



American Rescue Plan & COVID-19 Response Update

Updated June 21, 2022

FACTS

\$521,983,976

**ARP Research Recovery
Funds Mobilized**

1,530 Awards Funded

OVERVIEW



As part of the national effort to recover from the COVID-19 pandemic, the National Science Foundation (NSF) continues to fund important research as well as recovery efforts to help the United States science, engineering and STEM education communities rebound. From equipment delays and reagent shortages to lost training time and missed field research, the pandemic has strained research projects in unique ways. With the continued support from Congress and the Administration, including the \$600 million provided in the American Rescue Plan, NSF is able to support groups of individuals and institutions most strongly affected by the pandemic as well as those at vulnerable transition points in their research careers.

The funds are being invested consistent with the below guiding principles:



MOST STRONGLY AFFECTED GROUPS. The pandemic has exacerbated existing disparities and has had disproportionate impacts on specific groups of individuals. These strongly affected groups include:

- Women researchers, who have disproportionately taken on the duties associated with increased child-care and other family-related responsibilities.
- Underrepresented groups. Programs that support these students and researchers have been subject to disruption due to the pandemic.
- Early-career faculty. The early part of a research career represents a critical time for research productivity, building and funding a research program, and preparing for potential tenure and promotion.



INDIVIDUALS AT VULNERABLE CAREER TRANSITION POINTS. It is well established that attrition from STEM or higher education altogether frequently occurs at certain educational and career transition points, and the pandemic has intensified this threat. These individuals/transition points include:

- Undergraduates preparing to finish their degrees and attend graduate school.
- Graduate students, particularly those nearing the end of their research careers.
- Postdoctoral fellows, research trainees, and graduate fellows.
- Early career faculty.
- Mid-career faculty, who are often called upon to do greater service in light of pandemic impacts.

