Office of the Vice Chancellor for
RESEARCH

Annual Report

Fiscal Year 2008

Washington University in St. Louis

Office of the Vice Chancellor for
RESEARCH

November 1, 2008

Dear Colleagues:


Samuel L. Stanley, Jr., M.D.,
Vice Chancellor for Research

I am pleased to present the Office of the Vice Chancellor for Research (OVCR) fiscal year 2008 Annual Report, which highlights the major research accomplishments at Washington University over the past year.

Washington University, one of the world's premier research universities, has a long-standing commitment to education and research initiatives. This strong and vibrant research enterprise brings in more than $500 million in sponsored funds annually for a wide-range of projects at the School of Medicine and the Danforth Campus. The collaborative spirit that drives these endeavors has enabled the University to establish successful partnerships with organizations throughout the nation and the world.

The OVCR promotes and encourages faculty in their research activities, helps them obtain funding, administers their grants, and works with them to assure we are in compliance with the appropriate regulations, policies, and guidelines. The OVCR also provides resources to help faculty share their results through publication and commercialization for the use and benefit of the public.

Research funding trends indicate that these are challenging times for researchers. While research costs are rising, the purchasing power of the National Institutes of Health (NIH) budget has declined since 2003. The number of applications for new and competing research project grants, and the number of new scientists applying for grants, has nearly doubled since 1998. In recent years, the NIH has shifted a considerable amount of funding from small investigator-initiated grants toward center and program grants. The overall success rates for NIH R01 grants decreased by 8% from 1999 to 2008, while the success rate for applications on their first submission dropped by 17% during the same time period. It is a particularly difficult time for first time investigators: Their success rate for R01 grants slipped from 29% in 1999 to 25% in 2007. Appendix 2 to this report, "Historical Trends in Federal R&D Funding," examines these trends in more detail and discusses the near-term future landscape for federal funding.

Despite the highly competitive atmosphere for funding and decreasing federal budgets, the number of awards to Washington University in fiscal year 2008 increased, an indication that our research program continues to be extraordinarily successful. The total amount of research funding to Washington University in FY08 was $548.4M, up 2% from the previous year. Both the dollar amount and the number of awards increased in FY08.

Federal funding accounted for 80% of the total award dollars to Washington University in FY08 and remains the University's largest source for external sponsored activities funding. Funding from the NIH, consistently the University's main contributor of research funding, increased by $1.5M (0.4%) in FY08.

Funding from private sources to Washington University actually increased by 14% in FY08.

These dollars are necessary to support research and scholarly activities. In order for the University to sustain its research momentum, new research awards should exceed annual expenditures. According to Sponsored Projects Accounting (SPA), total research expenditures in FY08 were 97.8% of total research funding.

The Office of Technology Management (OTM) continues to improve efficiency and generate enthusiasm for the technology transfer effort. OTM helps federally funded technologies reach the public and quickly bring developments to the benefit of society. In FY08, OTM received 98 new invention disclosures from faculty, and the University filed 94 new patent applications. Sixteen U.S. patents (and fifteen foreign patents) were issued. The University entered into 42 revenue-generating license agreements during the year and received $17 million in technology transfer revenue. These license agreements have benefited society by advancing new technologies and therapies.

OTM re-established in 2008 the Bear Cub Fund, a grant program initiated by the OVCR to support innovative translational research not normally backed by federal grants. The goal of the Bear Cub Fund is to support innovative research projects that could be attractive for licensing by commercial entities or serve as the foundation for a start-up company.

The industry sponsored clinical trials highlighted in this report are performed by faculty throughout the School of Medicine. There are also a number of Centers dedicated to supporting clinical trials across the School of Medicine. More than 1,300 clinical trials are underway, carefully evaluating the safety and efficacy of new pharmaceuticals and medical devices aimed at treating cancer, AIDS, and other intractable diseases. In FY08, clinical trials generated over $24 million in income.

The "Notable Achievements" section in this Annual Report features some of the many fine research initiatives at Washington University. These are wonderful examples of collaborative projects involving diverse teams of researchers working together.

The report that follows summarizes the contributions that Washington University researchers made in the past year converting new knowledge into applications which benefit society.

Please contact my office if you have any questions or comments about this report.

Samuel L. Stanley, Jr., M.D.
Vice Chancellor for Research

Table of Contents

Page

Sponsored Research

Office of Technology Management

Industry Sponsored Clinical Trials

Sponsored Research Expense

Sponsored Research
Executive Summary

This report presents an overview of external funding for sponsored projects at Washington University (WU) during the University's fiscal year of 2008 (FY08). All references within Tables and Figures to "Fiscal Year" are to WU's fiscal year, which begins on July 1 and ends on June 30 of the following year. The awards reported within are those with start dates on or between July 1, 2007 and June 30, 2008, and the associated funds represent new money only (i.e., no carry-over funds from year to year for the same grant award are included).

In some instances, there are references to an agency's fiscal year, due to the fact that the fiscal years of agencies such as the National Institutes of Health (NIH) and the National Science Foundation (NSF) do not coincide with that of Washington University's.

Federal Agency Funding

During FY08, funding for WU's sponsored programs totaled $548.4M million, an increase of 2% from FY07. Federal award dollars decreased by 1% or about $4.5M in FY08. Regardless of difficult budget issues in Washington, federal agency support continues to be the University's leading source of award dollars, constituting 80% of total sponsored funding to WU in FY08.

Key Federal Research Sponsors

The number one federal sponsor of University research is the National Institutes of Health (NIH). Its total award obligation of $391M to WU (0.4% more than the previous fiscal year) represents 71.3% of WU's total sponsored project funding and 89% of its federal dollars.

Medical School NIH award dollars in FY08 ($367.5M) increased by $1.5M (0.4%) in FY08 compared to FY07. The total NIH dollars awarded the School of Engineering in FY08 ($7.8M) increased by 10.4% compared to FY07. NIH award dollars to both the School of Arts & Sciences and the George Warren Brown School of Social Work decreased in FY08, Arts & Sciences by 2.6% and Social Work by 6.5% compared to FY07.

Federal direct costs decreased by about $4M (1.2%) in FY08, and federal Facilities and Administrative (F&A) costs decreased by $0.4M (0.4%). A contributing factor to the decrease in F&A costs is that the University's negotiated F&A rate dropped from 52.5% to 52%, effective July 1, 2007 (beginning of FY08).

The National Science Foundation (NSF) remains the number two federal sponsor of University research with $25.4M, a 24.2% decrease ($8M) from FY07 ($33.4M). NSF funding to the School of Engineering totaled $6.8M, a slight increase of about 1.6% in FY08. NSF funding to the School of Arts & Sciences totaled $12M, a decrease of 1.6% from the previous year. The School of Social Work received $0.3M in awards from the NSF in FY08. No NSF dollars were awarded to the School of Social Work in FY07. Other Schools (i.e., not Arts & Sciences, Engineering, Medicine, or Social Work) saw a total increase in NSF award dollars, from $89,000 in FY07 to $1M in FY08. This was due in large part to an Innovation Acceleration Partnership (IAP) grant for $600,000 that was awarded to the Skandalaris Center for Entrepreneurial Studies.

NSF funding to the School of Medicine dropped significantly (63.6%) from $14.4M in FY07 to $5.2M in FY08. Much of that drop was due to the decrease in the amount of funds awarded to the "Sequencing the Maize Genome" project, from $13.4M in FY07 to $3.7M in FY08, a decrease of nearly $10M (72.3%).

Funding from the National Aeronautics and Space Administration (NASA) increased by about $3M. Although the Schools of Engineering and Medicine received less NASA funding in FY08 than in FY07, the School of Arts and Sciences received more NASA dollars in FY08 ($7.5M) than in FY07 ($3.6M). The Physics and Earth and Planetary Sciences Departments received several awards. The most significant award was to the Earth and Planetary Science Department for a project entitled "Planetary Data Systems: Geosciences Discipline Node" for approximately $1.8M.

The largest percentage increase from a federal agency was from the United States Department of Agriculture (USDA) (128.6%). The School of Engineering received two awards from the USDA (totaling $526,000), entitled "Biomass Production from Biomass Sugars by Electrochemically Assisted Hydrogen Production in Microbial Fuel Cells" and "Mixed Community Bioreactors to Convert Ligno Cellulose Feedstocks Into the Liquid Biofuel Butanol."

Department of Energy (DOE) funding increased 38.6% ($911,000). DOE funds awarded to the School of Arts & Sciences increased by 15.4%, from $1.8M in FY07 to $2M in FY08. DOE funding to the School of Engineering increased 88.7%, from $390,000 in FY07 to $736,000 in FY08. DOE funds to the School of Medicine increased by 143.1% from $204,000 in FY07 to $496,000 in FY08.

Department of Education (DOEd) funding to WU decreased by 86.6% ($3.5M) in FY08. The major contributing factor to that decrease was that, in FY07, a large DOEd grant for $3M was awarded to the Psychology Department, while no DOEd grants of that magnitude were awarded in FY08.

Table 6 (page 18) lists the different sponsoring agencies with dollar volume and change from FY07 to FY08. Table 7 (page 19) further breaks out agency funding by School.

Private Sources: Industry and Non-Profit Sponsor Support

There has been a trend toward an increase of private funding for research over the past few years. In FY08, support from private industry increased $1.6M (9.9%) from FY07. The largest industry award (Pfizer Biomedical Research Agreement) in FY08 was to the School of Medicine for $3.6M. Funding from private non-profit dollars increased in FY08 by 15% (about $9.2M) compared to the previous year. The University received significant award dollars from the Barnes Jewish Hospital Foundation ($12M), the American Heart Association ($2M), and the Ford Foundation ($2.8M to the School of Social Work).

Rankings of Top Institutions Receiving Funding

From 1996-2005, Washington University School of Medicine (WUSM) consistently ranked in the top five in NIH Awards to Medical Schools, according to the NIH comparative ranking tables.

Effective FY06, NIH stopped providing ranking data and now provides data by state. The data provided for Missouri for NIH-FY07 indicates that WU continues to have a major impact upon Missouri's economy, accounting for nearly 80% of the federal research funding dollars awarded to Missouri universities and other organizations.[1]

[1] *Source: NIH Research Portfolio Online Reporting Tool, State Detail.*
http://report.nih.gov/award/trends/State_Congressional/StateDetail.cfm?year=2007&state=MO

Notable Achievements for Fiscal Year 2008

Washington University's research initiatives and collaborations are carried out by more than 3,127 faculty members and their staff on the Danforth and Medical School campuses. The ever-increasing expectation for collaboration on research projects has been met by diverse teams of WU researchers, whose resultant discoveries and information could have a significant positive impact on society. Following are just a few of the notable achievements made in fiscal year 2008.

BioMed 21

BioMed 21 reorganizes the life sciences at WU to address the biggest questions about diseases: their origins, how they affect us, and how we can cure them. It creates a multidisclipinary and translational research imperative for basic scientists and clinician-researchers from many disciplines across the University. Housed on the WUSM campus, in a new building that adds 240,000 square feet of research space, it creates five Interdisciplinary Research Centers (IRCs): the Center for Cancer Genomics, the Center for the Investigation of Membrane Excitability Disorders, the Center for Women's Infectious Disease Research, the Hope Center Program on Protein Folding and Neurodegeneration, and the Center for Interdisciplinary Studies of Diabetic Cardiovascular Disease.

Center for Clinical Imaging Research

The Center for Clinical Imaging Research (CCIR), a multimillion-dollar biomedical imaging facility established within Barnes-Jewish Hospital on the WUSM campus, houses the latest state-of-the-art imaging equipment, including high-resolution positron-emission tomography (PET), three-dimensional ultrasound, high-powered magnetic resonance imaging (MRI), 64-slice computed tomography (CT) and advanced PET-CT scanners.

The CCIR is committed to supporting both basic and cutting-edge health care research at WUSM, using advanced bio-imaging and information technology systems. The CCIR assists investigators and their collaborators in the education, design, execution, and analysis of basic and translational science imaging research studies. The CCIR also creates a sense of community for research-based technology exchange that helps connect imaging scientists, physicians, and radiologists across different departments, divisions, and institutions.

Geosciences Discipline Node - Phoenix Mars Mission

The Geosciences Discipline Node is part of the Earth and Planetary Remote Sensing Laboratory in the Department of Earth and Planetary Sciences at WU. The Geosciences Discipline Node of NASA's Planetary Data System (PDS) archives and distributes digital data related to the study of the surfaces and interiors of terrestrial planetary bodies. Researchers from WU work directly with NASA missions to help generate well-documented, permanent data archives. They also provide data to NASA-sponsored researchers upon request, along with expert assistance in using the data. The focus of the project is mainly to serve the planetary science community, but some support is also provided for the general user interested in geosciences data. The Geosciences Discipline Node supports the projects associated with the Mars Surveyor Program, including orbiters, landers, and rovers, as well as support for archiving field tests of prototype landers and rovers.

I-CARES

The new International Center for Advanced Renewable Energy and Sustainability (I-CARES) encourages and coordinates University-wide and external collaborative research in the areas of renewable energy and sustainability – including biofuels, CO2 mitigation and coal-related issues. The University is investing more than $55 million in the initiative.

A key goal of I-CARES is to foster institutional, regional and international research on the development and production of biofuels from plant and microbial systems and the exploration of sustainable alternative energy and environmental systems and practices. Research at the center also focuses on the region's important coal resources and efforts to mitigate carbon dioxide accumulation, improve combustion processes, and reduce emissions.

Kidney Research Center

Researchers at The Kidney Research Center at WUSM investigate the underlying cause of kidney disease in order to speed the development of new treatments. The project is a collaborative effort involving 43 scientists and clinical researchers from WUSM and 12 investigators at several academic medical centers in the U.S. and worldwide. Researchers hope to better understand the way that kidney disease develops, including the role genes play in the structure and function of the organ, and determine how abnormalities in genes and their expression increase an individual's risk of developing kidney disease.

Law and Neuroscience Project

The Law and Neuroscience Project is a collaborative project between WU Schools of Law and Medicine. The project is centered at the University of California, Santa Barbara (UCSB), and involves scientists and legal scholars from more than two dozen universities world-wide. Topics include addiction, brain abnormalities, and decision-making as it relates to complex issues such as criminal responsibility. In addition, the project will support scientific advice to the legal profession, as well as public and professional education.

Molecular Imaging Center

The Molecular Imaging Center at WUSM is a place where scientists from WU and other institutions, including Saint Louis University, Stanford University, University of Missouri-St. Louis, and University of Notre Dame, collaborate on advanced imaging projects. Initiatives at the Center include an effort to help researchers track the spread of gene therapy for cancer projects and to closely monitor the contributions of key genes to the start of tumors. Scientists use whole-body imaging with positron-emission tomography (PET), including radio labeled tracers developed at the Molecular Imaging Center, to track where cells from the bone marrow transplants go in the body. Researchers can also study the roots of tumor formation and tumor development at the earliest stages, and can follow cells as they progress through the various stages of their life-cycles to determine how delays in cell replication occur.

SEED for Oklahoma Kids

The Center for Social Development (George Warren Brown School of Social Work), in partnership with the Oklahoma State Treasurer, recently launched the SEED for Oklahoma Kids (SEED OK) project, a seven-year research experiment. The purpose of SEED OK is to test the policy concept and impact of giving every child $1,000 at birth for postsecondary education. The objective of SEED OK is to determine how saving and accumulating assets within a household affects the family and educational achievements of children. SEED OK is among the most important policy tests in the United States to study impacts on saving for college, family attitudes and behaviors, and outcomes for children.

Funding History

The figures and tables in this section present WU's funding history over the past five years.

Figure 1 illustrates the total dollars received each year, and Table 1 sorts the dollars by three broad sponsor types: 1) Federal, 2) State, Local and International governments, and 3) Private sector, which includes industry and non-profit sponsors.

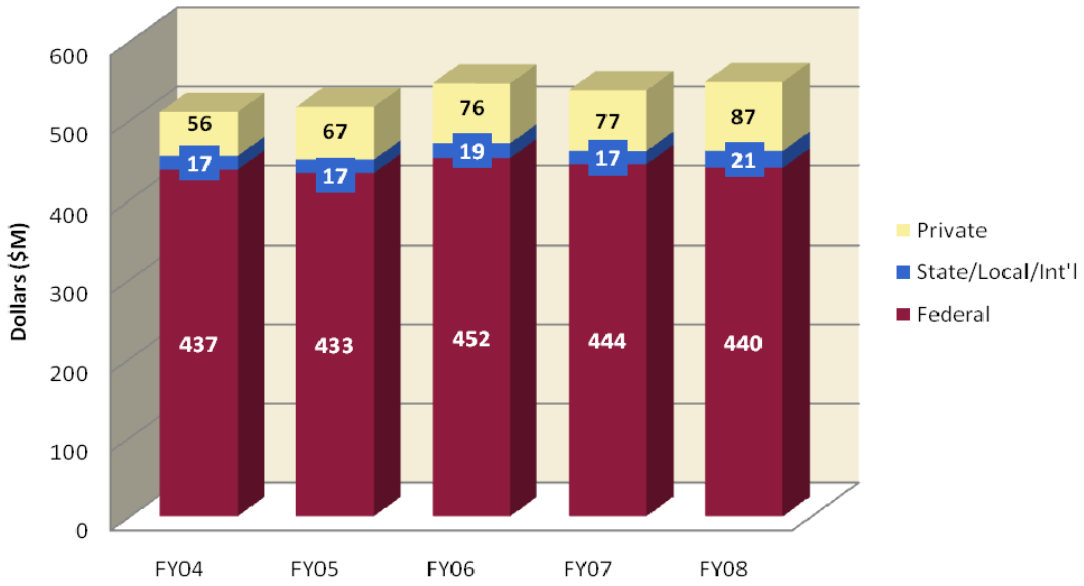


Figure 1
Funding History by Sponsor Type – FY04 to FY08 †

	FY04	FY05	FY06	FY07	FY08
Federal	$437,230	$432,779	$451,874	$444,018	$439,551
State/Local/Int'l	17,301	17,133	18,712	16,765	21,389
Private	55,685	66,821	75,738	76,691	87,411
TOTAL	**$510,216**	**$516,733**	**$546,324**	**$537,474**	**$548,351**

Table 1
Funding History by Sponsor Type – FY04 to FY08 †
(000s)

Note: Due to rounding, detail may not add to total.

† Beginning in 2005, business rules for reporting were changed to avoid including dollars approved by sponsors to be carried over from the previous award period. Five year trend tables have been adjusted accordingly. For a full explanation, please refer to Appendix 1.

Federal Research Funding

Federal research funding refers to the dollars awarded by federal agencies to WU for use in its sponsored research programs. Federal research funding provided 80% of total University award dollars for FY08.

As Figure 2 illustrates, the University has demonstrated cumulative growth in total federal research funding from 2004-2008 (an increase of about $3M, or about 0.6%).

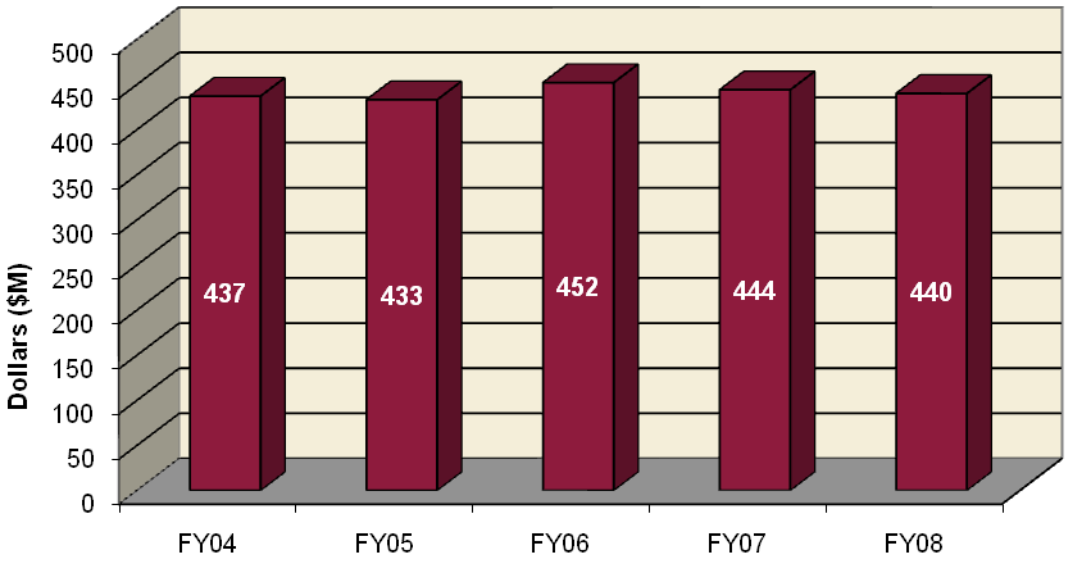


Figure 2
Federal Funding – FY04 to FY08 †

† Beginning in 2005, business rules for reporting were changed to avoid including dollars approved by sponsors to be carried over from the previous award period. Five year trend tables have been adjusted accordingly. For a full explanation, please refer to Appendix 1.

State, Local, and International (or "Other Government") Funding

This category most often includes state universities whose subagreements to WU are funded from their federal awards. It also includes funding from local entities such as the Missouri Department of Highways and Transportation (MODOT), the Missouri Department of Conservation, and the City of St. Louis, as well as occasional funding from foreign governments, such as the Australian Research Council.

The increase in state, local and international government funding in FY08 is largely due to a $1.6M grant from the State of Missouri that was awarded to the International Center for Advanced Renewable Energy and Sustainability (I-CARES).

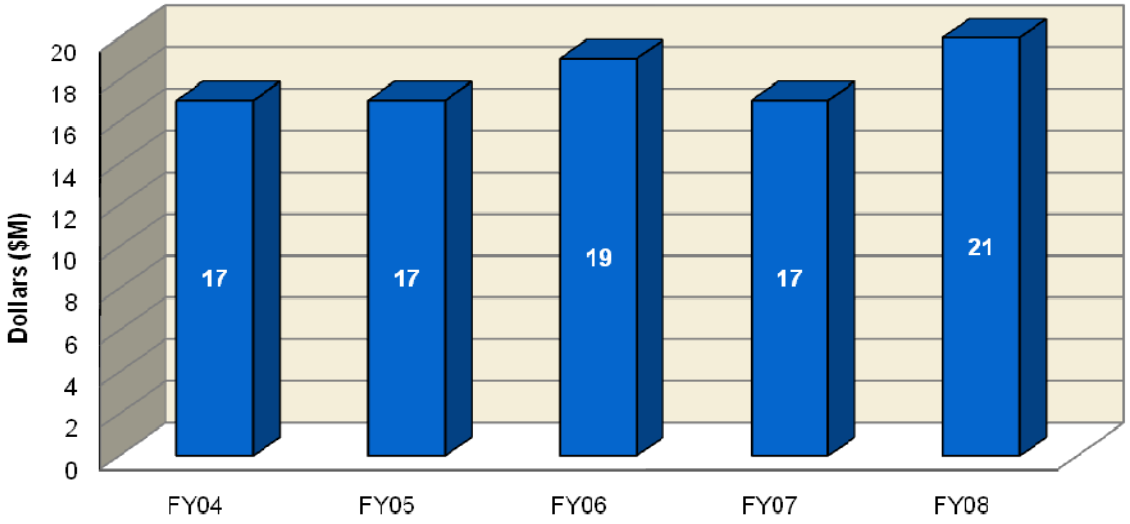


Figure 3
State/Local/International – FY04 to FY08 †

† Beginning in 2005, business rules for reporting were changed to avoid including dollars approved by sponsors to be carried over from the previous award period. Five year trend tables have been adjusted accordingly. For a full explanation, please refer to Appendix 1.

Private Funding

Private funding sources are received from companies and organizations that fall into the following two main categories:

Industry

- Typically commercial (for-profit) entities, such as Monsanto, Lockheed Martin, and Hoffman La Rouche.

Non-Profit

- Foundations & Trusts: Non-profit entities such as the James S. McDonnell Foundation, the Robert Wood Johnson Foundation, and the Juvenile Diabetes Foundation.
- Voluntary Health: Non-profit health- or disease-specific agencies, such as the American Heart Association, the American Cancer Society, and the National Multiple Sclerosis Society.
- Other: Non-profit agencies that are not Foundations, Trusts, or Voluntary Health organizations. Examples include Shriners Hospital for Children, Howard Hughes Medical Institute, and the St. Louis Zoo.

