

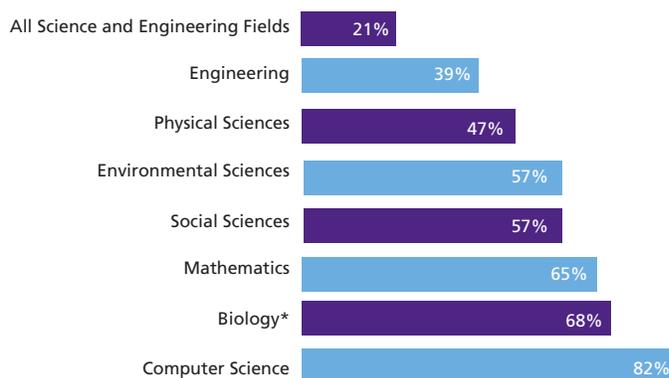
UNITED STATES  
National Science Foundation

# FY 2009 Performance and Financial Highlights

## Who We Are and What We Do: Investing in the Future

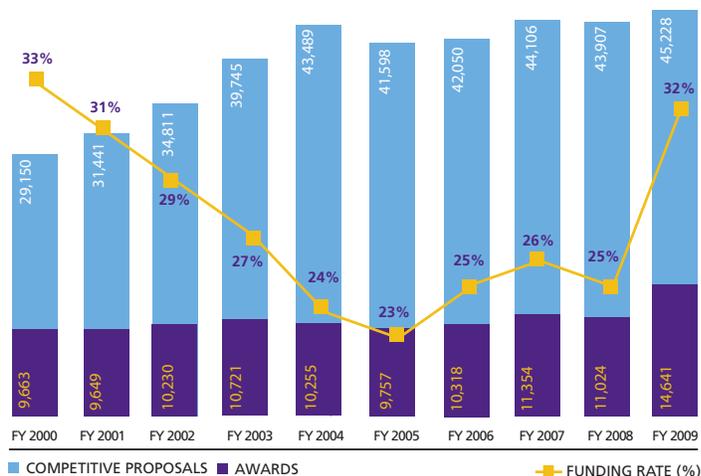
- The National Science Foundation (NSF) is the only federal agency dedicated to supporting basic research across all fields of science and engineering and science and engineering education at all levels.
- NSF seeks high-risk, potentially transformative projects that will generate path-breaking discoveries and new technologies and attract and develop a dynamic workforce.
- NSF funds advanced instrumentation and facilities and Arctic and Antarctic research, science operations, and other related activities for the U.S. polar research program.
- NSF also supports cooperative research between universities and industry and United States participation in international scientific efforts.
- In many fields, including computer science, mathematics, biology (nonmedical), environmental sciences, and the social sciences, NSF is the principal source of federal support.
- Nearly 90 percent of NSF funding is allocated through merit-based, competitive processes. Each year about 46,000 members of the science and engineering community participate in the merit review process as panelists and proposal reviewers.

### NSF SUPPORT OF ACADEMIC BASIC RESEARCH IN SELECTED FIELDS (as a percentage of total federal support)



\*Excludes the National Institutes of Health.  
Source: NSF Survey of Federal Funds for Research and Development.

### NUMBER OF NSF COMPETITIVE PROPOSALS, AWARDS, AND FUNDING RATES



## FY 2009 Highlights

- NSF evaluated over 45,000 proposals and made 14,600 new awards, of which 4,677 were funded through the American Recovery and Reinvestment Act (ARRA).
- NSF's FY 2009 funding rate reached 32 percent, the highest since FY 2000.
- Nearly 239,000 proposal reviews were conducted, involving almost 46,000 external reviewers.
- NSF awards reached nearly 2,000 colleges, universities, and other public and private institutions in all 50 states, Washington, D.C., and Puerto Rico.

**MISSION:** To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.

—From the National Science Foundation Act of 1950

**VISION:** Advancing discovery, innovation, and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering.

—From National Science Foundation Investing in America's Future, FY 2006–2011 Strategic Plan

## From the Director



Arden L. Bement, Jr.

This report is the third of three that the National Science Foundation (NSF) has prepared to demonstrate the agency's accountability to our stakeholders and the American public. It includes key information from NSF's *FY 2009 Agency Financial Report (AFR)* and *FY 2009 Annual Performance Report (APR)*.

Thanks to the American Recovery and Reinvestment Act, FY 2009 was an extraordinary year for NSF.

