DEPARTMENT OF HEALTH AND HUMAN SERVICES

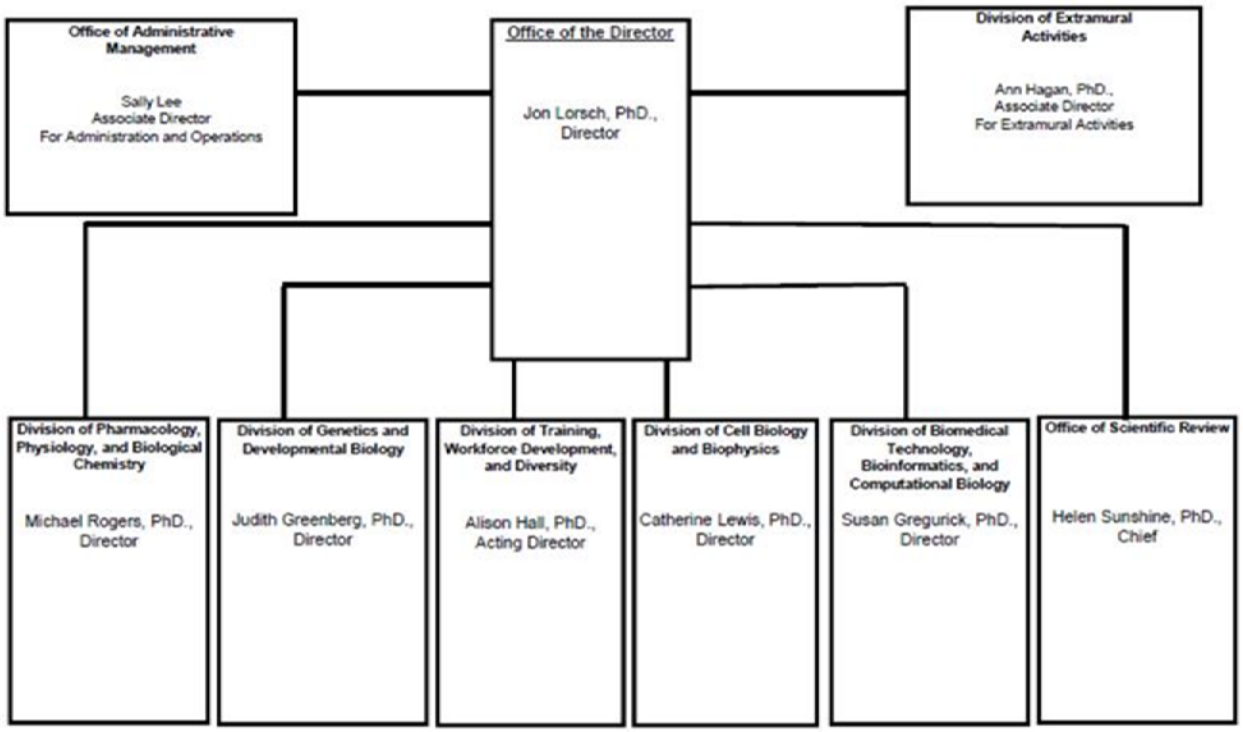
NATIONAL INSTITUTES OF HEALTH

National Institute of General Medical Sciences (NIGMS)

FY 2015 Budget — Page No.

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 PHS Act with respect to general medical sciences, [$2,364,147,000] *$2,368,877,000* [: *Provided*, That not less than $273,325,000 is provided for the Institutional Development Award program].

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Amounts Available for Obligation[1]
(Dollars in Thousands)

Source of Funding	FY 2013 Actual	FY 2014 Enacted	FY 2015 President's Budget
Appropriation	$2,430,036	$2,364,147	$2,368,877
Type 1 Diabetes	0	0	0
Rescission	-4,860	0	0
Sequestration	-121,971	0	0
Subtotal, adjusted appropriation	$2,303,204	$2,364,147	$2,368,877
FY 2013 Secretary's Transfer	-11,910	0	0
OAR HIV/AIDS Transfers	0	1,000	0
Comparative transfers to NLM for NCBI and Public Access	-2,722	-3,253	0
National Children's Study Transfers	1,953	0	0
Subtotal, adjusted budget authority	$2,290,525	$2,361,894	$2,368,877
Unobligated balance, start of year	0	0	0
Unobligated balance, end of year	0	0	0
Subtotal, adjusted budget authority	$2,290,525	$2,361,894	$2,368,877
Unobligated balance lapsing	-204	0	0
Total obligations	$2,290,322	$2,361,894	$2,368,877

[1] Excludes the following amounts for reimbursable activities carried out by this account:
FY 2013 - $420 FY 2014 - $5,000 FY 2015 - $5,000

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences
Budget Mechanism - Total[1]

(Dollars in Thousands)

