director's one-percent transfer authority (GEI)	-3,228,000		
Comparative transfer to NIBIB	-13,000		
Comparative transfer to OD	-6,000		
Comparative transfer to NCRR	-163,000		
Comparative transfers to the Office of the Assistant Secretary for Admin. And Mgmt. and to the Office of the Assistant Secretary for Public Affairs	-1,000		
Comparative transfer under Director's one-percent transfer authority (GEI)	3,228,000		
Subtotal, adjusted budget authority	1,935,625,000	1,935,808,000	1,937,690,000
Unobligated balance, start of year	0	0	0
Unobligated balance, end of year	0	0	0
Subtotal, adjusted budget authority	1,935,625,000	1,935,808,000	1,937,690,000
Unobligated balance lapsing	-99,000		
Total obligations	1,935,526,000	1,935,808,000	1,937,690,000

1/ Excludes the following amounts for reimbursable activities carried out by this account:  
FY 2007 - \$2,018,000    FY 2008 - \$5,000,000    FY 2009 - \$5,000,000

**NATIONAL INSTITUTES OF HEALTH**  
**National Institute of General Medical Sciences**  
(Dollars in Thousands)  
Budget Mechanism - Total

MECHANISM	FY 2007 Actual		FY 2008 Enacted		FY 2009 Estimate		Change	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
<b>Research Grants:</b>								
<b>Research Projects:</b>								
Noncompeting	2,800	\$926,762	2,955	\$1,016,527	2,839	\$1,001,121	(116)	-\$15,406
Administrative supplements	(292)	18,938	(277)	17,938	(292)	18,938	(15)	1,000
Competing:	1,116	375,066	825	280,154	835	283,594	10	3,440
Subtotal, RPGs	3,916	1,320,766	3,780	1,314,619	3,674	1,303,653	(106)	-10,966
<b>SBIR/STTR</b>	155	46,477	148	44,550	148	44,493	0	-57
Subtotal, RPGs	4,071	1,367,243	3,928	1,359,169	3,822	1,348,146	(106)	-11,023
<b>Research Centers:</b>								
Specialized/comprehensive	52	165,131	54	165,890	57	174,890	3	9,000
Clinical research	0	0	0	0	0	0	0	0
Biotechnology	0	753	0	753	0	753	0	0
Comparative medicine	0	100	0	100	0	100	0	0
Research Centers in Minority Institutions	0	0	0	0	0	0	0	0
Subtotal, Centers	52	165,984	54	166,743	57	175,743	3	9,000
<b>Other Research:</b>								
Research careers	79	15,498	94	17,011	94	17,011	0	0
Cancer education	0	0	0	0	0	0	0	0
Cooperative clinical research	0	0	0	0	0	0	0	0
Biomedical research support	0	0	0	0	0	0	0	0
Minority biomedical research support	154	100,476	150	99,271	150	99,271	0	0
Other	125	19,908	143	22,908	143	22,908	0	0
Subtotal, Other Research	358	135,882	387	139,190	387	139,190	0	0
<b>Total Research Grants</b>	<b>4,481</b>	<b>1,669,109</b>	<b>4,369</b>	<b>1,665,102</b>	<b>4,266</b>	<b>1,663,079</b>	<b>(103)</b>	<b>-2,023</b>
<b>Research Training:</b>								
Individual awards	570	24,133	570	24,133	570	24,325	0	192
Institutional awards	3,820	164,473	3,850	167,840	3,850	170,750	0	2,910
Total, Training	4,390	188,606	4,420	191,973	4,420	195,075	0	3,102
Research & development contracts (SBIR/STTR)	24 (0)	25,234 (106)	24 (0)	25,234 (106)	24 (0)	25,234 (106)	0 (0)	0 (0)
Intramural research	10	2,479	10	2,529	10	2,567	0	38
Research management and support	123	50,197	134	50,970	135	51,735	1	765
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
<b>Total, NIGMS</b>	<b>133</b>	<b>1,935,625</b>	<b>144</b>	<b>1,935,808</b>	<b>145</b>	<b>1,937,690</b>	<b>1</b>	<b>1,882</b>

Includes FTEs which are reimbursed from the NIH Roadmap for Medical Research

**NATIONAL INSTITUTES OF HEALTH**  
**National Institute of General Medical Sciences**  
**BA by Program**  
(Dollars in thousands)

<u>Extramural Research</u> <u>Detail:</u>	FY 2005 Actual		FY 2006 Actual		FY 2007 Actual		FY 2007 Comparable		FY 2008 Enacted		FY 2009 Estimate		Change	
	FTEs	Amount	FTEs	Amount	FTEs	Amount	FTEs	Amount	FTEs	Amount	FTEs	Amount	FTEs	Amount
Cell Biology and Biophysics		\$560,861		\$562,159		\$589,856		\$589,856		\$588,369		\$587,624		(\$745)
Genetics and Developmental Biology		513,462		503,437		484,079		487,307		486,079		485,464		(615)
Pharmacology, Physiology and Biological Chemistry		434,661		426,391		399,290		399,127		398,121		397,617		(504)
Bioinformatics and Computational Biology		66,927		82,159		92,356		92,356		92,124		92,008		(117)
Minority Opportunities in Research		126,973		125,099		125,697		125,697		125,643		125,600		(43)
Training		185,816		185,059		188,606		188,606		191,973		195,075		3,102
<b>Subtotal, Extramural</b>		1,888,700		1,884,304		1,879,884		1,882,949		1,882,309		1,883,388		1,079
<b>Intramural research</b>	13	2,522	9	2,507	10	2,479	10	2,479	10	2,529	10	2,567	0	38
<b>Res. management &amp; support</b>	115	40,555	116	47,232	123	50,217	123	50,197	134	50,970	135	51,735	1	765
<b>TOTAL</b>	128	1,931,777	125	1,934,043	133	1,932,580	133	1,935,625	144	1,935,808	145	1,937,690	1	1,882

Includes FTEs which are reimbursed from the NIH Roadmap for Medical Research

## Major Changes in the Fiscal Year 2009 Budget Request

Major changes by budget mechanism and/or budget activity detail are briefly described below. Note that there may be overlap between budget mechanism and activity detail and these highlights will not sum to the total change for the FY 2009 budget request for NIGMS, which is \$1.882 million more than the FY 2008 Estimate, for a total of \$1,937.690 million.