- The nearly 15,000 new awards funded were the most ever for the agency.
- The funding rate of 32 percent was the highest in nearly a decade.
- The number of people—241,000—directly engaged in NSF-funded activities increased by 21 percent from FY 2008.

More details about NSF's FY 2009 performance results are available in the *APR*, which is included in the agency's *FY 2011 Budget Request to Congress*. I am pleased to report that the performance information included in the FY 2009 *APR* is complete and reliable. As in past years, NSF's performance data are verified and validated by an independent management consulting firm, IBM Global Business Services, using guidelines from the Government Accountability Office.

Thank you for your interest in NSF and its commitment to continuous improvement.

A handwritten signature in black ink that reads "Arden L. Bement, Jr." with a stylized flourish at the end.

Dr. Arden L. Bement, Jr.  
February 16, 2010

### NSF BY THE NUMBERS

\$9.5 billion	FY 2009 Appropriations include \$6.5 billion from the regular appropriation and \$3.0 billion from the American Recovery and Reinvestment Act
2,000	Colleges, universities, and other institutions receiving NSF funding in FY 2009
45,000	Proposals evaluated in FY 2009 through a competitive merit review process
14,600	Competitive awards funded in FY 2009
239,000	Proposal reviews conducted in FY 2009
241,000	People involved in NSF-supported programs and activities (researchers, postdoctoral fellows, trainees, teachers, and students)
42,000	Students supported by NSF Graduate Research Fellowships since 1952

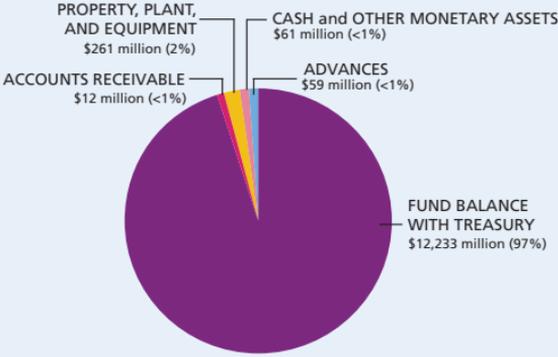


This still image is from computer models that simulate the flow of plasma in the deep interior of the Sun in unprecedented detail. This model was developed by researchers at the National Center for Atmospheric Research (NCAR) and other institutions. NCAR is supported by NSF and other federal agencies to provide facilities and support for a wide range of studies in the atmospheric and related sciences.

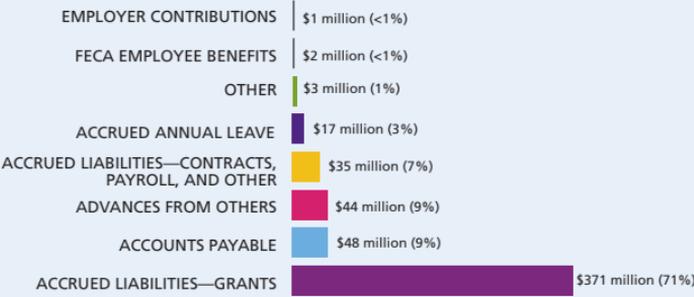
Image Courtesy of © University Corporation for Atmospheric Research; illustrated by Mark Miesch.

# Financial Highlights

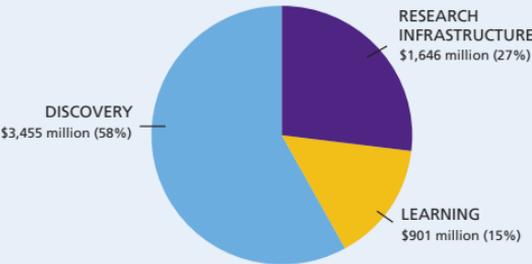
## FY 2009 ASSETS (\$12,627 million)



## FY 2009 LIABILITIES (\$522 million)



## FY 2009 NET COST (\$6,002 million)



Note: In the charts above, totals may not add due to rounding.

