NATIONAL SCIENCE FOUNDATION CENTERS

NSF supports a variety of centers programs that contribute to the Foundation's mission and vision. Centers exploit opportunities in science, engineering, and technology in which the complexity of the research program or the resources needed to solve the problem require the advantages of scope, scale, duration, equipment, facilities, and students. Centers are a principle means by which NSF fosters interdisciplinary research.

NSF Centers
(Dollars in Millions)

	Program Initiation	Number of Centers in FY 2011	FY 2011 Actual	FY 2012 Estimate	FY 2013 Request	Change Over FY 2012 Estimate Amount	Change Over FY 2012 Estimate Percent
Centers for Analysis & Synthesis	1995	4	$23.04	$26.32	$26.40	$0.08	0.3%
Centers for Chemical Innovation	1998	14	26.28	24.00	29.25	5.25	21.9%
Engineering Research Centers	1985	17	59.06	70.00	69.00	-1.00	-1.4%
Materials Centers[1]	1994	30	61.33	44.35	51.20	6.85	15.4%
Nanoscale Science & Engineering Centers	2001	19	39.13	31.48	26.50	-4.98	-15.8%
Science & Technology Centers	1987	17	66.10	50.75	74.39	23.64	46.6%
Science of Learning Centers	2003	6	23.08	20.37	20.02	-0.35	-1.7%
Totals		**107**	**$298.02**	**$267.27**	**$296.76**	**$29.49**	**11.0%**

Totals may not add due to rounding.

[1] In FY 2011, funding includes $2.66 million for Materials Interdisciplinary Research Teams, which are not formal NSF Centers. In FY 2012 and FY 2013, support for these teams is captured in core research programs, outside the NSF Centers portfolio.

Description of Major Changes

Centers for Analysis and Synthesis - BIO

The Socio-Environmental Synthesis Center (SESynC) is the newest (funding initiated in FY 2011) BIO Center for Analysis and Synthesis. SESynC uses a variety of approaches to synthesize scientific information, data, and knowledge to advance the frontiers of scientific understanding of environmental complexity through the active involvement of environmental and social scientists in order to anticipate and manage emerging environmental challenges. These approaches include discussions between scientists and policy makers, working groups from the broad socio-environmental community, and an array of computational and technical service providers. SESynC is expected to be funded at $6.0 million in FY 2013, which is flat with FY 2012.

The iPlant Collaborative provides cyberinfrastructure to enable new conceptual advances in plant sciences through integrative, computational thinking. iPlant focuses on grand challenge questions in the plant sciences, including innovative approaches to education, outreach, and the study of social networks. Pending a successful outcome from the FY 2012 site review, center funding could be renewed or a recompetition held for an additional five years of funding. iPlant is expected to be funded at $12.0 million in FY 2013, which is flat with FY 2012.

The National Evolutionary Synthesis Center (NESCent) promotes the synthesis of information, concepts and knowledge to address significant, emerging, or novel questions in evolutionary science and its applications. NESCent funds graduate students engaged in center synthesis activities; supports activities to expand the conceptual reach of the center; and initiates a formalized, three-tiered assessment of the center that includes milestones for reporting on the impact of center activities. Support for this Center

decreases by $540,000 to a total of $4.78 in FY 2013 as NSF funding ramps down; FY 2014 is expected to be the final year of funding for NESCent.

The National Institute for Mathematical and Biological Synthesis (NIMBioS) supports creative solutions to complex problems at the interface between mathematics and biology. The center is designing education programs aimed at the mathematics/biology interface, thereby building the capacity of mathematically competent, biologically knowledgeable, and computationally adept researchers needed to address the vast array of challenging questions in this century of biology. NSF support for NIMBioS increases by $1.0 million in FY 2013 to $3.62 million because prior co-funding from the Department of Homeland Security is expected to be withdrawn.