Research Project Grants (-\$10.966 million; total \$1,303.653 million): NIGMS will support a total of 3,674 Research Project Grant (RPG) awards in FY 2009. Noncompeting RPGs will decrease by 116 awards and \$15.406 million. Competing RPGs will increase by 10 awards and \$3.440 million. The NIH Budget policy for RPGs in FY 2009 is to provide no inflationary increases in noncompeting awards and no increase in average cost for competing RPGs.

Research Centers (+\$9.0 million; total \$175.743 million): NIGMS will expand support of the Models of Infectious Disease (MIDAS) initiative by developing specialized research centers. Total support for the MIDAS centers in FY 2009 is 3 awards and \$9.0 million.

Research Training (+\$3.102 million; total \$195.075 million): NIGMS will continue to support the same number of FTTPs while providing a one percent increase in stipends to all predoctoral and postdoctoral Ruth L. Kirschstein National Research Service Award trainees.

**NATIONAL INSTITUTES OF HEALTH**  
**National Institute of General Medical Sciences**  
**Summary of Changes**

FY 2008 enacted		\$1,935,808,000	
FY 2009 estimated budget authority		1,937,690,000	
Net change		1,882,000	
CHANGES	2008 Current Enacted Base		Change from Base
	FTEs	Budget Authority	FTEs Budget Authority
A. Built-in:			
1. Intramural research:			
a. Annualization of January 2008 pay increase			
		\$1,381,000	\$16,000
b. January FY 2009 pay increase			
		1,381,000	30,000
c. One less day of pay			
		1,381,000	(5,000)
d. Payment for centrally furnished services			
		158,000	2,000
e. Increased cost of laboratory supplies, materials, and other expenses			
		990,000	18,000
Subtotal			61,000
2. Research management and support:			
a. Annualization of January 2008 pay increase			
		\$18,520,000	\$208,000
b. January FY 2009 pay increase			
		18,520,000	403,000
c. One less day of pay			
		18,520,000	(71,000)
d. Payment for centrally furnished services			
		13,392,000	201,000
e. Increased cost of laboratory supplies, materials, and other expenses			
		19,058,000	351,000
Subtotal			1,092,000
Subtotal, Built-in			1,153,000



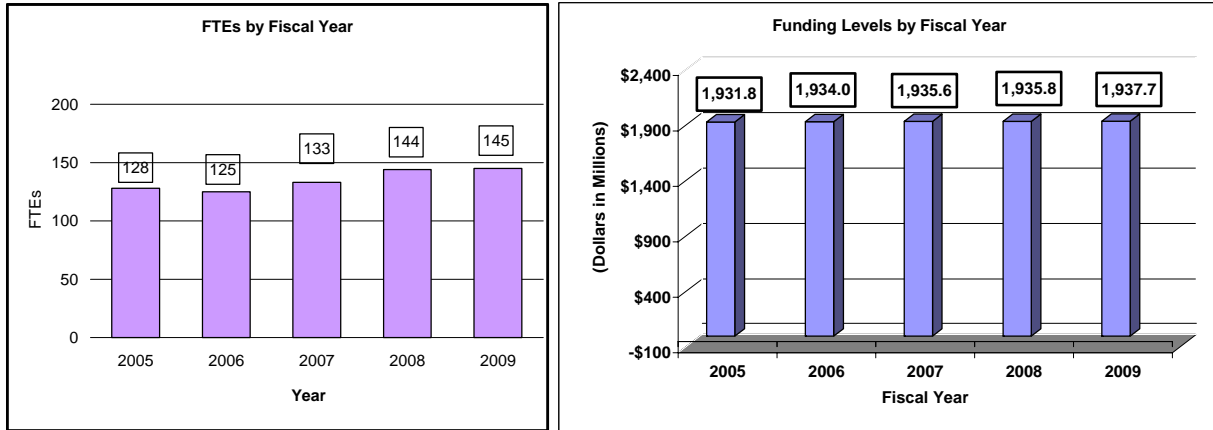
**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Summary of Changes--continued**

