



National Science Foundation FY 2019 Performance and Financial Highlights

Who We Are and What We Do

- The National Science Foundation (NSF) is the only federal agency that invests in fundamental, basic research and education across the full spectrum of science, technology, engineering, and mathematics (STEM) disciplines.
- NSF’s vision is of a Nation that is the global leader in research and innovation.
- NSF supports research and workforce development programs that help drive future economic growth and enhance our Nation’s security and global competitiveness.
- NSF invests in basic research that makes transformative breakthroughs and leads to new ways of thinking about scientific, economic, and sociotechnical challenges facing the Nation and the world.
- NSF funds advanced instrumentation and facilities, Arctic and Antarctic research and operations, cooperative research between universities and industry, and U.S. participation in international scientific efforts.

NSF by the Numbers	
\$8.1 billion	FY 2019 Appropriations (does not include mandatory accounts)
1,800	Colleges, universities, and other institutions receiving NSF funding in FY 2019
41,000	Proposals evaluated in FY 2019 through a competitive merit review process
11,300	Competitive awards funded in FY 2019
192,000	Proposal reviews conducted in FY 2019
306,000	Estimated number of people NSF supported directly in FY 2019 (researchers, postdoctoral fellows, trainees, teachers, and students)
60,000	Students supported by NSF Graduate Research Fellowships since 1952



From the Director



Credit: NSF/Stephen Voss

The National Science Foundation (NSF) is pleased to present its *Fiscal Year (FY) 2019 Performance and Financial Highlights Report*. In addition to identifying NSF’s annual financial performance and accountability results, this report highlights NSF’s accomplishments this fiscal year as we pursue our mission to “promote the progress of science, to advance the national health, prosperity and welfare; and to secure the national defense...”

For almost seven decades, NSF has invested in discovery and learning that has sparked new ways of thinking about scientific, economic, and sociotechnical challenges facing the Nation and the world. Among the exciting and transformational results we witnessed in 2019 was the first-ever image of a black hole some 55 million light-years away, captured by the NSF-supported Event Horizon Telescope. Also, this year, the agency accelerated research and spurred innovation in quantum technology through strategic investments. NSF-supported research will advance quantum information science and engineering, taking it from theory to practice, in order to lay the foundations for a new century of discovery in the quantum realm. As the Nation’s leader in polar policy, research and logistics, NSF has charted new courses in the once remote, yet still challenging Arctic. In 2019, NSF joined an international coalition to study Arctic changes by supporting the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) project. Throughout FY 2019, NSF has identified and guided investments toward new, cutting-edge research in all fields of science and engineering.

NSF strives to ensure that students from all sectors of our society have access to exemplary learning experiences. Our education and training

portfolio funds programs that enrich educational experiences for all students and enhance science, technology, engineering, and mathematics (STEM) talent needed for the 21st century. Students must be prepared for a world increasingly dependent on technology, and educators are developing learning platforms and training programs to pique scientific curiosity and strengthen analytical skills.

NSF works to build and sustain public trust in our operational and fiduciary responsibilities by using forward-looking risk management practices and by maintaining effective internal controls that provide transparency and accountability. NSF’s *Annual Performance Report*, which is included in the agency’s *FY 2021 Budget Request to Congress*, includes a full discussion of NSF’s progress toward its annual performance goals. As in past years, all NSF performance data were independently verified and validated using guidelines for completeness and reliability from the Government Accountability Office. NSF’s *Annual Performance Report* contains a discussion of NSF’s data validation.