MECHANISM	FY 2013 Actual		FY 2014 Enacted[2]		FY 2015 President's Budget		FY 2015 +/- FY 2014	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Research Projects:								
Noncompeting	2,807	$1,025,892	2,727	$1,031,611	2,699	$1,021,826	-28	-$9,785
Administrative Supplements	*(123)*	8,702	*(123)*	8,702	*(123)*	8,702	*(0)*	0
Competing:								
Renewal	359	142,422	402	162,832	442	179,267	40	16,435
New	451	153,006	506	174,931	557	192,588	51	17,657
Supplements	16	1,379	18	1,576	20	1,735	2	159
Subtotal, Competing	826	$296,807	926	$339,339	1,019	$373,590	93	$34,251
Subtotal, RPGs	3,633	$1,331,400	3,653	$1,379,652	3,718	$1,404,118	65	$24,466
SBIR/STTR	150	58,497	159	64,191	167	65,030	8	839
Research Project Grants	3,783	$1,389,898	3,812	$1,443,843	3,885	$1,469,148	73	$25,305
Research Centers:								
Specialized/Comprehensive	164	$387,298	165	$391,893	157	$364,375	-8	-$27,518
Clinical Research	0	0	0	0	0	0	0	0
Biotechnology	33	59,231	33	59,231	32	61,379	-1	2,148
Comparative Medicine	0	322	0	331	0	303	0	-28
Research Centers in Minority Institutions	0	0	0	0	0	0	0	0
Research Centers	197	$446,852	198	$451,455	189	$426,057	-9	-$25,398
Other Research:								
Research Careers	92	$23,359	92	$23,359	92	$23,452	0	$93
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	295	97,727	295	97,727	298	98,118	3	391
Other	159	40,560	159	40,560	176	46,722	17	6,162
Other Research	546	$161,645	546	$161,646	566	$168,292	20	$6,646
Total Research Grants	4,526	$1,998,395	4,556	$2,056,944	4,640	$2,063,497	84	$6,553
Ruth L Kirchstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	379	$18,302	379	$19,814	429	$20,210	50	$396
Institutional Awards	3,735	172,220	3,735	176,188	3,735	179,712	0	3,524
Total Research Training	4,114	$190,522	4,114	$196,002	4,164	$199,922	50	$3,920
Research & Develop. Contracts	29	$34,292	29	$33,761	29	$35,513	0	$1,752
(SBIR/STTR) (non-add)	*(0)*	*(2,397)*	*(0)*	*(1,685)*	*(0)*	*(3,000)*	*(0)*	*(1,315)*
Intramural Research	9	3,576	9	3,679	9	3,716	0	37
Res. Management & Support	174	63,740	174	65,573	174	66,229	0	656
Res. Management & Support (SBIR Admin) (non-add)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
Total, NIGMS	183	$2,290,525	183	$2,361,894	183	$2,368,877	0	$6,983

[1] All items in italics and brackets are non-add entries. FY 2013 and FY 2014 levels are shown on a comparable basis to FY 2015.

[2] The amounts in the FY 2014 column take into account funding reallocations, and therefore may not add to the total budget authority reflected herein.

Major Changes in the Fiscal Year 2015 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 2015 President's Budget for NIGMS, which is $6.983 million more than the FY 2014 level, for a total of $2,368.9 million.

Research Project Grants (+$24.466 million; total $1,404.118 million):
In FY 2015, NIGMS will increase support of investigator-initiated research across the entire RPG portfolio. This includes research project grants from investigators within IDeA eligible states through the IDeA program.

Research Center Grants (-$25.398 million; total $426.057 million):
In FY 2015 NIGMS will continue to maintain its center grant portfolio that comprises centers in systems biology, biomedical technology, structural biology, trauma and burn, as well as the Institutional Development Award (IDeA) program components. However, large commitments in Collaborative Research Centers (Glue Grants) and the Protein Structure Initiative end in FY 2014. This programmatic shift bolsters the Institute's commitment to prioritizing investigator-initiated Research Project Grants.

Other Research Grants (+6.646 million; total $168.292 million):
In FY 2015 NIGMS will begin Innovative Programs to Enhance Research Training (IPERT). This research training mechanism will be used to support creative and innovative training activities to enhance development of a workforce in order to meet the nation's biomedical, behavioral and clinical research needs.

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Summary of Changes[1]
(Dollars in Thousands)

FY 2014 Enacted				$2,361,894
FY 2015 President's Budget				$2,368,877
Net change				$6,983
	FY 2015 President's Budget		**Change from FY 2014**	
CHANGES	**FTEs**	**Budget Authority**	**FTEs**	**Budget Authority**
A. Built-in:				
1. Intramural Research:				
a. Annualization of January 2014 pay increase & benefits		$1,279		$3
b. January FY 2015 pay increase & benefits		1,279		9
c. Zero more days of pay (n/a for 2015)		1,279		0
d. Differences attributable to change in FTE		1,279		0
e. Payment for centrally furnished services		159		3
f. Increased cost of laboratory supplies, materials, other expenses, and non-recurring costs		2,277		18
Subtotal				$33
2. Research Management and Support:				
a. Annualization of January 2014 pay increase & benefits		$25,519		$63
b. January FY 2015 pay increase & benefits		25,519		188
c. Zero more days of pay (n/a for 2015)		25,519		0
d. Differences attributable to change in FTE		25,519		0
e. Payment for centrally furnished services		8,214		196
f. Increased cost of laboratory supplies, materials, other expenses, and non-recurring costs		32,495		146
Subtotal				$593
Subtotal, Built-in				$626

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

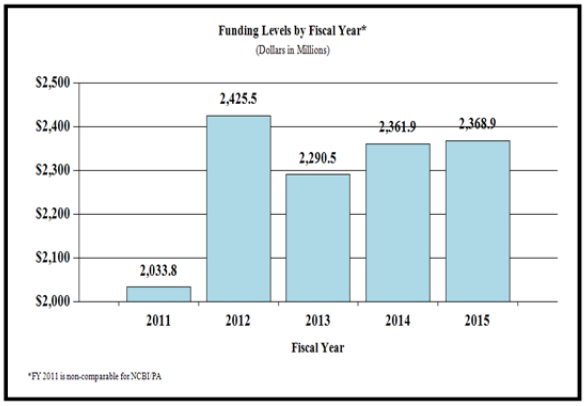
Summary of Changes[1]
(Dollars in Thousands)