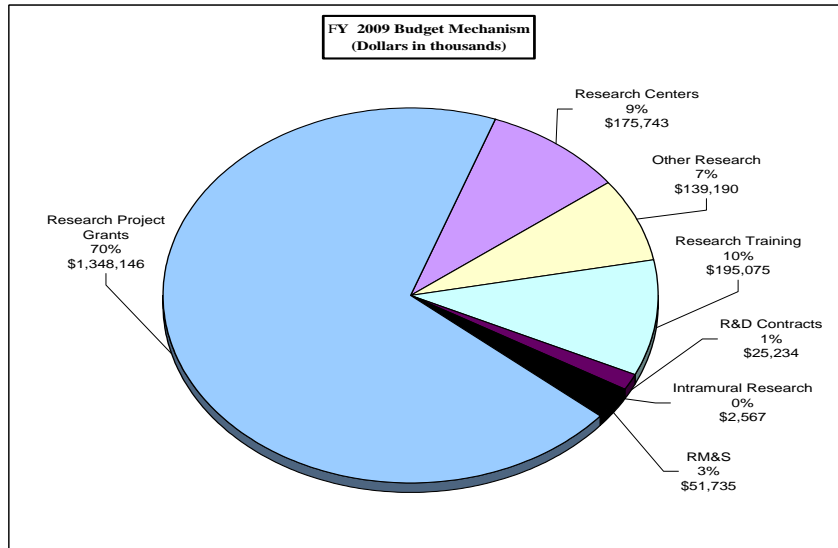
CHANGES	2008 Current Enacted Base		Change from Base	
	No.	Amount	No.	Amount
<b>B. Program:</b>				
1. Research project grants:				
a. Noncompeting	2,955	\$1,034,465,000	(116)	(\$14,406,000)
b. Competing	825	280,154,000	10	3,440,000
c. SBIR/STTR	148	44,550,000	0	(57,000)
Total	3,928	1,359,169,000	(106)	(11,023,000)
2. Research centers	54	166,743,000	3	9,000,000
3. Other research	387	139,190,000	0	0
4. Research training	4,420	191,973,000	0	3,102,000
5. Research and development contracts	24	25,234,000	0	0
Subtotal, extramural				1,079,000
6. Intramural research	<u>FTEs</u> 10	2,529,000	<u>FTEs</u> 0	(23,000)
7. Research management and support	134	50,970,000	1	(327,000)
8. Construction		0		0
9. Buildings and Facilities		0		0
Subtotal, program		1,935,808,000		729,000
Total changes	144		1	1,882,000

## Fiscal Year 2009 Budget Graphs

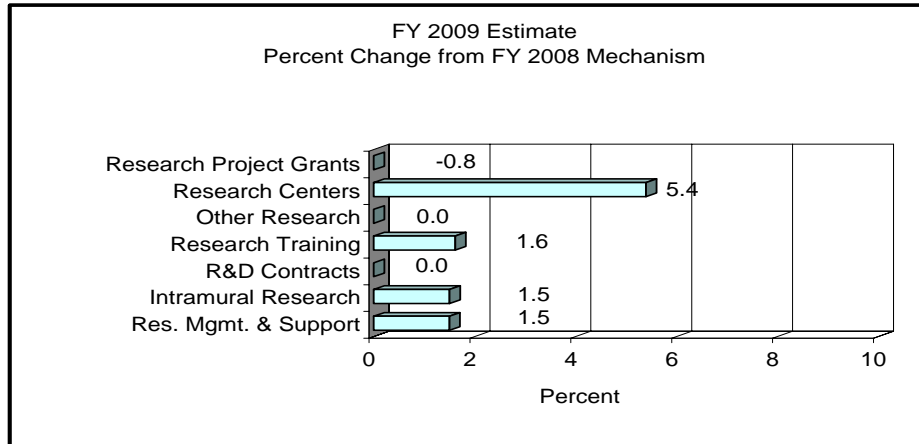
### History of Budget Authority and FTEs:



### Distribution by Mechanism:



### Change by Selected Mechanisms:



**Justification  
National Institute of General Medical Sciences**

Authorizing Legislation: Section 301 and Title IV of the Public Health Service Act, as amended.

Budget Authority:

FY 2007 Actual		FY 2008 Enacted		FY 2009 Estimate		Increase or Decrease	
<u>FTE</u>	<u>BA</u>	<u>FTE</u>	<u>BA</u>	<u>FTE</u>	<u>BA</u>	<u>FTE</u>	<u>BA</u>
133	\$1,935,625,000	144	\$1,935,808,000	145	\$1,937,690,000	1	\$1,882,000

This document provides justification for the Fiscal Year (FY) 2009 activities of the National Institute of General Medical Sciences (NIGMS), including NIH/AIDS activities. Details of the FY 2009 HIV/AIDS activities are in the “Office of AIDS Research (OAR)” Section of the Overview. Details on the Common Fund are located in the Overview, Volume One. Program funds are allocated as follows: Competitive Grants/Cooperative Agreements; Contracts; Direct Federal/Intramural and Other.

**DIRECTOR’S OVERVIEW**

For 45 years, the National Institute of General Medical Sciences (NIGMS) has supported a broad spectrum of basic biomedical research. Through these studies, scientists have explored the unknown, and their pursuit of fundamental questions in biology--and interrelated aspects of chemistry and physics—has led to many important medical advances. This basic research has had other tangible benefits, contributing to the development of the \$40 billion biotechnology industry<sup>1</sup> and helping to drive the nation’s ability to maintain global competitiveness.

The payoffs from this investment continue to be impressive, as evidenced by the fact that NIGMS has funded the Nobel Prize-winning work of 64 scientists to date. The two most recent are Drs. Mario Capecchi and Oliver Smithies, who won the 2007 Nobel Prize in Physiology or Medicine for their pioneering work on gene targeting in mice. Their creativity and diligence transformed the biomedical research landscape, enabling scientists to study the roles of individual genes in living animals. Since most genes in mice are closely related to human genes, these methods have dramatically advanced medical research.

<sup>1</sup> Hildreth M. Resilience: America’s Biotechnology Report 2003, Ernst & Young, July 2003

Almost all of today's medical breakthroughs have underpinnings in basic research from years before. To arrive at a time when we can truly predict and prevent diseases decades before symptoms occur and irreversible damage has already been done, we need to expand our knowledge of complex biological systems. Currently, we are just beginning to understand how molecular networks contribute to maintaining the body's health and how their dysfunction triggers disease.

NIGMS values and fosters an open dialogue with the scientific community about trends and opportunities in its research areas. In 2007, we extended our conversation further by engaging in a strategic planning process to help chart our course for the next 5 years. We collected broad input both before and during the development of this plan. We received strong support from our stakeholders for many aspects of our approaches to supporting basic research and training.