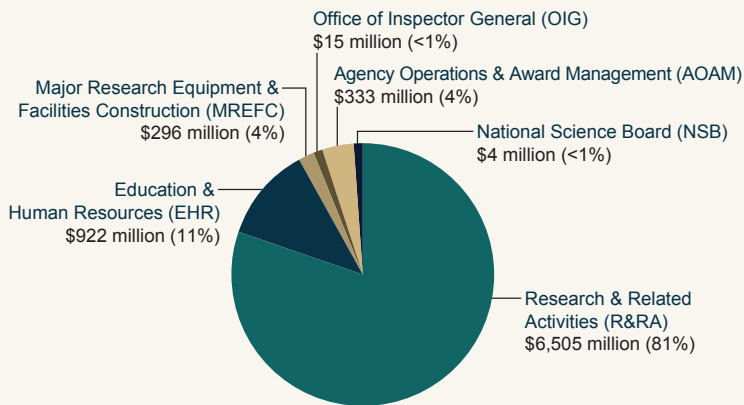
In addition to this *Highlights* report, I invite you to review NSF’s *FY 2019 Agency Financial Report* and our website at www.nsf.gov to learn more about NSF’s investments in science and engineering research and education. It is NSF’s commitment to efficient and effective management practices and sound financial oversight that allows NSF to pursue critical investments in science and engineering research and education. The discoveries and advances of the past year take us beyond what was previously imagined, illustrating that the research NSF funds impacts and shapes the future. Bold ideas, inspiring discoveries, far-reaching technologies, new industries: NSF is where this journey begins.

France A. Córdoba
February 10, 2020

NSF by the Numbers

Where It Comes From

FY 2019 Appropriations by Account—\$8,075 million



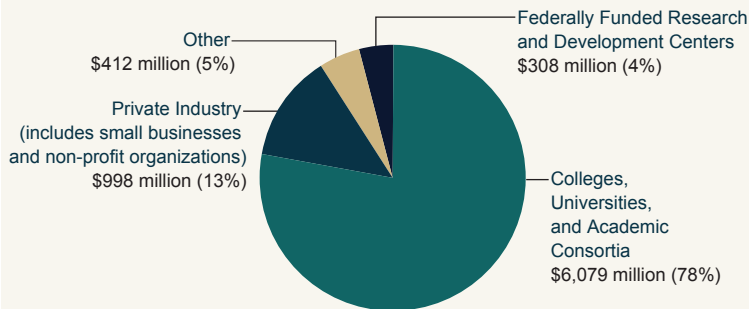
Note: \$15.49 million was transferred from R&RA to EHR and AOAM, \$12.0 million and \$3.49 million, respectively.

Totals may not add due to rounding.

Where It Goes

Institutions Funded by NSF

FY 2019 Obligations for Research and Education Programs—\$7,798 million



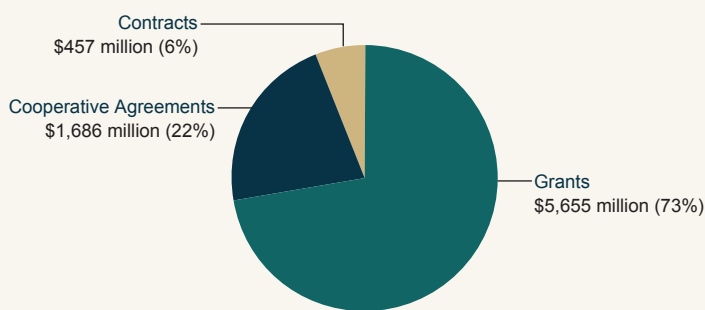
Notes: NSF Research and Education programs include - R&RA, EHR, and MREFC appropriations. Other institutions funded include federal, state, and local governments; and international organizations.

Totals may not add due to rounding.

How It Gets There

NSF Award Mechanisms

FY 2019 Obligations for Research and Education Programs—\$7,798 million



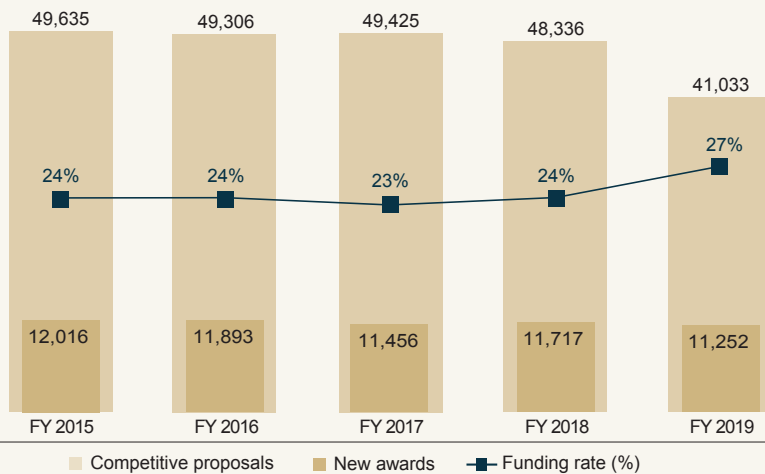
Notes: NSF Research and Education programs include - R&RA, EHR, and MREFC appropriations.