## FY 2009 FINANCIAL PERFORMANCE

Unqualified ("clean") opinion on financial statements	Yes
• Timely financial reporting	Yes
• Material weaknesses	None
Management Assurances	
• Effective internal control over financial reporting (FMFIA §2)	Yes
• Effective internal control over operations (FMFIA §2)	Yes
• Conformance with financial management system requirements (FMFIA §4)	Yes
• Substantial compliance with FFMIA system requirements, accounting standards, and U.S. General Ledger at transaction level	Yes
Improper Payments rate	0%
Number of grant payments	25,723

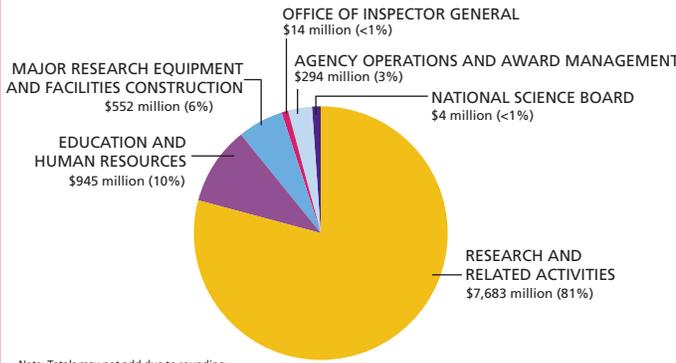
Note: Financial data referred to on this page were derived from NSF's audited financial statements; however, such limited data have not been specifically audited as stand-alone information.

FMFIA: Federal Managers' Financial Integrity Act of 1982

FFMIA: Federal Financial Management Improvement Act of 1996

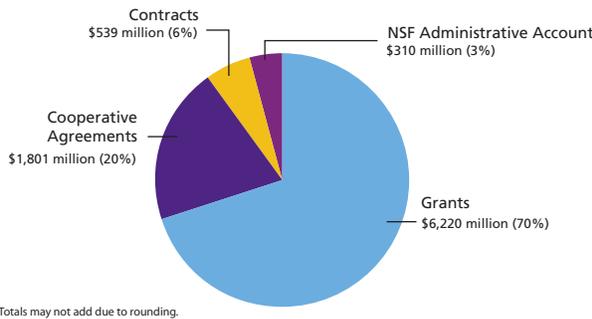
# Following the Money

## NSF BUDGET STRUCTURE FY 2009 Appropriations by Account—\$9,492 million



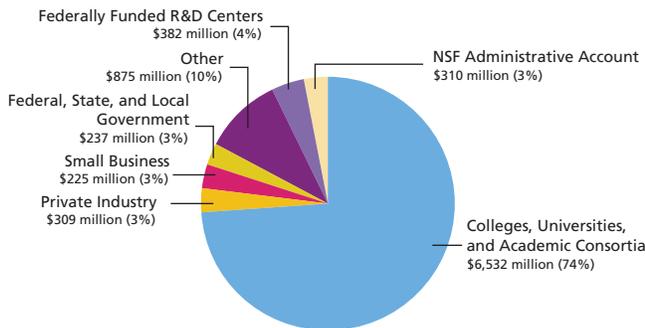
- NSF is funded primarily through six congressional appropriations. The three largest—Research and Related Activities, Education and Human Resources, and Major Research Equipment and Facilities Construction—fund the agency’s programmatic activities. Together, they accounted for 97 percent of NSF’s congressional appropriations in FY 2009.
- The Agency Operations and Award Management (AOAM) appropriation provides funds to administer and manage NSF’s programmatic activities. AOAM accounted for 3 percent of NSF’s FY 2009 appropriations.
- Separate appropriations are provided to support the activities of the National Science Board and the Office of Inspector General.

## HOW IT’S SPENT: AWARD MECHANISMS FY 2009 Budget Obligations—\$8,870 million



- Most of NSF’s projects—90 percent in FY 2009—are funded using grants or cooperative agreements.
- Grants can be funded either as standard awards, in which funding for the full duration of the project is provided in a single fiscal year, or as continuing awards, in which funding for a multi-year project is provided in increments.
- Cooperative agreements are used when the project requires substantial agency involvement during the project performance period—e.g., research centers and multi-use facilities.
- Contracts are used to acquire services and studies (e.g., program evaluations) required for NSF or other government use.

## WHERE IT GOES: INSTITUTIONS FUNDED FY 2009 Budget Obligations—\$8,870 million



- Most NSF awards are to academic institutions. In FY 2009, 74 percent of NSF’s budget went to colleges, universities, and academic consortia.
- Awards to federal agencies, state and local governments, and Federally Funded Research and Development (R&D) Centers accounted for 7 percent of FY 2009 obligations.
- NSF also funds for-profit businesses, including small businesses.
- Other recipients funded include international organizations.