Centers for Chemical Innovation (CCI) – MPS

The Centers for Chemical Innovation (CCI) are designed to support research on strategic, transformative "big questions" in basic chemical research. The program is stimulating the chemical sciences community to perform work that is high-risk and of potential high scientific and societal impact. CCIs promote the integration of research and education through the extensive involvement of students and postdoctoral fellows in all phases of the work. CCIs are expected to be agile, responding to scientific opportunities as they arise, and to creatively engage the public. Grand challenges include emulating and even surpassing the efficiency of the natural process of photosynthesis to capture the sun's energy; activating strong bonds as a means to store and use chemical energy and to lower energy costs in chemical processing; and designing self-assembling, complex structures, such as molecular computers, with emergent and useful functions not yet known or foreseen.

The CCI program is designed as a staged competition. Phase I centers, which are supported for three years, may then compete for larger Phase II awards, which are for five years. Phase I centers initiated in FY 2010 may compete for Phase II awards in FY 2013. In FY 2013, the MPS Division of Chemistry expects to support eight Phase I awards, five continuing and three new, and six Phase II awards, three continuing and three new and/or renewals. Funding levels per center have not changed over FY 2012. However, the requested change (+$5.25 million to a total of $29.25 million) will allow the Division of Chemistry to increase support for renewing Phase I awards, from $1.50 million to $1.75 million per year. The renewal of the Phase II "Center for Enabling Technologies through Catalysis" is currently pending, and the Phase II Center on "POWERING THE PLANET: A Chemical Bonding Center in the Direct Conversion of Sunlight into Chemical Fuel" will be seeking renewal in FY 2013.

The CCI program began collecting qualitative (e.g., list of partnering companies) data and quantitative data (e.g., the amount of funding leveraged from other sources) in FY 2012 to inform an external programmatic evaluation scheduled for FY 2017. A Leadership Network of CCI managing directors and staff has formed to plan meetings to discuss topics of common interest and build collaborations between the CCIs. The first Leadership Network meeting is scheduled for spring 2012.

Engineering Research Centers (ERC) – ENG

NSF Engineering Research Centers (ERCs) enable innovation through partnerships, bridging the intellectual curiosity of discovery-focused university research and the engineered systems and technology opportunities of industry research. The centers also educate a technology-enabled workforce with hands-on, real-world experience. These characteristics catalyze the development of marketable technologies to generate wealth and address grand challenges. ERCs are investigating intelligent electric power grid systems to provide electricity from renewable sources, devising healthcare innovations through tissue engineering and microelectronics research, creating sensing systems that improve the prediction of tornados, and demonstrating intelligent robotic systems to assist people who are elderly or disabled in daily tasks.

ERCs face two renewal reviews, one in year three to determine if they are structured effectively to deliver on ERC program goals, and another in year six to determine if they are making an impact, delivering on goals, and positioning themselves for more challenging tasks to warrant further support. The ERC program periodically commissions program-level evaluations by external evaluators such as SRI International; the Science and Technology Policy Institute (STPI); and ABT Associates to determine the effectiveness of ERC graduates in industry and the benefits of ERC membership to industry and others. A recent update of a past survey of the 35 ERCs that have graduated from NSF support after 10 years finds that 29 (83 percent) are self-sustaining with strong financial support and most ERC features in place.

In FY 2013, funding for ERCs will decrease by $1.0 million, below the FY 2012 Estimate, to a total of $69.0 million. Building on the long-standing ERC program model, NSF will maintain funding for the existing portfolio of ERCs and provide planned growth supplements to the first class of three Nanosystems ERCs (NERCs) funded in FY 2012. This investment will transition the nano-devices created at graduating NSECs to the systems level and commercialization. This will support the first class of three Nanoscale Engineering Research Centers (Nanoscale ERCs) initially funded in FY 2012, maintaining the number of traditional ERCs and Nanoscale ERCs at 17.

Materials Centers - MPS

The Materials Center program is an interdisciplinary vehicle for increasing materials research and educating students, including global experiences. These centers address fundamental research problems of intellectual and strategic importance that will advance U.S. competitiveness and the development of new technologies.