Totals may not add due to rounding.

- NSF is funded primarily through six Congressional appropriations, which totaled \$8,075 million in FY 2019. R&RA, EHR, and MREFC fund the agency's programmatic activities. The AOAM appropriation provides funds to administer and manage those programmatic activities. Separate appropriations support the activities of the OIG and NSB. (Appropriations acronyms are spelled out in chart to the left.)
- Approximately 29,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers. NSF made awards to over 1,800 institutions in 50 States, the District of Columbia, and three U.S. territories. These institutions employ many of America's leading scientists, engineers, and educators, and they train the leading innovators of tomorrow.
- Seventy-eight percent of support for research and education programs went to colleges, universities, and academic consortia. Awards also went to federally funded research and development centers and private industry, including small businesses and non-profit organizations. Other recipients included federal, state, and local governments; and international organizations. A small number of awards fund international science and engineering research, education, and partnerships, which add value to the U.S. scientific enterprise and maintain U.S. leadership in the global scientific enterprise.
- NSF funded most awards (95 percent) through grants or cooperative agreements. Grants can be either standard awards, in which funding for the full duration of the project is awarded in a single fiscal year, or continuing awards, in which funding for a multi-year project is awarded in increments. Cooperative agreements are used when the project requires substantial agency involvement (such as research centers, multi-use facilities). Contracts are used to acquire products, services, and studies, such as program evaluations, required for NSF or other government use.

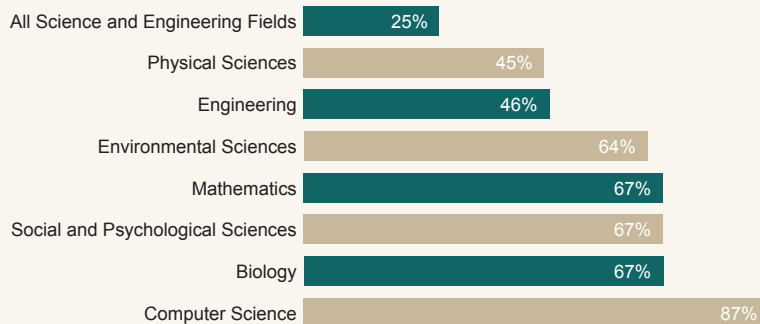
How It's Spent

Number of NSF Competitive Proposals, New Awards, and Funding Rates



Note: New awards are a subset of competitive proposals.

NSF Support of Academic Basic Research in Selected Fields (as a percentage of total federal support)



Note: Biology includes Biological Sciences and Environmental Biology. Biology and Psychological Sciences exclude National Institutes of Health.

Source: NSF/National Center for Science and Engineering Statistics, Survey of Federal Funds for Research & Development, FY 2017.

- The number of competitively reviewed proposals and new awards decreased from previous years, and funding rates increased. NSF is reviewing various factors that may have led to these changes. The upcoming FY 2019 merit review report will include this analysis.
- In FY 2019, an estimated 306,000 people were directly involved in NSF programs and activities. Beyond these figures, NSF programs indirectly impact millions of people. These programs reach kindergarten through 12th-grade students and teachers, the general public, and researchers through activities including workshops; informal science activities such as museums, television, videos, and journals; outreach efforts; and dissemination of innovative instructional resources and teaching methods.
- NSF supports 25 percent of all federally-sponsored basic scientific research conducted by America's colleges and universities; this share increases to 60 percent when medical research supported by the National Institutes of Health is excluded. In many fields, NSF is the primary source of federal academic support.
- NSF upholds its commitment to excellence in financial management by focusing on sound fiscal practices, continuously improving its business processes, increasing data transparency, and emphasizing the responsible stewardship and management of federal funds. Below is a summary of FY 2019 financial management performance results.