*Investing in Discovery*, the NIGMS Strategic Plan for 2008-2012, articulates the Institute's core principles and shows how we will make decisions to ensure that a stable basic research environment can continue to sustain vital progress in biomedical and behavioral research.

Our main strategy is to support competitive, investigator-initiated studies in areas ranging from cell growth to chemical methods to drug metabolism. These projects have as a common ingredient the quest for finding the biological principles and mechanisms that underlie health and disease.

As we gathered input for our strategic planning, we heard from some members of the scientific community who questioned our decision to use a portion of our funds for large-scale science projects rather than supporting a greater number of individual investigator-designed projects. Through the self-study that drove our strategic planning, we affirmed that multiple approaches are needed to solve complex research problems. Sometimes this calls for small teams or individuals. Other times, it requires multi-institution collaborations in which NIGMS plays a critical role in forging connections and making the resources developed as a result of these projects broadly available to scientists everywhere. Our job is to strike the right balance.

The feedback we received prompted us to redouble our efforts to communicate what we are doing, why we are doing it, and the value of sponsoring a multitude of research approaches. All NIGMS investments—large or small—are carefully considered, scientifically vetted, and rigorously monitored. To further leverage our resources, we continue to seek collaborative and shared research opportunities with other agencies and NIH institutes and centers in areas that show particular promise.

Science is a human endeavor, and a key element of our strategic plan is to maintain a healthy pipeline of intellectual talent. It is critical that this pipeline draw on—and reflect—the diversity of the U.S. population. To this end, we are adopting a comprehensive, systems-based approach to addressing future workforce development.

Biomedicine is evolving at an ever-increasing rate as new advances build on those from the past. We firmly believe that the Institute's long-term investments in a diverse and balanced portfolio of research will yield the breakthroughs of tomorrow. And we know that the new knowledge they provide will spur progress toward predictive, personalized, and preemptive medicine.

## **FY 2009 Justification by Activity Detail**

**Overall Budget Policy:** Investigator-initiated research projects and new investigator research are the institute's highest priorities. To maintain a balance of research support, NIGMS carefully evaluates investigator-initiated requests to submit grant applications for all large programs. The level of support provided for institute-initiated projects (e.g., RFAs) in areas of science that need stimulation is also carefully evaluated. A scientific review of all research grant applications is conducted and the results are presented to the NIGMS Advisory Council for input prior to making funding decisions. Developing a strong scientific workforce is a core element of the NIGMS mission. In addition to our research funding activities, we support this goal through a range of training programs. Intramural Research and Research Management and Support receive modest increases to help offset the cost of pay and other increases. NIGMS will continue to support new investigators and to maintain an adequate number of competing RPGs.

## **Program Descriptions and Accomplishments**

**Cell Biology and Biophysics:** The Cell Biology and Biophysics program fosters the study of cells and their components. Physics- and chemistry-based technological advances, driven by new types of microscopy, structural biology tools, and many other novel imaging techniques, have deepened understanding of life at the level of molecules and atoms. This basic research promotes the development of precise, targeted therapies and diagnostics for a range of diseases.

In FY 2007, the program's Protein Structure Initiative (PSI) reported significant progress toward its goal of making protein structure determination faster, easier, cheaper, and more useful to a broad range of biological scientists. PSI-funded scientists determined 748 new structures, for a total of more than 2,500 structures since the initiative began in 2000. The average cost per structure is now \$66,000, compared to \$94,000 in FY 2006 and \$138,000 in FY 2005. To share PSI resources with the scientific community, the program established a materials repository and a knowledge base of PSI data and research tools.

In FY 2008, scientists funded by the NIH Roadmap for Medical Research and the PSI participated in determining the structure of an important protein in the cell's outer membrane. This work also depended on investments in structure determination technology made in partnership by NIGMS and the National Cancer Institute. The techniques they developed will make it easier to determine the structures of other membrane proteins, which have been notoriously difficult to work with. Because these

proteins are the targets of more than half of all drugs, the work has clear relevance for drug development and enhancement.

Budget Policy: The FY 2009 budget estimate for the CBB program is \$587,624,000, a decrease of \$745,000 or -.13% from the FY 2008 estimate. The majority of CBB FY 2009 funds will be used to support investigator-initiated research projects in cell biology, biophysics, cellular imaging, and structural biology. In FY 2009, CBB will continue to support the Protein Structure Initiative (PSI), a 10-year project begun in 2000 that aims to make protein structure determination a rapid and inexpensive enterprise. CBB will also use FY 2009 funds to support an AIDS-related structural biology program.

**Genetics and Developmental Biology:** The mission of the Genetics and Developmental Biology (GDB) program is to promote basic research that aims to understand fundamental mechanisms of inheritance and development. This research underlies more targeted projects supported by other NIH institutes and centers. Much of GDB's investigator-initiated research is performed in model organisms, an approach that continues to deepen understanding of common diseases and diverse behaviors.

In FY 2007, the program held the second NIGMS Workshop on Human Embryonic Stem Cell Research to provide an opportunity for its grantees who are conducting basic research on human embryonic stem cells to report on their recent progress, exchange information, and identify challenges and opportunities unique to this promising area of science. The presentations and discussions demonstrated advances in technologies and approaches that are leading to a better understanding of self-renewal, pluripotency, and differentiation of the cells. The challenges and opportunities identified at the workshop are reflected in a request for applications issued later in the same fiscal year to support program projects on basic stem cell research.

**Budget Policy:** The FY 2009 budget estimate for the GDB program is \$485,464,000, a decrease of \$615,000 and -.13% from the FY 2008 estimate. In FY 2009, most GDB expenditures will support individual investigators seeking fundamental knowledge about life processes. The budget will also support systems-based approaches for understanding how genes that contribute to common diseases interact with each other and with external influences to bring about their effect.