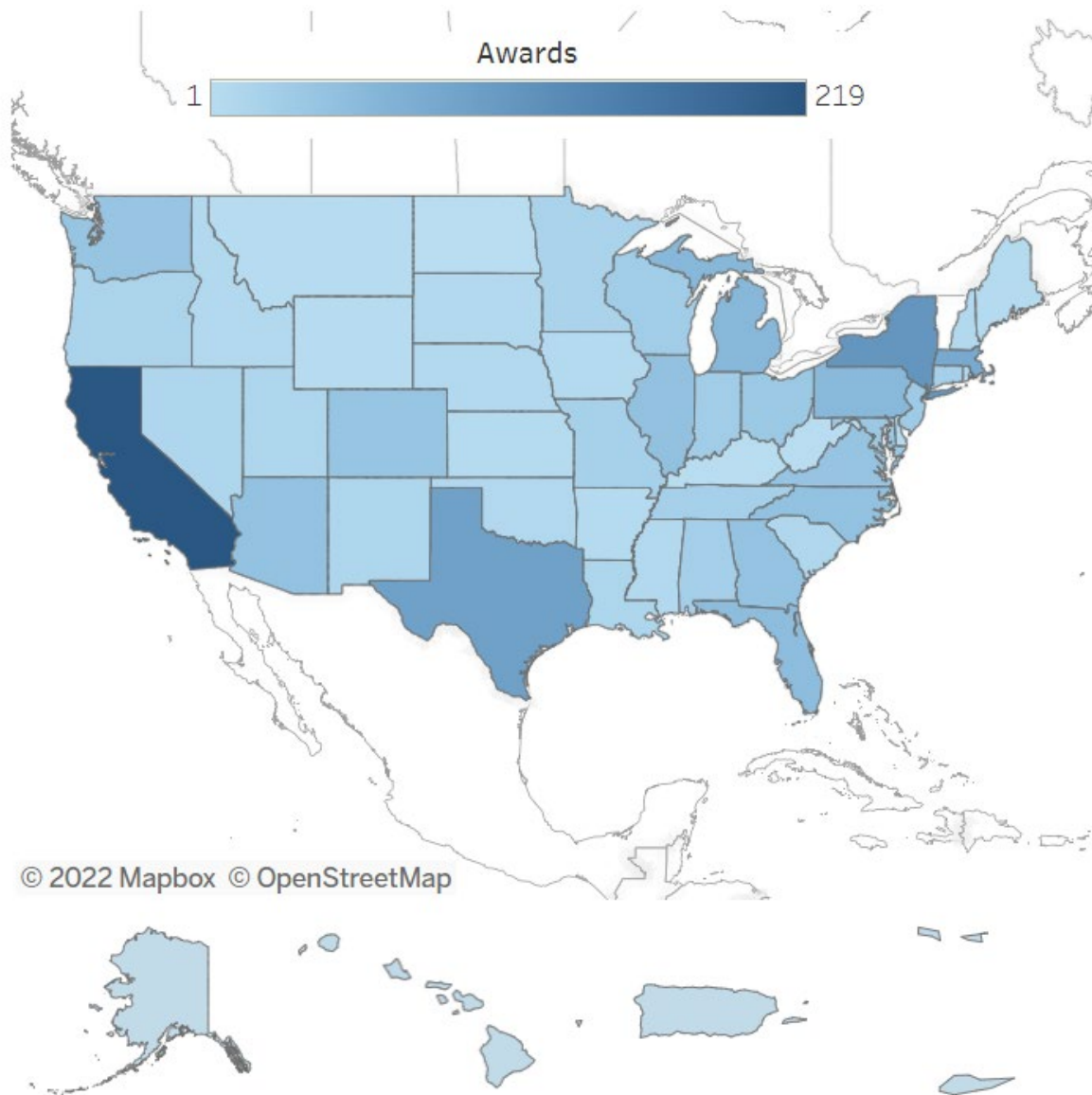


BROAD DISTRIBUTION. To ensure a broad distribution of funding and in further pursuit of the funds reaching those most impacted by the pandemic, NSF is using these funds towards an expansive research portfolio that prioritizes disproportionately affected persons at every institution as well as all persons at disproportionately affected institutions, such as:

- Minority-serving and less-affluent institutions, which may lack strong research administration infrastructure or the financial resources to support STEM students and faculty.
- Institutions in EPSCoR jurisdictions, which have not benefited from robust federal funding yet support a significant number of STEM students and faculty across the nation.

AWARDS

	American Rescue Plan funds	Research Recovery (FY21 + FY22)	COVID-19 Research (CARES Act + FY20 + FY21 + FY22)
Number of Awards	1,530	2,960	1,322
Funding Deployed	\$521,983,976	\$661,723,923	\$250,935,295



ARP awards by state

NSF Support

This update spotlights recent awards funded by the American Rescue Plan and research programs stood up by NSF to support the scientific research community. It is a snapshot of the essential research and support NSF is able to invest in thanks to the support from Congress and the Administration.

NSF PROGRAM FEATURE

Directorate for Engineering

Engineering Research Initiation Program

The U.S. National Science Foundation's investments in engineering research and education are critical building blocks for the nation's future economic growth and prosperity. Engineering breakthroughs have addressed national challenges, enriched our understanding of natural systems, fostered new technologies, fortified the nation's infrastructure, and introduced the exciting possibilities of engineering to the next generation. [NSF's Directorate for Engineering](#) supports the development of a diverse engineering workforce versed in the forefronts of engineering research and promotes the success of new academic investigators in their careers as researchers, educators, and innovators.

The [Engineering Research Initiation \(ERI\) program](#) supports new investigators who have yet to receive research funding from Federal Agencies. This funding opportunity aims to broaden the base of investigators involved in engineering research and specifically supports investigators who are not affiliated with "very high research activity" R1 institutions according to the [Carnegie Classification](#).

In FY 2022, NSF funded more than 80 ERI awards to non-R1 institutions supported in part by an \$11 million investment from the American Rescue Plan. The ERI program invests in engineering research with broad societal impact from improving our understanding of public water supplies to enabling fair work systems for emergency medical service professionals and developing innovative biomaterials for novel medical therapies. Please visit our website to learn more about [projects funded by NSF's ERI program](#).

AWARD HIGHLIGHTS

DIVISION OF CHEMICAL, BIOENGINEERING, ENVIRONMENTAL AND TRANSPORT SYSTEMS



American Rescue Plan \$199,988

Title [ERI:Network by network fabrication approach of bioinspired scaffolds to study the effect of fibrin and hyaluronic acid on the reactive and inflammatory response of human astrocytes](#)

Institution Trinity University; San Antonio, TX

Research & Recovery Inflammation of the nervous tissue, neuroinflammation, has been increasingly recognized as a risk factor for the progressive loss of structure or function of neurons and the onset and progression of neurological disorders. Several studies have identified changes in brain tissue composition as key factors in regulating acute and chronic inflammation in the central nervous system (CNS). Due to the dynamic changes, the relationship between changes in brain tissue composition and neuroinflammation remains unclear. This Engineering Research Initiation (ERI) award will investigate the relationship between changes in brain tissue composition and neuroinflammation. To enable this study, a biomaterial platform will be developed to study the abnormal behavior of human cells, called astrocytes, in CNS tissue triggered by changes in tissue composition. This project will provide a proof-of-principle for the fabrication of a 3D in vitro model to study the onset and progression of inflammatory signaling in human astrocytes. In the long term, the development and validation of the proposed 3D model will further contribute to the design, testing, and evaluation of new therapeutic molecules to treat CNS tissue damage. The execution of this project will provide undergraduate students with hands-on experience to develop problem-solving, laboratory, and leadership skills and to promote the STEM disciplines among at-risk middle/high school students.