FY 2019 Financial Management Performance Results

	Results
Financial Statement Audit* <ul style="list-style-type: none"> Unmodified opinion (22nd consecutive "clean" opinion) Material weaknesses 	Yes None
Management Assurances <ul style="list-style-type: none"> Effective internal control over operations, reporting, and compliance (FMFIA §2 and §4) Compliance with Section 803(a) of FFMIA: system requirements, accounting standards, and U.S. General Ledger at transaction level 	Yes No lack of compliance noted
Improper Payment Elimination and Recovery Act (IPERA) <ul style="list-style-type: none"> Improper payments reports 	Compliance

* NSF's FY 2019 Independent Auditor's Report is in NSF's FY 2019 Agency Financial Report.

FMFIA: Federal Managers Financial Integrity Act of 1982

FFMIA: Federal Financial Management Improvement Act of 1996

How We Are Doing: Performance Results

FY 2019 was NSF's first full fiscal year under its new Strategic Plan for FYs 2018-2022: *Building the Future: Investing in Discovery and Innovation*. This plan, released in FY 2018, lays out two strategic goals that embody the dual nature of NSF's mission to advance the progress of science while benefitting the Nation: *Expand knowledge in science, engineering, and learning* and *Advance the capability of the Nation to meet current and future challenges*. A third goal, *Enhance NSF's performance of its mission*, directs NSF to hold itself accountable for achieving excellence in carrying out its mission. Goals in this Strategic Plan each contain two Strategic Objectives, which are comprehensive of all agency program activities. This goal structure enables NSF to link its investments to longer-term outcomes.

Strategic Goal		Strategic Objective
1	Expand knowledge in science, engineering, and learning.	1.1 Knowledge Advance knowledge through investments in ideas, people, and infrastructure.
		1.2 Practice Advance the practice of research.
2	Advance the capability of the Nation to meet current and future challenges.	2.1 Societal Impacts Support research and promote partnerships to accelerate innovation and to provide new capabilities to meet pressing societal needs.
		2.2 STEM Workforce Foster the growth of a more capable and diverse research workforce and advance the scientific and innovation skills of the Nation.
3	Enhance NSF's performance of its mission.	3.1 Human Capital Attract, retain, and empower a talented and diverse workforce.
		3.2 Processes and Operations Continually improve agency operations.

In FY 2019, NSF tracked eight performance goals, one of which was a 2-year Agency Priority Goal (APG). Six of the eight achieved all of their targets. NSF's *FY 2019 Annual Performance Report* provides a full description of the agency's performance framework, including descriptions of the strategic reviews and the performance metrics, methodologies, results and explanations of unmet targets, and trends, along with a list of relevant external reviews. Performance data have been independently verified and validated.

Priority Goal	Status
<p>APG: Expand public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security.</p> <p>By September 30, 2019, NSF's number of partnerships and award actions with other federal agencies, private industry, and foundations/philanthropies will grow by 5 percent, relative to the FY 2017 baseline, to make available infrastructure, expertise, and financial resources to the US scientific and engineering research and education enterprise.</p>	<p>Achieved</p> <p>FY 2017 baseline = 57 partnerships FY 2019 result = 70 partnerships, a 23 percent increase</p>

FY 2019 Performance Goal	Status
1. Agency Priority Goal: Expand Public and Private Partnerships.	Achieved
2. Ensure that key FY 2019 NSF-wide program investments are implemented and on track.	Achieved
3. Ensure program integrity and responsible stewardship of major research facilities and infrastructure.	Achieved
4. Inform applicants whether their proposals have been declined or recommended for funding in a timely manner.	Not Achieved
5. Improve the quality of written reviews of NSF proposals.	Achieved
6. Foster a culture of inclusion through change management efforts resulting in change leadership and accountability.	Achieved January 2020
7. Ensure that employee job requirements are aligned with competencies and skills needed for the future.	Achieved
8. Streamline and simplify user interactions with IT systems and functions that support the merit review process, reducing non-value-added steps and reducing the time spent managing the proposal and award lifecycle.	Achieved

Management Challenges

For FY 2019, the NSF Office of the Inspector General (OIG) identified six management and performance challenges facing the agency and one emerging challenge:

- Managing major multi-user research facilities to ensure effective oversight.
- Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) reporting requirements using government-wide data standards.
- Eliminating improper payments and ensuring a thorough assessment of NSF's risk of improper payments.
- Managing and providing oversight of the Intergovernmental Personnel Act program that brings external researchers and educators to work temporarily at NSF.
- Managing the U.S. Antarctic Program, with a focus on infrastructure modernization efforts, health and safety, management of inventory, and fiscal oversight of contractors.
- Encouraging the ethical conduct of research through providing oversight and guidance on the implementation of responsible conduct of research requirements and training.