Figure 4 illustrates how the two main components of private funding – Industry and Non-Profit – compare to each other.

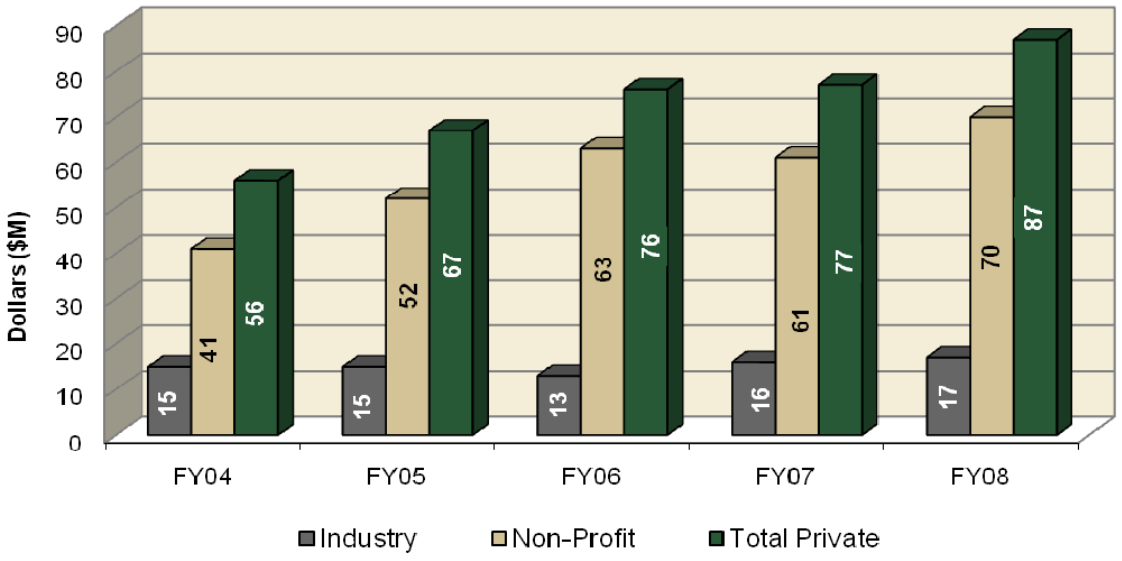


Figure 4
Private Funding – FY04 to FY08 †

† Beginning in 2005, business rules for reporting were changed to avoid including dollars approved by sponsors to be carried over from the previous award period. Five year trend tables have been adjusted accordingly. For a full explanation, please refer to Appendix 1.

Funding History by School

Figures 5-8 and Table 2 illustrate the history of funding among the four research-intensive units of the university: the School of Arts and Sciences, the School of Engineering, the School of Medicine, and the George Warren Brown School of Social Work.

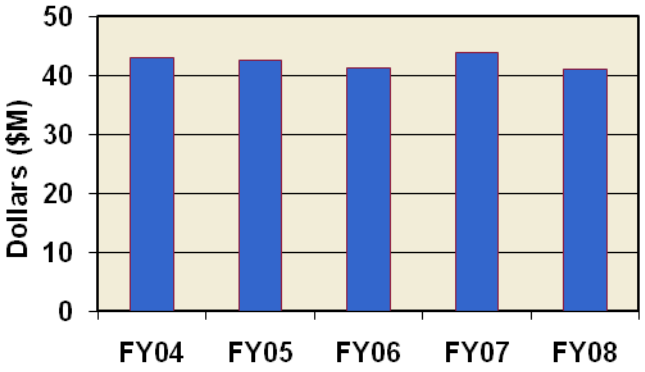


Figure 5 - School of Arts and Sciences

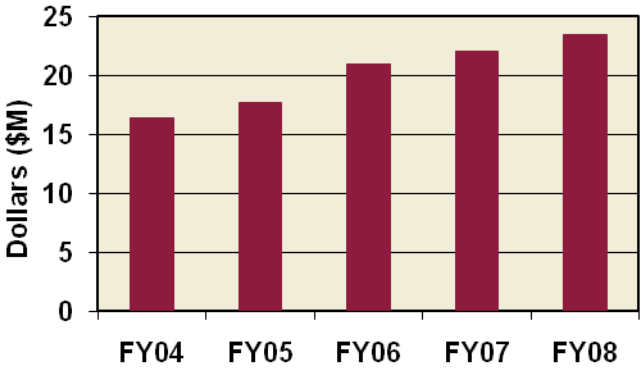


Figure 6 - School of Engineering

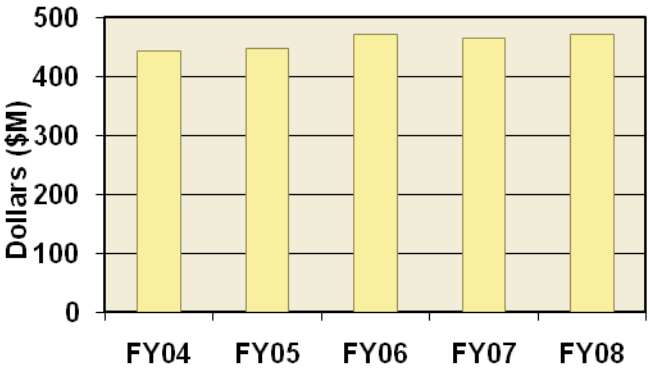


Figure 7 - School of Medicine

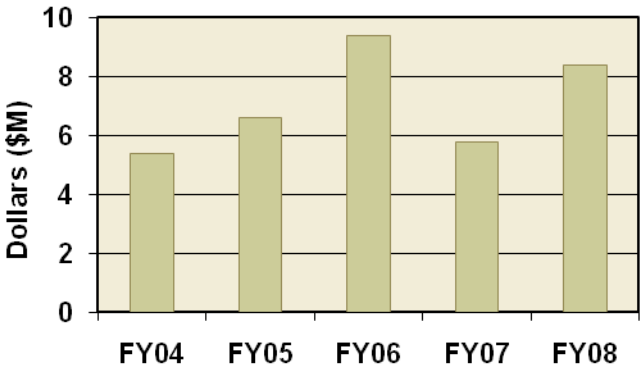


Figure 8 - School of Social Work

	FY04	FY05	FY06	FY07	FY08
Arts & Sciences	$43,102	$42,693	$41,390	$44,007	$41,278
Engineering	16,433	17,722	21,002	22,103	23,480
Medicine	443,558	447,727	472,635	464,444	471,753
Social Work	5,423	6,580	9,358	5,820	8,370
Other	1,700	2,011	1,938	1,099	3,470
Total	$510,216	$516,733	$546,324	$537,474	$548,351

Table 2
Funding History by School – FY04 to FY08 †
(000s)

Note: Due to rounding, detail may not add to total.

† Beginning in 2005, business rules for reporting were changed to avoid including dollars approved by sponsors to be carried over from the previous award period. Five year trend tables have been adjusted accordingly. For a full explanation, please refer to Appendix 1.

The following table compares FY08 award dollars for schools with the prior year, broken out by Direct and Facilities and Administrative (F&A) costs for each school. The percent of change from one fiscal year to the next is tracked in the far right column of Table 3.

As the table shows, the number of total awards for FY08 increased by 46, and the total dollars awarded increased by $10.8M.

Schools	FY08				FY07				Change	
	Award Count	Direct Costs	F&A Costs	Total	Award Count	Direct Costs	F&A Costs	Total	Dollars	%
Arts & Sciences	278	$30,081	$11,197	$41,278	261	$33,208	$10,799	$44,007	($2,729)	-6.2%
Business	1	51	2	54	1	34	15	49	5	10.2%
Engineering	136	16,987	6,493	23,480	148	15,738	6,365	22,103	1,377	6.2%
Law	5	380	116	496	2	137	9	145	351	242.0%
Medicine	1,914	356,838	114,915	471,753	1,890	350,120	114,324	464,444	7,309	1.6%
Social Work	51	7,036	1,334	8,370	38	4,599	1,222	5,820	2,550	43.8%
Other Schools	20	2,637	283	2,919	19	807	98	905	2,014	222.5%
TOTAL	**2,405**	**$414,010**	**$134,341**	**$548,351**	**2,359**	**$404,643**	**$132,831**	**$537,474**	**$10,877**	**2.0%**

Table 3
Award Dollars by School and Cost Category
FY08 and FY07
(000s)

Note: Due to rounding, detail may not add to total.

The term "Project Type" refers to the distinct types of awards received by the University. Table 4 breaks award dollars into three categories: **Research** (projects and activities that discover new scientific areas, procedures, and devices), **Research Training** (support provided to pre/postdoctoral students and fellows involved in research training programs), and **Other Sponsored Activities** (such as public service, patient service, conference grants, community outreach programs, and student aid).

School / Department	Research		Research Training		Other Sponsored Activities		TOTAL	
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
Administration[1]	$2,380	$233	$0	$0	$572	$611	$2,952	$844
Design & Visual Arts[2]	(94)	38	11	0	50	23	(33)	60
Arts & Sciences	38,285	38,911	1,976	2,119	1,017	2,977	41,278	44,007
Business	0	46	0	0	54	3	54	49
Engineering	21,798	21,324	1,550	392	131	388	23,480	22,103
Law	428	25	0	0	69	120	496	145
Medicine	427,616	428,805	22,724	20,130	21,413	15,509	471,753	464,444
Social Work	7,293	4,591	741	772	336	458	8,370	5,820
TOTAL	**$497,706**	**$493,973**	**$27,002**	**$23,412**	**$23,643**	**$20,089**	**$548,351**	**$537,474**

Table 4
Award Dollars by School or Department and Project Type
FY08 and FY07
(000s)

(1) Administration includes the Skandalaris Center, and the International Center for Advanced Renewable Energy and Sustainability (I-CARES).

(2) Sam Fox School of Design & Visual Arts. Negative figures are due to two transactions totaling $94,000 incorrectly awarded in years prior to FY08, but not corrected until FY08.

Note: Due to rounding, detail may not add to total.

Additional Detail for Arts and Sciences, Engineering, Medical School, Social Work, and Administration

Often award data is impacted by large, multiyear private awards where funding is provided up front. Though the work on these projects is spread over the course of several years, the amount of the total award is registered entirely in one year. For that reason, annual award levels may vary significantly and do not necessarily reflect the amount of funding potentially available in any given fiscal year.

The overhead limitations provided by sponsors, and, in some cases, the sponsor's prohibition against charging overhead to any amount of consortium expenditures, are constraints affecting the Schools' ability to recover overhead costs.

Arts and Sciences

The number of awards to the School of Arts and Sciences increased from FY07 (261) to FY08 (278), but the dollars represented by those awards decreased by $2.7M (6.2%), from $44M in FY07 to $41.3M in FY08. Direct costs also decreased, from $33.2M in FY07 to $30M in FY08. Federal funding decreased from $34.7M in FY07 to $34.3M in FY08. NIH funding decreased from $12.1M in FY07 to $11.8M in FY08, and NSF funding decreased from $12.2M in FY07 to $12M in FY08. Private non-profit funding decreased from $5.3M in FY07 to $2.5M in FY08. Private industry funding also decreased from $3M in FY07 to $2.4M in FY08.

Engineering

Although the number of awards to the School of Engineering decreased from FY07 (148) to FY08 (136), the dollars represented by those awards increased by $1.4M (6.2%), from FY07 ($22.1M) to FY08 ($23.5M). Direct costs increased slightly from $15.7M in FY07 to $17M in FY08. Federal funding increased $0.9M, from $16.8M in FY07 to $17.7M in FY08. NIH funding increased slightly, from $7M in FY07 to $7.8M in FY08. NSF funding also increased slightly, from $6.7M in FY07 to $6.8M in FY08. Private non-profit funding decreased from $2M in FY07 to $1.6M in FY08. Private industry funding increased from $1.6M in FY07 to $2.4M in FY08.

Medicine

The number of awards to WUSM increased from FY07 (1,890) to FY08 (1,914), and the dollars represented by those awards increased by about $7.4M (1.6%), from $464.4M in FY07 to $471.8M in FY08. Direct costs increased slightly from $350.1M in FY07 to $356.8M in FY08. Recovery of F&A increased from $114.3M in FY07 to $114.9M in FY08. Federal funding decreased from $387.7M in FY07 to $381.9 in FY08. NIH funding increased from $366M in FY07 to $367.5M in FY08. NSF funding decreased from $14.4M in FY07 to $5.2M in FY08. Private non-profit funding increased from $51.7M in FY07 to $61.7M in FY08. Private industry funding increased from $11M in FY07 to $12.4M in FY08.

Social Work

The number of awards to the George Warren Brown School of Social Work increased from FY07 (38) to FY08 (51). The dollars represented by those awards increased by $2.6M (43.8%), from $5.8M in FY07 to $8.4M in FY08. Direct costs increased from $4.6M in FY07 to $7M in FY08. F&A costs increased from $1.2M in FY07 to $1.3M in FY08. Federal funding decreased slightly in FY08 (by $15,000) from FY07. NIH awards decreased from $4.1M in FY07 to $3.9M in FY08. NSF funding increased from $0 in FY07 to $0.3M in FY08. Private non-profit funding increased from $1.7M in FY07 to $4.1M in FY08 (including a major award of almost $3M for the SEED Oklahoma Kids Project). Private industry funding increased from $0 in FY07 to $132,000 in FY08.

Administration

The total dollars awarded to Administration in FY08 ($3M) increased significantly from FY07 ($.8M). Two awards contributed to this increase: The Skandalaris Center received a $600,000 Innovation Acceleration Partnership (IAP) grant from NSF, and the International Center for Advanced Renewable Energy and Sustainability (I-CARES) received a $1.6M grant from the State of Missouri.

The graphs and tables in this section provide information about the sources of sponsored projects funding to the University, including:

- All the sources from which the University receives sponsored projects funding.
- The sectors from which the University receives the most funding: government, industry, and non-profit.
- The federal agencies that provide the most support to the individual schools within the University.
- The sponsors that have increased or decreased their investments in University research over the past fiscal year.

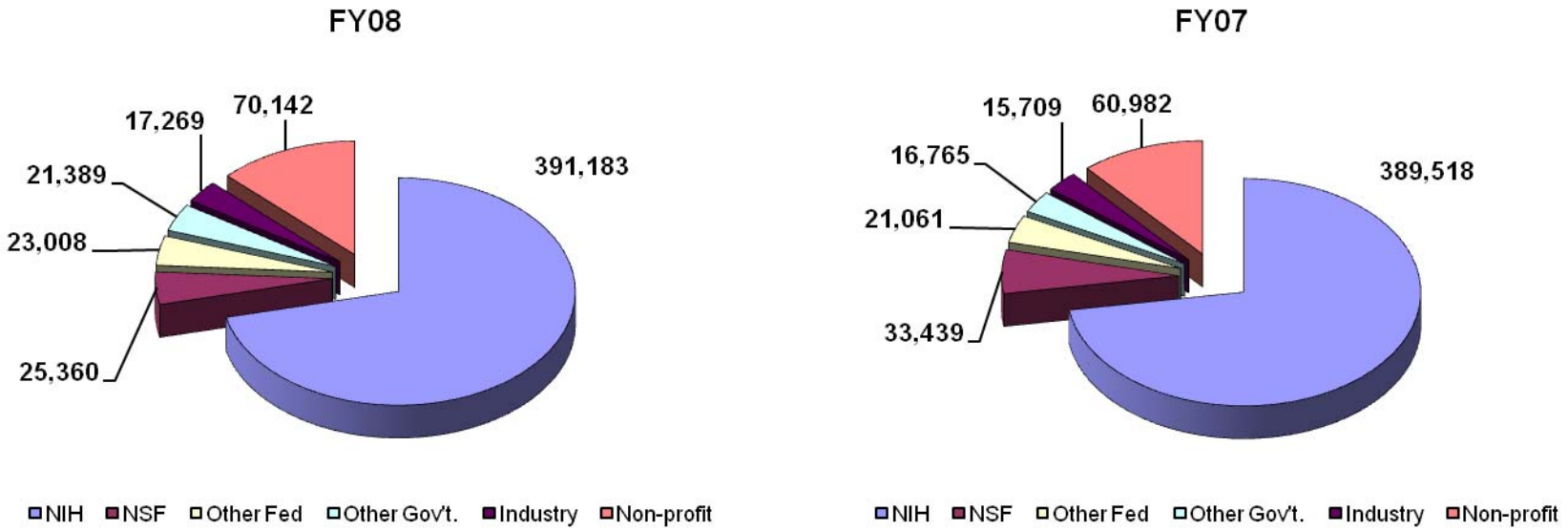


Figure 9
Award Summary by Sponsor Type – FY08 and FY07
(000s)

Sponsor	FY08						FY07					
	Direct Costs	% Total Direct	F&A Costs	% Total F&A	Total	% Total	Direct Costs	% Total Direct	F&A Costs	% Total F&A	Total	% Total
Federal	$323,752	78.2%	$115,799	86.2%	$439,551	80.2%	$327,795	81.0%	$116,223	87.5%	$444,018	82.6%
Other Govt.	15,868	3.8%	5,521	4.1%	21,389	3.9%	11,882	2.9%	4,884	3.7%	16,765	3.1%
Total Govt.	**339,620**	**82.0%**	**121,320**	**90.3%**	**460,940**	**84.1%**	**339,676**	**83.9%**	**121,107**	**91.2%**	**460,783**	**85.7%**
Industry	12,361	3.0%	4,908	3.7%	17,269	3.1%	11,430	2.8%	4,278	3.2%	15,709	2.9%
Nonprofit	62,029	15.0%	8,113	6.0%	70,142	12.8%	53,536	13.2%	7,446	5.6%	60,982	11.3%
Total Private	**74,390**	**18.0%**	**13,021**	**9.7%**	**87,411**	**15.9%**	**64,966**	**16.0%**	**11,724**	**8.8%**	**76,691**	**14.3%**
GRAND TOTAL	**$414,010**	**100.0%**	**$134,341**	**100.0%**	**$548,351**	**100.0%**	**$404,643**	**100.0%**	**$132,831**	**100.0%**	**$537,474**	**100.0%**

Table 5
Award Dollars by Sponsor Type and Cost Category
FY08 and FY07
(000s)

Note: Due to rounding, detail may not add to total.

	Sponsor	FY08 Direct Costs	FY08 F&A Costs	FY08 Total	FY07 Direct Costs	FY07 F&A Costs	FY07 Total	Change Dollars	Change %
FEDERAL AGENCIES	NIH	$287,618	$103,565	$391,183	$286,161	$103,357	$389,518	$1,665	0.4%
	NSF	19,418	5,942	25,360	26,175	7,264	33,439	(8,079)	-24.2%
	NASA	5,537	2,301	7,838	3,199	1,572	4,771	3,067	64.3%
	DOD	2,488	1,195	3,683	2,479	1153	3,633	50	1.4%
	EPA	5	0	5	171	84	255	(250)	-98.0%
	DOEd	520	23	543	3,227	815	4,042	(3,499)	-86.6%
	DOE	2,279	992	3,272	1,648	713	2,361	911	38.6%
	DHHS HRSA	2,264	472	2,737	2,016	455	2,471	266	10.8%
	LABOR	1,718	829	2,547	1,551	591	2,142	405	18.9%
	USDA	505	72	576	226	26	252	324	128.6%
	OTHER	1,400	407	1,807	941	194	1,134	673	59.3%
TOTAL FEDERAL		**323,752**	**115,799**	**439,551**	**327,795**	**116,223**	**444,018**	**(4,467)**	**-1.0%**
OTHER GOVERNMENT	Missouri	3,624	556	4,180	662	184	846	3,334	394.1%
	Other States	11,451	4,883	16,334	10,440	4,682	15,121	1,213	8.0%
	Other Gov't.	792	82	875	780	18	798	77	9.6%
TOTAL OTHER		**15,868**	**5,521**	**21,389**	**11,882**	**4,884**	**16,765**	**4,623**	**27.6%**
PRIVATE SOURCES	Industry	12,361	4,908	17,269	11,430	4,278	15,709	1,560	9.9%
	Non Profit	62,029	8,113	70,142	53,536	7,446	60,982	9,160	15.0%
TOTAL PRIVATE		**74,390**	**13,021**	**87,411**	**64,966**	**11,724**	**76,691**	**10,721**	**14.0%**
GRAND TOTAL		**$414,010**	**$134,341**	**$548,351**	**$404,643**	**$132,831**	**$537,474**	**$10,877**	**2.0%**

Table 6
Award Dollars by Sponsor and Cost Category
FY08 and FY07
(000s)

Note: Due to rounding, detail may not add to total.

Sponsor	Arts & Sciences		Engineering		Medicine		Social Work		Other Schools		Total University	
	FY08	% of Change From FY07	FY08	% of Change From FY07	FY08	% of Change From FY07	FY08	% of Change From FY07	FY08	% of Change From FY07	FY08	% of Change From FY07
NIH	$11,793	-2.6%	$7,820	10.4%	$367,500	0.4%	$3,864	-6.5%	$206	-3.3%	$391,183	0.4%
NSF	12,030	-1.6%	6,822	1.6%	5,245	-63.6%	254	—	1,009	1033.7%	25,360	-24.2%
NASA	7,548	111.0%	290	-65.6%	0	-100.0%	0	—	0	—	7,838	64.3%
DOD	158	-54.6%	1,442	5.3%	2,072	8.2%	0	—	11	—	3,683	1.4%
EPA	5	0.0%	0	-100.0%	0	—	0	—	0	—	5	-98.0%
DOEd	213	-94.1%	0	-100.0%	0	—	0	—	330	0.3%	543	-86.6%
DOE	2,040	15.4%	736	88.7%	496	143.1%	0	—	0	—	3,272	38.6%
DHHS HRSA	0	—	0	—	2,737	10.8%	0	—	0	—	2,737	10.8%
LABOR	0	-100.0%	0	—	2,547	34.5%	0	—	0	—	2,547	18.9%
USDA	0	-100.0%	526	662.3%	50	-15.3%	0	—	0	—	576	128.6%
OTHER	510	-29.4%	25	—	1,260	224.7%	0	—	12	-50.0%	1,807	59.3%
TOTAL	**$34,298**	**-1.2%**	**$17,662**	**4.8%**	**$381,905**	**-1.5%**	**$4,118**	**-0.4%**	**$1,568**	**139.4%**	**$439,551**	**-1.0%**

Table 7
Federal Award Dollars by Sponsor and School
FY08 and FY07
(000s)

Note: Due to rounding, detail may not add to total

Schools/Dept.	Government				Private				Total	
	Federal		Other Gov't.		Industry		Nonprofit			
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
Administration	$1,227	$586	$1,722	$93	$0	$0	$2	$166	$2,952	$844
Design & Visual Arts[1]	0	0	0	0	0	0	(33)	60	(33)	60
Arts & Sciences	34,298	34,701	2,058	1,004	2,391	3,023	2,531	5,279	41,278	44,007
Business	0	44	0	0	0	0	54	5	54	49
Engineering	17,662	16,847	1,841	1,625	2,380	1,624	1,597	2,008	23,480	22,103
Law	340	25	0	0	5	0	151	120	496	145
Medicine	381,905	387,682	15,757	14,028	12,361	11,061	61,729	51,672	471,753	464,444
Social Work	4,118	4,133	11	15	132	0	4,109	1,673	8,370	5,820
Total	**$439,551**	**$444,018**	**$21,389**	**$16,765**	**$17,269**	**$15,709**	**$70,142**	**$60,982**	**$548,351**	**$537,474**

Table 8
Award Dollars by School and Sponsor Type
FY08 and FY07
(000s)

[1] Sam Fox School of Design & Visual Arts. Negative figure is due to a transaction incorrectly awarded in FY07, but not corrected until FY08.

Note: Due to rounding, detail may not add to total.