**Portrait of a Program: Cell and DNA Repository Fuels Post-Genome Research**

FY 2008 Level: \$3 million

FY 2009 Level: \$3 million

Change \$0 million

Scientists researching a wide range of topics--from rare neurological disorders to how people respond to drugs and how DNA varies among individuals--have relied upon the same valuable resource for 35 years: the NIGMS-funded Human Genetic Cell Repository. This carefully maintained "warehouse" of human cells and DNA contains nearly 10,000 cell lines used by biomedical researchers across the country and around the world. Most of these cell lines are derived from blood or skin samples. The collection includes lines of cells and DNA from people with inherited diseases, people who are apparently healthy, and people from diverse geographic locations.

Housed at the Coriell Institute for Medical Research in Camden, New Jersey, the repository collection represents more than 500 diseases and dozens of geographic origins. This rich resource is especially useful to scientists looking for genetic contributions to rare diseases, since there are often limited numbers of people with these diseases who can participate in clinical studies. Samples from the repository also help researchers understand how genetic variation can influence the development of many complex conditions like breast cancer, birth defects, and heart disease.

In addition to assuring the scientific quality of samples contained in the repository, NIGMS has taken a special interest in ethical issues surrounding the use of these specimens. For example, the Institute took the lead in hosting several community consultations related to the collection and use of human population-based samples. NIGMS then spearheaded the development of NIH ethical guidelines described in "Points to Consider When Planning a Genetic Study that Involves Members of Named Populations" [[http://bioethics.od.nih.gov/named\\_populations.html](http://bioethics.od.nih.gov/named_populations.html)].

In FY 2008 and FY 2009, NIGMS plans to continue to fund the repository at similar levels as in the past. The Institute expects that the repository will be increasingly important as research teams seek to understand and apply genetic information yielded by the Human Genome Project.

**Pharmacology, Physiology, and Biological Chemistry:** The mission of the Pharmacology, Physiology, and Biological Chemistry (PPBC) program is to support fundamental research in chemistry, biochemistry, and physiology that contributes to understanding human biology in health and disease, and that generates knowledge for new diagnostics and therapeutics. PPBC funds molecular-level studies as well as research that explores clinical issues involving whole-body responses in important public health areas such as traumatic injury, burns, and anesthesia.

In FY 2007, NIGMS performed an administrative review of the program's Pharmacogenetics and Pharmacogenomics Knowledge Base (PharmGKB). External consultants concluded that PharmGKB plays a valuable role in providing curated information to the scientific community about the relationships among genes, drugs, and diseases. In particular, the evaluation panel praised PharmGKB for facilitating the creation and functioning of the Warfarin Consortium. Warfarin is a blood-thinning drug that is widely used despite considerable challenges in determining the proper dose for each patient. The consortium effort promises to set new paradigms for data sharing and for the extraction of maximum value from multiple small data sets. If successful, the consortium will generate a robust algorithm for the dosing of warfarin that is guided by knowledge of each patient's genetic makeup.

Budget Policy: The FY 2009 budget estimate for the PPBC program is \$397,617,000, a decrease of \$504,000 and -.13% from the FY 2008 estimate. The program plans for FY 2009 are as follows. PPBC will continue to emphasize the support of investigator-initiated research grants. The Pharmacogenetics Research Network, which is working toward promoting the goal of personalized medicine, will continue to receive support in FY 2009. PPBC will also renew its support in FY 2009 translational centers to improve understanding of basic physiological processes and clinical complications from serious injury, and for centers that will create diverse chemical libraries for use in drug discovery and biomedical research.

**Bioinformatics and Computational Biology:** The Center for Bioinformatics and Computational Biology (CBCB) supports research that draws expertise from mathematics, statistics, computer science, engineering, and physics to answer problems in biomedicine. CBCB emphasizes integrated, systems approaches that pair computational studies with laboratory-based investigations. Other projects create virtual laboratories that address questions difficult to tackle in the laboratory. CBCB also encourages the development of tools and techniques to acquire, store, analyze, and visualize data.

In FY 2007, the program funded three new National Centers for Systems Biology to advance the study of the complex interactions occurring inside biological systems and to train more scientists in this emerging field. This national effort, launched in 2002 and now totaling 10 centers, will broaden and deepen the understanding of how various factors contribute to the functioning of cells, tissues, and organisms. Among the exciting studies emerging from these centers is one published in FY 2007 that combines live imaging with quantitative approaches to shed light on embryonic development. The



research reveals how a chemical gradient allows a developing fruit fly embryo to determine positional information that enables it to differentiate, for example, between its head and its tail.

**Budget Policy:** The FY 2009 budget estimate for the CBCB program is \$92,008,000, a decrease of \$117,000 and -.13% from the FY 2008 estimate. As with last year, the highest priority will be given to investigator-initiated research, since this research will continue to yield information and tools for exploring complex biological systems. The Models of Infectious Disease Agent Study (MIDAS), which models the spread of infectious diseases, will receive increased funding in FY 2009, subject to NAGMS Council review and approval. A second major initiative employing FY 2009 funds is the Centers for Systems Biology program.

**Portrait of a Program: Centers for Systems Biology**

FY 2008 Level: \$19.4 million  
FY 2009 Level: \$19.4 million  
Change \$0

The human body is one of the most complicated systems we know. But even seemingly simple biological systems, such as individual cells, are staggeringly complex, with thousands of molecules interacting in intricate ways. Decades of research and large-scale efforts such as the Human Genome Project have generated a vast amount of information about genes, proteins, and other molecules, but to develop a level of understanding that is truly predictive, we need sophisticated computational approaches to monitor and model how the molecules work together in cells, organs, and tissues.