In FY 2011 the Materials Centers program was divided into centers and teams, or Centers for Materials Research and Innovation (CEMRIs) and Materials Interdisciplinary Research Teams (MIRTs). However, based on comments from the Committee of Visitors for the MPS Division of Materials Research in February 2011 and a request from the community, the CEMRIs are reverting to their original name, or Materials Research Science and Engineering Centers (MRSEC). "MRSEC" has been used since 1994 and is a recognized brand of excellence in the materials community. NSF agreed that it would be beneficial to continue using the MRSEC name in place of the newer CEMRI name. This change does not require any programmatic or funding adjustments. The materials teams, or MIRTs, will remain in place as planned. Due to their smaller size, MIRTs do not meet the criteria as formal NSF centers. Therefore, beginning in FY 2012, MIRT funding has been integrated with core research programs. $2.66 million of the funding decrease from FY 2011 to FY 2012 is due to this reallocation of MIRT funding to core programs.

The FY 2013 Request will support 23 MRSECs at $51.20 million (+$6.85 million over the FY 2012 Estimate). The number of centers is equal to FY 2012, with 14 from the 2008 competition and 9 from the 2011 competition. Funding supports continuing grant increments as outlined in existing cooperative agreements. The Materials Centers program holds triennial competitions; the last competition was in FY 2011 and the next is planned for FY 2014.

Nanoscale Science and Engineering Centers (NSEC) - multi-directorate

Nanotechnology, which addresses the smallest of scales, is projected to be one of the largest drivers of technological innovation for the next decade and beyond. This potential was recognized in the National Nanotechnology Initiative, particularly in the burgeoning area of nanomanufacturing. Research at the nanoscale, through NSF-funded Nanoscale Science and Engineering Centers (NSECs), aims to advance the development of the ultra-small technology that will transform electronics, materials, medicine, environmental science, and many other fields. Each center has an extended vision for research. Together they provide coherence and a long-term outlook to U.S. nanotechnology research and education and also address the social and ethical implications of such research. NSEC funding supports education and

outreach programs from K-12 to the graduate level, which is designed to develop a highly skilled workforce, advance pre-college training, and further public understanding of nanoscale science and engineering. These centers have strong partnerships with industry, national laboratories, and international centers of excellence, which puts in place the necessary elements to bring discoveries in the laboratory to real-world, marketable innovations and technologies.

The FY 2013 Request of $26.50 million, representing a decrease of $4.98 million below the FY 2012 Estimate, will support 11 continuing NSECs. The decrease from the FY 2012 Estimate level is primarily associated with two centers receiving final funding in FY 2012. The first class of six NSECs, initiated in 2001, received their final year of support in FY 2010 and completed their associated research programs in FY 2011.

Science and Technology Centers: Integrative Partnerships (STCs) - multi-directorate

The Science and Technology Centers: Integrative Partnerships (STC) program advances interdisciplinary discovery and innovation in science and engineering through the integration of cutting-edge research, excellence in education, targeted knowledge transfer, and the development of a diverse workforce. The STC portfolio reflects NSF-supported disciplines. Examples of investment include: engineering of biological systems; energy-efficient electronics; global and regional environmental systems − sustainability and change; new ways of handling the extraction, manipulation, and exchange of information; cyber security; and new materials for optical and electronic applications. STCs engage the Nation's intellectual talent and collaborate with partners in academia, industry, national labs, and government. STCs strengthen the caliber of the Nation's science, technology, engineering, and mathematics (STEM) workforce through intellectually challenging research experiences for students, postdoctoral fellows, researchers, and educators and advance public scientific understanding through partnerships with K-12 and informal education communities.

A recent review, released in December 2010, by the American Association for the Advancement of Science (AAAS) concluded that the STC program is an effective and distinctive mode of Foundation support for addressing grand challenges and emerging opportunities in science and technology. STCs serve as NSF's major funding instrument for supporting emerging fields of science and technology that do not fit within its existing organizational and programmatic structures – including its other existing center programs. See http://php.aaas.org/programs/centers/capacity/documents/stc_aaas_full_report.pdf.

The FY 2013 Request funding of $74.39 million will support the continuation of 11 existing STCs ($48.09 million), the start up of five new centers ($25.0 million), and the administrative costs ($1.30 million) associated with running the competition and overseeing the program. The change over the FY 2012 Estimate is primarily associated with the funding of five new STCs in FY 2013.