The emerging challenge, Responding to the National Security Threat of Foreign Talent Plans, focused on mitigating the risks from foreign states' talent recruitment programs.

NSF Management's report on the significant activities undertaken in FY 2019 to address these challenges is in NSF's *FY 2019 Agency Financial Report*, along with the OIG's memorandum identifying the FY 2020 Management Challenges.

For More Information

NSF Budget and Performance Website

www.nsf.gov/about/performance

NSF FY 2019 Agency Financial Report

www.nsf.gov/publications/pub_summ.jsp?ods_key=af

NSF FY 2019 Annual Performance Report

See Performance chapter of NSF FY 2021 Budget Request to Congress
www.nsf.gov/about/performance

NSF FY 2019 Progress Report on OIG Management Challenges (See Appendix 2B of NSF FY 2019 Agency Financial Report)

www.nsf.gov/publications/pub_summ.jsp?ods_key=af

Report to the National Science Board on NSF's Merit Review Process FY 2017

www.nsf.gov/nsb/publications/2018/nsb201915.pdf

Building the Future: Investing in Discovery and Innovation, NSF Strategic Plan for FY 2018–2022

www.nsf.gov/about/performance/strategic_plan.jsp

NSF Research and Education Discoveries

www.nsf.gov/discoveries

FY 2019 NSF Senior Management

Office of the Director (O/D)

France A. Córdoba, *Director*
Vacant, *Deputy Director*
F. Fleming Crim, *Chief Operating Officer*

O/D Offices:

Office of Diversity & Inclusion
Rhonda Davis, *Head*
Affirmative Action Officer

Office of the General Counsel
Lawrence Rudolph, *General Counsel*

Office of Integrative Activities
Suzanne Iacono, *Head*

Office of International Science & Engineering
Rebecca S. Keiser, *Head*

Office of Legislative & Public Affairs
Amanda Greenwell, *Head*

Directorate for Biological Sciences
Joanne S. Tornow, *Assistant Director*

Directorate for Computer & Information Science & Engineering
Erwin Gianchandani, *Assistant Director (Acting)*

Directorate for Education & Human Resources
Karen Marrongelle, *Assistant Director*

Directorate for Engineering
Dawn Tilbury, *Assistant Director*

Directorate for Geosciences
William E. Easterling, *Assistant Director*

Directorate for Mathematical & Physical Sciences
Anne Kinney, *Assistant Director*

Directorate for Social, Behavioral, & Economic Sciences
Arthur Lupia, *Assistant Director*

Office of Budget, Finance, & Award Management
Teresa Grancorvitz, *Head*
Chief Financial Officer
Performance Improvement Officer

Office of Information & Resource Management
Wonzie L. Gardner, *Head*
Chief Human Capital Officer

Other Designated Senior Officials

Chief Information Officer
Dorothy Aronson (O/D)

Chief Officer for Research Facilities
James S. Ulvestad (O/D)

National Science Board Members in FY 2019

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Tufts University

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National Academy of Engineering

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Washington University, St. Louis

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Stanford University

Vicki L. Chandler
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Maureen L. Condic
University of Utah

W. Kent Fuchs
University of Florida

Suresh V. Garimella
University of Vermont

Robert M. Groves
Georgetown University

James S. Jackson
University of Michigan

Stephen Leath
Iowa State University
and Auburn University (*retired*)

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University of Colorado

Victor R. McCrary
University of the District of Columbia

Emilio F. Moran
Michigan State University

Sethuraman Panchanathan
Arizona State University

G.P. "Bud" Peterson
Georgia Institute of Technology

Julia M. Phillips
Sandia National Laboratories

Daniel A. Reed
University of Utah

Geraldine L. Richmond
University of Oregon

Anneila I. Sargent
California Institute of Technology

S. Alan Stern
Southwest Research Institute

Stephen H. Willard
Cellphire, Inc.