This new field, now often referred to as systems biology, brings together teams of scientists who merge detailed knowledge of key biological questions with state-of-the-art mathematical and computer methods. To foster collaborative research in this vital area of modern science, NIGMS established a systems biology program in FY 2002. Since then, the Institute has funded 10 centers, including three in FY 2007. Some center scientists are examining how cells make decisions as they participate in networks within and between organs. At other centers, researchers are looking at how drugs—both therapeutic and abused—affect organ systems such as the heart and the brain, or how combinations of genes influence health and behavior. All of the centers rely on the interplay between experiment and computational modeling, making predictions and then testing them in detail.

A key aspect of the NIGMS systems biology program is training: Without a community of scientists to continue to push the development of this new field over the coming years, the ability of systems biology to address problems related to human health will be greatly inhibited. Thus, the centers have a strong emphasis on education and outreach. One in particular has thrown out traditional teaching approaches in favor of a dramatically new and exciting way to pair math and biology in beginning college courses.

NIGMS plans to continue the systems biology program in FY 2008 by funding up to three new centers in response to a request for applications and anticipates ongoing support for the program in FY 2009.

**Minority Opportunities in Research:** The mission of the Minority Opportunities in Research program is to increase the number of underrepresented minorities performing biomedical and behavioral research. Through support provided to institutions with

substantial minority enrollments, the program aims to strengthen the pipeline of minority researchers.

FY 2007 marked a period of transition for several of the program's longstanding activities. Research support to faculty at minority-serving institutions is now offered at three different levels, depending on how well developed the applicant is as a research scientist. Another major change is that these grants will now be administered by program officers across NIH who manage research in the scientific areas of the grants, rather than being administered solely by NIGMS staff. Three other activities were re-announced with an emphasis on institutional goals and objectives and a de-emphasis on the outcomes of individual trainees. These activities cover the research training of honors undergraduate students, facilitating the transition of students from associate to baccalaureate and from master's to Ph.D. studies, and encouraging postbaccalaureate students to pursue Ph.D.s in biomedically relevant sciences.

Budget Policy: The FY 2009 budget estimate for the MORE program is \$125,600,000, a decrease of \$43,000 and -.03% from the FY 2008 estimate. In FY 2009, NIGMS program staff will continue to reorganize existing programs to comply with recommendations issued from a working group of the NAGMS Council that advised the institute to rebalance its MORE portfolio. These efforts will place greater emphasis on student development and training. In FY 2009, MORE will also continue to examine the current state of research on interventions that influence the participation of underrepresented minorities in the biomedical and behavioral science.

**Research Training:** The Research Training program provides broad-based, multidisciplinary research training for the next generation of biomedical and behavioral scientists. In addition to training programs for Ph.D. and M.D. students, NIGMS supports postdoctoral fellows through advanced and specialized training in basic, translational, and clinical research, and also funds universities with a significant minority student population through the Minority Access to Research Careers program. This year, the Institute introduced a new program that supports the research training of basic behavioral scientists. Independent of institutional training grant activities, NIGMS also supports the training of students and fellows working in individual-investigator laboratories.

In FY 2007, the Institute made the first awards in a new institutional training grant program to support the research training of basic behavioral scientists. These programs are expected to provide an interdisciplinary research training experience and curriculum for predoctoral trainees that integrates both behavioral and biomedical perspectives, approaches, and methodologies.

Budget Policy: The FY 2009 budget estimate for the Research Training program is \$195,075,000, an increase of \$3,102,000 or +1.62% from the FY 2008 estimate. In FY 2009, the intention of the Training program is to continue to facilitate a healthy pipeline of researchers critical to maintaining the vibrancy of the scientific enterprise. NIGMS will continue to support rigorous research training programs that foster intellectual creativity,

learning of quantitative skills, and exposure to topics in human health. In FY 2009, NIGMS will continue its new program supporting the research training of basic behavioral scientists. NIGMS will continue to support the same number of FTTPs while providing a one percent increase in stipends to all predoctoral and postdoctoral Ruth L. Kirschstein National Research Service Award trainees.

**Intramural:** The institute has a small, but unique, intramural research program that supports postdoctoral research fellows for up to 3 years each. The Pharmacology Research Associate (PRAT) program provides scientists who have backgrounds in the basic or clinical sciences with multidisciplinary training in how drugs interact with living systems. For scientists who are already well-versed in pharmacology, the program offers experience in new fields.

In FY 2007, a scientist in the program determined the structure of an important protein complex involved in the action of the human immunodeficiency virus and in the normal degradation of proteins the cell no longer needs. He published his results in a highly prestigious scientific journal. The research of two other program scientists also received special recognition from scientific societies and federal organizations. A number of former program participants have gone on to distinguished careers in academia, industry, and government, and one has won a Nobel Prize.

Budget Policy: The FY 2009 budget estimate for the Intramural Research program is \$2,567,000, an increase of \$38,000 and +1.5% from the FY 2008 estimate. The program plans for FY 2009 are as follows. NIGMS will continue its Pharmacology Research Associate (PRAT) program, which funds fellows to conduct research in intramural laboratories of other NIH institutes and centers or in Food and Drug Administration laboratories. After NIH training, many PRAT fellows further their careers in universities, industry, or government agencies, contributing expertise to the design of new, more effective, and safer drugs.

**Research Management and Support:** NIGMS RMS activities provide administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants, training awards and research and development contracts. RMS functions also encompass strategic planning, coordination, and evaluation of the institute's programs, regulatory compliance, international coordination, and liaison with other Federal agencies, Congress, and the public. The institute currently oversees more than 4,400 research grants, 900 training grants and 20 research and support contracts.