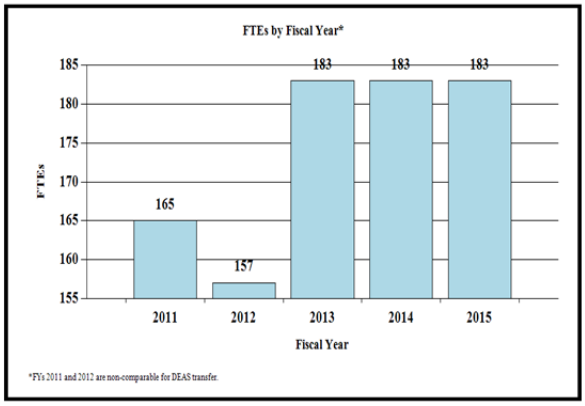
CHANGES	FY 2015 President's Budget		Change from FY 2014	
	No.	Amount	No.	Amount
B. Program:				
1. Research Project Grants:				
a. Noncompeting	2,699	$1,030,528	-28	-$9,785
b. Competing	1,019	373,590	93	34,251
c. SBIR/STTR	167	65,030	8	839
Subtotal, RPGs	3,885	$1,469,148	73	$25,305
2. Research Centers	189	$426,057	-9	-$25,398
3. Other Research	566	168,292	20	6,646
4. Research Training	4,164	199,922	50	3,920
5. Research and development contracts	29	35,513	0	1,752
Subtotal, Extramural		$2,298,932		$12,225
	FTEs		FTEs	
6. Intramural Research	9	$3,716	0	$37
7. Research Management and Support	174	66,229	0	656
8. Construction		0		0
9. Buildings and Facilities		0		0
Subtotal, Program	183	$2,368,877	0	$12,918
Total changes				$6,983

[1] The amounts in the Change from FY 2014 column take into account funding reallocations, and therefore may not add to the net change reflected herein.

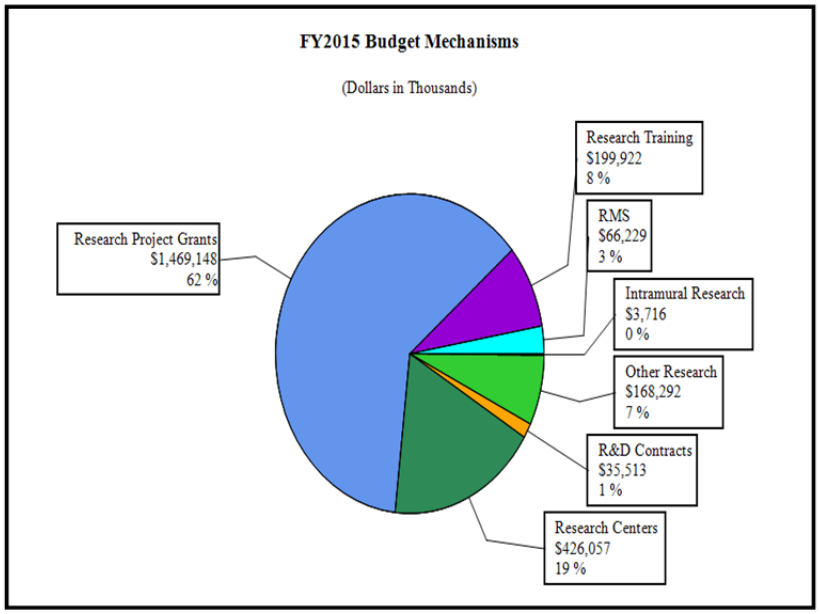
Fiscal Year 2015 Budget Graphs

History of Budget Authority and FTEs:

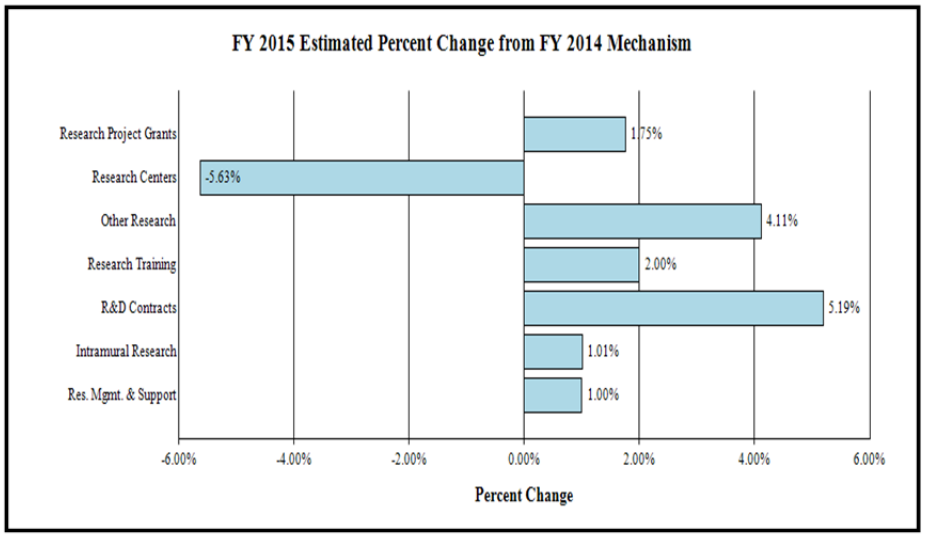




Distribution by Mechanism:



Change by Selected Mechanism:



NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Budget Authority by Activity[1]
(Dollars in Thousands)