Department[1]	Government		Private		Total	
	Federal	Other Gov't.	Industry	Nonprofit	FY08	FY07
African & Afro American Studies	$0	$2	$0	$0	$2	$0
Anthropology	182	0	2	62	247	390
Arts & Sciences	7	0	0	(19)	(12)	0.3
Arts & Sciences Administration	0	0	0	0.06	0.06	108
Asian & Near Eastern Languages & Lit.	0	0	0	25	25	0
Biology	9,945	1,470	1,683	1,143	14,242	14,560
Center For Joint Projects	150	0	0	0	150	0
Center for Materials Innovation	0	0	0	0	0	475
Chemistry	5,664	80	331	286	6,361	7,325
CNISS	0	0	0	0	0	44
Earth & Planetary Science	4,404	466	328	449	5,646	3,957
Economics	151	0	0	0	151	138
Education	11	0	0	37	48	1,753
English	40	0	0	0	40	0
Graduate School	700	0	47	0	747	823
History	40	0	0	0	40	5
Mathematics	403	0	0	0	403	1,024
Philosophy	28	0	0	0	28	0
Physics	7,855	0	0	224	8,079	4,678
Political Science	0.16	0	0	8	8	0
Psychology	4,198	24	0	317	4,539	7,708
Romance Languages	43	0	0	0	43	40
The Center For Humanities	74	15	0	0	89	234
Weidenbaum Center	401	0	0	0	401	745
Total	**$34,298**	**$2,058**	**$2,391**	**$2,531**	**$41,278**	**$44,007**

Table 9
School of Arts & Sciences – Award Dollars by Department and Sponsor Type (000s)
FY08 and FY07

(1) Only departments receiving awards in FY07 or FY08 are listed. As a result, some departments listed in the FY07 Annual Report are not listed this year.
Note: Due to rounding, detail may not add to total.

Department	Government		Private		Total	
	Federal	Other Gov't	Industry	Nonprofit	FY08	FY07
Biomedical Engineering	$8,548	$35	$80	$427	$9,090	$7,714
Computer Science & Engineering	4,162	638	971	510	6,281	5,662
Electrical & Systems Engineering	688	245	2	64	998	2,839
Environmental, Energy & Chemical Engineering	2,739	990	1,076	587	5,391	3,070
Mechanical, Aerospace & Structural Engineering	1,526	(67)	252	9	1,720	2,768
Other	0	0	0	0	0	50
TOTAL	**$17,662**	**$1,841**	**$2,380**	**$1,597**	**$23,480**	**$22,103**

Table 10
School of Engineering – Award Dollars by Department and Sponsor Type
FY08 and FY07
(000s)

Note: Due to rounding, detail may not add to total.

Departments	Government		Private		Total	
	Federal	Other Gov't	Industry	Nonprofit	FY08	FY07
Anatomy & Neurobiology	$10,707	$8	$0	$864	$11,580	$13,113
Biochemistry & Molecular Biophysics	6,808	123	140	234	7,304	6,463
Cell Biology & Physiology	7,809	75	386	1,167	9,437	12,157
Genetics	57,417	841	31	2,583	60,871	71,464
Developmental Biology [1]	9,401	348	578	1,608	11,934	14,641
Molecular Microbiology	10,370	201	0	281	10,853	12,044
Subtotal Preclinical	**102,512**	**1,596**	**1,135**	**6,737**	**111,979**	**129,883**
Anesthesiology	8,021	80	0	1,319	9,420	7,259
Internal Medicine	103,021	1,845	1,458	13,724	120,049	108,006
Neurological Surgery	1,582	503	25	743	2,853	2,614
Neurology	17,094	1,456	796	4,576	23,922	25,123
Obstetrics & Gynecology	2,362	7	0	3,456	5,824	4,144
Ophthalmology & Visual Sciences	11,014	17	100	1,358	12,489	13,273
Orthopedic Surgery	2,877	14	392	1,057	4,339	4,467
Otolaryngology	6,360	280	0	174	6,814	6,787
Pathology & Immunology	21,141	417	3,515	4,235	29,308	26,880
Pediatrics	19,567	2,285	658	7,049	29,559	25,042
Psychiatry	31,115	3,862	404	2,719	38,100	39,109
Radiation Oncology	5,915	173	26	640	6,754	5,811
Radiology	20,313	1,237	89	2,592	24,231	23,849
Surgery	15,072	809	913	8,932	25,726	20,654
Subtotal Clinical	**265,455**	**12,984**	**8,376**	**52,573**	**339,388**	**313,018**
Administration [2]	140	1	2,816	149	3,106	3,771
Biology/Biomedical Sciences	4,627	0	0	366	4,994	4,493
Biostatistics	1,834	144	0	351	2,328	3,272
Center for Clinical Studies	0	0	0	0	0	10
Center For Health Behavior Research	630	122	0	220	972	2,084
Center For Study Of Health Policy	0	0	0	23	23	219
Div Of Comparative Medicine	23	0	0	0	23	20
Emergency Medicine	192	0	0	77	269	260
Experimental Neurol/Neuro Surg	121	0	0	0	121	15
Medical Library	0	228	0	0	228	139
Occupational Therapy	702	648	0	982	2,331	1,377
Physical Therapy	1,461	8	34	74	1,577	1,454
Physician Billing Services	0	0	0	0	0	6
Siteman Cancer Center	4,209	27	0	178	4,414	4,423
Subtotal Other	**13,939**	**1,177**	**2,850**	**2,420**	**20,386**	**21,543**
Grand Total	**$381,905**	**$15,757**	**$12,361**	**$61,729**	**$471,753**	**$464,444**

Table 11
School of Medicine – Award Dollars by Department and Sponsor Type
FY08 and FY07
(000s)

[1]In FY08 Molecular Biology and Pharmacology was renamed "Developmental Biology."
[2]Administration includes: Continuing Medical Education, Associate Dean Curriculum, Associate Dean Faculty Affairs, Student Support, and Medical School Administration.
Note: Due to rounding, detail may not add to total.

Office of Technology Management
Executive Summary

During Fiscal Year 2008, the Office of Technology Management (OTM) received 98 new invention disclosures. Of these disclosures, 81% originated in the School of Medicine, 13% from the School of Engineering and Applied Science, and 6% from the School of Arts & Sciences. The Office handled 3% fewer disclosures than the prior year. Washington University (WU) filed 94 new United States patent applications. The U.S. Patent Office issued 16 patents on behalf of the University. Foreign offices issued 15 patents on behalf of the University.

The University received $17M in total technology transfer revenue. This amount increased by $5.0M, primarily because of a one-time payment on a future royalty stream. The University entered into a total of 42 revenue generating license agreements during the year. Of the new license agreements, 71% were non-exclusive. Open source software licenses, most involving gene sequencing and related topics, numbered 1,616.

Technology transfer revenues broken down by School are as follows:

School of Medicine $14M
School of Engineering and Applied Sciences $1.3M
School of Arts and Sciences $1.7M

The number of industry sponsored research agreements was 72 (an increase of 20%), confidentiality agreements 84 (a decrease of 23%), evaluation and option agreements 12 (an increase of 50%), inter-institutional agreements 2 (a decrease of 82%), and material transfer agreements 725 (a decrease of 9.8%).

OTM continues its community involvement through such organizations as the St. Louis Regional Chamber and Growth Association (RCGA), BioGenerator, Danforth Plant Sciences Center Alliance, Center of Research, Technology & Entrepreneurial Exchange (CORTEX), Coalition for Plant and Life Sciences, Nidus Center for Scientific Enterprise (NIDUS), Center for Emerging Technologies (CET), MO Bio Laboratories, Inc. (MOBio), Missouri Venture Forum, Midwest Research Universities Network and the Research Alliance of Missouri. Involvement with these various organizations extends the mission of the University to local, state and regional levels. In its relationships with these organizations, OTM works to build the economy and to develop channels for commercializing WU technologies. OTM staff members work continuously with the Business School's entrepreneurship program and the larger Kaufmann Foundation (e.g., iBridge) entrepreneurship undertaking. This year, OTM launched a technology transfer trainee program designed for advanced-degree WU students to acquire a hands-on experience in technology transfer. One (1) candidate has been through the program and hired by OTM, and another trainee is currently in the program.

After a two-year gap in funding, the University re-established the Bear Cub Fund grant program through the OTM. The fund supports innovative translational research not normally backed by federal grants. Any WU faculty member, post-doctoral fellow, graduate student or employee can apply. In the Spring of 2008, WU awarded four (4) Bear Cub Fund grants totaling $150,000 to

support innovative research projects that could be attractive for licensing by commercial entities or serve as the foundation for a start-up company.

The grants were awarded to: William A. Frazier, Ph.D., Professor of Biochemistry & Molecular Biophysics; Gerald Linette, M.D., Ph.D., Assistant Professor of Medicine; Daniel W. Moran, Ph.D., Assistant Professor of Biomedical Engineering; Burton Wice, Ph.D., Research Assistant Professor of Medicine; and Kenneth Polonsky, M.D., the Adolphus Busch Professor of Medicine and Head of the Department of Medicine.

Technology Highlights for Fiscal Year 2008

Brain-Computer Interface
Using electrocorticographic (ECoG) activity, Eric Leuthardt has been able to record much finer analysis of signals from the brain, subsequently using the brain signals to control the cursor on a computer screen or a controller for prosthetics. The system has promise for prosthetic control, epilepsy warning and control, as well as bisomatic control. Primary Investigator: Eric Leuthardt, Neurosurgery.

Low-Voltage Cardiac Defibrillation
By determining the exact positioning of the rotating wave that causes both ventricular and atrial fibrillation, a very low voltage can be applied to decouple the rotating wave and restore the heart to normal sinus rhythm. The first application will be in controlling atrial fibrillation and atrial flutter, with planned expansion into ventricular defibrillation. Primary Investigator: Igor Efimov, Biomedical Engineering.

Cardiac Imaging
By using new analysis and computation techniques, coupled with existing Magnetic Resonance Imaging (MRI) techniques, a clear picture of the expansion and contraction of the heart can be made. The resulting precise image can be used clinically by cardiologists and surgeons to determine the proper type of treatment. Primary Investigator: Michael Pasque, Surgery.

Anodized Pedicle Screws
By anodizing pedicle screws to a particular pattern, a controlled voltage can be applied in a directional way to promote bone growth and healing after spinal surgery. Primary Investigator: Eric Leuthardt, Neurosurgery.

Flame Aerosol Reactor (FLAR)
The use of this new reactor enables development of nanomaterials with new properties. In one example, lab tests of a new photovoltaic material made using the FLAR have shown 150% increase capacity over existing photovoltaic materials. Primary Investigator: Pratim Biswas, Civil Engineering.

Genetic Association of Candidate Genes with Nicotine Dependence, a Focus on rsl6969968, a Genetic Variant in the a5 Nicotinic Receptor (CHRNA5) with Nicotine Dependence (Smoking Addiction)
This invention relates to correlations between polymorphisms and addiction, as well as systems and kits for diagnosis, prognosis, treatment of addiction and methods of identifying addiction modulators. Primary Investigator: Laura Bierut, Psychiatry.

Dichromic Fluorescent Compounds
It has been discovered that structural asymmetry of chromic compounds results in the generation of dichromic emissions that have distinct lifetimes. Because the fluorescent lifetimes of the two peaks are distinct, the information content may be multiplexed. The dichromic fluorescent compounds may advantageously be utilized for several applications including imaging, diagnostics, to monitor biological events, and for detecting and monitoring molecular processes. Primary Investigator: Samuel Achilefu, Radiology.

Induction of Cell Death by the Type JIB Collagen Amino Propeptide
It has been discovered that a splice variant of the Type II procollagen amino propeptide can mediate cell death, inhibit angiogenesis, and inhibit cell migration. This invention includes compositions and methods for treating a cell, or population of cells, to induce cell death, inhibit angiogenesis, or inhibit cell migration. Further, this invention may be beneficial for the treatment of tumor cell migration and metastasis, detrimental angiogenesis, tumor formation and growth, osteoporosis, cartilage repair and other diseases where targeted cell death and inhibiting angiogenesis or migration may be advantageous. Primary Investigator: Linda Sandell, Orthopedic Surgery.

Sigma-2 Receptor Ligands as Chemosensitizers
A series of N-substituted 9-azabicyclo [3.3.1] nonan-3α-yl phenyl carbamate analogs are disclosed as well as methods of their preparation. Their affinities for sigma (σ1 and σ2) receptors are described. Two new compounds are shown to have a high affinity and selectivity for σ2 versus σ1 receptors. Some of these compounds have been shown to induce cell death and are effective for treatment of tumors. The compounds can be used as chemotherapeutics or chemosensitizers in the treatment of a wide variety of solid tumors. Primary Investigator: Robert Mach, Radiology.

Novel Treatment for Sepsis and Cancer
A large technology estate has been developed for treating sepsis and cancer using siRNA molecules to inhibit or activate certain apoptosis or anti-apoptosis genes. Several collaborations involving WU investigators are currently occurring to study different targets, molecule designs, and delivery techniques. Primary Investigator: Jonathan McDunn, Surgery.

Breast Cancer Prognostic Screen
Methods for deriving a minimal "intrinsic" gene set for making biological classifications of breast cancer and using "intrinsic" genes in a real-time qRT-PCR assay for breast cancer classification, prognosis and/or treatment. Primary Investigator: Matthew Ellis, Oncology/Endocrinology Surgery.

Novel Murine Norovirus (MNV)
This technology has continued to gain traction in mouse diagnostics and is currently being evaluated as a surrogate virus for testing commercial disinfectants. To date, two patents have been issued for detection of MNV antibody in a mouse and a virus culture system. A further set of claims for detection of MNV nucleic acid in mouse tissues is pending. Primary Investigator: Herbert Virgin, Immunobiology.

Nanoparticle Technologies for Novel Compounds, Linkers, and Processes
Several disclosures have been submitted to cover various embodiments of nanoparticle technology for imaging and therapeutic delivery. This technology estate may provide the basis for a platform system to detect and treat cancer. Primary Investigator: Samuel Wickline, Internal Medicine, Cardiovascular Division.

Limiting CD47 or Blocking Thrombospondin-1 Reverses the Detrimental Effects on Tissue Healing and Blood Flow
This technology has demonstrated that certain monoclonal antibodies and possibly other compounds allow for more effective wound healing and graft survival in animal models. This joint collaboration with the NIH is also ideally positioned for further translational studies to create and identify new therapeutic compounds. Primary Investigator: William Frazier, Biochemistry and Molecular Biophysics.

Golgicide A (GCA), a Novel Inhibitor of Intracellular Transport
GCA is a small molecule compound that was identified in a chemical screening. Surprisingly, there has been no mention of GCA compounds anywhere in the literature. This compound inhibits the transportation of shiga and related toxins into cells. Technology is currently being expanded to identify other compounds and other indications. Primary Investigator: David Haslam, Pediatrics.

Neimann Pick C Disease Marker
A novel marker to detect Neimann Pick C (NPC), a fatal neurodegenerative disease, has been discovered. This discovery demonstrates the first and only plasma biomarker that has been discovered for this orphan disease. Certain NPC organizations have already shown interest in this technology and have provided funding to further examine NPC. Primary Investigator: Daniel Ory, Internal Medicine - Cardiovascular Division.

Natriuretic Peptide-Mediated Imaging and/or Treatment of Atherosclerotic Plaque
This invention includes a functionalized peptide that preferentially binds to unstable plaque. Imaging of unstable plaque may identify areas of imminent plaque rupture so that corrective action can be taken before a catastrophic event occurs. Primary Investigator: Pamela Woodard, Radiology.

Phosphorylation of Beta-Catenin at Serine-191 and Serine-605 as a Biomarker for Active Wnt Signaling
Phosphorylation of beta-catenin on serine residues 191 and 605 controls nuclear localization of beta-catenin during canonical Wnt signaling. Canonical Wnt signaling through beta-catenin plays an important role in development and diseases, for instance in certain types of cancers and other diseases associated with cellular proliferation. Antibodies specifically recognizing these phosphorylation events have been generated and are being tested as an efficient method to identify cells undergoing active Wnt signaling, both in breast cancer cell lines and biopsies. Primary Investigator: Fanxin Long, Internal Medicine, Bone and Mineral Diseases.

Phospho-Specific Chemokine Antibodies for Multiple Sclerosis (MS) Diagnostics
The pathological expression and redistribution of CXCL12, a known chemokine, at the blood-brain barrier occurs during MS and correlates with the severity of disease. The investigators found that this aberrant localization of CXCL12 was associated with an increase in the levels of its activated receptor, CXCR4 phosphorylated on serine 339, as detected by an antibody specific for the activated form of the chemokine receptor. Given the frequency with which physicians test for MS and the need for refined diagnostics, detection of activated receptor levels could

provide a specific biomarker for diagnosing and/or monitoring the progression of MS. Primary Investigator: Robyn Klein, Internal Medicine, Infectious Diseases.

Method of Treating Pruritus

Itch, or pruritus, is an unpleasant sensation that causes the desire to scratch. Itch sensation includes both sensory and affective components, and can be induced by chemical, mechanical and psychological factors. While acute pruritus may serve as a protective mechanism, chronic pruritus represents a significant clinical problem resulting from renal insufficiency, cholestasis, Hodgkin's lymphoma, polycythemia vera, solid tumors, HIV, as well as several serious skin diseases. The present invention provides methods for treating pruritus by providing methods of substantially inhibiting the activation of a pruritus specific receptor on a pruritus specific neuron. Primary Investigator: Zhou-Feng Chen, Anesthesiology.

Bear Cub Fund

After a two-year gap in funding, the University re-established the Bear Cub Fund grant program through the Office of Technology Management (OTM). The fund supports innovative translational research not normally backed by federal grants. Any WU faculty member, post-doctoral fellow, graduate student or employee can apply. Approximately $200,000 in grant funds will be allocated to WU scientists each year in individual grants of $20,000 to $50,000 each.

In the Spring of 2008, WU awarded four Bear Cub Fund grants totaling $150,000 to support innovative research projects that could be attractive for licensing by commercial entities or serve as the foundation for a start-up company.

The grants were awarded to: William A. Frazier, Ph.D., Professor of Biochemistry & Molecular Biophysics; Gerald Linette, M.D., Ph.D., Assistant Professor of Medicine; Daniel W. Moran, Ph.D., Assistant Professor of Biomedical Engineering; Burton Wice, Ph.D., Research Assistant Professor of Medicine; and Kenneth Polonsky, M.D., the Adolphus Busch Professor of Medicine and Head of the Department of Medicine.

Dr. Frazier's project has the potential to treat wide-ranging medical problems, including severe burns, heart attacks and peripheral vascular disease, a complication of diabetes, by opening up blood vessels to increase blood flow. He will test monoclonal antibodies for their ability to improve vascularization and increase survival of skin grafts in animal models.

Dr. Linette's grant will fund work to make adoptive T cell immunotherapy a reality for patients with infectious diseases and cancer. This therapy involves harvesting T cells from the patient's immune system, expanding their number and then putting them back into the body, where they can be activated to recognize and destroy tumor cells or infectious agents. Linette's technology can rapidly expand and enrich the T cell population and will establish proof of concept using cytomegalovirus as a model antigen to manufacture T cells. This infection is common among patients who receive organ transplants.

Dr. Moran has developed a microelectrode that may help restore movement in patients paralyzed by spinal cord injuries and also suppress seizures in epileptics. Its novel design enables selective stimulation of small groups of nerve cells and the production of action potentials in one direction. Computer simulations have confirmed its utility, and Bear Cub funding will now enable the electrode to be fabricated, implanted in the sciatic nerves of rats, and evaluated.

The grant to Drs. Wice and Polonsky will support a potential treatment for Type 2 diabetes. This form typically develops later in life but is becoming more common among overweight children and teens. The researchers have developed a mouse model of type 2 diabetes and found they can restore the body's response to insulin by administering the hormone Xenin-25, alone or in combination with a peptide known as GIP. They now plan to evaluate the therapy in patients.

More information about the Bear Cub grants can be found at http://otm.wustl.edu/bearcubfund/index.asp.

Invention Disclosures

Under the University's Intellectual Property (IP) Policy, creators are required to disclose to OTM inventions made using significant University resources. OTM evaluates each new "disclosure" to determine:

- accuracy of the disclosure
- potential commercial value
- protection of the intellectual property
- the best mode for its commercialization
- if the University wishes to retain title to invention

During FY08, OTM received 98 new invention disclosures. Of these disclosures, 81% originated in the School of Medicine, 13% from the School of Engineering and Applied Science, and 6% from the School of Arts & Sciences. The Office handled 3% less disclosures than the prior year. The University filed 94 new U.S. patent applications.

	FY08	FY07
Arts & Sciences	6	6
Engineering	13	13
Medicine	79	81
Law School	0	1
Total	98	101

Table 1
Invention Disclosures by School – FY08 and FY07

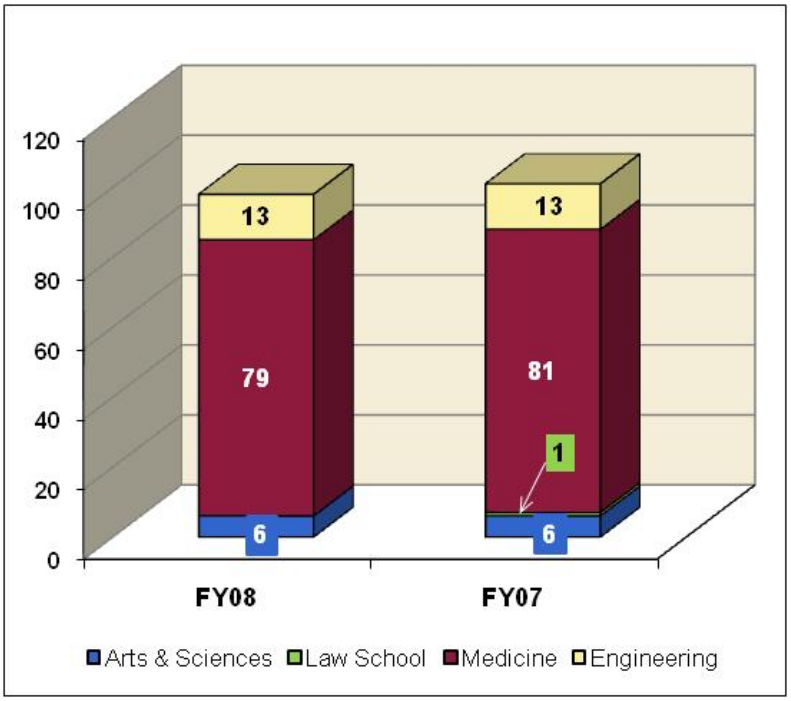


Figure 1
Invention Disclosures by School – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Disclosures by FY	FY08	FY07
Total new disclosures for FY	98	101
Department	**FY08**	**FY07**
Arts & Sciences		
Biology	4	3
Chemistry	0	0
Earth & Planetary Sciences	0	1
Mathematics	1	0
Physics	0	2
Psychology	1	0
Arts & Sciences Total	**6**	**6**
School of Engineering		
Biomedical Engineering	9	2
Computer Science & Engineering	0	3
Electrical & Systems Engineering	0	1
Energy, Environmental & Chemical Engineering	0	5
Mechanical, Aerospace & Structural Engineering	4	2
Engineering Total	**13**	**13**
School of Medicine		
Anatomy & Neurobiology	0	0
Anesthesiology	4	3
Biochemistry & Molecular Biophysics	4	3
Cell Biology & Physiology	0	1
Developmental Biology	5	7
Genetics	2	2
Internal Medicine	24	22
Molecular Microbiology	0	3
Neurology	5	6
Neurological Surgery	1	2
Obstetrics & Gynecology	0	0
Ophthalmology & Visual Sciences	3	4
Orthopedic Surgery	1	2
Otolaryngology	1	1
Pathology & Immunology	7	3
Pediatrics	2	1
Physical Therapy	0	2
Psychiatry	3	2
Radiation Oncology	2	0
Radiology	10	5
Siteman Cancer Center	0	0
Surgery	5	12
Medicine Total	**79**	**81**
School of Law		
Law	0	1
Law Total	**0**	**1**
Total	**98**	**101**

Table 2
Invention Disclosures by Department – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

U.S. Patent Applications

OTM filed a total of 94 U.S. provisional and non-provisional patent applications in FY08. Patent applications are filed on inventions that have potential commercial value, as well as social value. Frequently, the first step is to file for a provisional patent. This filing is not actually examined by the Patent Office, but rather serves to establish a filing date and "patent pending" status for a year. Provisional filings, because of their relative ease and speed, are particularly useful for managing the sometimes conflicting demands between publication and commercialization. At a later date, OTM will file for a non-provisional patent that will be examined by the patent office before it is granted. Patent protection strengthens the University's position with respect to potential licensees, particularly in a field such as pharmaceuticals where the investment to bring a product to market can be large. OTM filed 18 patents in foreign countries. In total, OTM invested $2.27M in WU patents.