Maria T. Zuber
Massachusetts Institute of Technology

Member *ex officio*:

France A. Córdoba
National Science Foundation

National Science Board Office
John J. Veysse, II, *Executive Officer*

Office of Inspector General
Allison C. Lerner, *Inspector General*

Research and Education Highlights

Astronomers capture first image of a black hole. The Event Horizon Telescope (EHT) was designed to see the unseeable. Black holes exert such strong gravitational forces that even light can't escape them. It took EHT, a planet-scale array of eight ground-based radio telescopes linked through international collaboration, to gather the first direct visual evidence of a supermassive black hole and its shadow, 55 million light-years from Earth. EHT uses very-long-baseline interferometry (VLBI), which synchronizes telescope facilities around the world to form one huge, Earth-size telescope. Decades of NSF investments in VLBI and radio astronomy technologies led to the creation of EHT and the black-hole image. In 2019, EHT's members received the Breakthrough Prize in Fundamental Physics, an annual recognition of scientific achievements. Their next goals include imaging the supermassive black hole at the center of the Milky Way and capturing video of a black hole.



Credit: Event Horizon Telescope Collaboration et al

An entire year trapped in the ice. In most cases, having your vessel frozen to an iceberg in the Arctic would be a worst-case scenario. For a group of international researchers who set sail in 2019, it was the launchpad for the largest polar expedition in the world. Hundreds of researchers, including NSF-supported scientists from the U.S., boarded the German research vessel *Polarstern* for the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition, a year-long operation that required lengthy logistical preparation by NSF staff and their international partners. Researchers worked to set up an observational network monitoring air, land, and sea that stretched over the sea ice as far as 30 miles away from the research vessel. MOSAiC aims to produce breakthroughs in understanding the Arctic climate system.



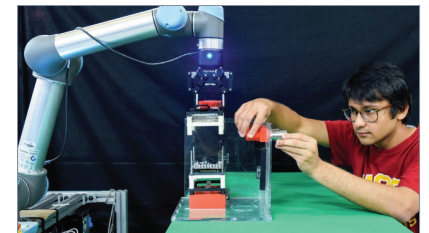
Credit: Mario Hoppmann

Placement of wind turbines is key. Nearly 90 percent of wind farms in the U.S. are located within 40 kilometers of another wind farm. NSF-funded researchers used data and analytic tools from across the fields of atmospheric science, economics, and law to model the consequences of upwind turbine wake effects on downwind turbine energy production and revenues. The researchers also explored the legal constructs guiding wind farm construction. The study found that wake effects from upwind turbines can cover large distances (over 50 kilometers), decreasing the energy production by downwind turbines and causing economic losses of millions of dollars. While many states and the federal government have policies to guide the creation of wind farms, there is little legal guidance to help protect wind farms from the wake-effects of other farms.



Credit: ©University Corporation for Atmospheric Research

Working with industry to strengthen the STEM workforce. Across the U.S., industries increasingly depend on rapidly changing technology, creating pressure for employers to find workers with STEM skills and knowledge. To empower the workers of today to hold the jobs of tomorrow, a unique public-private partnership will develop online learning platforms and study the effectiveness of courseware to see what connects with learners of different ages and skill levels. Using a \$10 million gift from The Boeing Company, NSF funded five separate projects exploring approaches that will allow schools, companies, nonprofits and others to create new learning experiences to build a stronger, more STEM-educated workforce.



Credit: A. Kabir

Collision-detecting suitcase. For the visually impaired, unfamiliar environments can prove difficult to navigate. A team of NSF-supported researchers are working to make at least one of those environments safer, with a smart suitcase that warns blind users of impending collisions, along with a wayfinding smartphone app for safe and independent navigation through airport terminals. The rolling suitcase sounds alarms when users are headed for a collision with a pedestrian, and the navigation app provides turn-by-turn audio instructions to users on how to reach a departure gate — or a restroom or a restaurant. The app, known as NavCong, employs airports' Bluetooth beacons, for navigation waypoints.



Credit: Carnegie Mellon University



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We welcome your comments on how we can make this report more informative. Please submit them to Accountability@nsf.gov.