This ERI award supports research and education at an institution that is designated as a Predominantly Black Institution and an emerging Hispanic Serving Institution. The principal investigator is an early-career, new researcher who is part of an underrepresented racial and ethnic group in engineering.

DIVISION OF CIVIL, MECHANICAL AND MANUFACTURING INNOVATION



American Rescue Plan \$114,276

Title [ERI: Analyzing the Impact of Outdoor Water-Use Restrictions and the COVID-19 Pandemic on Water Consumption in Massachusetts](#)

Institution Western New England University; Springfield, MA

Research & Recovery This Engineering Research Initiation (ERI) project will provide critical understanding of the impacts of outdoor water-use restrictions on water consumption in Massachusetts. Despite relatively abundant rainfall and regulations on water withdrawal, Massachusetts' water supplies are stressed. Consequently, public water suppliers are often required to implement outdoor water-use restrictions by the regulatory authority. These restrictions are complex, non-uniform, and contentious, and the COVID-19 pandemic is yet another confounding factor. This project, the first of its kind to be implemented at a state-wide scale anywhere in the United States, will (a) provide new insights to facilitate integrated water resources management at the scale of major river basins, (b) provide comprehensive analysis to inform regulatory action, and (c) empower public water suppliers with improved understanding of the factors influencing restriction effectiveness. Furthermore, this project will identify the impact of the pandemic, thus providing knowledge about the resilience of Massachusetts' water supply systems and revealing important lessons for ensuring water supply under future unforeseen conditions. Lastly, this project supports an early-career woman researcher and will provide meaningful research experiences for undergraduate and master students, including those in minority/underrepresented groups, resulting in valuable benefits such as increased independence and intrinsic motivation to learn.

DIVISION OF CIVIL, MECHANICAL AND MANUFACTURING INNOVATION

American Rescue Plan \$199,901



Title [ERI: Workload-Informed Operations for Emergency Medical Services](#)

Institution Wichita State University; Wichita, KS

Research & Recovery This Engineering Research Initiation (ERI) award supports research enabling a fair work system for Emergency Medical Service (EMS) professionals and other first responders. EMS systems save the lives of patients needing emergency health care outside the hospital by responding to 911 calls. These professionals tend to work long shifts during which they may be exposed to a great variety of situations, including traumatic events. However, the actual workload experienced by EMS professionals is not well understood, leading to stress, burnout, and high levels of attrition. The resulting shortage of paramedics in the United States endangers the ability to respond to

emergency calls and puts lives at risk. This research will assess the workload experienced by EMS crewmembers in real time and incorporate that into operational decision-making, such as call coverage, task and crew switching, within EMS systems. An improved operating environment is expected to lead to a reduction in work-related attrition among EMS professionals, thereby ensuring that the community receives high-quality emergency out-of-hospital health care while promoting the well-being of first responders. This research will impact the discipline of work systems science by transforming how work one measures and designs work involving highly variable, non-repetitive tasks, which constitute many of today's occupations in the United States.

This award supports an early-career, woman researcher and will provide a team of graduate and undergraduate students from the Department of Industrial, Systems and Manufacturing Engineering with the opportunity to collaborate with EMS professionals and decision-makers through data collection, analysis and reporting activities. The PI is committed to recruiting and mentoring students from diverse backgrounds, particularly women and Hispanic, into the research team. The grantee institution is in Kansas, an EPSCoR jurisdiction.