	FY 2013 Actual		FY 2014 Enacted [2]		FY 2015 President's Budget		FY 2015 +/- FY 2014	
Extramural Research	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
Cell Biology and Biophysics		$528,703		$543,804		$546,043		$2,239
Biomedical Technology, Bioinformatics and Computational Biology		232,195		238,827		239,810		983
Genetics and Developmental Biology		491,445		505,482		510,374		4,892
Pharmacology, Physiology and Biological Chemistry		369,448		380,000		381,564		1,564
Training, Workforce Development and Diversity		601,417		618,594		621,141		2,547
Institutional Development Award (IDeA)		*(261,554)*		*(273,325)*		*(273,325)*		*(0)*
Subtotal, Extramural		**$2,223,209**		**$2,286,707**		**$2,298,932**		**$12,225**
Intramural Research	**9**	**$3,576**	**9**	**$3,679**	**9**	**$3,716**	**0**	**$37**
Research Management & Support	**174**	**$63,740**	**174**	**$65,573**	**174**	**$66,229**	**0**	**$656**
TOTAL	**183**	**$2,290,525**	**183**	**$2,361,894**	**183**	**$2,368,877**	**0**	**$6,983**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

[2] The amounts in the FY 2014 column take into account funding reallocations, and therefore may not add to the total budget authority reflected herein.

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2014 Amount Authorized	FY 2014 Enacted	2015 Amount Authorized	FY 2015 PB
Research and Investigation	Section 301	42§241	Indefinite	$2,361,894,000	Indefinite	$2,368,877,000
National Institute of General Medical Sciences	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$2,361,894,000		$2,368,877,000

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
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				($1,952,000)
2007	$1,923,481,000	$1,923,481,000	$1,934,888,000	$1,935,618,000
Rescission				$0
2008	$1,941,462,000	$1,966,019,000	$1,978,601,000	$1,970,228,000
Rescission				($34,420,000)
Supplemental				$10,296,000
2009	$1,937,690,000	$2,004,295,000	$1,991,609,000	$1,997,801,000
Rescission				$0
2010	$2,023,677,000	$2,069,156,000	$2,031,886,000	$2,051,798,000
Rescission				$0
2011	$2,125,090,000		$2,121,783,000	$2,051,798,000
Rescission				($18,016,009)
2012	$2,102,300,000	$2,102,300,000	$2,347,309,000	$2,434,637,000
Rescission				($4,601,464)
2013	$2,378,835,000		$2,387,112,000	$2,430,035,536
Rescission				($4,860,071)
Sequestration				($121,971,075)
2014	$2,401,011,000		$2,435,570,000	$2,364,147,000
Rescission				$0
2015	$2,368,877,000			

Justification of Budget Request

National Institute of General Medical Sciences

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

Budget Authority (BA):

	FY 2013 Actual	FY 2014 Enacted	FY 2015 PB	FY 2015 + / - FY 2014
BA	$2,290,525,426	$2,361,894,000	$2,368,877,000	+$6,983,000
FTE	183	183	183	0

Program funds are allocated as follows: Competitive Grants/Cooperative Agreements; Contracts; Direct Federal/Intramural and Other.

Director's Overview

In the current challenging economic climate, the National Institute of General Medical Sciences (NIGMS) makes strategic investment decisions with a focus on efficiency, effectiveness, and flexibility, while keeping a close eye on return on investment. The importance of NIGMS' mission of enabling fundamental research on living systems is made clear by the recent set of Nobel laureates. Five of the six 2013 Nobel prizes relevant to biomedicine were awarded to researchers who used NIGMS funds i) to learn how nutrients and other molecules move in and out of cells, and ii) to create computer-based techniques to understand and predict chemical reactions. Collectively, these fundamental findings have had a huge impact on research conducted by thousands of biomedical scientists worldwide.

Today's Basic Science for Tomorrow's Breakthroughs

"Great things are not done by impulse, but by a series of small things brought together," said Vincent Van Gogh--as evidenced by his timeless art. The same can be said about how several small changes in body function can turn into disease. That is why understanding health at the level of its molecular building blocks is essential for seeing the bigger picture. This past year, NIGMS-funded researchers gathered important new clues about the vitamin folic acid, whose normal function is key to healthy metabolism and whose malfunction is a point of vulnerability for developing cancer, Crohn's disease, and birth defects. The scientists pieced together a three-dimensional picture of the receptor molecule that brings folic acid into cells, and this new information may provide new ideas for treatment strategies.

Basic discoveries in chemistry have also fueled major progress in biomedicine (see Program Portrait, page 17). And although NIGMS has funded the fruitful research of many outstanding chemists, Nature is perhaps the most gifted chemist of all. A large proportion of marketed drugs are "natural products," meaning they are made by organisms ranging from bacteria and molds to plants and marine sponges. However, the pharmaceutical industry has largely abandoned natural products-based drug discovery because of a diminishing discovery rate of new molecules using existing approaches. This past year, NIGMS teamed with NIH's National Center for

Complementary and Alternative Medicine to fund research toward developing genomic technologies to find new natural products and the genes that make them.

Precision Medicine

Whether you call it personalized or precision medicine, the ultimate goal is the same: matching treatments to individuals based on the wide array of health determinants that make each of us unique. This past year, NIGMS-funded researchers reported a major advance in individualized therapy for breast cancer. The findings, a team effort between U.S. and Japanese scientists, identified two genetic variants that can predict accurately how an individual will respond to anti-cancer medication. The new information will help high-risk women get effective medicines while sparing those unlikely to benefit from unnecessary treatment.

In another advance highlighting the use of precise genetic sleuthing, scientists uncovered a new clue about the link between sleep and migraines--punishing headaches that account for enormous disability and work productivity losses worldwide. NIGMS has funded a substantial body of work to understand the sleep-wake cycle, mostly in model organisms that share many of the core biochemical pathways that govern human biological rhythms. This past year, scientists connected the dots between a rare sleep disorder in people and a misspelled gene known to be important for a properly timed biological clock. Experiments in mice showed that the same genetic misspelling that disrupted sleep caused sensory changes very similar to those typical of migraines, affirming the genetic link to migraines and providing a good animal model for further study of these debilitating headaches.