Note: The NSF Administrative Account includes the funding of administrative operations and award management and the activities of the National Science Board and the Office of Inspector General.

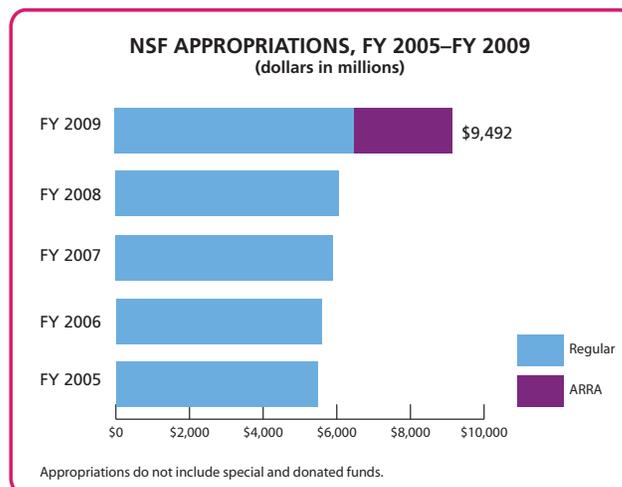
# American Recovery and Reinvestment Act of FY 2009 (ARRA)

## NSF ARRA Priorities

- Create and sustain research jobs through new awards, graduate research fellowships, and support for early career researchers.
- Encourage high-risk, transformative research that has the potential to drive the Nation's future economic growth.
- Meet facilities and infrastructure needs, including deferred maintenance.
- Strengthen the Nation's overall cyberinfrastructure and enhance institutional broadband access connectivity.

## FY 2009 ARRA Highlights

- \$2.0 billion (67 percent) was allocated for core research, facilities, and infrastructure investments; specified funding levels were designated for Major Research Instrumentation (\$300 million) and Academic Research Infrastructure (\$200 million).
- NSF obligated \$2.4 billion (80 percent) of its total ARRA funding in FY 2009.
- The ARRA Research and Related Activities (R&RA) program funded 4,599 awards that supported 6,762 investigators. More than one-third (2,352) were new investigators or new co-investigators, which fell short of NSF's goal of 2,400.



- ARRA enabled the funding of more than 300 proposals that had been declined earlier in the year due to budgetary constraints even though they were rated very good to excellent.
- ARRA funded 76 awards under the Robert Noyce Teacher Scholarship and Math and Science Partnership programs in FY 2009.

## FY 2009 ARRA SPENDING PLAN AND OBLIGATIONS

	Program/Activity	Funds Received (\$ millions)	Funds Obligated (\$ millions)	Performance Goal		
					Target	Result
<b>Research &amp; Related Activities (R&amp;RA)</b>	Core Research, Facilities, and Infrastructure Investments	\$2,000	\$1,963	<b>R&amp;RA: Number of competitive awards</b>	4,000	4,599 ▲
	Major Research Instrumentation	300	100	<b>R&amp;RA: Number of investigators supported on competitive awards</b>	6,400	6,762 ▲
	Academic Research Infrastructure	200	0	<b>R&amp;RA: Number of new investigators supported on competitive awards</b>	2,400	2,352 ▼
<b>Education &amp; Human Resources (EHR)</b>	Robert Noyce Scholarship Program	60	60	Number of awards	67	67 ▲
	Math and Science Partnership Program	25	25	Number of awards	9	9 ▲
	Science Masters' Program	15	0	To be determined in FY 2010.		
<b>Major Research Equipment &amp; Facilities Construction (MREFC)</b>	Alaska Region Research Vessel	148	148	Keep negative cost and schedule variance to less than 10% while monitoring percentage of as built-capacity as compared to the final, construction-ready design.	Results available at the end of FY 2010	
	Advanced Technology Solar Telescope	146	0			
	Ocean Observatories Initiative	106	106			
	<b>TOTAL</b>	<b>\$3,000</b>	<b>\$2,402 (80%)</b>			

Note: The Office of Inspector General received \$2.0 million for oversight activities.

▲ Goal achieved. ▼ Goal not achieved.