	FY08	FY07
Arts & Sciences	3	3
Engineering	7	13
Medicine	84	59
Total	94	75

Table 3
U.S. Patent Applications by School – FY08 and FY07

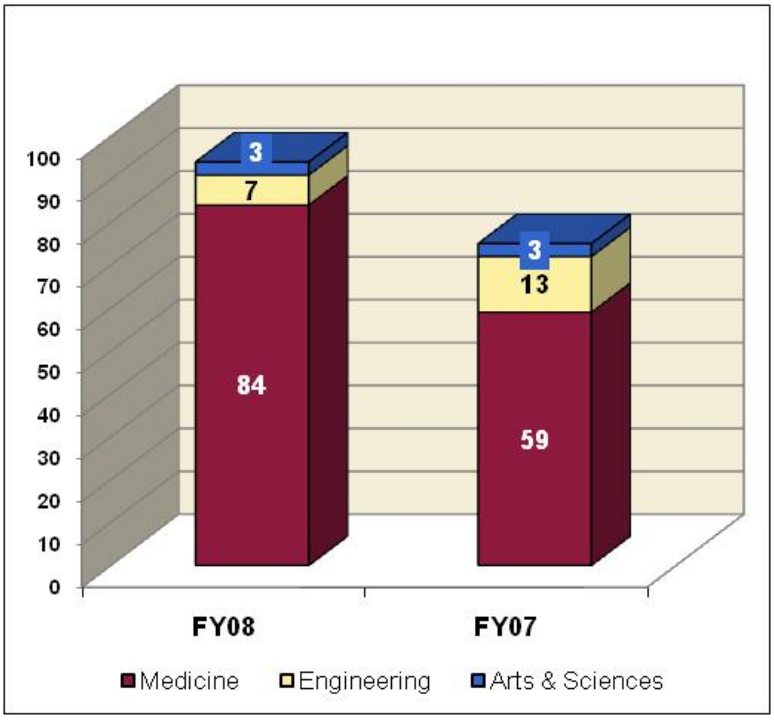


Figure 2
U.S. Patent Applications by School – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Patents by FY	FY08	FY07
Total US Patent Applications for FY	94	75
Department	**FY08**	**FY07**
Arts & Sciences		
Biology	3	3
Chemistry	0	0
Earth & Planetary Sciences	0	0
Mathematics	0	0
Physics	0	0
Psychology	0	0
Arts & Sciences Total	**3**	**3**
School of Engineering		
Biomedical Engineering	5	3
Computer Science & Engineering	2	4
Electrical & Systems Engineering	0	1
Energy, Environmental & Chemical Engineering	0	2
Mechanical, Aerospace & Structural Engineering	0	3
Engineering Total	**7**	**13**
School of Medicine		
Anatomy & Neurobiology	2	0
Anesthesiology	1	2
Biochemistry & Molecular Biophysics	6	6
Cell Biology & Physiology	2	0
Developmental Biology	9	1
Genetics	1	3
Internal Medicine	18	18
Molecular Microbiology	4	5
Neurology	8	2
Neurological Surgery	7	2
Obstetrics & Gynecology	0	0
Ophthalmology & Visual Sciences	3	1
Orthopedic Surgery	1	1
Otolaryngology	0	1
Pathology & Immunology	3	1
Pediatrics	5	0
Physical Therapy	0	1
Psychiatry	2	2
Radiation Oncology	0	0
Radiology	9	10
Siteman Cancer Center	0	0
Surgery	3	3
Medicine Total	**84**	**59**
Total	**94**	**75**

Table 4
U.S. Patent Applications by Department – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Licenses

Patented and unpatented inventions are transferred to industry through a variety of licensing arrangements. The rights to a license are defined by the allowed field of use and by the exclusivity of the license. Payment terms are also highly varied including one or a combination of license fees due on signing, maintenance fees, milestone payments, and earned royalties on sales. Defined here are major categories used in this report.

Exclusive:

- A fee-and royalty-bearing exclusive license grants a licensee the sole right to commercialize a technology (may include sublicensing rights).

Non-Exclusive:

- Fee- and royalty-bearing license: rights are granted to commercialize the technology; may be granted to multiple licensees.
- Paid-up license: a non-exclusive license granted in return for a one-time, up-front license fee without subsequent fees or royalties.
- No-fee license: rights are granted to a third-party (usually another non-profit educational institution) to use a technology (frequently computer software) that is generally licensed to others for a fee.

License Modifications:

- Amendment: an agreement modifying the terms of an existing license.
- Assignment: a reassignment of rights caused by a change in ownership of the license through merger or acquisition.

The majority of licenses granted by the University are to existing commercial companies located in the United States, with a smaller number to foreign entities. The University is also beginning to focus more on partnerships with Missouri and St. Louis companies and is actively supporting and encouraging the creation of new business ventures. Licensing technology to start-up companies can provide the best mode of commercialization for early-state platform technologies.

The University generated $17M in total technology transfer revenue. The University entered into a total of 42 revenue-generating license agreements during FY08. Of the new license agreements, 71% were non-exclusive. Open source software licenses, most involving gene sequencing and related topics, numbered 1,616.

	FY08	FY07
Arts & Sciences	0	0
Engineering	3	0
Medicine	38	45
Social Work	1	0
Total	**42**	**45**

Table 5
Revenue Generating License Agreements by School
FY08 and FY07

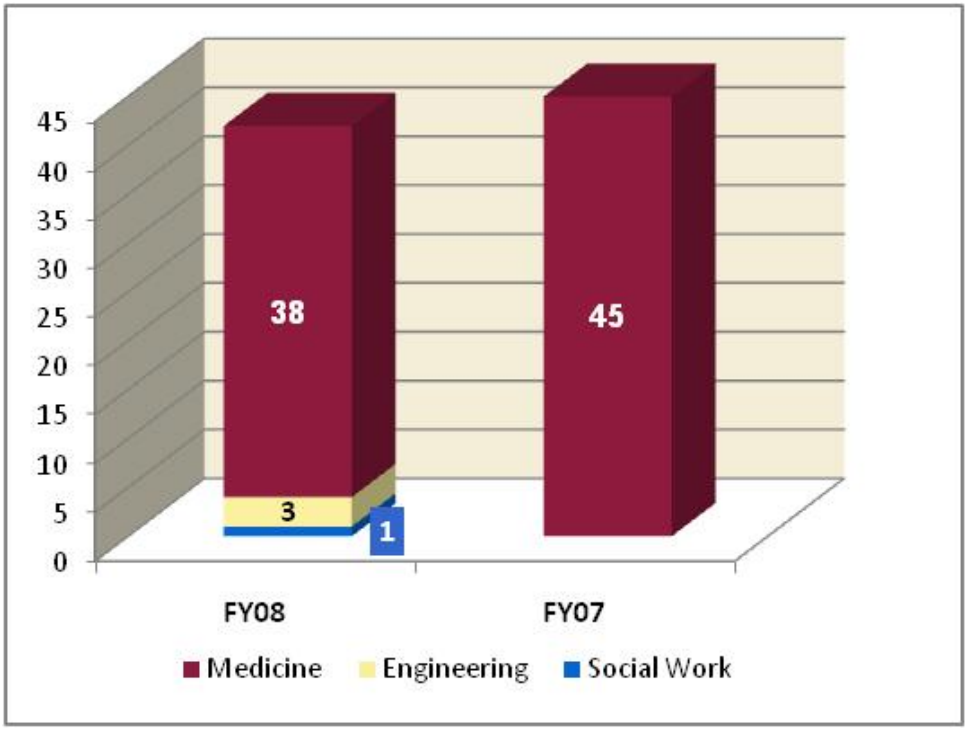


Figure 3
Revenue Generating License Agreements by School
FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Department	FY08	FY07
Total Licenses for FY	42	45
Department	**FY08**	**FY07**
Arts & Sciences		
Biology	0	0
Chemistry	0	0
Earth & Planetary Sciences	0	0
Mathematics	0	0
Physics	0	0
Psychology	0	0
Arts & Sciences Total	**0**	**0**
School of Engineering		
Biomedical Engineering	0	0
Computer Science & Engineering	2	0
Electrical & Systems Engineering	0	0
Energy, Environmental & Chemical Engineering	0	0
Mechanical, Aerospace & Structural Engineering	1	0
Engineering Total	**3**	**0**
School of Medicine		
Anatomy & Neurobiology	2	1
Anesthesiology	0	0
Biochemistry & Molecular Biophysics	0	1
Cell Biology & Physiology	0	1
Developmental Biology	0	4
Genetics	0	1
Internal Medicine	6	8
Molecular Microbiology	0	0
Neurology	5	3
Neurological Surgery	0	0
Obstetrics & Gynecology	0	0
Ophthalmology & Visual Sciences	0	0
Orthopedic Surgery	1	0
Otolaryngology	6	2
Pathology & Immunology	15	17
Pediatrics	0	2
Psychiatry	1	2
Radiation Oncology	0	0
Radiology	1	0
Siteman Cancer Center	0	0
Surgery	1	3
Medicine Total	**38**	**45**
School of Law		
Law	1	0
Law Total	**1**	**0**
Subtotal	**42**	**45**
No Fee Licenses	0	0
Total Licenses	**42**	**45**

Table 6
Licenses by Department – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Department	Exclusive	Non-Exclusive
Arts & Sciences		
Biology	0	0
Chemistry	0	0
Earth & Planetary Sciences	0	0
Mathematics	0	0
Physics	0	0
Psychology	0	0
Arts & Sciences Total	**0**	**0**
Engineering & Applied Science		
Biomedical Engineering	0	0
Computer Science & Engineering	0	1
Electrical & Systems Engineering	0	0
Energy, Environmental & Chemical Engineering	0	0
Mechanical, Aerospace & Structural Engineering	1	0
Engineering & Applied Science Total	**1**	**1**
Medicine		
Anatomy & Neurobiology	0	2
Anesthesiology	0	0
Biochemistry & Molecular Biophysics	0	0
Cell Biology & Physiology	0	0
Developmental Biology	0	0
Genetics	0	0
Internal Medicine	3	5
Molecular Microbiology	0	0
Neurology	1	3
Neurological Surgery	0	0
Obstetrics & Gynecology	0	0
Ophthalmology & Visual Sciences	0	0
Orthopedic Surgery	1	0
Otolaryngology	0	6
Pathology & Immunology	2	12
Pediatrics	0	0
Psychiatry	2	0
Radiation Oncology	0	0
Radiology	1	0
Siteman Cancer Center	0	0
Surgery	0	1
Medicine Total	**10**	**29**
School of Law		
Law	1	0
Law Total	**1**	**0**
Total Exclusive and Non-Exclusive	**12**	**30**
Total		***42***

Table 7
Licenses by Department – Exclusive and Non-Exclusive – FY08

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

License Revenue

Under most licenses, OTM receives gross licensing income in the form of license fees, maintenance fees, milestone payments, and earned royalties against product sales. In addition, the University collects patent expense reimbursement from some licensees, particularly when the license is exclusive.

Legal expenses represent the amounts paid out to external law firms engaged in the preparation and prosecution of patents. Other expenses may include specific out-of-pocket costs incurred as part of technology licensing (e.g., consulting fees, marketing fees) or non-patent legal costs.

The University received $17M in total technology transfer revenue. Technology transfer revenues generated by each School were as follows:

	FY08	FY07
Arts & Sciences	$1,762,509	$312,773
Engineering	1,291,326	1,054,607
Law	8,568	0
Medicine	13,952,595	10,642,473
Social Work	0	0
TOTALS	$17,014,998	$12,009,853

Table 8
License Revenue by School – FY08 and FY07

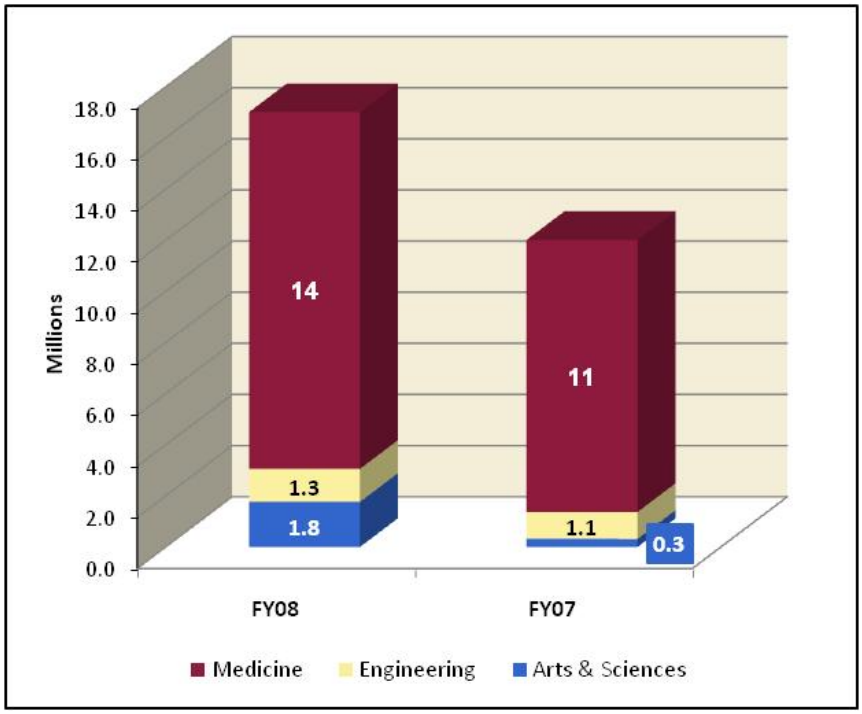


Figure 4
License Revenue by School – FY08 and FY07

	Fiscal Year 08				
	Arts & Sciences	Engineering	Law	Medicine	Total
Income					
Licensing Income	$1,713,849	$1,043,357	$8,568	$12,950,044	$15,715,818
Expense Reimbursements OTM Current FY (External)	38,545	241,061	---	658,019	937,625
Expense Reimbursements OTM Prior FY (External)	10,115	6,908	---	344,532	361,554
Expense Reimbursements for Dept. (External)	0	0	---	0	0
Expense Credits	0	0	---	0	0
Other	0	0	---	0	0
Subtotal Income	**1,762,509**	**1,291,326**	**8,568**	**13,952,595**	**17,014,998**
Expenses					
Legal	54,729	376,362	---	1,840,696	2,271,787
Other	32	36	---	689	758
Subtotal Expenses	**54,761**	**376,397**	**0**	**1,841,386**	**2,272,545**
Distributions (1)					
Distribution to Inventors	570,678	482,373	2,999	6,120,975	7,177,024
Distribution to Schools (License Income)	725,560	489,617	3,427	5,569,242	6,787,846
Distribution to Schools (Other Income)	0	0	---	0	0
Distribution to Third Parties	330,957	41,636	---	386,478	759,070
Expense Payback to 3rd Parties from License Revenue	0	0	---	0	0
Expense Payback to Dept. from License Revenue	0	0	---	0	0
Expense Reimbursement for Dept. (External)	0	0	---	0	0
Carry Forward - - Expenses Held/Paid in Advance	0	0	---	0	0
CFU Legal expense recovery	0	0	---	0	0
Transfer to reserve	0	0	---	0	0
Patent expense held in advance	0	0	---	0	0
Patent expense adjustment	0	0	---	0	0
Subtotal Distributions	**1,627,194**	**1,013,626**	**6,426**	**12,076,695**	**14,723,940**
Contributions to OTM Operations	**$80,554**	**($98,697)**	**$2,142**	**$34,514**	**$18,513**

Table 9
Technology Transfer Activity by School – FY08

	FY08	FY07
Income		
Licensing Income	15,715,818	10,388,459
Expense reimbursements OTM Current FY (External)	937,625	1,401,739
Expense reimbursements OTM Prior FY (External)	361,554	219,655
Expense reimbursements for Dept. (External)	0	0
Expense Credits	0	0
Other	0	0
Subtotal Income	**17,014,998**	**12,009,853**
Expenses		
Legal	2,271,787	2,113,917
Other	758	331
Subtotal Expenses	**2,272,545**	**2,114,248**
Distributions		
Distribution to inventors	7,177,024	4,658,904
Distribution to schools (License Income)	6,787,846	4,172,039
Distribution to schools (Other Income)	0	0
Distribution to third parties	759,070	664,687
Expense Payback to Third Parties from License Revenue.	0	0
Expense Payback to Dept. from License Revenue	0	0
Expense Reimbursements for Dept. (External)	0	0
Carry forward - - Expenses Held/Paid in Advance	0	0
CFU legal expense recovery	0	0
Transfer to reserve	0	0
Patent Expenses held in advance	0	0
Patent expense adjustment	0	0
Subtotal Distributions	**14,723,940**	**9,495,631**
Contribution to OTM operations	**18,513**	**399,974**

Table 10
Technology Transfer Activity – FY08 and FY07

Industry-Sponsored Research Agreements by School

OTM handles all sponsored research agreements (SRAs) where the sponsor is a for-profit entity and the research does not involve human subjects (i.e., not federal funding nor a clinical trial). "Research" is defined primarily as laboratory activity that may result in the discovery of new intellectual property.

The FY08 negotiated revenue for SRAs was over $7.0M.

	FY08	FY07
Arts & Sciences	5	5
Engineering	15	4
Medicine	52	51
Total	**72**	**60**

Table 11
Number of Industry SRAs by School – FY08 and FY07

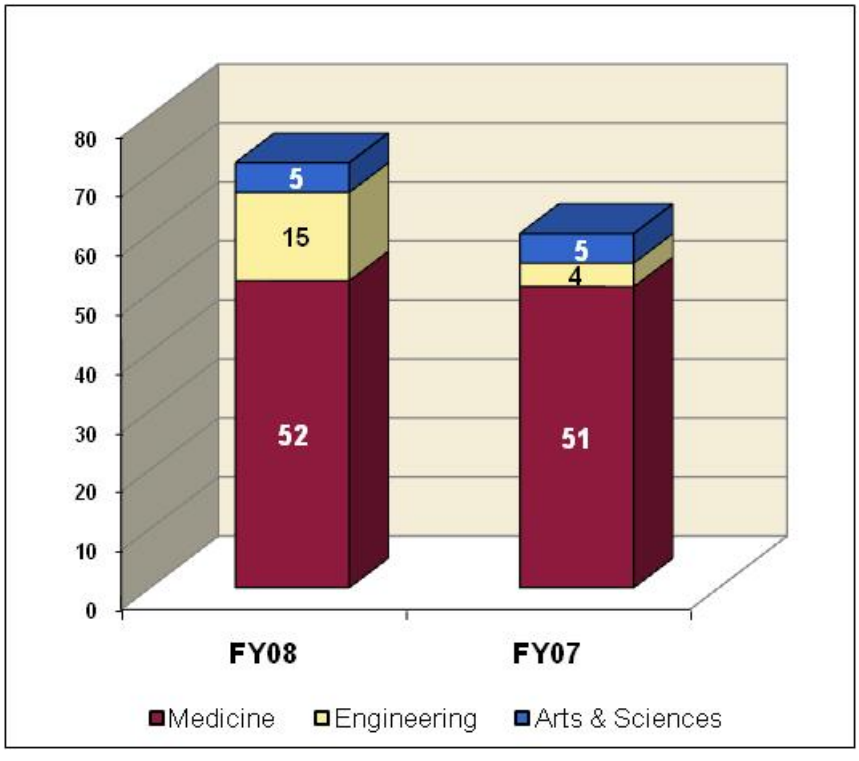


Figure 5
Number of Industry SRAs by School – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

	FY08	FY07
Total Industry-Sponsored Research Agreements	**72**	**60**
Department/School	**FY08**	**FY07**
Arts & Sciences		
Biology	2	2
Chemistry	3	3
Earth & Planetary Sciences	0	0
Physics	0	0
Psychology	0	0
Arts & Sciences Total	**5**	**5**
Engineering & Applied Science		
Biomedical Engineering	0	0
Computer Science & Engineering	0	2
Electrical & Systems Engineering	1	1
Energy, Environmental & Chemical Engineering	10	1
Mechanical, Aerospace & Structural Engineering	4	0
Engineering & Applied Science Total	**15**	**4**
Medicine		
Anatomy & Neurobiology	0	0
Anesthesiology	2	2
Biochemistry & Molecular Biophysics	0	0
Cell Biology & Physiology	0	0
Developmental Biology	0	4
Genetics	2	1
Internal Medicine	14	6
Molecular Microbiology	1	1
Neurology	6	3
Neurological Surgery	0	0
Obstetrics & Gynecology	0	0
Ophthalmology & Visual Sciences	0	0
Orthopedic Surgery	4	2
Otolaryngology	3	2
Pathology & Immunology	1	7
Pediatrics	2	6
Physical Therapy	0	0
Psychiatry	1	2
Radiation Oncology	1	2
Radiology	8	9
Siteman Cancer Center	0	0
Surgery	7	4
Medicine Total	**52**	**51**
Social Work		
Social Work	0	0
Law Total	**0**	**0**
Total Industry-Sponsored Research Agreements	**72**	**60**

Table 12
Industry-Sponsored Research Agreements by Department – FY08 and FY07

Note: In 2006, OTM installed a new technology-based system to more accurately capture and report OTM non-revenue data. FY07 numbers in this report were created retroactively using that system and may not match data published in prior annual reports. See Appendix 1.

Other Agreements by Department

OTM processes service contracts-limited laboratory research activities frequently involving the testing of another party's proprietary material or device. OTM manages confidentiality agreements, evaluation and option, interinstitutional, service agreements and other various contracts involving for-profit companies. These agreements play a key role in laying the foundation for better industry relationships and potential future license collaboration becomes a more significant element in advanced research.

	Confidentiality		Evaluation & Option		Inter-institutional		Amendments		Sublicense	
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
Total Other Agreements for FY	**84**	**109**	**12**	**8**	**2**	**11**	**52**	**31**	**4**	**4**
Department	**FY08**	**FY07**	**FY08**	**FY07**	**FY08**	**FY07**	**FY08**	**FY07**	**FY08**	**FY07**
Arts & Sciences										
Biology	2	5	0	0	0	0	1	0	0	0
Chemistry	1	4	0	0	0	1	0	0	0	0
Earth & Planetary Sciences	0	0	0	0	0	0	0	0	0	0
Mathematics	0	0	0	0	0	0	0	0	0	0
Physics	0	1	0	0	0	0	0	0	0	0
Psychology	0	0	0	0	0	0	0	0	0	0
Arts & Sciences Total	3	10	0	0	0	1	1	0	0	0
Engineering & Applied Science										
Biomedical Engineering	3	7	2	1	0	0	1	0	0	0
Computer Science & Engineering	0	2	0	0	0	0	1	2	0	0
Electrical & Systems Engineering	0	0	0	0	0	0	0	0	0	0
Energy, Environmental & Chemical Engineering	5	9	0	0	0	0	0	0	0	0
Mechanical, Aerospace & Structural Engineering	2	0	0	0	0	0	0	0	0	0
Engineering & Applied Science Total	10	18	2	1	0	0	2	2	0	0
Medicine										
Anatomy & Neurobiology	0	4	0	0	0	0	0	0	0	0
Anesthesiology	7	4	0	1	0	0	0	0	0	0
Biochemistry & Molecular Biophysics	1	2	0	1	1	0	1	0	0	0
Cell Biology & Physiology	3	3	0	0	0	0	1	0	0	0
Developmental Biology	7	2	0	1	0	0	1	0	0	0
Genetics	2	3	0	0	0	1	1	4	0	0
Internal Medicine	21	26	2	3	0	3	14	2	1	0
Molecular Microbiology	0	0	0	0	0	0	1	3	3	3
Neurology	5	13	1	1	0	0	5	3	0	0
Neurological Surgery	3	1	0	0	0	1	0	0	0	0
Obstetrics & Gynecology	0	0	0	0	0	0	0	0	0	0
Ophthalmology & Visual Sciences	0	3	0	0	0	0	0	0	0	0
Orthopedic Surgery	0	3	0	0	0	0	1	0	0	0
Otolaryngology	1	2	0	0	0	0	0	1	0	0
Pathology & Immunology	3	4	7	0	0	2	8	3	0	0
Pediatrics	1	2	0	0	1	1	2	3	0	0
Physical Therapy	1	0	0	0	0	0	0	0	0	0
Psychiatry	3	2	0	0	0	0	4	4	0	1
Radiation Oncology	1	1	0	0	0	0	0	1	0	0
Radiology	7	6	0	0	0	2	10	4	0	0
Siteman Cancer Center	0	0	0	0	0	0	0	0	0	0
Surgery	5	0	0	0	0	0	0	1	0	0
Medicine Total	71	81	10	7	2	10	49	29	4	4
Social Work	0	0	0	0	0	0	0	0	0	0
Social Work Total	0	0	0	0	0	0	0	0	0	0
Total	**84**	**109**	**12**	**8**	**2**	**11**	**52**	**31**	**4**	**4**

Table 13
Other Agreements by Department – FY08 and FY07

Material Transfer Agreements by Department

When transferring proprietary materials in and out of the University to support research activities, the University requires execution of material transfer agreements (MTA). Incoming MTAs are no-fee agreements used when the material is received from another non-profit institution or from a commercial third party. Many of these materials are highly valuable research tools deemed essential to our research activities. Outgoing MTAs are used to distribute our materials (patented and unpatented) without charge to other non-profit institutions so that researchers can use them in their research activities. The nature of materials agreements involving transfer to for-profit companies depends on whether the use of the material will be restricted to internal research purposes.