Science of Learning Centers (SLC) - multi-directorate

The Science of Learning Centers (SLC) program supports six large-scale, long-term centers that create the intellectual, organizational, and physical infrastructure needed for the advancement of Science of Learning research. It supports research that harnesses and integrates knowledge across multiple disciplines to create a common groundwork of conceptualization, experimentation, and explanation that anchor new lines of thinking and inquiry towards a deeper understanding of learning. The SLC program goal is to advance the frontiers of all the sciences of learning through integrated research; to connect the research to specific scientific, technological, educational, and workforce challenges; to enable research communities to capitalize on new opportunities and discoveries; and to respond to new challenges. The SLC portfolio represents synergistic, exciting research efforts that address many different dimensions of learning.

In FY 2013, $20.02 million (-$350,000 below the FY 2012 Estimate) will fund six SLCs. SBE will continue to oversee management of all six centers, with co-funding from the NSF Directorates for Biological Sciences (BIO), Computer and Information Science and Engineering (CISE), and Engineering (ENG).

Four awards for the first cohort of SLCs were made in FY 2004. One center was decommissioned in its second year due to its failure to develop cohesively as a center. The remaining three centers, Pittsburgh Science of Learning Center (PSLC), Learning in Formal and Informal Environments (LIFE), and the Center of Excellence for Learning in Education, Science and Technology (CELEST), have been approved for renewal through FY 2014, with a ramp down in funding beginning in FY 2012. Three awards for a second cohort were made in FY 2006 and renewed in February 2011. Two of the three centers in Cohort 2, Temporal Dynamics of Learning Center (TDLC) and the Spatial Intelligence and Learning Center (SILC), were renewed for an additional five years, ending in FY 2015. The third, Visual Language and Visual Learning Center (VL2), was renewed for four years, ending in FY 2014.

Each SLC award requires an annual, external evaluation of the center. Annual meetings of the SLC evaluators contribute to consistency across these evaluations and its usefulness for program managers. A Committee of Visitors (COV) review for the SLCs was held in 2009, and an external, program-level evaluation of the SLC program is being planned for FY 2012.

SBE initiated external discussion on the future of the SLC program and the science it supports at its May 2010 Advisory Committee meeting. The consensus was that NSF should evaluate the program as funding for individual centers comes to a close, with consideration of shifting resources wherever possible to enhance support for the science of learning through non-center mechanisms. In FY 2012 there will be a workshop to explore future directions for the Science of Learning, including diversifying the program's funding mechanisms to include non-center opportunities. NSF started ramping down its funding for the SLC Program in FY 2012.

NSF Estimates for Centers Participation in 2011

(Dollars in Millions)

	Number of Participating Institutions	Number of Partners	Total FY 2011 NSF Support	Total Leveraged Support	Number of Participants
Centers for Analysis & Synthesis	385	62	$23	$8	2,369
Centers for Chemical Innovation	74	62	$26	$3	505
Engineering Research Centers	472	299	$59	$101	2,720
Materials Centers	388	344	$61	$54	4,000
Nanoscale Science & Engineering Centers	648	622	$39	$47	6,553
Science & Technology Centers	177	460	$66	$46	3,129
Science of Learning Centers	44	73	$23	$17	1,120

No. of Participating Institutions: All academic institutions participating in activities at the centers.

No. of Partners: The total number of non-academic participants, including industry, states, and other federal agencies at the centers.

Total Leveraged Support: Funding for centers from sources other than NSF.

No. of Participants: The total number of people who use center facilities, not just persons directly supported by NSF.