Big Opportunities in Big Data

The Institute's longstanding foci on genetics and systems biology have enabled NIGMS-funded researchers to stay at the leading edge of biomedical discovery. A recent example of the NIGMS investment in so-called Big Data is new research from a large-scale computational analysis of chromosomal alterations. Using funding from an NIH research project grant and an NIH New Innovator Award, the scientists canvassed 8,000 cancer genomes that differed only slightly in DNA sequence. The results provided a comprehensive view of which of those small changes is likely to be important for the cause and progression of various cancers.

The NIGMS-funded Models of Infectious Disease Agent Study (MIDAS) is an example of how efficient analyses of Big Data can guide public health policy. This past year, MIDAS researchers determined through computer modeling that schoolchildren and young adults in the workplace account for most of the spread of seasonal flu. The findings suggest the importance of implementing current recommendations to provide influenza vaccines to these relatively healthy populations, in addition to targeting the elderly and people with weak immune systems.

Nurturing Talent and Innovation

NIGMS remains committed to helping the nation create the best trained, most innovative and productive scientific workforce in the world. A key strategy is partnering with the academic community that hosts NIH-funded training programs and research grants on their campuses. The Institute is developing strategies to enable universities to conduct real-world experiments toward optimizing graduate and post-graduate research training that recognize the broad needs of modern society for well-trained scientists. In particular, NIGMS plans to increase its focus on improving methods for measuring the outcomes of the federal research training investment.

The NIGMS Institutional Development Award program for Clinical and Translational Research (IDeA-CTR) aims to enhance geographic diversity in federal research funding. This past year, NIGMS funded three awards to spur increased clinical and translational research collaboration in Nevada, Oklahoma, and Delaware--strengthening research networks that span the United States.

Program Descriptions and Accomplishments

Cell Biology and Biophysics (CBB): The CBB 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 other novel imaging techniques, have deepened understanding of life at the level of molecules and atoms. Critical basic research supported by the program promotes the development of precise, targeted therapies, as well as diagnostics for a range of diseases. In FY 2013, the CBB program funded PSI:Biology, the third and final phase of the Protein Structure Initiative (PSI), which makes useful protein structure resources available to the broad scientific community. The PSI:Biology initiative is expected to continue through FY 2015. In FY 2013, this program also invested in projects that investigate macromolecular interactions in cells and provide scientists with access to state-of-the-art technologies in cell biology and biophysics.

Budget Policy:
The FY 2015 President's Budget request for the CBB program is $546.043 million, an increase of $2.239 million or 0.4 percent above the FY 2014 Enacted level. The majority of CBB funds will be used to support investigator-initiated research projects in cell biology, biophysics, cellular imaging, and structural biology. In FY 2015, CBB will support current grantees to extend the scope of their studies of living systems to probe interactions among the large and diverse complexes that govern cell function. CBB will also use FY 2015 funds to support its PSI:Biology initiative as well as for AIDS-related structural biology projects.

Genetics and Developmental Biology (GDB): The GDB program promotes a comprehensive research program on the fundamental mechanisms of genetic, cellular, developmental, and evolutionary processes. This basic research provides a strong foundation for more disease-targeted projects that are supported by other NIH components. To complement GDB's large investment in research that is performed in model organisms, GDB will also employ FY 2014 and FY 2015 funds to bolster human research studies in both individuals and in diverse populations. This research will be directed toward revealing the underpinnings of the genetic components in human biology and human disease. GDB also continues to support research that reveals fundamental insights about the basic biology of stem cells and that unravels the genetics and ecology underlying the microbial communities ("microbiota") normally associated with the human body.

Budget Policy:
The FY 2015 President's Budget request for the GDB program is $510.374 million, an increase of $4.892 million, or 1.0 percent above the FY 2014 Enacted level. As with FY 2013, most GDB expenditures will support individual investigators seeking fundamental knowledge about life processes. In FY 2015, GDB will continue its support for collaborative research for molecular and genomic studies in animal models, as well as research into specific genetic variants within complex disorders. FY 2015 funds will also support research to explore interactions between hosts and microorganisms that make up the microbiota in humans and in

model organisms. These relationships have a major impact on human health but remain poorly understood.

Program Portrait: The Next Genetic Revolution: Genome-Editing Comes to Life

FY 2014 Level: $3.2 million
FY 2015 Level: $3.2 million
Change: + 0.0 million

While some basic research finds quick application, most of it adds value in a stepwise fashion that can nevertheless be transformative. A perfect example is the recent discovery of two new genome-editing methods that come 60 years after Watson and Crick first determined the structure of the DNA double helix in 1953. During the 1970s, the so-called genetic revolution arrived when researchers first learned how to mix and match, or recombine, isolated DNA via molecular cloning. This molecular legerdemain launched the entire biotechnology industry, making possible synthetic insulin, hormones, vaccines, and other medicines manufactured in the laboratory from DNA. Three decades later, in 2003, the Human Genome Project came to fruition, providing researchers everywhere with the entire letter-by-letter sequence of the human genome. In the 10 years since, scientists have developed exciting new methods to edit genomes precisely inside intact, living cells, without first removing the DNA as was originally necessary. In the past year alone, a flurry of NIH-supported studies have reported two new breakthrough technologies (TALEN and CRISPR, known by their scientific acronyms) that are already having a profound impact on biomedical research and are expected to speed progress in cell-based therapies through their ability to readily modify genes inside cells with extreme precision. As a testament to the value of these methods, multiple small biotechnology companies have already been established to exploit the biomedical promise of these discoveries. TALEN relies on the use of "designer nucleases"--precision molecular scissors that nick the DNA in genes of interest to zoom in on any DNA region a researcher chooses to study and/or change. The CRISPR method grew out of basic research studies of bacterial "immune systems" that give microbes the ability to deactivate invader viruses called bacteriophages by shearing the viral DNA. Recently, researchers adapted the CRISPR approach to target human genes, extending the ability to add, delete, rev up, or tone down genes—up to five at a time--in cells from people and from most model organisms ranging from yeast to zebrafish to mice. Perhaps the most remarkable features of CRISPR are its speed, power, and low cost—enabling scientists to create transgenic mice for human-disease experiments in weeks instead of months. Collectively, these genome-editing techniques offer promise to expedite translation of discoveries made in the laboratory into therapies for the patients who need them.

