MAJOR INVESTMENTS IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) GRADUATE EDUCATION

Overview

The U.S. federal government invests significantly to support science, technology, engineering, and mathematics (STEM) graduate education through traineeships and fellowships, along with a substantial investment through faculty research grants where graduate students are supported as research assistants.[1] To underscore the importance of these investments, the FY 2014 Budget Request introduces a coherent and streamlined NSF investment strategy for the preparation of tomorrow's science and engineering (S&E) workforce. This plan builds on the ideas generated through the strategic planning process of the National Science and Technology Council's Committee on Science, Technology, Engineering, and Mathematics Education (Co-STEM) and on-going interagency discussions of mechanisms for improved effectiveness.

Approach

NSF will provide leadership in developing a more coherent and streamlined strategy for investing in graduate STEM education through a national fellowship program and a new traineeship program.

The NSF strategy for building human capital in graduate education has centered on the NSF Graduate Research Fellowship (GRF) and the Integrative Graduate Education and Research Traineeship (IGERT) programs managed in the Division of Graduate Education (DGE). GRF invites applications from the Nation's most promising students in any STEM field, thereby identifying and supporting the disciplines that are foundational to tomorrow's science and engineering (S&E). With this FY 2014 request, the GRF program will be expanded into a National Graduate Research Fellowship program (NGRF) to incorporate features and opportunities that allow fellows to gain specialized experiences and training in key STEM areas. IGERT will evolve into a new program, NSF Research Traineeships (NRT) that will allow for institutional traineeship program applications that will incorporate plans for transforming aspects of graduate programs and experiences at those institutions, and that will focus on specific areas of need for both the federal government and the STEM enterprise.

Investment Framework

National Graduate Research Fellowship Program

The goal of NGRF is to help build the U.S. S&E human capital necessary to ensure the Nation's leadership in advancing S&E and innovation. NGRF will select, recognize, and financially support graduate students with demonstrated high potential for excellence in STEM and potential for excelling in their ultimate chosen career.

NGRF will support outstanding graduate students in disciplines where there is significant national need and in areas of particular interest to mission agencies. NGRF awardees would be offered the opportunity to compete for targeted opportunities through which they will be able to develop specialized expertise in critical areas. Such targeted opportunities may involve, for example, internships in industry or government laboratories, work on projects of interest to federal agencies, specialized or advanced training, or international experiences. This set of options build upon the structures currently in place within the GRF program, such as Graduate Research Opportunities Worldwide (GROW) and the Engineering Innovation Fellows program. This model allows NSF to maintain the high standards and broad scope of the GRF program while adding targeted opportunities to meet evolving federal priorities

[1] At NSF, about 40,000 graduate students are supported annually at a level of about $1 billion. These dollars are distributed across traineeships (6-8 percent), fellowships (10-15 percent), and research assistantships in individual grants and centers (80 percent).

and emerging workforce needs. This approach will provide flexibility and access to opportunities for students at different stages of their graduate career, while leveraging the federal investment in these students.

The NGRF program will be managed within the current general GRF framework, including consultation with all NSF directorates and other agencies to help ensure the most effective practices are used and suitable targeted opportunities are provided. The stipend, duration, and cost-of-education allowance will be the same as the current GRF.

NGRF Funding by Directorate

(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request
Education and Human Resources	$109.24	$109.64	$162.57
International and Integrative Activities	88.50	88.50	162.57
Total	**$197.74**	**$198.14**	**$325.14**

Totals may not add due to rounding.

Funding for NGRF increases by $127.0 million above the FY 2012 Enacted for a total investment of $325.14 million. This 64 percent increase aligns with the Administration's commitment to coherence and efficiency of investment in STEM graduate education activities across the federal government and will allow for an increase of approximately 700 fellows bringing the total estimated number of new fellows awarded in FY 2014 to 2,700.

NSF Research Traineeships Program

In FY 2014, NSF will challenge the STEM graduate education community to build "NSF Research Traineeships" projects through the NRT program. These projects will design and implement traineeships programs in emphasis areas that align with national priorities where new areas of science are emerging rapidly. NRT will also provide a mechanism for learning about the implementation and impact of innovative graduate traineeship programs or graduate education policies. The program will build on what has been learned through IGERT, the Graduate STEM Fellows in K-12 Education (GK-12) program, and in other relevant NSF-sponsored efforts. NRT will seek transformative approaches to graduate education that keep pace with the transformation of science in emerging fields and in specialized areas.

NRT Funding by Directorate[1]
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request
Biological Sciences	$3.25	$3.25	$3.25
Computer and Information Science and Engineering	5.20	4.20	5.69
Education and Human Resources	31.01	31.20	26.33
Engineering	10.68	7.00	4.44
Geosciences	6.39	6.39	3.64
Mathematical and Physical Sciences	4.53	3.48	3.69
Social, Behavioral, and Economic Sciences	4.30	4.30	3.03
International and Integrative Activities	0.07	-	5.00
Total	**$65.43**	**$59.82**	**$55.07**

Totals may not add due to rounding.

[1] The FY 2012 Actul and the FY 2012 Enacted/FY 2013 Annualized CR funding levels represent investments made through IGERT. In FY 2014, $33.71 million is for continuing IGERT commitments. The remaining $21.36 million is for new NRT investments.

A total investment of $21.36 million for NRT aligns with the Administration's commitment to more coherence in STEM graduate education activities across the federal government. This will allow for a significant launch of the new NRT program in FY 2014 with particular focus areas to be identified in FY 2013. NRT will encourage much stronger and documented efforts at innovation and new design in graduate programs to support growth and trainees within this targeted emphasis area.

Evaluation Framework

The evaluation framework for both NGRF and NRT is outlined in the table below.

	Potential Measure/Indicator	**Desired Outcome**

Program Development	• Development of coherent solicitations for a fellowship and traineeships program
	• Implementation of effective collaboration across NSF directorates and federal agencies in graduate fellowships and traineeship investment
	• Identification of agreed-upon outcomes of federal investments in graduate students and graduate education
	• Development of targeted opportunities for NGRF and areas of research focus for NRT
		• Graduate STEM fellowship and traineeship investments that:
		  • Serve missions of federal agencies
		  • Provide clarity and efficiency for applicants for fellowship support
		  • Provide opportunities for training for work in areas of national needs
		• A successful initial step in considering frameworks for graduate education investment that can be applied across fellowship, traineeship and research assistantship investments.

Student Development	• Metrics will include:
	  • student educational decisions;
	  • degree attainment;
		• Diverse population of students who are well prepared for:
		  • a range of career options and potential

	• student preparation in identified areas of national need; and • performance of groups under-represented in STEM. • Quality of education and career development, comparing student experiences based on funding mechanism.	changes in career paths; • work in areas of national need/missions of federal agencies; and • national leadership in STEM in the private and public sectors.
Career Impact	• Metrics will include information concerning: • career trajectories; • range of career paths; • productivity appropriate for careers; and • leadership roles in public and private sectors.	• Diverse workforce that: • makes significant contributions through a range of careers; • conducts research at the frontiers of S&E; • develops innovations of high impact; and • provides national leadership in the public and private sectors.