	FY08		FY07	
Total Material Transfer Agreements for FY	725		804	
Department	**Academic**	**Industry**	**Academic**	**Industry**
Arts & Sciences				
Biology	27	2	47	0
Chemistry	1	1	2	0
Earth & Planetary Sciences	0	0	0	0
Mathematics	0	0	0	0
Physics	0	0	0	0
Psychology	0	0	0	0
Arts & Sciences Total	**28**	**3**	**49**	**0**
Engineering & Applied Science				
Biomedical Engineering	1	0	2	0
Computer Science & Engineering	0	0	0	0
Electrical & Systems Engineering	0	0	0	0
Energy, Environmental & Chemical Engineering	0	0	0	0
Mechanical, Aerospace & Structural Engineering	0	0	0	0
Engineering & Applied Science Total	**1**	**0**	**2**	**0**
Medicine				
Anatomy & Neurobiology	10	1	25	0
Anesthesiology	15	2	11	0
Biochemistry & Molecular Biophysics	11	0	4	0
Cell Biology & Physiology	34	0	25	3
Developmental Biology	79	6	107	0
Genetics	8	1	9	0
Internal Medicine	164	23	165	16
Molecular Microbiology	52	1	45	5
Neurology	28	6	34	8
Neurological Surgery	2	0	2	0
Obstetrics & Gynecology	3	0	3	0
Ophthalmology & Visual Sciences	14	0	25	3
Orthopedic Surgery	6	0	3	3
Otolaryngology	6	0	8	0
Pathology & Immunology	110	2	123	2
Pediatrics	35	0	41	4
Physical Therapy	0	0	0	0
Psychiatry	4	1	6	1
Radiation Oncology	8	0	7	1
Radiology	31	3	33	4
Siteman Cancer Center	0	0	0	0
Surgery	25	2	22	5
Medicine Total	**645**	**48**	**698**	**55**
Total	**674**	**51**	**749**	**55**

Table 14
Material Transfer Agreements by Department – FY08 and FY07

Social and Financial Impact

OTM extends the University's reach via its involvement with the Regional Chamber and Growth Association, the Danforth Plant Sciences Center Alliance, the Missouri Venture Forum, the Midwest Research Universities Network, and many other organizations. Together, they develop channels for making WU technologies widely available and simultaneously build the economy.

	FY08	FY07
Start-up Companies Formed	4	5
Invention Disclosures Received	98	101
Patents Filed	94	75
Licenses Executed	42	45
Industry-Sponsored Research Agreements	72	60

Table 15
Summary of Economic Impact – FY08 and FY07

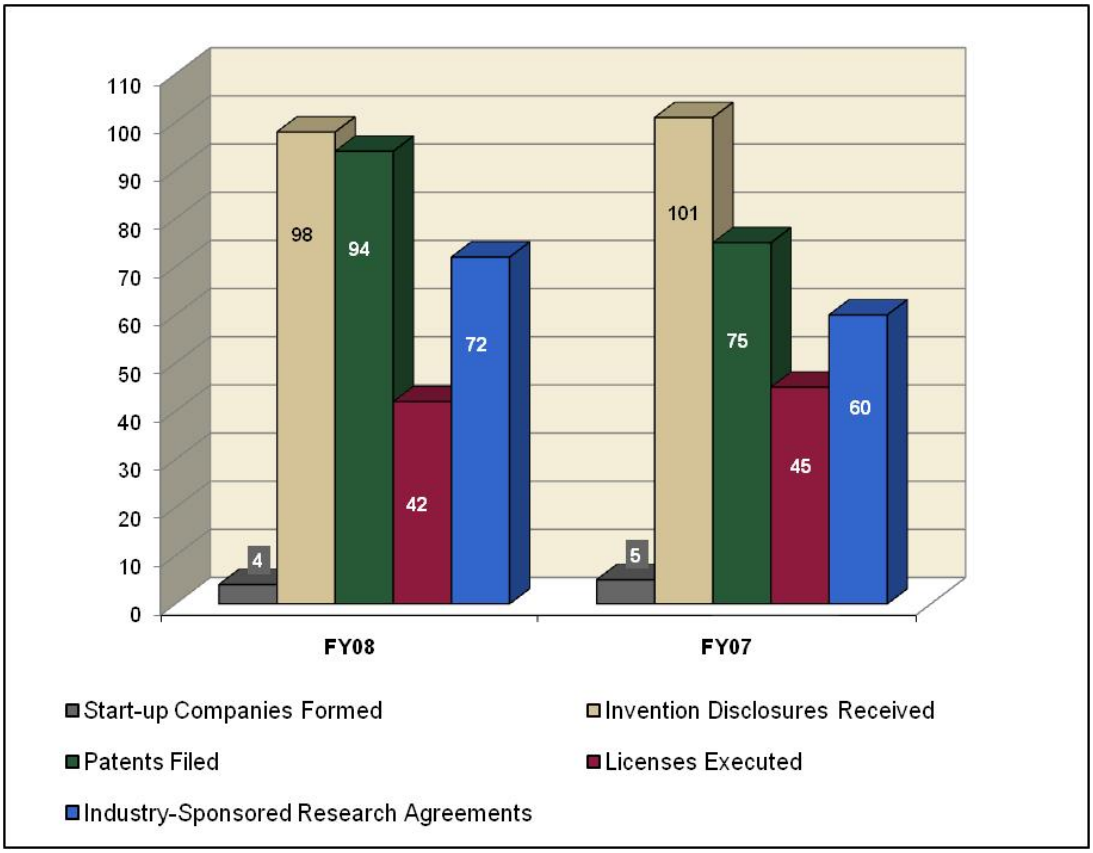


Figure 6
Summary of Economic Impact – FY08 and FY07

Center for Applied Research Sciences
Executive Summary

The industry sponsored trials in this report are performed by numerous faculty throughout the School of Medicine. There are also a number of centers dedicated to supporting clinical trials across the School of Medicine. These centers are highlighted below.

Center for Applied Research Sciences

The Center for Applied Research Sciences (CARS), established in September 2007, combines the Center for Clinical Studies (CCS), the Adult General Clinical Research Center (GCRC) (now called the Intensive Research Unit), and the Pediatric GCRC (now called the Pediatric Research Unit) to enhance services and efficiency. The establishment of CARS will improve access to specialized clinical research units that contain state-of-the-art resources and where studies can be performed safely, ethically and efficiently across a spectrum of study populations, research designs and physical sites. The CARS is responsible for negotiating all industry-sponsored clinical trial contracts performed at Washington University, Barnes-Jewish Hospital and St. Louis Children's Hospital along with providing a full spectrum of services for planning and conducting clinical trials. The coordinated research efforts of the CARS are conducted in three areas: the Clinical Trials Unit, the Intensive Research Unit, and the Pediatric Research Unit.

The Clinical Trials Unit is 5,400 square feet of outpatient research space located on the 11th floor of the Center for Advanced Medicine Building. This fully staffed and dedicated clinical trial space has six patient exam rooms, phlebotomy room, consultation room, 2 long-term lounges for extended visits, portable ECG machine, IV infusion pumps, laboratory specimen processing and packaging area.

The Intensive Research Unit is located on the 4th and 5th floors of Barnard Hospital. The 4th floor is staffed 24 hours a day Monday through Friday and consists of 12 beds (6 semiprivate rooms). The 5th floor houses the metabolic research kitchen and Bionutrition Services along with 3 beds and 6 reclining chairs.

The Pediatric Research Unit is located on the 11th floor of St. Louis Children's Hospital. This staffed unit consists of 2 private exam rooms, 2 pulmonary exam rooms, phlebotomy area and lab, and a large treatment/procedure room that can accommodate 3-4 patients.

Siteman Cancer Center

The Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine in St. Louis is an international leader in cancer treatment, research, prevention, education and community outreach. It is the only cancer center in Missouri and within a 240-mile radius of St. Louis to hold the prestigious Comprehensive Cancer Center designation from the National Cancer Institute. The Siteman Cancer Center offers many different types of clinical trials. At any given time, Siteman has more than 350 clinical

studies, including many collaborative efforts with other leading cancer centers throughout the country.

There are different types of clinical trials performed at Siteman. Therapeutic trials involve some type of treatment, such as a new drug, combination of new and/or existing drugs or a new combination of therapies (for example, changing the schedule of the chemotherapy and radiation therapy). They are aimed at patients who have already been diagnosed with cancer. Other trials are designed to prevent cancer in healthy people or control cancer in people who have had curative treatment.

Recruitment Enhancement Core (REC)

In order to improve patient accrual in clinical trials, CARS has instituted a program called Recruitment Enhancement Core (REC). The goal of the REC is to assist investigators to recruit potential participants while ensuring compliance with all relevant regulations, including informed consent, confidentiality, privacy of health information, and recruitment of women and underrepresented minorities. The REC provides investigators with pre-qualified, pre-screened and consenting research participants. The service increases public awareness and knowledge concerning medical research needs and opportunities, and the increasing need for minority participation. This education of the community is done in a variety of ways, including radio and print advertising as well as targeted health fair promotion. This paradigm shift has been achieved by utilizing a pre-existing WU medical center resource called Volunteer for Health (VFH). The Washington University VFH recruitment program was established in September 1998 and assists investigators in recruitment of study participants. This program includes a HIPAA compliant database with registries of potential subjects in a variety of therapeutic areas, as well as assistance with on-campus and/or media advertising. Currently, the database contains more than 25,000 interested, consenting volunteers. In its nearly eight years of operation, VFH has recruited participants for 63 investigators conducting 401 studies and provided more than 51,000 referrals to studies.

AIDS Clinical Trials Unit (ACTU)

The Washington University AIDS Clinical Trials Unit (ACTU) was established in 1987 to conduct clinical research and participate in clinical trials for persons with HIV-associated disease. Since 1987, the Washington University ACTU has been a highly productive participant in the AIDS Clinical Trials Group funded by the National Institute of Allergy and Infectious Diseases. It conducts clinical research trials of potential treatments for HIV and its complications. Studies of anti-retroviral agents and immunomodulators have been conducted in patients with asymptomatic HIV disease, symptomatic infection and AIDS. In addition, the unit has participated in collaborative trials investigating the treatment and prevention of most of the opportunistic infections associated with AIDS. Unit oncologists perform studies in AIDS-related malignancies. The ACTU has a neurology clinical core to participate in specific neurologic protocols and to perform more detailed neurologic sub-studies of patients actively enrolled in other ACTU protocols. In addition, a newly established metabolic clinical core has been established to perform more detailed metabolic sub-studies of patients with HIV disease as these become a greater problem in infected

individuals. The unit has two clinics: the main unit at the Washington University Medical Center and a second at St. Louis ConnectCare. The latter, located at the only municipally supported public clinic in St. Louis, was specifically developed to increase access to clinical trials for minorities, drug abusers and other individuals underrepresented in clinical research. Since 1988, the ACTU has screened approximately 4,200 HIV-infected individuals for possible participation in clinical trials. As of December 1, 2006, 1,800 volunteers have participated in studies offered at our site.

Patient Oriented Research Unit (Pediatrics)

The Patient Oriented Research Unit (PORU) has dedicated space on the 11th floor of the McDonnell Pediatric Research Building (MPRB) and serves as an academic base for the interaction and collaboration of clinical investigators within the Department of Pediatrics. Administrative members of the PORU assist members of the Department with submission of human studies protocols to the Internal Review Board (IRB) and with preparation of clinical research grants and contracts. PORU investigators are studying a variety of clinical topics, including diabetes, asthma, sickle cell disease, hypertension, cancer predisposition, organ transplantation, smoking cessation and many others. Beyond physicians, participants in these studies include psychologists, epidemiologists, and biostatisticians.

Industry Sponsored Clinical Trials – FY06-FY08

The number of Industry Sponsored Clinical Trials performed at Washington University remained fairly constant over the last three fiscal years yet the revenue received from the trials has increased. Over the three year period, the number of clinical trials performed at the institution has slightly decreased from 1,370 trials in fiscal year 2006 to 1,360 trials in fiscal year 2008 (1%). During that same time, the cash receipts from those trials have increased by 4% from $23.1 million in 2006 to $24.1 million in 2008. For a break-down of clinical trials by department of the School of Medicine please refer to Table 1.

Of the total trials performed at the School of Medicine in 2008, 717 out of 1,360 or 53% were performed in the Department of Internal Medicine. In dollar terms, this represents 44% of the total clinical trial dollars for fiscal year 2008. For a break-down of clinical trials by Division of the School of Medicine's Department of Internal Medicine, please refer to Table 2. Also, during the period fiscal years 2006 to 2008 the number of new clinical trial contracts has increased by 1.4% as is shown in Table 3.

Department	FY 2008 #'s	FY 2008 $	FY 2007 #'s	FY 2007 $	FY 2006 #'s	FY 2006 $	% Change FY06 to FY08 #'s	% Change FY06 to FY08 $
Internal Medicine	717	$10,679,081	683	$11,746,362	691	$12,559,967	4%	-15%
Neurology	128	2,787,969	110	2,484,777	110	2,204,449	16%	26%
Surgery	139	1,908,198	132	1,968,265	135	1,709,189	3%	12%
Radiology	71	1,517,708	63	1,889,619	83	1,012,135	-14%	50%
Psychiatry	32	1,057,192	35	1,254,825	31	1,412,699	3%	-25%
Pediatrics	88	918,258	101	917,159	94	892,206	-6%	3%
Developmental Biology	5	890,192	0	0	0	0	100%	100%
Orthopedic Surgery	21	843,870	22	689,710	25	878,324	-16%	-4%
Radiation Oncology	9	757,416	9	411,826	11	452,998	-18%	67%
Siteman Cancer Center	15	708,225	13	572,209	9	172,805	67%	310%
Pathology & Immunology	38	664,041	46	620,793	61	569,369	-38%	17%
Obstetrics & Gynecology	20	568,178	29	675,200	34	484,147	-41%	17%
Ophthalmology & Visual Sciences	13	214,336	13	540,730	8	15,109	63%	1319%
Otolaryngology	14	155,596	8	157,658	10	85,896	40%	81%
Molecular Microbiology	3	108,260	2	7,535	4	0	-25%	100%
Neurological Surgery	10	102,418	12	220,520	11	170,895	-9%	-40%
Anesthesiology	15	83,367	14	224,498	24	370,796	-38%	-78%
Emergency Medicine	15	73,972	16	22,875	17	110,837	-12%	-33%
Occupational Therapy	3	28,387	1	2,599	2	8,968	50%	217%
Biochemistry & Molecular Biophysics	2	0	2	0	1	0	100%	0%
Biostatistics	1	0	0	0	0	0	100%	0%
Health Behavior Research	1	0	0	0	0	0	100%	0%
Molecular Biology & Pharmacology	0	0	5	32,375	3	18,750	-100%	-100%
Div of Comparative Medicine	0	0	1	0	2	(7,151)	-100%	-100%
Health Administration	0	0	1	0	0	0	0%	0%
Genetics	0	0	0	0	4	0	-100%	0%
Total	**1,360**	**$24,066,664**	**1,318**	**$24,439,532**	**1,370**	**$23,122,386**	-1%	4%

Table 1
Industry Sponsored Clinical Trials by Department of the School of Medicine
FY08, FY07, and FY06

Notes:

1. The majority of industry sponsored clinical trials for the Siteman Cancer Center are accounted for in other departments.

2. The dollar totals contained in this chart are based on cash receipts from industry sponsors.

Divisions of Internal Medicine	FY 2008		FY 2007		FY 2006		% Change FY06 to FY08	
	#'s	$	#'s	$	#'s	$	#'s	$
Medical Oncology	177	$2,528,834	189	$2,693,822	183	$3,132,872	-3%	-19%
Pulmonary	57	1,502,925	56	1,207,936	50	873,866	14%	72%
Center for Human Nutrition	19	1,210,184	13	666,952	15	398,593	27%	204%
Cardiology	97	1,175,680	104	1,288,036	107	1,067,968	-9%	10%
Bone Marrow Transplant	34	902,021	25	730,254	12	157,607	183%	472%
Lipid Research	37	597,851	18	930,797	17	3,175,321	118%	-81%
Renal	38	525,103	31	594,400	40	576,758	-5%	-9%
Endocrine / Metabolism	66	511,958	62	707,511	66	675,025	0%	-24%
Gastroenterology	46	291,582	42	364,920	41	642,198	12%	-55%
Infectious Diseases	17	291,179	17	240,450	14	182,577	21%	59%
Rheumatology	18	211,971	18	246,372	14	181,735	29%	17%
Chrom Kidney Center	55	202,241	30	404,510	30	601,943	83%	-66%
Dermatology	8	161,013	24	501,081	41	382,873	-80%	-58%
AIDS Clinical Trial Unit	16	166,865	17	178,336	32	119,857	-50%	39%
Geriatrics / Gerontology	3	147,022	4	416,232	3	25,658	0%	473%
Bone & Mineral Diseases	11	140,171	14	305,216	16	136,020	-31%	3%
Hematology	11	61,927	12	223,229	5	159,208	120%	-61%
Immunology	5	50,555	5	36,308	4	69,886	25%	-28%
General Medical Sciences	1	0	1	10,000	0	0	100%	0%
Applied Physiology	1	0	1	0	1	0	0%	0%
Total	**717**	**$10,679,081**	**683**	**$11,746,362**	**691**	**$12,559,967**	**4%**	**-15%**

Table 2
Industry Sponsored Clinical Trials by Division of the Department of Internal Medicine
FY08, FY07, and FY06

Note: The dollar totals contained in this chart are based on cash receipts from industry sponsors.

	Fiscal Year			% Change FY06 to FY08
	FY08	FY07	FY06	
Clinical Studies	279	252	313	-11%
Confidentiality Agreements	139	131	114	22%
Amendments (all types)	233	230	226	3%
Other	49	32	37	32%
TOTAL	**700**	**645**	**690**	**1%**

Table 3
New Contracts Completed FY08, FY07 and FY06

Sponsored Research Expense
Executive Summary

This report presents an overview of expenditure activity for sponsored research projects at Washington University (WU) during the fiscal year of 2008 (FY08). The expense dollars reported are for all transactions that occurred on or between July 1, 2007 and June 30, 2008.

Data Sources

The data presented in this report was obtained from WU's Financial Information System (FIS) and it reflects the expenditure activity incurred during the performance of sponsored projects. Expenses associated with projects supported by sales and service agreements and clinical trials are excluded from this report.

Expenditure Activity

WU's total research expenditures for FY08 amounted to $525.7 million, a 1% decrease from FY07. This modest percentage decrease is the net effect of reductions in federal expenditures and increases in private expenditures.

The University continued to maintain a strong position in sponsored research during FY08. Detailed schedules regarding this activity have been compiled into Tables 1-12 in this section. Note below definitions and descriptions of the key expenditure categories.

During FY08, the University implemented a more detailed accrued expenditure method for the financial statements. Accordingly, the previously reported FY07 figures in this report were adjusted to reflect this method. The net effect of the accounting changes has been deemed immaterial in relation to the total report.

Sponsor / Sponsor Type

Federal Direct Agreements Expenditures incurred under sponsored agreements awarded by a Federal agency directly to the University.

- **DHHS -** Department of Health and Human Services (Agencies other than HRSA and NIH)
- **DOD** - Department of Defense (Includes Air Force, Army, Navy, DARPA, and ARPA)
- **DOE** - Department of Energy
- **EPA** - Environmental Protection Agency
- **HRSA** - Health Resources and Services Administration (A division of DHHS)
- **NASA** - National Aeronautics and Space Administration
- **NIH** - National Institutes of Health (A division of DHHS)

- **NSF** - National Science Foundation
- **USDA** - United States Department of Agriculture
- **USDE** - United States Department of Education

Federal Subagreements Expenditures incurred under a subagreement from another entity (usually another university) that has received an award directly from a Federal agency. The University is considered a subrecipient of federal funds.

Total Federal Expenditures incurred under direct agreements with Federal agencies and subagreements with other entities (that have received a direct award from a Federal agency). The figure(s) is the total of the Federal and Federal Subagreements categories noted above.

Other Government Expenditures incurred under sponsored agreements with other city, county, state, and international government agencies.

Private Sources Expenditures incurred under sponsored agreements from industry, foundations and trusts, voluntary health agencies, and other entities.

- Industry – Typically commercial (for-profit) entities that fund hardware, software, fabrication and clinical device projects. Entities would include companies such as Monsanto, Lockheed Martin, and Hoffman La Rouche.
- Foundations & Trusts – Sponsored agreements from non-profit entities such as; the James S. McDonnell Foundation, Robert Wood Johnson Foundation, and the Juvenile Diabetes Foundation.
- Voluntary Health - Sponsored agreements from non-profit health/disease specific agencies such as; American Heart Association, American Cancer Society, and the National Multiple Sclerosis Society.
- Other – Sponsored agreements and subagreements (excluding federal pass-thru funding) from other non-profit agencies such as: Shriners Hospital for Children, Howard Hughes Medical Institute, and the St. Louis Zoo.

Project Type

Research Projects and activities that discover new scientific areas, procedures and devices.

Research Training Support provided to pre/postdoctoral students and fellows involved in research training programs.

Other Sponsored Activities Other activities such as public service, patient service, conference grants, community outreach programs, and student aid.

Schools

School of Medicine

School of Arts & Sciences

School of Engineering

George Warren Brown School of Social Work

Other

John M. Olin School of Business
Sam Fox School of Design and Visual Arts
School of Law

Cost Category

Direct Costs Expenditures incurred that can be specifically identified to a particular sponsored agreement/project. Costs of this nature would include those such as; faculty & staff salaries (and applicable fringe benefits), consultants, consumable supplies, travel, subagreements, and equipment. Direct costs are booked to the general ledger on a daily basis.

F&A Costs Abbreviated term for Facilities and Administrative (F&A) Costs (also known as indirect/overhead costs). F&A costs are defined as expenditures incurred for common or joint objectives which cannot be specifically identified with a particular agreement/project. Costs of this nature would include: utilities and building services, building and equipment depreciation, university/school/ department administration, research administration, and the library. The University has negotiated F&A rates with our cognizant federal agency (the Department of Health and Human Services). The F&A costs are posted to the general ledger monthly, based upon the project's direct or modified direct (excludes capital equipment, subcontract expenses greater than $25,000, patient care costs, tuition, and off-campus rent) costs and the applicable F&A rate.

Cost Sharing Defined as costs incurred under a specific cost objective which are not supported by the sponsoring agency. Cost sharing can be described as the dollar amount

the University provides to support a sponsored project. The University will commit resources to support a project under the following conditions:

The University monitors and maintains cost sharing expenditures by establishing separate accounts/funds in the general ledger. For each sponsored project, a specific cost sharing account will be established based upon the terms and conditions of the award. See Table 12 for a summary of the University's cost sharing contributions.