Pharmacology, Physiology, and Biological Chemistry (PPBC): The PPBC program supports fundamental research in chemistry, biochemistry, pharmacology, and physiology that contributes to understanding human biology in health and disease and generates knowledge for new ways to diagnose and treat disease. In addition, PPBC funds research that explores clinical issues involving whole-body responses, including traumatic injury, burns, wound healing, sepsis, and anesthesia. In FY 2013, PPBC emphasized research in glycomics, the study of complex carbohydrates, and sought to stimulate research and training in quantitative and systems pharmacology, aiming to enhance the predictive ability of efforts in drug discovery, development, and metabolism. In FY 2015, PPBC plans to support research to uncover novel, and currently unapproachable, natural products for drug discovery. The program will also begin a collaborative effort with National Heart, Lung and Blood Institute to dissect the mechanisms of sepsis through multi-disciplinary approaches.

Budget Policy:
The FY 2015 President's Budget request for the PPBC program is $381.564 million, an increase of $1.564 million or 0.4 percent over the FY 2014 Enacted level. In FY 2015, this program will continue to emphasize the support of investigator-initiated research grants related to basic

physiology, pharmacology, and chemistry that inform knowledge of how small molecules influence human health. In FY 2015, the NIH Pharmacogenomics Research Network will continue promoting the goal of precision medicine using requested funds to support research on novel methods to identify and produce new potentially useful chemical entities using synthetic chemistry and synthetic biology.

Program Portrait: Organic Chemistry for Biomedical Applications

FY 2014 Level: $44.2 million
FY 2015 Level: $44.3 million
Change: + $0.1 million

Recognizing that mold growing on a petri dish looked suspicious led Sir Alexander Fleming to discover penicillin, possibly the most important medical advance of the 20th century. But not right away: due to the limited quantities available at first, penicillin had to be recovered from patient urine. What really turned Fleming's lucky discovery into the lifesaving antibiotic we use today was chemistry. Innovations in chemical methods that occurred years later led to the modern production of a range of penicillin-like substances. We have all benefited from the power of chemistry to inform biology and medicine, as once-lethal infections ultimately became nuisances for which we take a daily pill, although antibiotic resistance is now creating new chemical challenges. Other medical mainstays have resulted from synthetic organic chemistry, in which chemists create a design process to make a complex molecule by choosing the best starting materials and optimal reaction conditions, then perform a series of carefully designed experiments to find the best solution. Examples of successes include many drugs: singulair for asthma, gleevec for cancer, lipitor for heart disease, losartan for high blood pressure, and ciprofloxacin for infections. Non-drug medical uses of synthetic organic polymers include plastic prosthetic joints and other body parts, absorbable sutures, and dental adhesives. But beyond specific products, synthetic organic chemistry breakthroughs have been so central to biomedical progress that, since the mid-1960s, eight Nobel prizes have been awarded to NIGMS-funded chemists doing this work that has been aptly termed "rebuilding nature." For example, 1990 Chemistry Nobel laureate Elias J. Corey, Ph.D., first devised "retrosynthetic analysis." This process is not unlike an architect drawing plans for a house, then gathering and combining the materials to build it. Since then, several other NIGMS-funded chemists have developed methods that have provided new and powerful components for the general toolkit that any chemist can use. In one recent innovation, NIGMS grantee Phil Baran, Ph.D., who at age 36 was awarded a 2013 Macarthur Foundation "genius grant," created several new "recipes" for tinkering with ringed structures that are basic components of many modern medicines. Baran demonstrated this technique by adding a specialized chemical concoction called zinc salts to a cup of oolong tea. He then watched while the salts specifically captured the molecules of caffeine in the tea without interfering with any of the hundreds of other components in the watery liquid. Like other synthetic organic chemistry discoveries, Baran's chemical constructions will likely find routine use in the pharmaceutical industry, and chemical advances will continue to enlighten biologists' paths of fundamental discovery.

Division of Biomedical Technology, Bioinformatics and Computational Biology (BBCB): The BBCB program supports research to understand complex biological systems and develop research tools and methods—scientific instrumentation, software, models, and analytical approaches—to solve problems in biomedicine. A major effort in BBCB is the Biomedical Technology Research Centers (BTRC) initiative that creates critical, pioneering technologies and methods and applies them to a broad range of basic, translational, and clinical research areas. These resources are used by thousands of NIH-supported scientists each year. Through its Systems Biology initiative, BBCB emphasizes integrated, systems approaches that combine computational studies with laboratory-based investigations to develop and authenticate research models. In FY 2014, BBCB also plans to support research to address new challenges that face

biomedical researchers in accessing, managing, analyzing, integrating, and releasing Big Data (large datasets) of diverse types.

Budget Policy:
The FY 2015 President's Budget request for the BBCB program is $239.810 million, an increase of $0.983 million or 0.4 percent over the FY 2014 Enacted level. As with all NIGMS programs, highest priority will go to investigator-initiated research that explores complex biological systems. Major initiatives employing FY 2014 funds include the Models of Infectious Disease Agent Study (MIDAS), which models the spread of infectious diseases, and the Biomedical Technology Research Centers (BTRCs). In FY 2015, BBCB plans to fund investigator-initiated approaches to enable maximal usability of biomedical data and information.