Centers Supported by NSF in FY 2011

Center	Institution	State
Centers for Analysis and Synthesis		
National Evolutionary Synthesis Center	Duke, NC State U, U of N. Carolina	NC
National Institute for Mathematical & Biological Synthesis	U of Tennessee- Knoxville	TN
Plant Science Cyberinfrastructure Collaborative	U of Arizona	AZ
SocioEnvironmental Synthesis Center	U of Maryland	MD
Centers for Chemical Innovation		
Chemistry at the Space-Time Limit (phase II)	U of California-Irvine	CA
Center for Aerosol Impacts on Climate and Environment (phase I)	U of California-San Diego	VA
Center for Chemical Evolution (phase II)	Georgia Institute of Technology	GA
Center for Enabling New Technologies through Catalysis (phase II)	U of Washington	WA
Center for Energetic Non-Equilibrium Chem. at Interfaces (phase I)	U of Chicago	IL
Center for Molecular Spintronics (phase I)	North Carolina State U	NC
Center for Molecular Optimization of Electronic Plastics (phase I)	U of Texas Austin	TX
Center for Multiscale Theory and Simulation (phase I)	U Chicago	IL
Center for Nanostructured Electronic Materials (phase I)	University of Florida	FL
Center for Stereoselective C-H Functionalization (phase I)	Emory U	GA
Center for Sustainable Materials Chemistry (phase II)	Oregon State U	OH
Center for Sustainable Polymers (phase I)	U of Minnesota-Twin Cities	MN
Powering the Planet (phase II)	California Institute of Tech	CA
Quantum Information Center for Quantum Chemistry (phase I)	Purdue U	IN
Engineering Research Centers		
Biomimetic Microelectronic Systems	U of Southern California	CA
Biorenewable Chemicals	Iowa State U	IA
Center for Ultra-wide-area Resilient Electric Energy Transmission Network (CURENT)	U of Tennessee Knoxville	TN
Collaborative Adaptive Sensing of the Atmosphere	U of Mass-Amherst	MA
Compact and Efficient Fluid Power	U of Minnesota	MN
Extreme Ultraviolet Science and Technology	Colorado State	CO
Future Renewable Electric Energy Delivery & Mgmt. Systems	North Carolina State U	NC
Integrated Access Networks	U of Arizona	AZ
Mid-IR Tech for Health and the Environment	Princeton	NJ
Quality of Life Technology	Carnegie Mellon/U of Pittsburgh	PA
Quantum Energy and Sustainable Solar Technologies (QESST)	Arizona State U	AZ
Re-inventing the Nation's Urban Water Infrastructure	Stanford University	CA
Revolutionizing Metallic Biomaterials	North Carolina A&T U	NC
Sensorimotor Neural Engineering	U of Washington	WA
Smart Lighting	Rensselaer Polytechnic Institute	NY
Structured Organic Composites	Rutgers	NJ
Synthetic Biology	U of California-Berkeley	CA
Materials Centers		
Brandeis Materials Research Science and Engineering Center	Brandeis U	MA
Princeton Center for Complex Materials	Princeton	NJ
Center for Emergent Materials	Ohio State U	OH
Cornell Center for Materials Research	Cornell	NY
Center for Materials Science and Engineering	Massachusetts Institute of Tech	MA
Center for Micro- and Nanomechanics of Materials	Brown	RI
Center for Multifunctional Nanoscale Materials Structures	Northwestern	IL
Quantum and Spin Phenomena in Nanomagnetic Structures	U of Nebraska	NE
Center for Nanoscale Science	Pennsylvania State	PA
Center for Nanostructured Interfaces	U of Wisconsin	WI
Center for Interface Structures and Phenomena	Yale	CT
Center for Photonics and Multiscale Nanomaterials	U. Michigan	MI