Facilities and Administrative (F&A) Rates

Sponsored projects awarded to the University provide funding for Direct and F&A costs (see above). A percentage rate is applied to the direct costs in order to determine the F&A funding/expenses for the project. The Federal F&A rate for on-campus research can change at the start of a fiscal year, based upon our current rate agreement. Federal F&A rates are applied based on the competitive start date of the project. Non-federal sponsors will also provide funding for F&A costs, but the rates can vary based upon the internal policies of the sponsor. Noted below is a brief description of the major F&A rates.

- 54% Federal on-campus research rate for projects awarded during the period 7/1/01 – 6/30/02. Applied to modified total direct costs.
- 53% Federal on-campus research rate for projects awarded during the period 7/1/02 – 6/30/06. Applied to modified total direct costs.
- 52.5% Federal on-campus research rate for projects awarded during the period 7/1/06 – 6/30/07. Applied to modified total direct costs.
- 52% Federal on-campus research rate for projects awarded during the period 7/1/07 – 6/30/10. Applied to modified total direct costs.
- 26% Federal off-campus research rate.
- 25.8% Federal on-campus research rate for genome sequencing center projects awarded during the period 7/1/06 – 6/30/10. Applied to modified total direct costs.
- 8% Federal rate for research training and fellowship projects.
- Other Includes various rates from federal, private and other government sponsors.

Sponsored Projects Accounting

The mission of Sponsored Projects Accounting (SPA) is to provide consistent and high quality financial stewardship, policy interpretation and compliance assurance to the University's research community and the sponsoring agencies. Members of the department strive to perform accurate and timely transaction approvals, financial analysis and reporting of costs incurred for sponsored projects. SPA monitors and maintains the accounting structure involved with revenue, expense and receivable transactions for sponsored projects so that these amounts are properly stated in the University's financial statements. In conjunction with Grants and Contracts and the Research Office, SPA develops a coordinated and consistent approach on institutional issues involving sponsored projects.

The office of SPA reports to Barbara Feiner, Vice Chancellor for Finance and Chief Financial Officer. This report and other data is available of on the SPA website, see http://www.spa.wustl.edu/.

Sponsors	FY08						FY07					
	Direct Costs	% Total Direct	F&A Costs	% Total F&A	Total	% Total	Direct Costs	% Total Direct	F&A Costs	% Total F&A	Total	% Total
Federal	$340,367	85%	$120,928	95%	$461,295	88%	$349,767	89%	$126,386	96%	$476,153	91%
Private Sources	57,094	14%	6,424	5%	63,518	12%	46,792	12%	5,608	4%	52,400	10%
Other Government	736	0%	145	0%	881	0%	533	0%	111	0%	644	0%
TOTAL	**$398,197**	**100%**	**$127,497**	**100%**	**$525,694**	**100%**	**$397,092**	**100%**	**$132,105**	**100%**	**$529,197**	**100%**

Table 1
Direct and F&A Expenditures by Sponsor Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

SCHOOLS	FY08 DIRECT COSTS	FY08 F&A COSTS	FY08 TOTAL	FY07 DIRECT COSTS	FY07 F&A COSTS	FY07 TOTAL	CHANGE $$	CHANGE %
Medicine	$339,277	$109,223	$448,500	$341,521	$114,584	$456,105	($7,605)	-1.7%
Arts & Sciences	31,226	10,145	41,371	31,250	10,207	41,457	(86)	-0.2%
Engineering	15,662	6,406	22,068	13,931	5,662	19,593	2,475	12.6%
Social Work	7,556	1,290	8,846	5,928	1,269	7,197	1,649	22.9%
Other	4,476	433	4,909	4,462	383	4,845	64	1.3%
TOTAL	$398,197	$127,497	$525,694	$397,092	$132,105	$529,197	($3,503)	-0.7%

Table 2
Direct and F&A Expenditures by School and Cost Category – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

SCHOOLS	Research		Research Training		Other Sponsored Activities		Total	
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
Medicine	$387,907	$402,133	$42,116	$39,533	$18,477	$14,439	$448,500	$456,105
Arts & Sciences	36,221	36,510	2,496	2,394	2,654	2,553	41,371	41,457
Engineering	20,292	18,008	1,495	1,202	281	383	22,068	19,593
Social Work	7,303	5,628	762	706	781	863	8,846	7,197
Other	595	544	11	(11)	4,303	4,312	4,909	4,845
TOTAL	$452,318	$462,823	$46,880	$43,824	$26,496	$22,550	$525,694	$529,197

Table 3
Direct and F&A Expenditures by School and Project Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

	FY08			FY07			CHANGE	
	DIRECT AGREEMENTS	SUB AGREEMENTS	TOTAL	DIRECT AGREEMENTS	SUB AGREEMENTS	TOTAL	$$	%
FEDERAL AGENCIES								
NIH	$373,154	$24,977	$398,131	$385,490	$21,681	$407,171	($9,040)	-2%
NSF	25,791	1,234	27,025	32,914	1,258	34,172	(7,147)	-21%
USDE	5,605	423	6,028	5,634	249	5,883	145	2%
NASA	6,151	1,585	7,736	6,589	1,768	8,357	(621)	-7%
DOD	6,414	1,611	8,025	5,208	2,138	7,346	679	9%
EPA	110	506	616	266	252	518	98	19%
DHHS OTHER	3,469	808	4,277	3,092	807	3,899	378	10%
DOE	2,672	1,135	3,807	2,696	1,466	4,162	(355)	-9%
DHHS HRSA	2,571	1,307	3,878	2,221	828	3,049	829	27%
USDA	342	98	440	619	128	747	(307)	-41%
OTHER	837	495	1,332	524	325	849	483	57%
TOTAL FEDERAL	**427,116**	**34,179**	**461,295**	**445,253**	**30,900**	**476,153**	**(14,858)**	**-3%**
OTHER GOVERNMENT	**881**	**0**	**881**	**644**	**0**	**644**	**237**	**37%**
PRIVATE SOURCES								
INDUSTRY	9,618	0	9,618	8,959	0	8,959	659	7%
FOUNDATIONS & TRUSTS	34,333	0	34,333	28,357	0	28,357	5,976	21%
VOL HEALTH	10,689	0	10,689	9,454	0	9,454	1,235	13%
OTHER	8,878	0	8,878	5,630	0	5,630	3,248	58%
TOTAL PRIVATE	**63,518**	**0**	**63,518**	**52,400**	**0**	**52,400**	**11,118**	**21%**
TOTAL	**$491,515**	**$34,179**	**$525,694**	**$498,297**	**$30,900**	**$529,197**	**($3,503)**	**-1%**

Table 4
Expenditures by Sponsor and Agreement Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

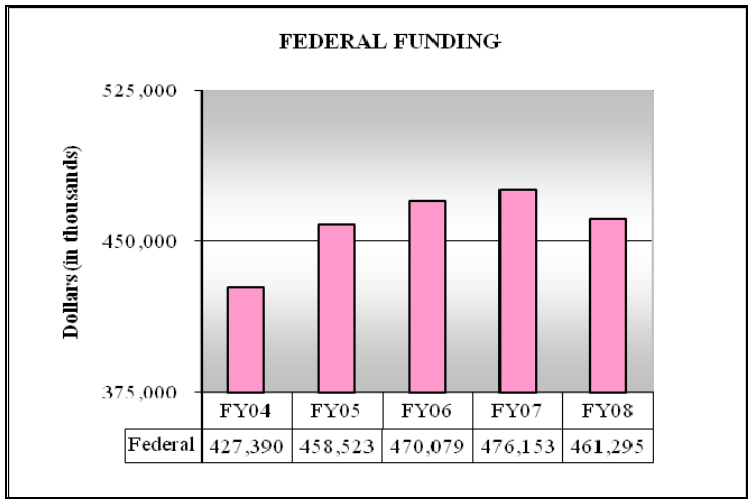


Figure 1

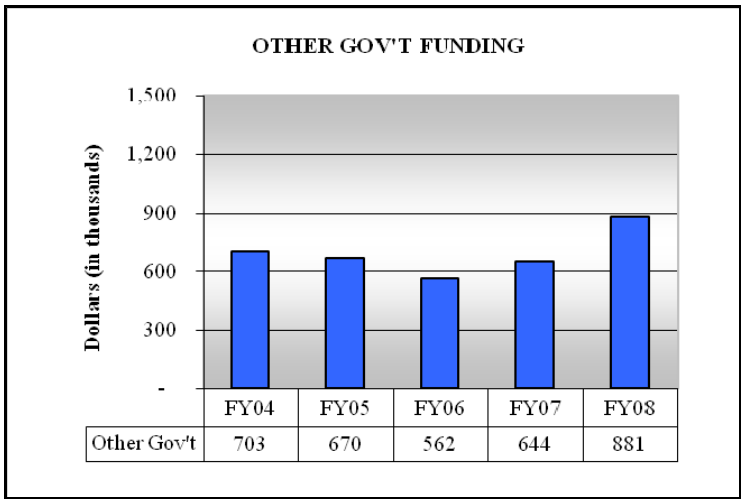


Figure 2

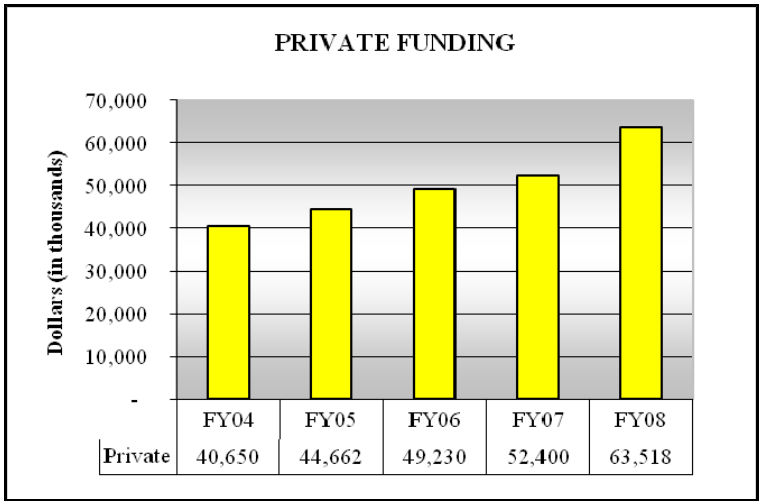


Figure 3

Expenditures by Sponsor Type – FY04–FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

	Research		Research Training		Other Sponsored Activities		Total	
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
FEDERAL AGENCIES								
NIH	$359,452	$372,720	$34,394	$32,587	$4,285	$1,864	$398,131	$407,171
NSF	24,285	31,964	2,412	2,116	328	92	27,025	34,172
USDE	423	244	0	0	5,605	5,639	6,028	5,883
NASA	7,161	7,890	575	467	0	0	7,736	8,357
DOD	7,831	7,062	182	284	12	0	8,025	7,346
EPA	613	512	3	6	0	0	616	518
DHHS OTHER	3,403	3,077	473	321	401	501	4,277	3,899
DOE	3,802	4,162	0	0	5	0	3,807	4,162
DHHS HRSA	411	60	0	0	3,467	2,989	3,878	3,049
USDA	421	690	10	57	9	0	440	747
OTHER	879	614	0	0	453	235	1,332	849
TOTAL FEDERAL	**408,681**	**428,995**	**38,049**	**35,838**	**14,565**	**11,320**	**461,295**	**476,153**
OTHER GOVERNMENT	**371**	**167**	**0**	**0**	**510**	**477**	**881**	**644**
PRIVATE SOURCES								
INDUSTRY	8,918	8,213	601	579	99	167	9,618	8,959
FOUNDATIONS & TRUSTS	20,128	15,189	3,785	3,435	10,420	9,733	34,333	28,357
VOL HEALTH	6,914	5,993	3,723	3,412	52	49	10,689	9,454
OTHER	7,306	4,266	722	560	850	804	8,878	5,630
TOTAL PRIVATE	**43,266**	**33,661**	**8,831**	**7,986**	**11,421**	**10,753**	**63,518**	**52,400**
TOTAL	**$452,318**	**$462,823**	**$46,880**	**$43,824**	**$26,496**	**$22,550**	**$525,694**	**$529,197**

Table 5
Expenditures by Sponsor and Project Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

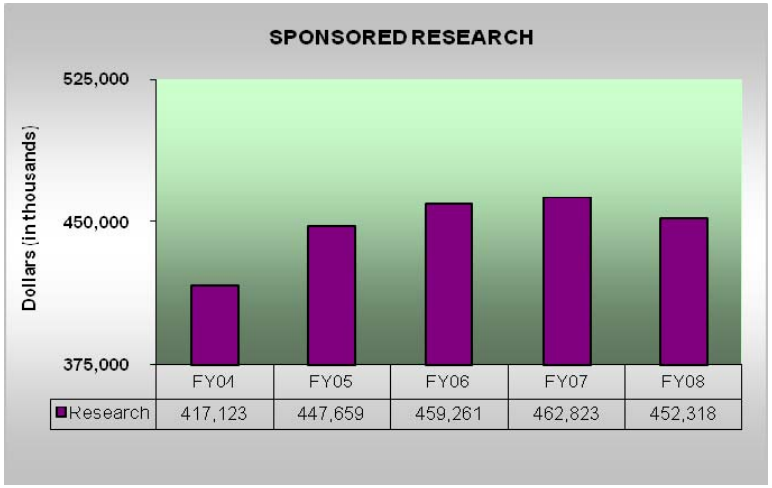


Figure 4

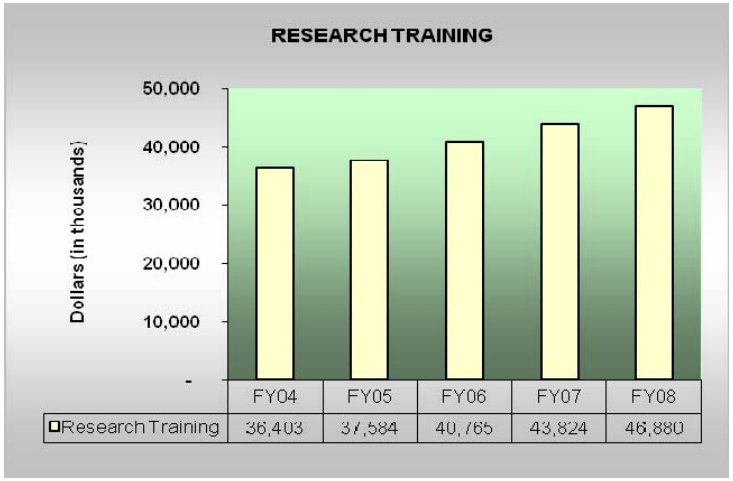


Figure 5

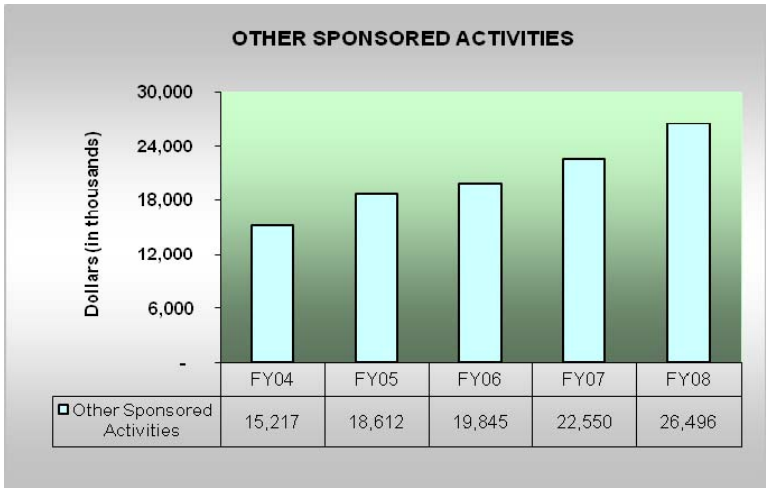


Figure 6

Expenditures by Project Type – FY04 – FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

	School of Medicine		Arts & Sciences		School of Engineering		GWB School of Social Work		Other Schools		Total University	
	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07
TOTAL FEDERAL	$396,496	($17,418)	$36,931	($99)	$19,570	$2,487	$3,843	$43	$4,455	$129	$461,295	($14,858)
OTHER GOVERNMENT	593	37	121	114	32	21	4	4	131	61	881	237
PRIVATE SOURCES												
Industry	6,641	56	1,444	324	1,532	283	-	-	1	(4)	9,618	659
Foundations & Trusts	28,287	5,611	814	(447)	365	(411)	4,587	1,366	280	(143)	34,333	5,976
Vol Health	10,296	1,162	91	23	302	50	0	0	0	0	10,689	1,235
Other	6,187	2,947	1,970	(1)	267	45	412	236	42	21	8,878	3,248
TOTAL PRIVATE	51,411	9,776	4,319	(101)	2,466	-33	4,999	1,602	323	(126)	63,518	11,118
TOTAL ALL SOURCES	**$448,500**	**($7,605)**	**$41,371**	**($86)**	**$22,068**	**$2,475**	**$8,846**	**$1,649**	**$4,909**	**$64**	**$525,694**	**($3,503)**

Table 6
Expenditures by Sponsor Type and School – FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

DETAILED COST CATEGORY	FEDERAL			OTHER GOVERNMENT			PRIVATE SOURCES			TOTAL		
	FY08	FY07	% Of Change from FY07	FY08	FY07	% Of Change from FY07	FY08	FY07	% Of Change from FY07	FY08	FY07	% Of Change from FY07
Academic Salaries	$67,510	$66,974	1%	$79	$47	68%	$9,056	$8,070	12%	$76,645	$75,091	2%
Staff Salaries	71,440	72,438	-1%	336	303	11%	11,326	9,393	21%	83,102	82,134	1%
Grad Assistant	20,648	20,634	0%	51	3	1600%	3,459	2,915	19%	24,158	23,552	3%
Subtotal Salaries	159,598	160,046	0%	466	353	32%	23,841	20,378	17%	183,905	180,777	2%
Fringe Benefits	33,351	32,782	2%	106	85	25%	5,298	4,591	15%	38,755	37,458	3%
Stipends/Health Allowance	14,515	14,108	3%	0	0	0%	3,181	3,285	-3%	17,696	17,393	2%
Consultants	1,338	1,271	5%	43	25	72%	532	515	3%	1,913	1,811	6%
Consumable Supplies	42,258	47,730	-11%	6	2	200%	8,589	6,061	42%	50,853	53,793	-5%
Other	37,103	39,398	-6%	52	60	-13%	8,806	6,262	41%	45,961	45,720	1%
Travel	4,703	4,788	-2%	3	6	-50%	1,066	1,079	-1%	5,772	5,873	-2%
Subcontracts	35,403	37,827	-6%	60	0	100%	3,862	3,021	28%	39,325	40,848	-4%
Equipment	12,098	11,817	2%	0	2	0%	1,919	1,600	20%	14,017	13,419	4%
TOTAL DIRECT COSTS	340,367	349,767	-3%	736	533	38%	57,094	46,792	22%	398,197	397,092	0%
F&A Costs	120,928	126,386	-4%	145	111	31%	6,424	5,608	15%	127,497	132,105	-3%
TOTAL	**$461,295**	**$476,153**	**-3%**	**$881**	**$644**	**37%**	**$63,518**	**$52,400**	**21%**	**$525,694**	**$529,197**	**-1%**

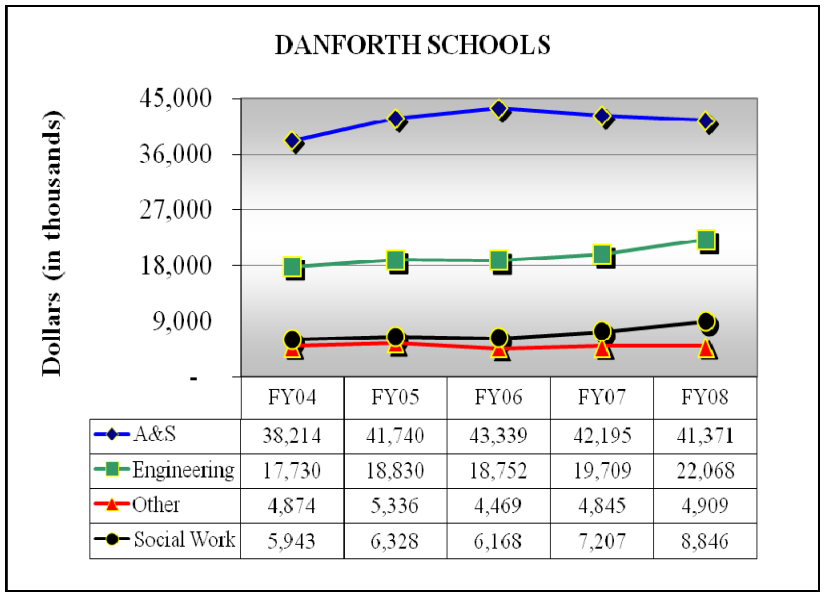
Table 7
Expenditures by Detailed Cost Category and Sponsor Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

DETAILED COST CATEGORY	School of Medicine FY08	School of Medicine $ Change from FY07	Arts & Sciences FY08	Arts & Sciences $ Change from FY07	School of Engineering FY08	School of Engineering $ Change from FY07	GWB School of Social Work FY08	GWB School of Social Work $ Change from FY07	Other Schools FY08	Other Schools $ Change from FY07	Total University FY08	Total University $ Change from FY07
Academic Salaries	$64,391	$762	$6,590	($99)	$4,268	$732	$1,148	$121	$248	$38	$76,645	$1,554
Staff Salaries	75,874	919	3,676	(90)	780	(25)	1,561	73	1,211	91	83,102	968
Grad Assistant	14,401	169	4,821	(3)	4,577	272	50	15	309	153	24,158	606
Subtotal Salaries	154,666	1,850	15,087	(192)	9,625	979	2,759	209	1,768	282	183,905	3,128
Fringe Benefits	34,370	1,025	2,619	28	1,166	180	482	33	118	31	38,755	1,297
Stipends/Health Allowance	15,080	194	1,597	(50)	600	134	419	25	0	0	17,696	303
Consultants	847	14	492	38	151	50	279	(75)	144	75	1,913	102
Consumable Supplies	48,023	(2,954)	1,829	65	893	(37)	105	(5)	3	-9	50,853	(2,940)
Other	39,526	376	2,549	86	652	(212)	983	379	2,251	(389)	45,961	240
Travel	3,531	(118)	1,325	28	507	32	277	(91)	132	48	5,772	(101)
Subcontracts	31,990	(3,102)	3,932	(153)	1,091	608	2,252	1,153	60	(29)	39,325	(1,523)
Equipment	11,244	472	1,796	123	977	4	0	0	0	0	14,017	599
TOTAL DIRECT COSTS	339,277	(2,243)	31,226	(27)	15,662	1,738	7,556	1,628	4,476	9	398,197	1,105
F&A Costs	109,223	(5,362)	10,145	(59)	6,406	737	1,290	21	433	55	127,497	(4,608)
TOTAL	**$448,500**	**($7,605)**	**$41,371**	**($86)**	**$22,068**	**$2,475**	**$8,846**	**$1,649**	**$4,909**	**$64**	**$525,694**	**($3,503)**

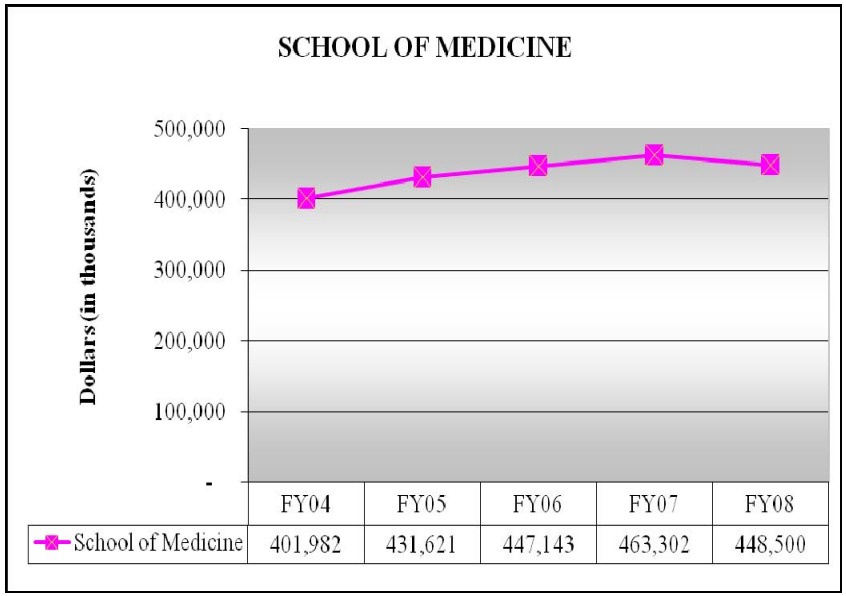
Table 8
Expenditures by Detailed Cost Category and School – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.