## How We Are Doing: Performance Highlights

- NSF's Strategic Plan for FY 2006–2011 established four long-term strategic outcome goals for the agency's activities and performance: *Discovery*, *Learning*, *Research Infrastructure*, and *Stewardship*. The first three goals focus on NSF's long-term investments in science and engineering research and education. The fourth goal—*Stewardship*—is internally focused and emphasizes improving the effectiveness and efficiency of the agency's management practices.
- Progress toward achieving the annual performance goals is determined using a combination of internal and external assessments, including qualitative reviews and quantitative metrics.
- In FY 2009, NSF demonstrated significant achievement for the three long-term strategic outcome goals of *Discovery*, *Learning*, and *Research Infrastructure*, according to an independent evaluation by the NSF Advisory Committee for GPR Performance Assessment (AC/GPA).
- NSF achieved all annual performance milestones and measures under the fourth strategic outcome goal of *Stewardship*.



- A notable facet of many NSF investments is that they serve multiple purposes. For example, research projects advance *Learning* by providing valuable experiences to students. Such indirect investments are important to the attainment of NSF's mission.

### NSF FY 2009 STRATEGIC OUTCOME GOALS

DISCOVERY	LEARNING	RESEARCH INFRASTRUCTURE	RESULTS
Foster research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit, and establishing the Nation as a global leader in fundamental and transformational science and engineering.	Cultivate a world-class, broadly inclusive science and engineering workforce and expand the science literacy of all citizens.	Build the Nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure, and experimental tools.	FY 2005 ▲ FY 2006 ▲ FY 2007 ▲ FY 2008 ▲ FY 2009 ▲
<b>PRINCIPAL ASSESSMENT ACTIVITIES:</b>			
<b>Advisory Committee for GPR Performance Assessment (AC/GPA) Review:</b> The AC/GPA, an external expert group, evaluated research and education outcomes and determined that NSF demonstrated significant achievement of its FY 2009 <i>Discovery</i> , <i>Learning</i> , and <i>Research Infrastructure</i> goals.			
<b>Qualitative Performance Information:</b> External evaluations were conducted on 17 NSF programs in FY 2009. Scope, findings, recommendations, and follow-up on all evaluations are available at <a href="http://www.nsf.gov">www.nsf.gov</a> .			
<b>NSF Committees of Visitors (COVs):</b> COVs evaluate about one-third of NSF's activities each year. In FY 2009, 26 COVs were convened. COV reports and the program responses are available on the NSF website after approval by the appropriate Advisory Committee.			
STEWARDSHIP			RESULTS
Support excellence in science and engineering research and education through a capable and responsive organization.			All <i>Stewardship</i> goals were achieved in FY 2009 ▲
<ol style="list-style-type: none"> <li><b>Time to Decision:</b> For 70% of proposals, be able to inform applicants of a decision within 6 months.</li> <li><b>Merit Review:</b> Improve the quality and transparency of the merit review process.</li> <li><b>Customer Service:</b> Improve customer service to the science, engineering, and education communities.</li> <li><b>Broadening Participation:</b> Expand efforts to increase participation from underrepresented groups and diverse institutions throughout the United States in all NSF activities and programs.</li> <li><b>Management of Large Facilities:</b> Ensure the effective management of the construction and operation of large facilities.</li> <li><b>Post-award Financial Monitoring:</b> Implement NSF's program of post-award and financial administrative monitoring.</li> <li><b>Strategic Information Technology (IT) initiatives:</b> Provide new tools and capabilities.</li> <li><b>IT Security:</b> Conduct a successful Federal Information Security Management Act (FISMA) IT program review.</li> </ol>			
<small>Note: A detailed discussion of each performance goal may be found in the FY 2009 Annual Performance Report, which is included in NSF's FY 2011 Budget Request to Congress.</small>			
<small>▲ Goal achieved. ▼ Goal not achieved.</small>			

## FY 2005–FY 2009 PERFORMANCE SCORECARD

(number and percent of goals achieved)

	Strategic Outcome Goals ( <i>Discovery, Learning, and Research Infrastructure</i> )	Stewardship and Other Annual Goals
FY 2005	3 of 3 (100%)	15 of 18 (83%)
FY 2006	3 of 3 (100%)	16 of 23 (70%)
FY 2007	3 of 3 (100%)	15 of 21 (71%)
FY 2008	3 of 3 (100%)	18 of 24 (75%)
FY 2009	3 of 3 (100%)	12 of 13 (92%)

## How NSF's Investments in Basic Research and Education Benefit Society

Investments in science and technology foster economic growth, create high tech, high wage jobs that allow U.S. workers to lead the global economy, improve the quality of life for all Americans, and strengthen our national security. NSF's investments produce both tangible and intangible benefits that keep the United States at the forefront of science and engineering.