In FY 2007, the Institute oversaw more than 4,400 research grants, 900 training grants, and 20 research and support contracts. During the same fiscal year, it engaged in intensive strategic planning efforts that included meetings with the scientific community and other outreach efforts to solicit advice and help set priorities for the future. The resulting strategic plan for 2008-2012, to be published in January 2008, conveys the Institute's goals and values and provides a framework for its decision-making.

Budget Policy: The FY 2009 budget estimate for RMS is \$51,735,000, an increase of \$765,000 and +1.5% from the FY 2008 estimate. In FY 2009, RMS funds will continue to support periodic meetings with the biomedical and behavioral research community. These interactions help NIGMS assign priorities and set its research agenda for future years. Additionally, RMS funds will also be used to develop and support an NIGMS information technology architecture that utilizes and integrates trans-NIH information technology systems. This ongoing investment has already significantly reduced the use of paper files in grants administration management functions.

The NIGMS is the lead institute for the NIH Director's Pioneer Awards initiative, the New Innovator Awards initiative, the Structural Biology initiative, and the Bioinformatics and Computational Biology initiative supported through the NIH Common Fund. Additionally, the NIGMS participates in the support of the Molecular Libraries initiative and the Interdisciplinary Research initiative funded through the NIH Common Fund.

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Budget Authority by Object**

	FY 2008 Enacted	FY 2009 Estimate	Increase or Decrease
<b>Total compensable workyears:</b>			
Full-time employment	144	145	1
Full-time equivalent of overtime and holiday hours	0	0	0
Average ES salary	\$0	\$0	\$0
Average GM/GS grade	12.5	12.5	12.5
Average GM/GS salary	\$96,695	\$99,907	\$3,212
Average salary, grade established by act of July 1, 1944 (42 U.S.C. 207)	\$0	\$0	\$0
Average salary of ungraded positions	138,083	142,670	4,587
<b>OBJECT CLASSES</b>			
	FY 2008 Enacted	FY 2009 Estimate	Increase or Decrease
<b>Personnel Compensation:</b>			
11.1 Full-time permanent	\$9,343,000	\$9,834,000	\$491,000
11.3 Other than full-time permanent	5,729,000	6,031,000	302,000
11.5 Other personnel compensation	449,000	473,000	24,000
11.7 Military personnel	0	0	0
11.8 Special personnel services payments	415,000	437,000	22,000
<b>Total, Personnel Compensation</b>	<b>15,936,000</b>	<b>16,775,000</b>	<b>839,000</b>
12.0 Personnel benefits	3,844,000	4,047,000	203,000
12.2 Military personnel benefits	0	0	0
13.0 Benefits for former personnel	0	0	0
<b>Subtotal, Pay Costs</b>	<b>19,780,000</b>	<b>20,822,000</b>	<b>1,042,000</b>
21.0 Travel and transportation of persons	469,000	475,000	6,000
22.0 Transportation of things	73,000	74,000	1,000
23.1 Rental payments to GSA	0	0	0
23.2 Rental payments to others	0	0	0
23.3 Communications, utilities and miscellaneous charges	220,000	222,000	2,000
24.0 Printing and reproduction	609,000	616,000	7,000
25.1 Consulting services	309,000	312,000	3,000
25.2 Other services	7,262,000	7,346,000	84,000
25.3 Purchase of goods and services from government accounts	92,253,000	93,068,000	815,000
25.4 Operation and maintenance of facilities	0	0	0
25.5 Research and development contracts	2,911,000	2,912,000	1,000
25.6 Medical care	0	0	0
25.7 Operation and maintenance of equipment	195,000	197,000	2,000
25.8 Subsistence and support of persons	0	0	0
<b>25.0 Subtotal, Other Contractual Services</b>	<b>102,930,000</b>	<b>103,835,000</b>	<b>905,000</b>
26.0 Supplies and materials	104,000	105,000	1,000
31.0 Equipment	476,000	482,000	6,000
32.0 Land and structures	0	0	0
33.0 Investments and loans	0	0	0
41.0 Grants, subsidies and contributions	1,811,147,000	1,811,059,000	(88,000)
42.0 Insurance claims and indemnities	0	0	0
43.0 Interest and dividends	0	0	0
44.0 Refunds	0	0	0
<b>Subtotal, Non-Pay Costs</b>	<b>1,916,028,000</b>	<b>1,916,868,000</b>	<b>840,000</b>
<b>Total Budget Authority by Object</b>	<b>1,935,808,000</b>	<b>1,937,690,000</b>	<b>1,882,000</b>

Includes FTEs which are reimbursed from the NIH Roadmap for Medical Research

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Salaries and Expenses**

OBJECT CLASSES	FY 2008 Enacted	FY 2009 Estimate	Increase or Decrease
<b>Personnel Compensation:</b>			
Full-time permanent (11.1)	\$9,343,000	\$9,834,000	\$491,000
Other than full-time permanent (11.3)	5,729,000	6,031,000	302,000
Other personnel compensation (11.5)	449,000	473,000	24,000
Military personnel (11.7)	0	0	0
Special personnel services payments (11.8)	415,000	437,000	22,000
<b>Total Personnel Compensation (11.9)</b>	<b>15,936,000</b>	<b>16,775,000</b>	<b>839,000</b>
Civilian personnel benefits (12.1)	3,844,000	4,047,000	203,000
Military personnel benefits (12.2)	0	0	0
Benefits to former personnel (13.0)	0	0	0
<b>Subtotal, Pay Costs</b>	<b>19,780,000</b>	<b>20,822,000</b>	<b>1,042,000</b>
Travel (21.0)	469,000	475,000	6,000
Transportation of things (22.0)	73,000	74,000	1,000
Rental payments to others (23.2)	0	0	0
Communications, utilities and miscellaneous charges (23.3)	220,000	222,000	2,000
Printing and reproduction (24.0)	609,000	616,000	7,000
<b>Other Contractual Services:</b>			
Advisory and assistance services (25.1)	309,000	312,000	3,000
Other services (25.2)	7,262,000	7,346,000	84,000
Purchases from government accounts (25.3)	27,681,000	27,778,000	97,000
Operation and maintenance of facilities (25.4)	0	0	0
Operation and maintenance of equipment (25.5)	195,000	197,000	2,000
Subsistence and support of persons (25.8)	0	0	0
<b>Subtotal Other Contractual Services</b>	<b>35,447,000</b>	<b>35,633,000</b>	<b>186,000</b>
Supplies and materials (26.0)	102,000	103,000	1,000
<b>Subtotal, Non-Pay Costs</b>	<b>36,920,000</b>	<b>37,123,000</b>	<b>203,000</b>
<b>Total, Administrative Costs</b>	<b>56,700,000</b>	<b>57,945,000</b>	<b>1,245,000</b>