	FY04	FY05	FY06	FY07	FY08
A&S	38,214	41,740	43,339	42,195	41,371
Engineering	17,730	18,830	18,752	19,709	22,068
Other	4,874	5,336	4,469	4,845	4,909
Social Work	5,943	6,328	6,168	7,207	8,846

Figure 7



	FY04	FY05	FY06	FY07	FY08
School of Medicine	401,982	431,621	447,143	463,302	448,500

Figure 8

Expenditures by School – FY04–FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

	F&A RATE PERCENTAGES											
	54% / 53% /52.5%		26%		25.8%		8%		OTHER		Total F&A Costs	
	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07	FY08	FY07
FEDERAL AGENCIES												
NIH	$94,114	$101,539	$2,589	$2,463	$6,656	$4,262	$2,099	$2,035	$989	$754	$106,447	$111,053
NSF	4,618	4,823	91	60	1,256	2,369	26	20	76	54	6,067	7,326
USDE	146	121	50	40	0	0	20	21	233	226	449	408
NASA	2,359	2,502	25	18	0	0	0	0	0	0	2,384	2,520
DOD	2,276	1,961	141	144	0	0	23	36	3	23	2,443	2,164
EPA	168	162	0	0	0	0	0	0	0	0	168	162
DHHS OTHER	704	544	171	226	0	0	44	31	75	82	994	883
DOE	933	981	100	140	0	0	0	0	0	0	1,033	1,121
DHHS HRSA	102	21	289	258	0	0	55	6	184	220	630	505
USDA	17	21	0	0	0	0	1	4	54	77	72	102
OTHER	126	41	37	10	14	40	0	0	64	51	241	142
TOTAL FEDERAL	**105,563**	**112,716**	**3,493**	**3,359**	**7,926**	**6,671**	**2,268**	**2,153**	**1,678**	**1,487**	**120,928**	**126,386**
OTHER GOVERNMENT	**0**	**12**	**11**	**(1)**	**0**	**0**	**5**	**4**	**129**	**96**	**145**	**111**
PRIVATE SOURCES												
INDUSTRY	529	456	0	1	0	0	39	34	2,035	2,036	2,603	2,527
FOUNDATIONS & TRUSTS	98	260	0	0	0	0	40	40	2,255	1,787	2,393	2,087
VOL HEALTH	0	0	0	0	0	0	12	14	676	614	688	628
OTHER	23	73	29	31	0	0	39	48	649	214	740	366
TOTAL PRIVATE	**650**	**789**	**29**	**32**	**0**	**0**	**130**	**136**	**5,615**	**4,651**	**6,424**	**5,608**
TOTAL	**$106,213**	**$113,517**	**$3,533**	**$3,390**	**$7,926**	**$6,671**	**$2,403**	**$2,293**	**$7,422**	**$6,234**	**$127,497**	**$132,105**

Table 9
F&A Expenditures (Recovery) by Sponsor Type and F&A Rate – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

	FY08			FY07			CHANGE	
	DIRECT AGREEMENTS	SUB AGREEMENTS	TOTAL	DIRECT AGREEMENTS	SUB AGREEMENTS	TOTAL	$$	%
FEDERAL AGENCIES								
NIH	$98,762	$7,685	$106,447	$104,279	$6,774	$111,053	($4,606)	-4%
NSF	5,686	381	6,067	6,943	383	7,326	(1,259)	-17%
USDE	381	68	449	365	43	408	41	10%
NASA	1,886	498	2,384	1,948	572	2,520	(136)	-5%
DOD	1,957	486	2,443	1,510	654	2,164	279	13%
EPA	37	131	168	89	73	162	6	4%
DHHS OTHER	867	127	994	782	101	883	111	13%
DOE	821	212	1,033	853	268	1,121	(88)	-8%
DHHS HRSA	478	152	630	447	58	505	125	25%
USDA	53	19	72	77	25	102	(30)	-29%
OTHER	145	96	241	79	63	142	99	70%
TOTAL FEDERAL	111,073	9,855	120,928	117,372	9,014	126,386	(5,458)	-4%
OTHER GOVERNMENT	145	0	145	111	0	111	34	31%
PRIVATE SOURCES								
INDUSTRY	2,602	0	2,602	2,527	0	2,527	75	3%
FOUNDATIONS & TRUSTS	2,393	0	2,393	2,087	0	2,087	306	15%
VOL HEALTH	689	0	689	628	0	628	61	10%
OTHER	740	0	740	366	0	366	374	102%
TOTAL PRIVATE	6,424	0	6,424	5,608	0	5,608	816	15%
TOTAL	**$117,642**	**$9,855**	**$127,497**	**$123,091**	**$9,014**	**$132,105**	**($4,608)**	**-3%**

Table 10
F&A Expenditures (Recovery) by Sponsor Type and Agreement Type – FY08 and FY07
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

FEDERAL AGENCIES	School of Medicine		Arts & Sciences		School of Engineering		GWB School of Social Work		Other Schools		Total University	
	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07
NIH	$372,070	($11,600)	$13,021	$620	$9,254	$2,219	$3,530	($217)	$256	($62)	$398,131	($9,040)
NSF	9,650	(6,492)	11,116	(1,014)	5,909	74	43	84	307	201	27,025	(7,147)
USDE	584	89	1,566	170	81	(41)	71	(11)	3,726	(62)	6,028	145
NASA	182	(666)	6,824	(253)	730	298	0	0	0	0	7,736	(621)
DOD	5,380	816	465	72	2,180	(209)	0	0	0	0	8,025	679
EPA	0	0	3	(3)	613	101	0	0	0	0	616	98
DHHS OTHER	4,071	201	0	(17)	19	19	187	175	0	0	4,277	378
DOE	208	(227)	3,102	(26)	497	(102)	0	0	0	0	3,807	(355)
DHHS HRSA	3,878	829	0	0	0	0	0	0	0	0	3,878	829
USDA	162	(272)	120	(60)	158	25	0	0	0	0	440	(307)
OTHER	311	(96)	714	412	129	103	12	12	166	52	1,332	483
TOTAL FEDERAL	**$396,496**	**($17,418)**	**$36,931**	**($99)**	**$19,570**	**$2,487**	**$3,843**	**$43**	**$4,455**	**$129**	**$461,295**	**($14,858)**

Table 11
Federal Expenditures by Agency and School – FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

DETAILED COST CATEGORY	School of Medicine		Arts & Sciences		School of Engineering		GWB School of Social Work		Other Schools		Total University	
	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07	FY08	$ Change from FY07
Academic Salaries	$14,424	$1,819	$2,135	$401	$116	($90)	$48	$7	$11	($104)	$16,734	$2,033
Staff Salaries	3,748	123	63	(22)	2	1	20	3	75	75	3,908	180
Grad Assistant	482	174	83	(128)	10	0	0	0	0	0	575	46
Subtotal Salaries	18,654	2,116	2,281	251	128	(89)	68	10	86	(29)	21,217	2,259
Fringe Benefits	3,369	397	420	69	20	(6)	14	1	20	(7)	3,843	454
Stipends/Health Allowance	118	3	6	6	0	(9)	3	3	0	0	127	3
Consultants	7	(12)	0	(5)	0	0	0	0	0	0	7	(17)
Consumable Supplies	6,184	370	19	(31)	14	12	0	0	0	0	6,217	351
Other	1,617	(448)	101	(132)	148	(2,220)	2	2	15	(5)	1,883	(2,803)
Travel	32	24	9	(30)	2	(2)	2	2	0	(1)	45	(7)
Subcontracts	18	(12)	0	0	0	0	0	0	0	0	18	(12)
Equipment	1,272	1,021	108	94	0	(10)	0	0	0	0	1,380	1,105
TOTAL DIRECT COSTS	31,271	3,459	2,944	222	312	(2,324)	89	18	121	(42)	34,737	1,333
F&A Costs	8,088	1,053	1,130	86	63	(37)	28	5	18	(20)	9,327	1,087
TOTAL	**$39,359**	**$4,512**	**$4,074**	**$308**	**$375**	**($2,361)**	**$117**	**$23**	**$139**	**($62)**	**$44,064**	**$2,420**

Table 12
Cost-Sharing Expenditures by Detailed Cost Category and School – FY08
(000s)

Note: Some previously reported FY07 figures were adjusted due to a change in accounting method implemented in FY08. See Appendix 1.

Appendix I

Changes in Business Rules and Accounting Methods Affecting Historical Data in Annual Reports

Sponsored Research

An analysis conducted in 2005 showed that the "new award" data provided in past years actually contained totals for both new fiscal year dollars awarded and *carried forward* award dollars from the previous fiscal year. Essentially, this resulted in a report of dollars that were actually "available award dollars" rather than newly awarded dollars for each of the fiscal years.

Beginning with the Fiscal Year 2005 Annual Report, Tables 1 – 11 in Sponsored Research have been modified to reflect only new dollars.

Sponsored Projects Accounting (SPA)

In Fiscal 2008, Washington University implemented a fund-level method of accruing year end expenditures to sponsored accounts. Prior to FY08, these accrued transactions were posted in summary accounts within the schools. The net effect of the accounting change has been deemed immaterial to this report and the University's financial statements.

In order to more accurately compare current and prior year expenditures, these new accounting rules were retroactively applied to FY07 expenses.

Office of Technology Management (OTM)

In FY06, OTM implemented a new database, Knowledge Sharing System (KSS), which resulted in numerous re-classifications of the historic results for OTM. Additionally, in FY08, OTM has upgraded and implemented many modifications and improvements in KSS. As a result, the OTM non-revenue results reported for FY07 in the last year's Annual Report are different than what is provided in this year's Annual Report. OTM decided to include only FY07 and FY08 results in this year's Annual Report so as to establish a basis for future comparisons using the same database criteria.

Appendix 2

Historical Trends in Federal Research & Development (R&D) Funding

This Appendix to the OVCR Annual Report contains information regarding trends in federal research funding and is compiled from various sources, including data from sponsoring agencies, publications, and presentations from members of the research community. Many of the charts and graphs following are based on data collected by the NIH, NSF, or the American Association for the Advancement of Science (AAAS).

While every effort was made to provide the most recent information, in many cases the newness of data from sources may be affected by factors such as when an agency's fiscal year ended. Historically, agency information in the form of tables and charts has lagged as many as two years behind Washington University's (WU) fiscal year. Therefore, although this report reflects WU funding and expenditures for fiscal year 2008, data from an external source, such as the National Institutes for Health (NIH), may be from its fiscal year 2007. Additionally, an agency's latest fiscal year information may be designated "preliminary".

The tables and graphs contained within this Appendix present an overall realistic trend analysis, and subsequent conclusions, regarding research funding in the past and present. Future funding scenarios are also discussed here.

Trend: Decline in R&D Funding

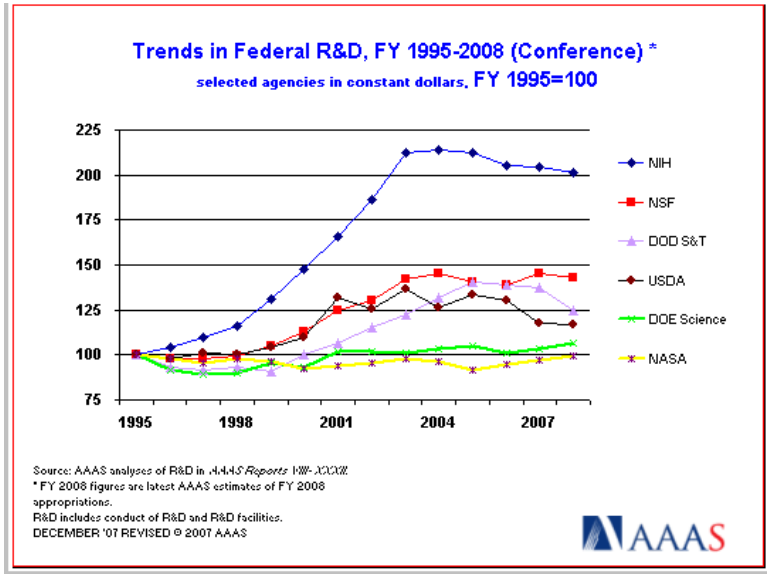
Following a period of rapid growth between 1993 and 2003, during which the NIH budget doubled, funding levels have declined from year to year.

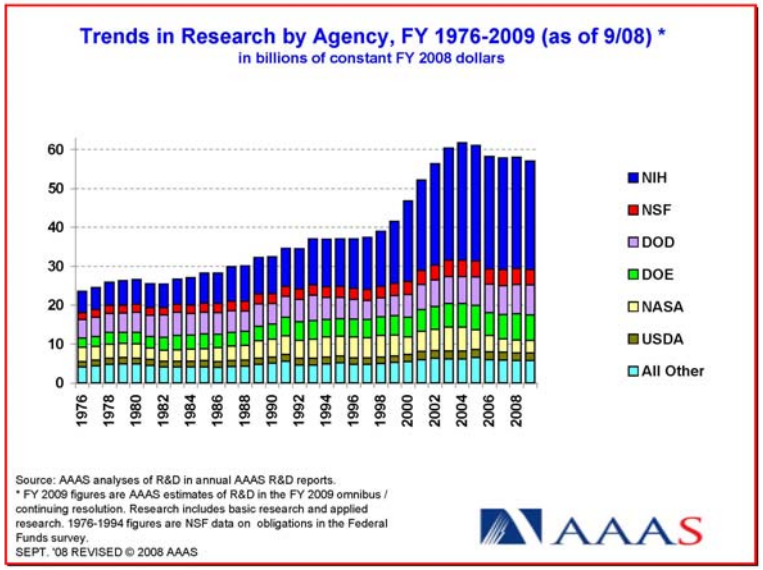
"The purchasing power of the NIH budget has declined substantially since FY2004. As funding fails to keep up with rising research costs, the strain on the NIH budget also curtails the ability of scientists to take advantage of new opportunities and respond to new health challenges."

Source: http://opa.faseb.org/pdf/NIHresearchfunding2008/NIH_Research_Funding_2009_Summary.pdf

The graphs below reflect historical trends in Federal R& D funding for selected agencies in constant FY08 dollars.

Sources: AAAS R&D Funding Update September 30, 2008. http://www.aaas.org/spp/rd/upd908.pdf and AAAS Analysis of R&D in the FY09 budget March 7, 2008 revised. http://www.aaas.org/spp/rd/cht9809a.pdf





The chart below shows NIH R&D, in current dollars. Note that, during the period FY98 through FY05, obligations in current dollars to Universities and Colleges increased every year. Although the change in current dollars overall from FY98 to FY07 was 108.6%, obligations declined in FY06. Note also that the slight increase in obligations in FY07 from FY06 was not enough to bring them to the FY05 level.

Source: http://www.aaas.org/spp/rd/nihper07.pdf

.

Table. NIH R&D by Performer

Table. NIH R&D by Performer, FY 1998-2007
(obligations in millions of current dollars)

	FY 1998 Actual	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual	FY 2003 Actual	FY 2004 Actual	FY 2005 Actual	FY 2006 Prelim.	FY 2007 Prelim.	Change 98-07 %
Intramural	2,639	2,879	2,979	3,716	4,081	4,966	5,250	5,417	5,264	5,285	100.2%
Industrial Firms	627	696	803	561	972	1,373	1,675	1,675	1,679	1,686	169.2%
Universities and Colleges	7,581	8,786	10,162	11,603	13,159	14,829	15,301	15,845	15,748	15,818	108.6%
FFRDCs	215	210	292	306	380	544	508	446	447	449	108.6%
Nonprofits	1,923	2,308	2,746	3,424	3,537	3,952	4,119	4,150	4,155	4,174	117.1%
All Other	152	127	152	161	214	301	459	394	395	397	161.1%
Total NIH R&D	13,138	15,005	17,135	19,771	22,343	25,965	27,312	27,926	27,688	27,810	111.7%

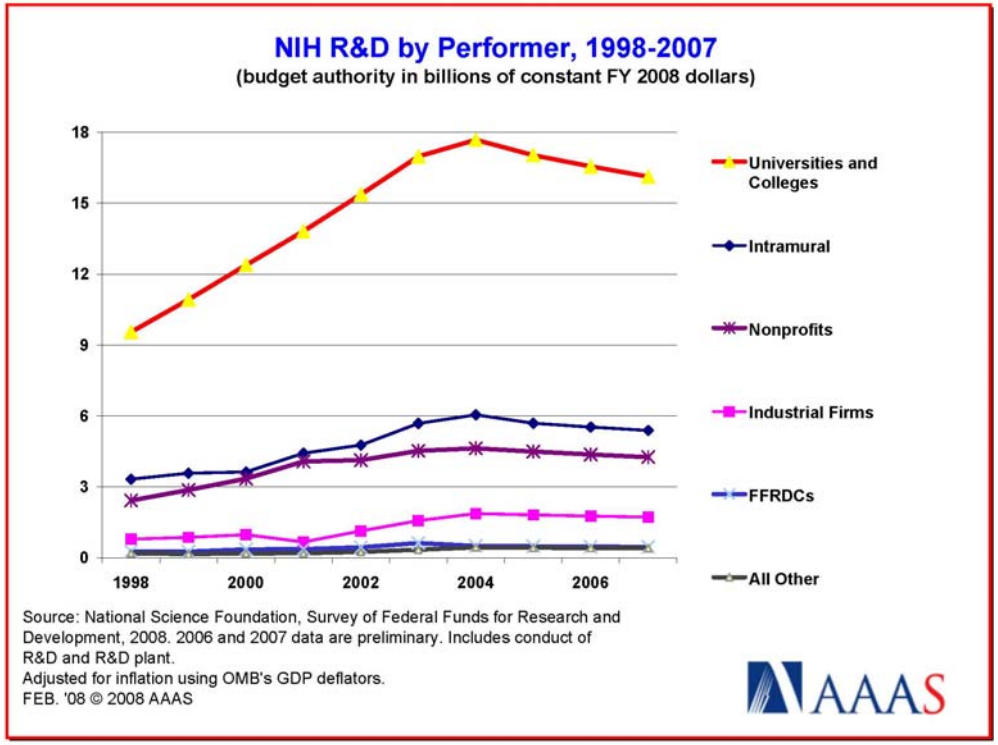
Source: National Science Foundation Federal Funds for Research and Development survey. Data are for NIH R&D support, including conduct of R&D and R&D facilities. Data differ from other tables because survey data are expressed in obligations.
February 2008 - AAAS based on NSF data

According to R&D Magazine, "The U.S. research and development environment is being shaped in 2008 by a myriad of economic, political, and technical factors. The gradual evolution of the total system has seen some significant changes in behavior which can be traced to the several major events or activities including: the restructuring of the major corporate R&D approaches in industry; the significant growth of the practice of offshore outsourcing of R&D; the shift in federal government emphasis that is traceable, in large part, to the events of 9/11 and their aftermath; and the growth in the federal deficit."

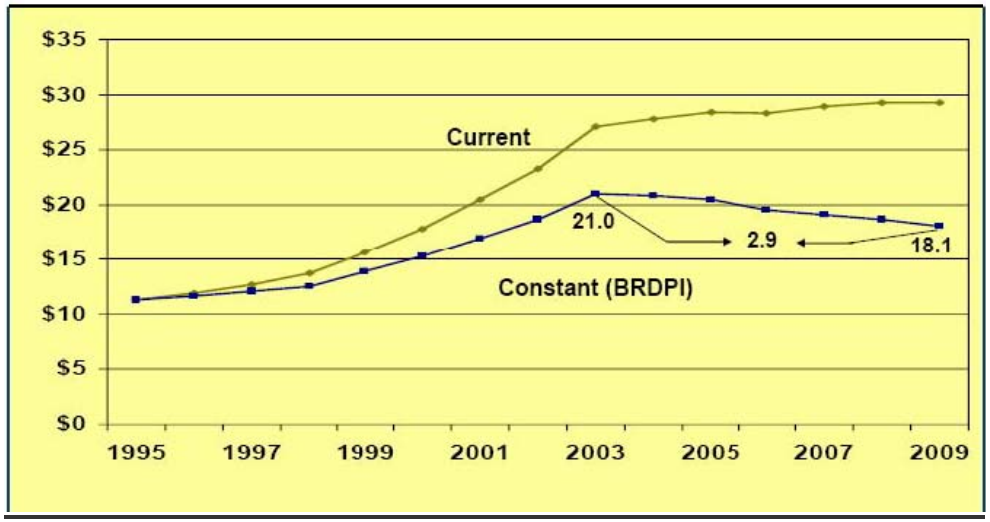
Source: *http://www.rdmag.com/pdf/RD0802_FundForecast.pdf*

The graph below represents NIH R&D funding from 1998 to 2007 in constant FY08 dollars.

Source : *http://www.aaas.org/spp/rd/nih07perfh.pdf*



The graph below shows the NIH funding from 1995, projected through 2009. Note that in current dollars (green line), NIH funding doubled in the 5-year period between 1998 and 2003, with small increases in 2004 and 2005, and a subsequent leveling through 2008, while the constant dollars (blue line) actually decreased from 2003 through 2008, indicating that the NIH budget is not keeping pace with inflation. Note that, while current dollars projected for 2009 appear to be in line with 2008, constant dollars are projected to decline.



Source: http://erm.wustl.edu/Stanley_ERM_3.26.08.pdf Slide 8.

NIH Funding, FY 1995-2009 (in billions)

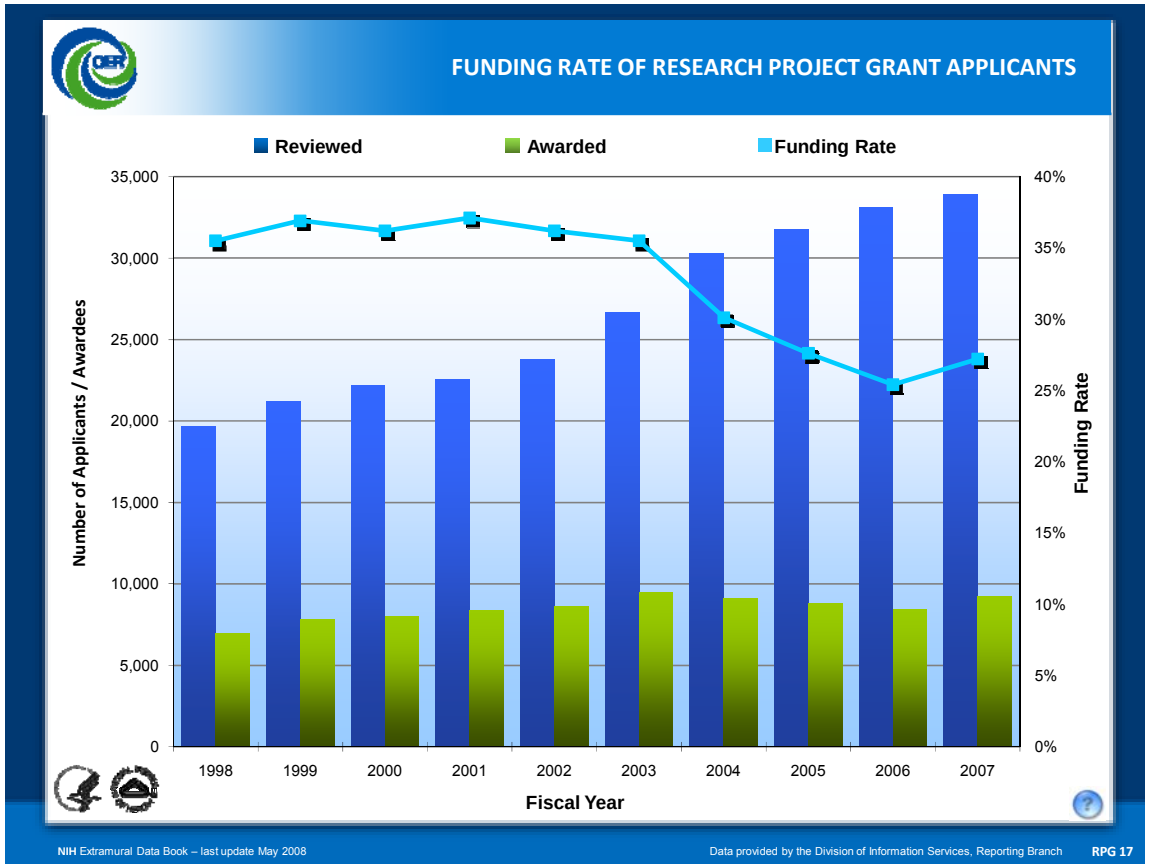
"Inflation at NIH is calculated annually according to the Biomedical Research and Development Price Index (BRDPI, commonly referred to as "Bird Pie"). BRDPI is usually a point or two above the general inflation rate, and in recent years has been in the range of about 3.5% annually, or about 21% overall in the period 2003-2008. Thus, because of inflation, NIH as a whole has lost about 12% of the purchasing power it enjoyed in 2003, even though its budget in the same period has gone up over $2 billion."