**DIVISION OF CIVIL, MECHANICAL AND
MANUFACTURING INNOVATION**
American Rescue Plan \$649,999



Title [BRITE Relaunch: A Liquid Phase Process for Graphene Manufacturing](#)

Institution Brown University; Providence, RI

Research & Recovery Remarkable materials can be engineered from carbon. Fullerenes, carbon nanotubes, and most recently graphene have garnered huge interest due to their special chemical, optical, magnetic, and mechanical properties. Whether it is protecting metals from corrosion or enabling the next generation of lightweight and strong plastics, these new carbon materials are poised to enable a greener and more sustainable society. To fully exploit these systems requires transformative approaches to their manufacturing. The highly inefficient and energy consuming techniques used by researchers to make these special carbons, while adequate for the laboratory, are poorly suited to the large scale and sustainable production needed to translate them to widespread commercial use. This Boosting Research Ideas for Transformative and Equitable Advances in Engineering (BRITE) Relaunch award capitalizes on a recent discovery that will support the manufacturing of graphene at relatively low temperatures, and it will apply this advanced manufacturing technique to form intricately shaped magnetic polymers as well as porous

carbon sponges. Such sponges are excellent bulk materials for removing waste materials from contaminated water. This effort will offer an alternative manufacturing route to the rapidly expanding graphene industry and provide intensive research training for graduate students and undergraduates alike, with efforts aimed at increasing the retention of STEM undergraduates in engineering. It also supports the development of sustainable materials education for engineers, providing a quantitative framework for assessing the overall impact of a manufacturing process.

The Relaunch track of the BRITE program supports the return of midcareer and more senior principal investigators to active research after a pause and diversifies the experiences of the nation's STEM researchers directly (by reinvesting in highly-skilled PIs) and indirectly (via a Diversity, Equity, and Inclusion plan as part of each proposal). This BRITE Relaunch project is in Rhode Island, an EPSCoR jurisdiction, and supports a principal investigator who is part of an underrepresented group in engineering that has been more strongly impacted by the pandemic.

DIVISION OF BIOLOGICAL INFRASTRUCTURE

American Rescue Plan \$327,972



Title	<u>REU: Research Experience for undergraduates in Genomics, Proteomics, Metabolomics and Data Science</u>
Institution	Florida A&M University; Tallahassee, FL
Research & Recovery	This REU Site award to Florida A&M University, a HBCU located in Tallahassee, will support the training of 8 students for 10 weeks during the summers of 2022 - 2024. It is anticipated that a total of 24 students, primarily from schools with limited research opportunities or from an under-represented group, will be trained in the program.

This REU program focuses on systems biology research, integrating -omics technologies and data science, to understand interactions within a living system. A multidisciplinary faculty team from biology, chemistry, and computer science will serve as mentors. The REU participants will gain research experience in cutting-edge technologies to encourage pursuit of advanced degrees and careers in STEM. Students will learn how research is conducted, and many will present the results of their work at scientific conferences. Students will be encouraged to form networks critical to their development as scientists.

DIVISION OF BIOLOGICAL INFRASTRUCTURE

American Rescue Plan \$398,004



- Title** [REU Site: Understanding biological responses to global change in a field station community](#)
- Institution** Michigan State University; East Lansing, MI
- Research & Recovery** This REU Site award to Michigan State University's Kellogg Biological Station (KBS), located in Hickory Corners, MI, will support the training of 10 students for 10 weeks during the summers of 2022-2024. It is anticipated that a total of 30 students, primarily from schools with limited research opportunities or from an under-represented group, will be trained in the program.

REU students at KBS will conduct research to understand how organisms and ecosystems respond to global changes, in a time when this knowledge is more essential than ever. Mentors come from departments of Integrative Biology, Plant Biology, Fisheries and Wildlife, and Plant, Soil, and Microbial Sciences. In a close-knit community of researchers and other STEM professionals, REU students will benefit from regular interactions with scholars and summer program participants, participation in professional development workshops, and leadership, inclusion, and research ethics trainings. They will also practice communicating their science to a wide variety of audiences and participate in an end-of-summer research symposium. Students will learn how research is conducted, professional development and leadership skills, and many will present the results of their work at scientific conferences.

DIVISION OF UNDERGRADUATE EDUCATION

American Rescue Plan \$267,822



- Title** [Collaborative Research: Using Communities of Practice to Transform STEM education for Latinx Students at Two-Year Hispanic Serving Institutions](#)
- Institution** University of Connecticut; Storrs, CT
- Research & Recovery** This is a CS for All: Research and RPPs collaborative project among University of Nevada Las Vegas, George Mason University, University of South Carolina Upstate and Weber State University. This project seeks to develop integrated computer science (CS) curricula using affordances of educational robotics for grades 3-5 students in linguistically diverse classrooms; provide teacher professional development around classroom implementation of integrated units; and conduct educational research with regard to teacher outcomes (computer science teaching efficacy beliefs and teacher identity) and student outcomes (attainment of computer science concepts and practices, views of computer scientists, and computer scientist identity). This project will assist elementary school teachers in culturally, linguistically, and economically diverse