Center for Science and Engineering of Materials	California Institute of Tech	CA
Center for Semiconductor Physics in Nanostructures	U of Oklahoma, U of Arkansas	OK, AR
Liquid Crystals Materials Research Center	U of Colorado-Boulder	CO
Genetically Engineered Materials Science and Engineering Center	U of Washington	WA
Laboratory for Research on the Structure of Matter	U of Pennsylvania	PA
Materials Research Center	U of Chicago	IL
Materials Research Science and Engineering Center	Carnegie Mellon	PA
Materials Research Science and Engineering Center	Johns Hopkins	MD
Materials Research Science and Engineering Center	Harvard	MA
Materials Research Science and Engineering Center	Georgia Institute of Tech	GA
Materials Research Science and Engineering Center	New York U	NY
Materials Research Science and Engineering Center	U of California-Santa Barbara	CA
Materials Research Science and Engineering Center	U of Maryland	MD
Materials Research Science and Engineering Center	U of Minnesota	MN
Materials Research Science and Engineering Center	U. Utah	UT
Materials Research Science and Engineering Center on Polymers	U of Massachusetts	MA
Renewable Energy Materials Science and Engineering Center	Colorado School of Mines	CO
Triangle Materials Research Science and Engineering Center	Duke U.	NC
Nanoscale Science and Engineering Centers		
Affordable Nanoengineering of Polymer Biomedical Devices	Ohio State	OH
Center for Environmental Implications of Nanotechnology (CEIN)	Duke	NC
Center for Integrated and Scalable Nanomanufacturing	U of California-Los Angeles	CA
Directed Assembly of Nanostructures	Rensselaer Polytechnic Institute	NY
Electronic Transport in Molecular Nanostructures	Columbia	NY
High Rate Nanomanufacturing	Northeastern, U of New Hampshire, U of Mass-Lowell	MA, NH
Integrated Nanomechanical Systems	U of California-Berkeley, Cal Tech, Stanford, U of California-Merced	CA
Integrated Nanopatterning and Detection Technologies	Northwestern	IL
Molecular Function at the Nano/Bio Interface	U of Pennsylvania	PA
Nanotechnology in Society Network: Center at ASU	Arizona State U	AZ
Nanotechnology in Society Network: Center at UCSB	U of California-Berkeley	CA
Nanoscale Chemical-Electrical-Mechanical Manufacturing Systems	U of Illinois-Urbana Champaign	IL
Nanoscale Systems in Information Technologies	Cornell	NY
Nanoscience in Biological and Environmental Engineering	Rice	TX
National Nanomanufacturing Network: Center for Hierarchical Manufacturing	U of Massachusetts-Amherst	MA
Predictive Toxicology Assessment & Safe Implementation of Nanotechnology in the Environment (CEIN)	U of California-Los Angeles	CA
Probing the Nanoscale	Stanford, IBM	CA
Science of Nanoscale Systems and their Device Applications	Harvard	MA
Templated Synthesis and Assembly at the Nanoscale	U of Wisconsin-Madison	WI
Science and Technology Centers		
An NSF Center for the Study of Evolution in Action	Michigan State U	MI
Center of Adv. Materials for the Purification of H2O with Systems	U of Illinois-Urbana Champaign	IL
Center for Biophotonics Science and Technology	U of California-Davis	CA
Center for Coastal Margin Observation and Prediction	Oregon Health and Science U	OR
Center for Dark Energy Biosphere Investigations	U of Southern California	CA
Center for Energy Efficient Electronics Science	U of California-Berkeley	CA
Center for Embedded Networked Sensing	U of California-Los Angeles	CA
Center for Integrated Space Weather Modeling	Boston U	MA
Center for Layered Polymeric Systems	Case Western Reserve U	OH
Center for Microbial Oceanography: Research and Education	U of Hawaii-Manoa	HI
Center for Multi-Scale Modeling of Atmospheric Processes	Colorado State U	CO
Center for Remote Sensing of Ice Sheets	U of Kansas	KS
Emergent Behaviors of Integrated Cellular Systems	MIT	MA

Emerging Frontiers of Science Information	Purdue U	IN
National Center for Earth Surface Dynamics	U of Minnesota-Twin Cities	MN
Center on Materials and Devices for Info. Technology Research	U of Washington	WA
Team for Research in Ubiquitous Secure Technology	U of California-Berkeley	CA
Science of Learning Centers		
Center for Excellence for Learning in Education, Science, & Tech.	Boston U	MA
Pittsburgh Science of Learning Center - Studying Robust Learning with Learning Experiments in Real Classrooms	Carnegie Mellon	PA
LIFE Center - Learning in Formal and Informal Environments	U of Washington	WA
Spatial Intelligence and Learning Center	Temple	PA
The Temporal Dynamics of Learning Center	U of California-San Diego	CA
Visual Language and Visual Learning	Gallaudet	DC