### EXAMPLES OF NSF INVESTMENTS

New Knowledge	<ul style="list-style-type: none"> <li>• Quantum computing</li> <li>• Nanotechnology</li> <li>• Computer visualization techniques</li> <li>• Metagenomics</li> <li>• Science of science and innovation policy</li> </ul>
World Class Facilities	<ul style="list-style-type: none"> <li>• U.S. South Pole Station</li> <li>• Alaska Region Research Vessel</li> <li>• Laser Interferometer Gravitational-Wave Observatory</li> <li>• Large Hadron Collider</li> </ul>
New Tools, Methods, and Processes	<ul style="list-style-type: none"> <li>• Internet</li> <li>• Magnetic resonance imaging</li> <li>• Novel materials</li> <li>• Biofuels</li> <li>• Nanoelectronics</li> </ul>
Insight into National and Global Challenges	<ul style="list-style-type: none"> <li>• Climate change</li> <li>• Environmental protection</li> <li>• Cybersecurity</li> <li>• Sustainable energy</li> <li>• Homeland security</li> </ul>
A Highly Trained Workforce	<p>NSF has supported:</p> <ul style="list-style-type: none"> <li>• 42,000 Graduate Research Fellows since 1952</li> <li>• 5,200 Ph.D. students have received integrative graduate education and research training since 1998</li> <li>• 63,000 K–12 teachers in FY 2009</li> </ul>
Resources for Teachers and Students	<ul style="list-style-type: none"> <li>• MSPnet, an electronic learning community for the Math and Science Partnership Program</li> <li>• CYBERCHASE, an Emmy award-winning, groundbreaking multi-platform program for children in grades 3–5, on PBS KIDS GO!</li> </ul>

## FY 2009 NSF Executive Staff and Officers

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### Office of the Deputy Director

Cora B. Marrett, Deputy Director (Acting)<sup>1</sup>

### National Science Board

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Patricia D. Galloway (Vice Chair)

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James Collins, Assistant Director

### Directorate for Computer and Information Science and Engineering

Jeanette M. Wing, Assistant Director

### Directorate for Education and Human Resources

Wanda E. Ward, Assistant Director (Acting)

### Directorate for Engineering

Thomas W. Peterson, Assistant Director<sup>2</sup>

### Directorate for Geosciences

Timothy L. Killeen, Assistant Director

### Directorate for Mathematical and Physical Sciences

Tony F. Chan, Assistant Director<sup>3</sup>

### Directorate for Social, Behavioral and Economic Sciences

David W. Lightfoot, Assistant Director

### Office of Cyberinfrastructure

H. Edward Seidel, Director (Acting)<sup>4</sup>

### Office of International Science and Engineering

Larry H. Weber, Director

### Office of Polar Programs

Karl A. Erb, Director

### Office of Equal Opportunity Programs

James Lightbourne, Director (Acting)<sup>5</sup>

### Office of the General Counsel

Lawrence Rudolph, General Counsel

### Office of Inspector General

Allison C. Lerner, Inspector General<sup>6</sup>

### Office of Integrative Activities

W. Lance Haworth, Director

### Office of Legislative and Public Affairs

Jeff Nesbit, Director

### Office of Budget, Finance and Award Management

Thomas N. Cooley, Director

### Office of Information and Resource Management

Anthony A. Arnolie, Director

## NSF Officers

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### Chief Human Capital Officer

Anthony A. Arnolie (Office of Information and Resource Management)

### Chief Information Officer/Chief Privacy Officer

George O. Strawn (Office of Information and Resource Management)

### NSF Affirmative Action Officer

James Lightbourne (Office of Equal Opportunity Programs)

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Purdue University

### Patricia D. Galloway (Vice Chair)

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### Dan E. Arvizu

National Renewable Energy Laboratory

### Camilla P. Benbow

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### Alan Leshner

American Association for the Advancement of Science

### G.P. "Bud" Peterson

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### Douglas D. Randall

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### Arthur K. Reilly

Cisco Systems, Inc.