Division of Training, Workforce Development, and Diversity (TWD): The TWD program is the Institute's focal point for facilitating the development of a diverse biomedical research workforce. A major TWD activity is supporting training of Ph.D. and M.D.-Ph.D. students, as well as postdoctoral fellows, through advanced and specialized training in basic, translational, and clinical research. TWD also supports the Institutional Development Award (IDeA) program that expands research infrastructure development at institutions in states that have received limited NIH research support. Two IDeA initiatives are new in FY 2013 and FY 2014. One extends clinical and translational research infrastructure through national networks and the other will foster, in IDeA states, the development of products to advance public health through small-business research funding. In FY 2015 and FY 2016, TWD will continue its support for specialized programs in the biomedical and behavioral sciences that recruit and train students from diverse backgrounds.

Budget Policy:
The FY 2015 President's Budget request for the TWD program is $621.141 million, an increase of $2.547 million, or 0.4 percent above the FY 2014 Enacted level. The requested amount includes $273.325 million for IDeA in FY 2015, which is the same level as in FY 2014. The budget includes funds for the Ruth L. Kirschstein NRSA training program, which supported 4,114 trainees in FY 2013. High priority will go to activities that promote diversity in the biomedical and behavioral research workforce--in particular, the Post-baccalaureate Research Education Program and the Minority Access to Research Careers Program.

Intramural: NIGMS has a small, but unique intramural research training program, the NIGMS Postdoctoral Research Associate Program (PRAT). PRAT postdoctoral research fellows (15, currently) are supported for up to three years. They pursue independent research in intramural NIH or FDA laboratories under the guidance of tenured/tenure-track investigators, and they receive specialized training and career mentoring from NIGMS staff. Fellows in this highly regarded program have received numerous honors and awards for their innovative research in areas ranging from cell and molecular biology to pharmacology to genetics.

Budget Policy:
The FY 2015 President's Budget request for the Intramural Research program is $3.716 million, which is $37 thousand or 1.0 percent above the FY 2014 Enacted level. FY 2015 funds will provide training for outstanding postdoctoral fellows conducting research in emerging areas of science, while working in the intramural laboratories of other NIH Institutes or in the FDA. In

FY 2015, the PRAT program, led by a newly hired director, will prioritize funding for fellows conducting research in quantitative/systems pharmacology and computational biology.

Research Management and Support (RMS): The RMS program provides administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants, training awards, and research and development contracts. The program also encompasses strategic planning, coordination, and evaluation of NIGMS programs; regulatory compliance; and international coordination and liaison with other federal agencies, Congress, and the public. RMS funds improvements in information technology tools to facilitate the peer review process, to conduct portfolio analyses, and to assist with grants administration. In FY 2015, NIGMS will use RMS funds to migrate core systems to a more robust development platform, which will reduce the Institute's software development/maintenance costs, enhance flexibility, and improve integration with NIH enterprise systems. These investments will better serve the business needs of NIGMS and its stakeholders.

Budget Policy:
The FY 2015 President's Budget request for RMS is $66.229 million, an increase of $656 thousand or 1.0 percent above the FY 2014 Enacted level. RMS funds support the operational requirements of the Institute, including its necessary investments in information technology. In FY 2015, requested funds will also be used to manage the Office of Emergency Care Research. The office will serve as the primary NIH coordinating component for emergency care research, coordinate relevant emergency medicine efforts across NIH, and communicate with the extramural community and other federal agencies.

NATIONAL INSTITUTES OF HEALTH
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Budget Authority by Object Class[1]
(Dollars in Thousands)

		FY 2014 Enacted	FY 2015 President's Budget	FY 2015 +/- FY 2014
Total compensable workyears:				
	Full-time employment	183	183	0
	Full-time equivalent of overtime and holiday hours	0	0	0
	Average ES salary	$0	$0	$0
	Average GM/GS grade	12.4	12.4	0.0
	Average GM/GS salary	$108	$109	$2
	Average salary, grade established by act of July 1, 1944 (42 U.S.C. 207)	$0	$0	$0
	Average salary of ungraded positions	$146	$148	$2
	OBJECT CLASSES	**FY 2014 Enacted**	**FY 2015 President's Budget**	**FY 2015 +/- FY 2014**
	Personnel Compensation			
11.1	Full-Time Permanent	$15,763	$15,920	$158
11.3	Other Than Full-Time Permanent	4,186	4,228	42
11.5	Other Personnel Compensation	173	175	2
11.7	Military Personnel	0	0	0
11.8	Special Personnel Services Payments	408	412	4
11.9	**Subtotal Personnel Compensation**	**$20,530**	**$20,735**	**$205**
12.1	Civilian Personnel Benefits	$5,858	$6,063	$205
12.2	Military Personnel Benefits	0	0	0
13.0	Benefits to Former Personnel	0	0	0
	Subtotal Pay Costs	**$26,388**	**$26,799**	**$410**
21.0	Travel & Transportation of Persons	$524	$533	$9
22.0	Transportation of Things	61	62	1
23.1	Rental Payments to GSA	0	0	0
23.2	Rental Payments to Others	0	0	0
23.3	Communications, Utilities & Misc. Charges	285	289	5
24.0	Printing & Reproduction	0	0	0
25.1	Consulting Services	$337	$343	$6
25.2	Other Services	8,877	9,027	151
25.3	Purchase of goods and services from government accounts	$109,275	$104,513	-$4,762
25.4	Operation & Maintenance of Facilities	$6	$6	$0
25.5	R&D Contracts	6,107	6,211	104
25.6	Medical Care	0	0	0
25.7	Operation & Maintenance of Equipment	278	282	5
25.8	Subsistence & Support of Persons	0	0	0
25.0	**Subtotal Other Contractual Services**	**$124,879**	**$120,382**	**-$4,497**
26.0	Supplies & Materials	$167	$170	$3
31.0	Equipment	863	877	15
32.0	Land and Structures	0	0	0
33.0	Investments & Loans	0	0	0
41.0	Grants, Subsidies & Contributions	2,208,727	2,219,764	11,037
42.0	Insurance Claims & Indemnities	0	0	0
43.0	Interest & Dividends	0	0	0
44.0	Refunds	0	0	0
	Subtotal Non-Pay Costs	**$2,335,506**	**$2,342,078**	**$6,573**
	Total Budget Authority by Object Class	**$2,361,894**	**$2,368,877**	**$6,983**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

