

GROWING CONVERGENCE RESEARCH (GCR)

GCR Funding¹ (Dollars in Millions)		
FY 2020	FY 2021	FY 2022
Actual	Estimate	Request
\$15.90	\$16.00	\$24.17

¹ Funding displayed may have overlap with other topics and programs

Overview

GCR is a NSF program that empowers the U.S. research community to leverage multiple scientific and engineering (S&E) disciplines and develop novel research strategies to address extremely challenging and complex problems. GCR research challenges are inspired by deep scientific questions or pressing societal needs and require the integration of multi-disciplinary perspectives.

The grand challenges of today—such as developing infrastructure resilient to extreme events and geo-hazards; combining biology, physical sciences, engineering, computer and cognitive science to produce the machines and materials of the future; enhancing sustainability in an era of rapid global change; exploring the universe at all scales; preparing the future scientific workforce for convergence research through innovations in STEM education at all levels; and creating the breakthroughs that will enable emerging industries—will not be solved by one discipline alone. They require convergence: the merging of ideas, approaches, tools, and technologies from widely diverse fields of knowledge to stimulate innovation and discovery. Convergence research is a means of solving complex research problems that have two unifying characteristics: (1) they have the potential to make a significant impact, either on fundamental understanding in S&E or on the Nation’s ability to meet pressing societal challenges, or both; and (2) they require the integration of knowledge, tools, and ways of thinking from multiple disciplines.

NSF’s GCR responds in part to recommendations from major reports describing the importance of convergence for the research ecosystem. Key reports include National Academies of Science, Engineering, and Medicine reports from 2014 and 2017, Massachusetts Institute of Technology (MIT) reports from 2011 and 2016, and a 2013 report published by Springer. These reports emphasize the importance of convergence approaches to S&E research to address grand challenges. These reports also emphasize the role of federal funding agencies in realizing the benefits of convergence by expanding mechanisms for funding convergence research.

Goals

The goals of GCR are to:

1. Catalyze convergence approaches to solve compelling scientific and engineering research problems at the intersection of existing disciplines.
2. Identify emerging convergence research challenges.
3. Enhance NSF’s review process to more effectively assess the merit of convergence research proposals.

Approach

GCR will strengthen the global competitiveness of the U.S. S&E enterprise by growing a new generation of convergence researchers skilled at working in teams and able to respond rapidly to new research challenges. To support convergence research, NSF continues to use review processes designed to address the key technical, organizational, and logistical challenges that hinder the evaluation of truly integrative

Growing Convergence Research

research. GCR's strategic investments in emerging convergence research themes will support the development of new fields of inquiry, discovery of the knowledge necessary for society to develop solutions or technologies to address important societal challenges, and training in convergence research.

GCR uses several mechanisms to accomplish programmatic goals, including:

Exploratory Grants

GCR exploratory research grants enable research teams to demonstrate their ability to collaborate effectively, resolve epistemological and ontological differences between disciplines, integrate conceptual models, tools, methodologies, and infrastructure; and show progress on their convergence research projects. Exploratory grants are expected to have budgets of up to \$3.60 million and durations of up to five years. Exploratory grants will prepare research teams for larger scale convergence research awards through programs such as Science and Technology Centers, Engineering Research Centers, and NSF Research Traineeships. NSF announced the first exploratory grant opportunity in FY 2018.¹ In February 2019, NSF released a GCR solicitation, NSF 19-551,² which described annual funding opportunities starting in FY 2019.

Emerging Research Challenges

GCR will take advantage of a number of proven tools to enable the research community to identify and explore important emerging research challenges. Examples include Ideas Labs and Research Coordination Networks, as well as novel incubation approaches that may be suggested by researchers.

Enhanced Merit Review Process

An enhanced merit review process is employed for convergence research projects. NSF identified a cadre of experienced convergence researchers using data-mining tools, the knowledge of program staff, and suggestions from learned societies to evaluate GCR research projects. A diverse pool of such researchers participate in a College of Reviewers (CoR). NSF staff draws on members of the CoR as well as other technical experts to review proposals submitted in response to the GCR solicitation.

FY 2022 Investments

Exploratory Grants

Investments will focus on two phases: (1) catalyzing convergence of new teams at the intersection of existing disciplines (four to seven new research collaborations, each funded at up to \$600,000 per year for the first two years); and (2) continuing support of four to seven teams funded in 2020 who have demonstrated significant progress on their convergence research projects.³

Emerging Research Challenges

GCR will invest in research community-led activities to identify and explore pressing, emerging research challenges that are large in scope, innovative in character, originate outside of any particular NSF directorate, and may require a long-term commitment.

Enhanced Merit Review Process

Additional experts will be recruited to expand the Convergence CoR.

¹ www.nsf.gov/pubs/2018/nsf18058/nsf18058.jsp. This resulted in seven awards in FY 2018 and three in FY 2019.

² www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=505637&ods_key=nsf19551.

³ The second phase of projects will be funded up to \$800,000 per year and may continue for up to three years pending successful yearly progress.