### Diane L. Souvaine

Tufts University

### Jon C. Strauss

Texas Tech University

### Kathryn D. Sullivan

Ohio State University

### Thomas N. Taylor

University of Kansas

### Richard F. Thompson

University of Southern California

### Arden L. Bement, Jr.

Member, *ex officio*  
Director, National Science Foundation

### Craig R. Robinson

Executive Officer and Director, NSB Office (Acting)

<sup>1</sup>Effective January 18, 2009.

<sup>2</sup>Effective January 13, 2009.

<sup>3</sup>Replaced by H. Edward Seidel on September 1, 2009.

<sup>4</sup>Replaced by Jose Munoz on September 1, 2009.

<sup>5</sup>Replaced by Claudia J. Postell on August 3, 2009.

<sup>6</sup>Effective April 26, 2009.

## Meeting Future Opportunities and Challenges

The Inspector General's Memorandum on NSF's FY 2009 management challenges identified five broad issue areas: award administration; human capital; budget, cost, and performance integration; the U.S. Antarctic Program; and merit review. Some challenges reflect fundamental program risk that is likely to require management's attention for years to come. NSF undertook actions in FY 2009 to address each management challenge. A detailed report of these actions is included in NSF's *FY 2009 Agency Financial Report*. The following table summarizes some of the significant actions taken by the agency to address three of these challenges.

OIG's FY 2009 Management Challenge	Significant Actions Taken by NSF in FY 2009	NSF's Anticipated Next Steps
<b>POST-AWARD ADMINISTRATION POLICIES</b>	<ul style="list-style-type: none"> <li>Assessed business performance of 30% of awardees managing 94% of NSF funds through advanced monitoring (30 site visits, 159 desk reviews) under the Award Monitoring and Business Assistance Program.</li> <li>Issued and updated the <i>Proposal and Award Procedures Guide</i> that incorporated revisions related to America COMPETES Act (ACA); updated the <i>NSF Proposal and Award Manual</i>.</li> <li>Initiated planning for public-facing project report on outcomes of NSF-funded awards (per ACA), highlighting results and other products.</li> <li>Developed Division Director concur functionality in e-Jacket.</li> <li>Provided support to a National Science Board report on cost-sharing policies.</li> <li>Implemented system edit to prohibit award close-out without grantee final cost share certification and Program Officer acceptance.</li> <li>Held effective practices forums for NSF Centers programs to share information.</li> </ul>	<ul style="list-style-type: none"> <li>Work with the Recovery Act Steering Committee on updating Recovery Act policies and procedures document.</li> <li>Update proposal and award manuals to reflect changes in policies and procedures.</li> <li>Modify NSF Grant Conditions to require Principal Investigators (PIs) to submit a new type of final report on project outcomes.</li> <li>Modify the <i>Research.gov</i> website to include the capability for PIs to report on end-of-project outcomes.</li> <li>Implement beta Division Director concur functionality in e-Jacket.</li> <li>Create automatic notification to awardees for final cost share certification.</li> </ul>
<b>WORKFORCE PLANNING</b>	<ul style="list-style-type: none"> <li>Completed staffing plans for FY 2009–FY 2010.</li> <li>Created administrative functions management (AFM) position summary and competency profiles; created learning maps within the Academy Learn system for all five AFM jobs.</li> <li>Evaluated existing workforce planning systems and identified systems requirements.</li> <li>Updated workload analysis model forecast for FY 2009–FY 2011.</li> <li>Piloted a new executive transition website.</li> <li>Piloted a knowledge management portal.</li> <li>Developed content for a comprehensive program management curriculum.</li> <li>Developed a list of e-business courses for NSF Program Officers on review analysis and finding reviewers.</li> <li>Achieved a 4.7%–10.5% improvement in workforce planning, performance management, staff recruitment, and organizational development activities as indicated by the annual customer satisfaction survey.</li> </ul>	<ul style="list-style-type: none"> <li>Further efforts in the areas of staffing, management succession, and the use of rotators, which will be guided by the results of an upcoming comprehensive analysis of these human capital issues.</li> <li>Develop content for the New Executive Transition website.</li> <li>Continue vetting e-business courses.</li> <li>Explore other alternatives for knowledge management retention for departing and replacing executives based on feedback from the pilot study.</li> <li>Roll out new briefing for all new employees about working at NSF and for the federal government.</li> </ul>
<b>BROADENING PARTICIPATION IN THE MERIT REVIEW SYSTEM</b>	<ul style="list-style-type: none"> <li>Finalized and published the <i>Framework for Action</i>, incorporating Advisory Committee comments.</li> <li>Established web pages for Broadening Participation.</li> <li>Published and updated Broadening Participation portfolio.</li> <li>Held workshops for tribal colleges, universities, and other diverse institutions.</li> <li>Refined plan for Reviewer Services, integrating with other <i>Research.gov</i> services.</li> <li>Began implicit bias training module for NSF Program Officers.</li> </ul>	<ul style="list-style-type: none"> <li>Pilot the Reviewer Services module.</li> <li>Pilot implicit bias training and make it available for all Program Officers.</li> <li>Distribute Office of Management and Budget-approved reviewer questionnaire and measure merit review participation results.</li> </ul>