NATIONAL INSTITUTES OF HEALTH
National Institute of General Medical Sciences

Salaries and Expenses
(Dollars in Thousands)

OBJECT CLASSES	FY 2014 Enacted	FY 2015 President's Budget	FY 2015 +/- FY 2014
Personnel Compensation			
Full-Time Permanent (11.1)	$15,763	$15,920	$158
Other Than Full-Time Permanent (11.3)	4,186	4,228	42
Other Personnel Compensation (11.5)	173	175	2
Military Personnel (11.7)	0	0	0
Special Personnel Services Payments (11.8)	408	412	4
Subtotal Personnel Compensation (11.9)	**$20,530**	**$20,735**	**$205**
Civilian Personnel Benefits (12.1)	$5,858	$6,063	$205
Military Personnel Benefits (12.2)	0	0	0
Benefits to Former Personnel (13.0)	0	0	0
Subtotal Pay Costs	**$26,388**	**$26,799**	**$410**
Travel & Transportation of Persons (21.0)	$524	$533	$9
Transportation of Things (22.0)	61	62	1
Rental Payments to Others (23.2)	0	0	0
Communications, Utilities & Misc. Charges (23.3)	285	289	5
Printing & Reproduction (24.0)	0	0	0
Other Contractual Services:			
Consultant Services (25.1)	337	343	6
Other Services (25.2)	8,877	9,027	151
Purchases from government accounts (25.3)	36,256	30,386	-5,870
Operation & Maintenance of Facilities (25.4)	6	6	0
Operation & Maintenance of Equipment (25.7)	278	282	5
Subsistence & Support of Persons (25.8)	0	0	0
Subtotal Other Contractual Services	**$45,753**	**$40,044**	**-$5,709**
Supplies & Materials (26.0)	$167	$170	$3
Subtotal Non-Pay Costs	**$46,790**	**$41,098**	**-$5,692**
Total Administrative Costs	**$73,178**	**$67,897**	**-$5,281**

NATIONAL INSTITUTES OF HEALTH
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Detail of Full-Time Equivalent Employment (FTE)

OFFICE/DIVISION	FY 2013 Actual			FY 2014 Est.			FY 2015 Est.		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Division of Biomedical Technology, Bioinformatics and Computational Biology									
Direct:	11		11	11		11	11		11
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	11		11	11		11	11		11
Division of Cell Biology and Biophysics									
Direct:	14		14	14		14	14		14
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	14		14	14		14	14		14
Division of Genetic and Developmental Biology									
Direct:	13		13	13		13	13		13
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	13		13	13		13	13		13
Division of Pharmacology, Physiology and Biological Chemistry									
Direct:	24		24	25		25	25		25
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	24		24	25		25	25		25
Division of Training, Workforce Development and Diversity									
Direct:	17		17	17		17	17		17
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	17		17	17		17	17		17
Office of Administrative Management									
Direct:	26		26	25		25	25		25
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	26		26	25		25	25		25
Office of Extramural Activities									
Direct:	48		48	48		48	48		48
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	48		48	48		48	48		48
Office of Scientific Review									
Direct:	18		18	18		18	18		18
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	18		18	18		18	18		18
Office of the Director									
Direct:	12		12	12		12	12		12
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	12		12	12		12	12		12
Total	183	-	183	183	-	183	183	-	183
Includes FTEs whose payroll obligations are supported by the NIH Common Fund.									
FTEs supported by funds from Cooperative Research and Development Agreements.	0	0	0	0	0	0	0	0	0

FISCAL YEAR	Average GS Grade
2011	12.7
2012	13.2
2013	12.4
2014	12.4
2015	12.4

NATIONAL INSTITUTES OF HEALTH
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Detail of Positions

GRADE	FY 2013 Actual	FY 2014 Enacted	FY 2015 President's Budget
Total, ES Positions	0	0	0
Total, ES Salary	0	0	0
GM/GS-15	21	21	21
GM/GS-14	50	51	51
GM/GS-13	41	41	41
GS-12	14	14	14
GS-11	6	6	6
GS-10	0	0	0
GS-9	1	1	1
GS-8	6	6	6
GS-7	18	18	18
GS-6	2	2	2
GS-5	0	0	0
GS-4	0	0	0
GS-3	0	0	0
GS-2	0	0	0
GS-1	0	0	0
Subtotal	159	160	160
Grades established by Act of July 1, 1944 (42 U.S.C. 207)	0	0	0
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	35	35	35
Total permanent positions	159	159	159
Total positions, end of year	194	194	194
Total full-time equivalent (FTE) employment, end of year	183	183	183
Average ES salary	0	0	0
Average GM/GS grade	12.4	12.4	12.4
Average GM/GS salary	106,761	107,751	109,428

Includes FTEs whose payroll obligations are supported by the NIH Common Fund.