Source: American Society for Biochemistry and Molecular Biology (ASBMB) Today. Centers Versus Individuals-Funding Choices at NIH. April 2008 pages 4-5 Heidi Hamm.
http://www.asbmbtoday-digital.com/asbmbtoday/200804/?pg=6

Trend: More Competition for NIH Grants

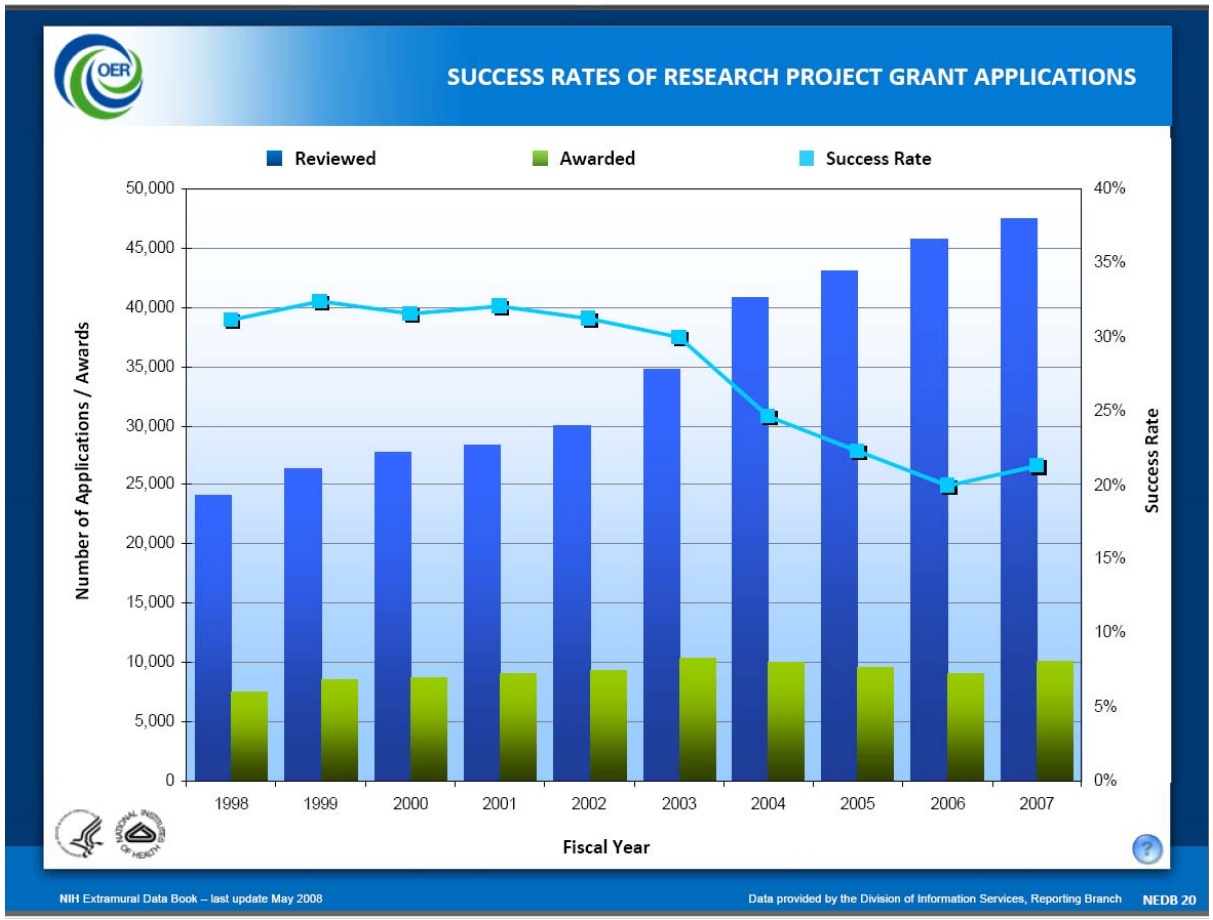
"Many scientists are dismayed that it is more difficult to get funded today than it was before the NIH budget doubled. The core reason is the increase in the number of new applications and applicants for NIH grants. The doubling in demand for grants is primarily due to a large increase in the number of new scientists applying for grants." *Source: Elias A Zerhouni Science Magazine – November 17, 2006 Vol . 314. No.5802 pp. 1088-1090– Research Funding: Enhanced: NIH in the Post-Doubling Era: Realities and Strategies (http://www.sciencemag.org/cgi/content/full /314/5802/1088*

In 1998, there were 19,663 scientists applying for competing awards. In 2006, NIH received applications from 33,119 scientists, and 33,886 scientists applied in 2007. The success rates declined from 2003 (29.9%) to 2006 (20%) and then saw a slight increase in 2007 (21.3%). The slight increase in success rate in 2007 was due to NIH funding increases in 2007. *Source: National Institutes of Health (NIH) Extramural Data Book, May 2008. http://report.nih.gov/NIH_Investment/PDF_sectionwise/NIH_Extramural_DataBook_PDF/NEDB_Core_Deck.pdf. Page 21.*



According to the graph below, NIH received 24,151 applications in 1998 for new and competing Research Project Grants (RPGs). The NIH received almost twice as many applications in 2007 (47,455).

Source: National Institutes of Health (NIH) Extramural Data Book, May 2008. http://report.nih.gov/NIH_Investment/PDF_sectionwise/NIH_Extramural_DataBook_PDF/NEDB_Core_Deck.pdf. Page 20.



Note: Research Project Grants (RPGs) include the following selected Research Grant and Cooperative Agreement activities: R00, R01, R03, R15, R21, R22, R23, R29, R33, R34, R35, R36, R37, R55, R56, RL1, RL2, RL5, RL9, P01, P42, PN1, UC1, UC7, U01, U19, U34, DP1, and DP2. Also includes RPGs from NLM as of FY07.

Trend: Growth in Center and Program Grant Funding

In recent years, the NIH has shifted a considerable amount of funding from small investigator-initiated grants toward center and program grants. Center grants are awarded to groups of collaborating investigators supporting long-term multidisciplinary programs of research and development.

One example of the entities to benefit from this trend is the Clinical and Translational Science Awards (CTSA). NIH currently funds twelve CTSA sites in the U.S., and has plans to extend their funding to 60 sites. One of those sites – the Institute of Clinical and Translational Sciences (ICTS) – was established at Washington University in 2007 (http://crscholars.im.wustl.edu/documents/Evanoff_ERM_3.27.08.pdf).

The table below shows the growth in funding for Research Centers and RPGs from 2003 to 2008. Over that time period, NIH Research Center funding increased 20% and funding for NIH RPGs increased 13%, while NIH funding overall increased by only 9%.

Year	Center Funding	RPG Funding	NIH Total
2003	2.46	13.70	27.06
2004	2.55	14.50	27.88
2005	2.70	14.89	28.49
2006	2.77	14.75	28.46
2007	2.93	15.62	29.13
2008	2.94	15.54	29.46
2009 (request)	2.96	15.52	29.46
TOTAL Increase	+$0.5B/20%	+$1.8B/13%	+$2.4B/9%

Source: NIH, AAAS, FASEB

Growth in Funding for Research Centers and RPGs
2003-2008 (Dollars in Billions)

According to Heidi Hamm, President of the American Society for Biochemistry and Molecular Biology (ASBMB) Today, the National Center for Research Resources (NCRR) is currently trying to lessen the effect of CTSAs on smaller projects. She believes, however, that the trend toward heavily funding the larger grants will remain long-term. Further, the data suggests that, although more than half of NIH dollars are awarded to RPGs, those that are investigator-initiated are receiving fewer funds. In the years between 1996 and 1998, R01 grants accounted for 80-83% of RPGs, while in 2007 only 50% were R01s.

Source: American Society for Biochemistry and Molecular Biology (ASBMB) Today. Centers Versus Individuals-Funding Choices at NIH. April 2008 pages 4-5 Heidi Hamm. (http://www.asbmbtoday-digital.com/asbmbtoday/200804/?pg=6)

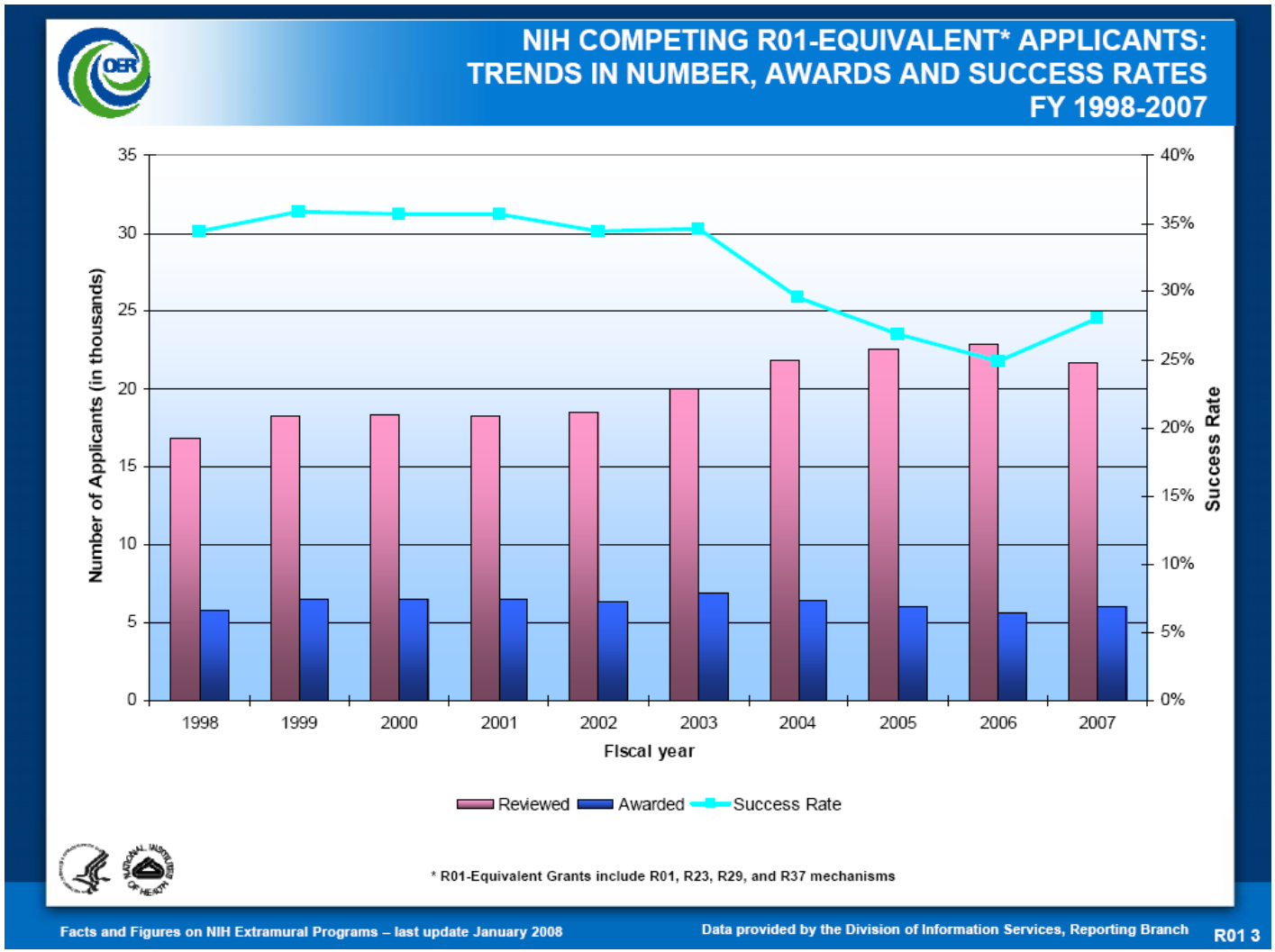
Trend: Success Rates of R01 Applications Declining

The matrix below and the graph on the following page show the trends in numbers, awards, and success rates of NIH R01 applications funded in fiscal years 1998-2007. The overall success rate for NIH competing R01-Equivalent dropped from a high of 32% in 1999 to a low of 20.70% in 2006. The success rate in FY07 rose to 23.60%. This was due to two factors: fewer applications and increased funding. Applications for R01 grants declined by 1,772 in FY07. According to the Office of Public Affairs for the Federation of American Societies for Experimental Biology (FASEB), the NIH recognized that "flat budgets and rising research costs" had negatively affected the research community. In response, the organization increased funding for "competing" R01 grants in FY07 by $279M (13.1%).

Source: http://opa.faseb.org/pdf/NIHresearchfunding2008/NIH_Research_Funding_2009_Summary.pdf

Source: R01-Equivalent Grants: Information on Numbers and Funding, January 2008, NIH Office of Extramural Research.
*http://grants1.nih.gov/grants/award/Research_Training_Investment/**R01**.ppt*

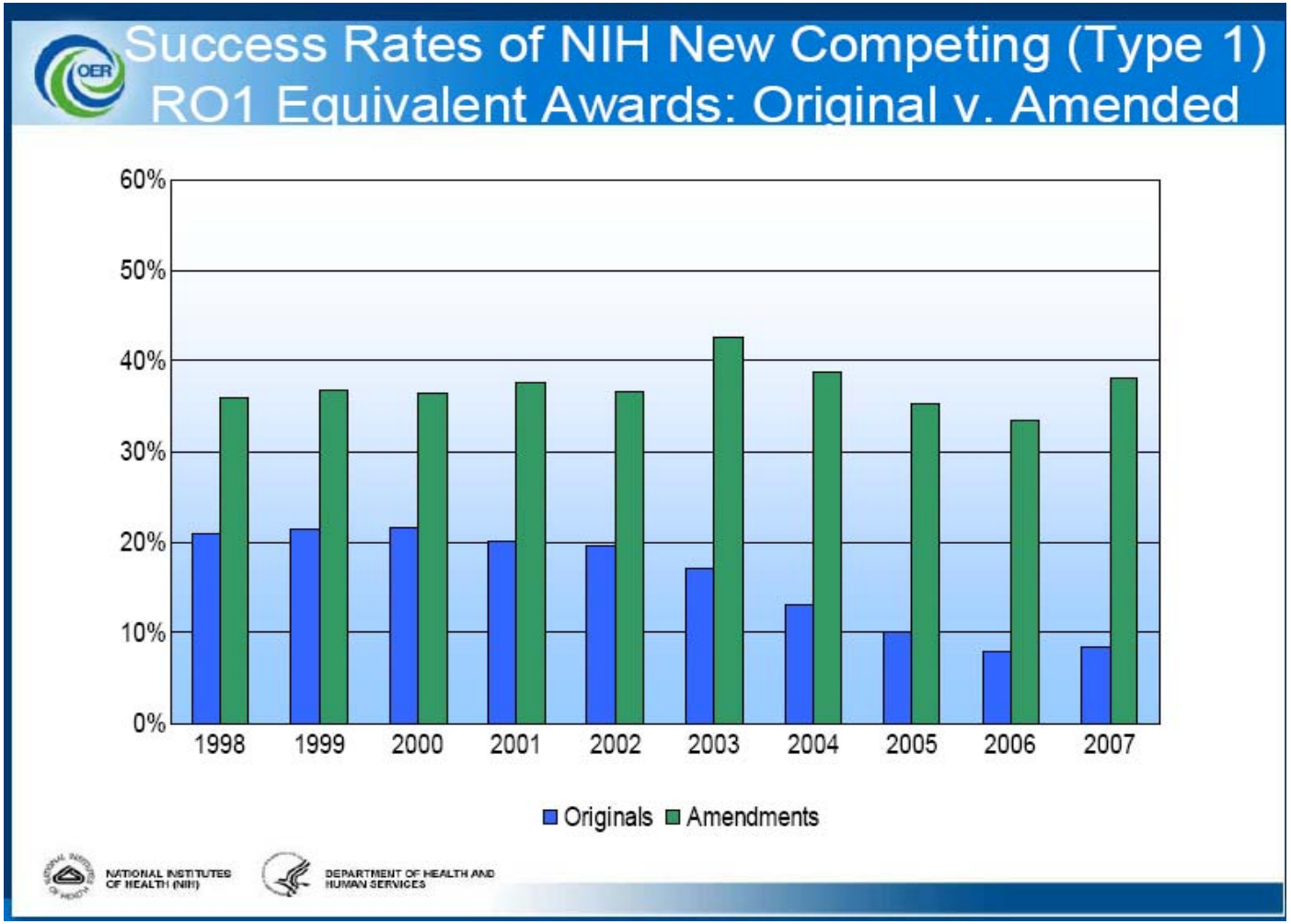
Fiscal Year	Reviewed	Awarded	Success Rate
1998	20,039	6,195	30.90%
1999	21,944	7,028	32.00%
2000	22,088	7,063	32.00%
2001	21,967	6,965	31.70%
2002	22,212	6,799	30.60%
2003	24,634	7,430	30.20%
2004	27,461	6,991	25.50%
2005	28,423	6,463	22.70%
2006	29,097	6,037	20.70%
2007	27,325	6,456	23.60%



*Source: R01-Equivalent Grants: Information on Numbers and Funding, January 2008, NIH Office of Extramural Research. http://grants1.nih.gov/grants/award/Research_Training_Investment/**R01**.ppt. Slide 3.*

The number of distinct R01 equivalent amended applications is increasing. Amendments have higher success rates than original applications, both for competing new and continuation R01 applications as shown in the graph below.

Source: R01-Equivalent Grants: Information on Numbers and Funding, January 2008, NIH Office of Extramural Research.
*http://grants1.nih.gov/grants/award/Research_Training_Investment/**R01**.ppt*



The chart below shows the overall success rate for NIH R01 proposals in 1999 and 2007 as well as the success rate on first submission. Fewer applications are being funded on first submission (only 12% in 2007, as compared to 29% in 1999).

Challenging Times for All Researchers		
	1999	**2007**
Overall success rate for NIH R01 Proposals	**32%**	**24%**
Success rate on first submission	**29%**	**12%**

Source : A Broken Pipeline? Flat Funding of the NIH Puts a Generation of Science At Risk, pages 3-4, March 2008 (http://www.brokenpipeline.org/brokenpipeline.pdf)

Trend: More Difficult Environment for Young Researchers

In addition to the struggle among established researchers for funding, there is concern among the research community regarding young researchers' ability to obtain funding and support for research. A large concern is that young researchers will become disillusioned and leave academic research.

According to the chart on the following page, the average age at which investigators received their first NIH grant rose to 43 in 2007 compared to 39 in 1990.

Additionally, the chart indicates that the percent of R01s that go to first-time investigators is decreasing. In 1990, they received 29% of R01 grants, but in 2007, they received 25% of R01s.

"As a result of increased funding for competing R01 grants, the number of grants to new investigators (investigators receiving their first R01 awards) increased in 2007. This is good news for the young scientists and for the nation's future, but it may be too little and too late. The years of flat funding and the bleak outlook for the future may have already begun to take their toll, and it appears that some scientists are beginning to reassess their options in the face of declining career prospects." As mentioned earlier, applications for R01 grants declined in FY07. "One third of this decline is due to a lower number of applications from investigators seeking their first R01 grant."

Source: http://opa.faseb.org/pdf/NIHresearchfunding2008/NIH_Research_Funding_2009_Summary.pdf

Especially for Young Investigators		
	1999	**2007**
Age at first RO1 grant	**39**	**43**
% of RO1s* that go to first-time investigators	**29%**	**25%**

**ROs Equivalents: RO1, R29, R37*
Source: National Institutes of Health

(1) Source: A Broken Pipeline? Flat Funding of the NIH Puts a Generation of Science at Risk. March 2008. http://www.brokenpipeline.org/brokenpipeline.pdf

Projections: Future of Funding

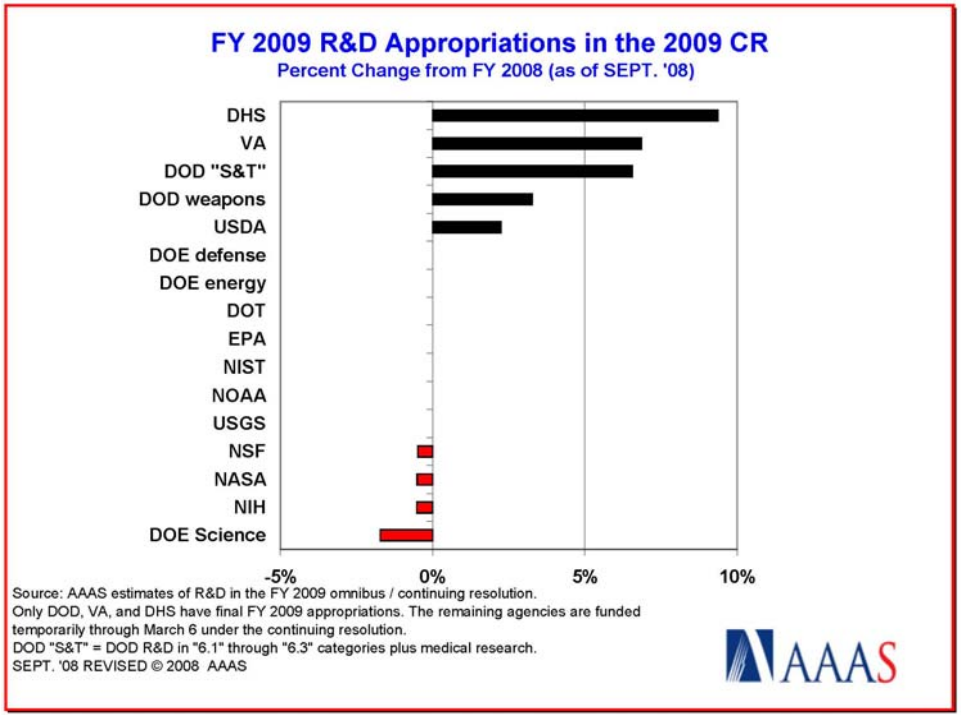
A summary of AAAS estimates and analyses of federal R&D FY09 appropriations, entitled "Federal Research Funding Flat in 2009 as Federal Budget Stalls," states:

"Although the federal government's fiscal year (FY) 2009 begins October 1, as of September 30th most of the government's FY2009 budget is still unfinished. Congress drafted and approved a continuing resolution extending funding for all programs in unfinished 2009 appropriations bills at 2008 funding levels through March 6. The continuing resolution (CR) contains three final FY 2009 appropriation

bills, covering the Department of Defense (DOD), Homeland Security (DHS) and Veterans Affairs (VA); all three will receive substantial increases for their R&D portfolios and will have final budgets." (See figure below.)

"The CR extends to March 6, indicating that Congress intends to wait until after the inauguration to finalize the remaining 2009 appropriations bills. Most likely, lawmakers will spend the month of February writing final versions of the 9 remaining appropriations bills and then roll them into a single omnibus bill."

Source: *http://www.aaas.org/spp/rd/upd908.htm*



Research funding trends indicate that these are challenging times for all researchers, but particularly for new, young researchers. With the many competing national priorities that demand resources, forthcoming changes in NIH leadership, the increasing federal deficit, tight budget constraints, soaring economic problems, and the impending presidential election, researchers face an uncertain future.