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Authorizing Legislation**

	PHS Act/ Other Citation	U.S. Code Citation	2007 Amount Authorized	FY 2008 Enacted	2008 Amount Authorized	FY 2009 Budget Estimate
Research and Investigation	Section 301	42§241	Indefinite		Indefinite	
National Institute of General Medical Sciences	Section 402(a)	42§281	Indefinite	\$1,935,808,000	Indefinite	\$1,937,690,000
					\$1,935,808,000	
<b>Total, Budget Authority</b>					<b>1,935,808,000</b>	<b>1,937,690,000</b>

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Appropriations History**

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation <sup>1/</sup>
2000	1,194,068,000 <sup>2/</sup>	1,298,551,000	1,352,843,000	1,361,668,000
Rescission				(7,248,000)
2001	1,389,492,000 <sup>2/</sup>	1,548,313,000	1,554,176,000	1,535,823,000
Rescission				(125,000)
2002	1,720,206,000	1,706,968,000	1,753,465,000	1,725,263,000
Rescission				(124,000)
2003	1,874,243,000	1,874,243,000	1,853,584,000	1,859,084,000
Rescission				(12,084,000)
2004	1,923,133,000	1,923,133,000	1,917,033,000	1,916,333,000
Rescission				(11,495,000)
2005	1,959,810,000	1,959,810,000	1,975,500,000	1,959,810,000
Rescission				(15,743,000)
2006	1,955,170,000	1,955,170,000	2,002,622,000	1,955,170,000
Rescission				(19,552,000)
2007	1,923,481,000	1,923,481,000	1,934,888,000	1,935,618,000
2008	1,941,462,000	1,966,019,000	1,978,601,000	1,970,228,000
Rescission				(34,420,000)
2009	1,937,690,000			

<sup>1/</sup> Reflects enacted supplementals, rescissions, and reappropriations.

<sup>2/</sup> Excludes funds for HIV/AIDS research activities consolidated in the NIH Office of AIDS Research.



**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Details of Full-Time Equivalent Employment (FTEs)**

OFFICE/DIVISION	FY 2007 Actual	FY 2008 Enacted	FY 2009 Estimate
Office of the Director	11	13	13
Office of Scientific Review	10	12	12
Office of Administrative Management	24	24	24
Division of Extramural Activities	34	36	36
Division of Genetic and Developmental Biology	11	13	13
Division of Pharmacology, Physiology, and Biological Chemistry	22	23	23
Division of Cell Biology and Biophysics	10	11	11
Center of Bioinformatics and Computational Biology	4	5	6
Division of Minority Opportunities in Research	7	7	7
<b>Total</b>	<b>133</b>	<b>144</b>	<b>145</b>
Includes FTEs which are reimbursed from the NIH Roadmap for Medical Research			
FTEs supported by funds from Cooperative Research and Development Agreements	(0)	(0)	(0)
FISCAL YEAR	Average GM/GS Grade		
2005	12.2		
2006	12.3		
2007	12.5		
2008	12.5		
2009	12.5		

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**Detail of Positions**

GRADE	FY 2007 Actual	FY 2008 Enacted	FY 2009 Estimate
Total, ES Positions	0	0	0
Total, ES Salary	0	0	0
GM/GS-15	12	12	12
GM/GS-14	25	27	27
GM/GS-13	25	28	29
GS-12	9	10	10
GS-11	11	11	11
GS-10	0	0	0
GS-9	6	7	7
GS-8	4	4	5
GS-7	0	1	0
GS-6	0	0	0
GS-5	1	2	2
GS-4	1	0	0
GS-3	0	0	0
GS-2	0	0	0
GS-1	0	0	0
Subtotal	94	102	103
Grades established by Act of July 1, 1944 (42 U.S.C. 207):			
Assistant Surgeon General	0	0	0
Director Grade	0	0	0
Senior Grade	0	0	0
Full Grade	0	0	0
Senior Assistant Grade	0	0	0
Assistant Grade	0	0	0
Subtotal	0	0	0
Ungraded	53	57	57
Total permanent positions	102	110	110
Total positions, end of year	147	158	158
Total full-time equivalent (FTE) employment, end of year	133	144	145
Average ES salary	0	0	0
Average GM/GS grade	12.5	12.5	12.5
Average GM/GS salary	92,931	96,695	99,907

Includes FTEs which are reimbursed from the NIH Roadmap for Medical Research.

**NATIONAL INSTITUTES OF HEALTH  
National Institute of General Medical Sciences**

**New Positions Requested**

	FY 2009		
	Grade	Number	Annual Salary
Health Science Administrator	GS-14	1	\$109,863
<b>Total Requested</b>		<b>1</b>	