communities of Clark County, Nevada, and Spartanburg, South Carolina, and the less culturally and linguistically diverse community of Davis County, Utah to successfully integrate CS into their classroom teaching. This project reflects the stance that CS should be meaningfully integrated with math, science, and rich literacy connections by considering English learners' (EL) funds of knowledge and English language proficiency levels to extend all elementary school students', including ELs, exposure to CS before middle school. This approach would provide all students with equitable learning opportunities to access CS education and eventually cultivate their interest in computing fields. The RPP will provide information to the field on the successes and challenges of engaging in this work and a program that is evidence-based through rigorous efficacy research.

OFFICE OF POLAR PROGRAMS
American Rescue Plan \$1,199,063



Title [Collaborative Research: Arctic Observing Network For Observing Transformation of the Greenland Ice Sheet Firn Layer](#)

Institution University of Montana; Missoula, MT

As the Arctic warms two-to-three times faster than the global average, the duration and intensity of melting is generally increasing on the surface of the Greenland ice sheet. The aged and dense snow covering the ice sheet is called 'firn' and forms a porous layer. However, as this porous layer absorbs more meltwater it becomes warmer, denser, and filled with ice layers, which reduces its ability to absorb additional meltwater. The thermal and structural transformation that Greenland's firn layer is undergoing has important implications for the ice sheet's capacity to retain future meltwater. This project team is observing firn layer changes using a network of instruments installed within the firn layer and by taking ice cores samples of the firn. The observational data collected will provide documentation of firn conditions needed to develop and test models and remote sensing tools for large-scale investigations of changes to the Greenland ice sheet. Future transformation of the firn layer will govern how much surface meltwater is retained locally on the ice sheet and how much runs off, thereby impacting hydrologic conditions of the ice sheet and surrounding regions, as well as ocean salinity and sea level rise.

The project will engage and support a relatively large number of undergraduate and graduate students at R2 institutions with field research experiences and real-world classroom learning. Outreach activities will target three groups poorly represented in cryospheric science: 1) local and Indigenous residents of Greenland; 2) American Indian undergraduate students; and 3) economically disadvantaged school children.

The researchers are located at R2 institutions that have been negatively impacted by the pandemic. The researchers will incorporate research activities into their courses at various class levels. In addition, the researchers will coordinate with a tribal college, Salish Kootenai College, to provide educational and field experience opportunities in polar and cryosphere science.

OFFICE OF INTERNATIONAL SCIENCE AND ENGINEERING
American Rescue Plan \$300,000



Title [IRES Track I Investigating the demographic consequences of species interactions](#)

Institution University of Tennessee in Knoxville; Knoxville, TN

Research & Recovery Plants and insects develop mutually beneficial relationships. These mutualistic relationships are important for the maintenance of biological diversity. However, mutualistic relationships are increasingly threatened by expanding human activities including farming, species invasion and forest overharvest. This International Research Experience for Students (IRES) grant will support 3 cohorts of 5 US students over a 3 year period to spend 6 weeks/year in Benin conducting collaborative research with mentors and students from three Benin universities. This project will broaden participation in STEM by recruiting from a strong pool of underrepresented minority students via an integrated recruitment strategy. These US students will gain research skills investigating the causes and consequences of the disruption of mutualistic relationships between African mahogany and weaver ants with a focus on statistical analysis of real data they collect by themselves. By studying the mechanistic influence of human activities on mutualism disruption, this project will advance our knowledge of how ecological interactions can persist in human-modified landscapes. From an educational perspective, this IRES project will advance our understanding of the role that learning from peers in multicultural environment plays in alleviating students' fear of statistics, one of the major issues limiting the recruitment of minorities in ecology programs. This IRES project will facilitate international research collaboration and provide evidence for the importance of field research experience in training a diverse globally engaged workforce. A foundational outcome of this IRES project is the training of 3 cohorts of 5 US students, while sequentially building on each cohort's work, advancing global collaboration through global science, training the next generation of scientists, and support workforce development in ecology, statistical methods, field research and scientific communication.

NSF Research News

Science Matters: [Engineers studying how PFAS interact with environment](#)

Science Matters: [Image of Sgr A*, the black hole at the center of our galaxy](#)

Science Matters: [Battery recycling breakthrough](#)

Research News: [New class of light-powered polymer catalysts could improve pharmaceutical manufacturing](#)

Research News: [How sleep builds relational memory](#)