## Research and Education Highlights

The following are some of the NSF-supported research results reported in FY 2009. Additional results can be found at [www.nsf.gov/discoveries](http://www.nsf.gov/discoveries).

**Green gasoline** is a mixture of chemical compounds that is nearly identical to standard gasoline, yet it comes from biomass, not petroleum. Researchers around the world are working on different approaches to creating green gasoline. Approaches range from harnessing microbes to customizing catalysts (materials that speed up reactions without sacrificing themselves in the process). Each approach is being optimized to efficiently produce desired hydrocarbons. Scientists and engineers have made a number of recent breakthroughs, including the conversion of wood chips into high-octane fuel components and the conversion of sugar (potentially derived from plants) into gasoline, diesel, and jet fuel materials, and precursors for pharmaceuticals and plastics. In the flask above, the gasoline and water were produced in a process that converts a sugar-water mixture into hydrocarbons using specialized crystal catalysts called zeolites. The process was developed by Randy Cortright at Virent Energy Systems with support from NSF's Small Business Technology Transfer program.



Green gasoline sits above water in this flask.

Credit: Virent Energy Systems, Inc.

The **Elementary School Teachers** project involves innovative, hands-on science education. Faculty members and lab personnel from the University of Oklahoma work as facilitators, encouraging elementary school teachers without prior knowledge of the field (i.e., biology of the fruit fly) to conduct their own research, raise questions, develop hypotheses, and test those hypotheses. The project, which involves a summer science camp for the teachers, has been expanded to include sixth graders, who get direct experience with brain research. These teachers and

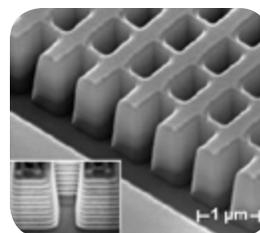
students develop an interest in scientific work through active engagement in the scientific process of discovery. The project provides a replicable approach for science education and university collaboration with pre-K–12 education. Through integration with the Experimental Program to Stimulate Competitive Research plan for Oklahoma, it demonstrates the potential for broader impacts to researchers across the state and can serve as a vehicle for broadening participation.



Left to right: Stephen Hinkle (Norman, Oklahoma, Independent School District) and John Tauber (University of Oklahoma undergraduate student) sort fruit flies under the microscope.

Credit: Bing Zhang

**Metamaterials:** When light waves travel from one medium to another, their speed and direction change in a phenomenon known as positive refraction. Thanks to scientists and engineers working with metamaterials, or materials that have been artificially engineered to have properties not normally found in nature, there are literally new directions for light to go. The scientific world was stunned recently when papers based on NSF-supported research at the Nanoscale Science and Engineering Center at the University of California, Berkeley, demonstrated the creation of three-dimensional metamaterials that exhibit negative refraction at short wave lengths, including some in the visible spectrum.



A scanning electron microscope image of a fabricated structure developed by NSF-supported researchers at the University of California, Berkeley.

Credit: Xiang Zhang Group, University of California, Berkeley

To create bulk samples of metamaterials, the researchers designed two new nanoscale fabrication techniques. These developments could lead to dramatic advances in applications such as antennas, high-performance computers, and radar-evading stealth technologies.

### For more information:

NSF's Budget and Performance Website  
[www.nsf.gov/about/performance](http://www.nsf.gov/about/performance)

NSF's FY 2009 Annual Performance Report  
(see NSF FY 2011 Budget Request to Congress at [www.nsf.gov/about/budget](http://www.nsf.gov/about/budget))

Report of the FY 2009 Advisory Committee on GPRA Performance Assessment  
[www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf09068](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf09068)

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NSF FY 2009 Management Challenges Report  
(see NSF FY 2009 Agency Financial Report)



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