Who We Are and What We Do

- The mission of the National Science Foundation (NSF) is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.

- 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 sets the stage for 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 Helps Make and Keep America a Global Leader**

NSF by the Numbers	
$7.8 billion	FY 2018 Appropriations (does not include mandatory accounts)
1,800	Colleges, universities, and other institutions receiving NSF funding in FY 2018
48,300	Proposals evaluated in FY 2018 through a competitive merit review process
11,700	Competitive awards funded in FY 2018
223,800	Proposal reviews conducted in FY 2018
386,000	Estimated number of people NSF supported directly in FY 2018 (researchers, postdoctoral fellows, trainees, teachers, and students)
57,700	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) 2018 Performance and Financial Highlights report*, one of three accountability reports that provides key financial and performance information to our stakeholders and the American people.

NSF is a U.S. federal agency with a global reputation for supporting groundbreaking research and education across the full range of science and engineering (S&E) disciplines. For nearly 70 years, NSF investments have enabled U.S. researchers to deepen our understanding of the universe, transform the way we live, open the world to new occupations and industries, and enrich our quality of life.

NSF supports discoveries across the broad spectrum of scientific disciplines. In 2018, an international research team, using data gathered by NSF's IceCube Neutrino Observatory at the South Pole, detected a high-energy neutrino, apparently from a cosmic source. The data, when combined with simultaneous observations of high-energy gamma rays by multiple observatories, and corroborated with archival IceCube neutrino data, point to an active galaxy called a blazar as the source. This remarkable result marks the discovery of the origin of high-energy cosmic rays, solving a century-old mystery. It is a discovery that, like the previous results with NSF's Laser Interferometer Gravitational-Wave Observatory, showcases the importance of multi-messenger astronomy.

NSF also catalyzes innovation that keeps the U.S. on the cutting edge of science and technology. It fosters this innovation through support of small businesses; promoting creative partnerships among academia, industry, and national laboratories; broadening participation in the S&E enterprise by non-profit, non-academic organizations; and providing entrepreneurship training for academic scientists to accelerate commercialization of basic research. Moreover, NSF invests in world-class facilities and equipment – from telescopes and polar stations to ecological sites to cyberinfrastructure and supercomputers.

As societies around the world transition to more knowledge-based economies, our global standing increasingly relies on a skilled workforce. I am proud of the multiple opportunities NSF's education and training portfolio provides to enrich educational experiences for all students and to develop science, technology, engineering, and mathematics (STEM) talent needed for the 21st century. These opportunities challenge students to exceed expectations and help direct future career choices. NSF strives to ensure that students from all sectors of our society have access to exemplary learning experiences.

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 2020 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.
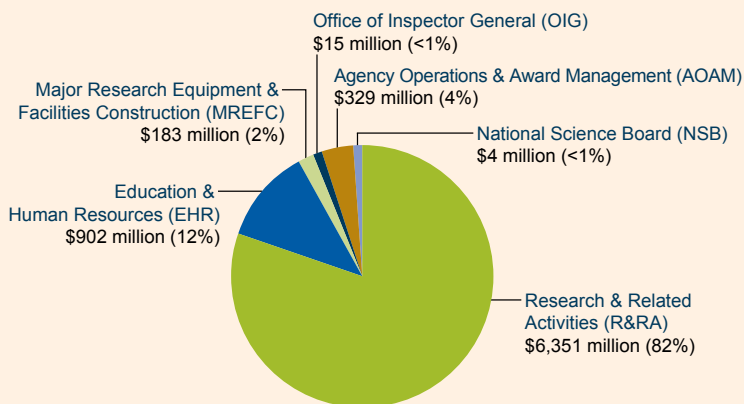
I invite you to review NSF's *FY 2018 Agency Financial Report* and our website at *www.nsf.gov* to learn more about NSF's investments in science and engineering research and education. With the support of the American people, NSF-funded researchers will continue to transform the world with their ingenuity and creativity and provide new knowledge and innovations that will propel our economy, enhance our lives, and secure our Nation.

France A. Córdova
March 18, 2019

NSF by the Numbers

Where It Comes From
FY 2018 Appropriations by Account—$7,784 million

Office of Inspector General (OIG)
$15 million (<1%)

Major Research Equipment &
Facilities Construction (MREFC)
$183 million (2%)

Agency Operations & Award Management (AOAM)
$329 million (4%)

National Science Board (NSB)
$4 million (<1%)

Education &
Human Resources (EHR)
$902 million (12%)
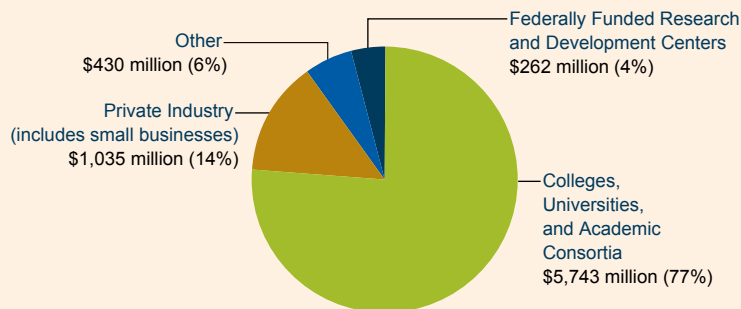
Research & Related
Activities (R&RA)
$6,351 million (82%)

Note: R&RA includes Additional Supplemental Appropriation for Disaster Relief
Requirements of $16.3 million from P.L. 115-123.
Totals may not add due to rounding.

Where It Goes
Institutions Funded by NSF
FY 2018 Obligations for Research and Education Programs—$7,471 million

Other
$430 million (6%)

Federally Funded Research
and Development Centers
$262 million (4%)

Private Industry
(includes small businesses)
$1,035 million (14%)

Colleges,
Universities,
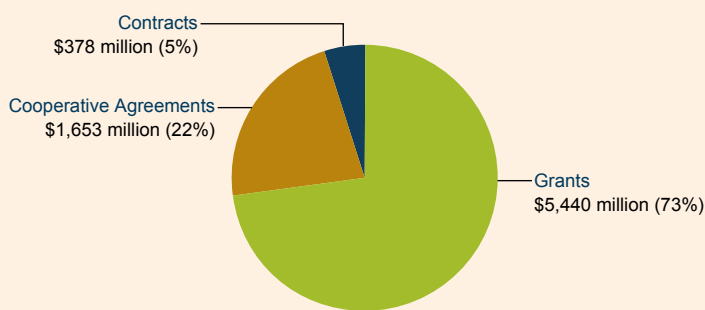and Academic
Consortia
$5,743 million (77%)

Notes: NSF Research and Education Programs include Research & Related Activities,
Education & Human Resources, and Major Research Equipment & Facilities Construction
appropriations. Other institutions funded include federal, state, and local governments;
nonprofit organizations; and international organizations.
Totals may not add due to rounding.

How It Gets There
NSF Award Mechanisms
FY 2018 Obligations for Research and Education Programs—$7,471 million

Contracts
$378 million (5%)

Cooperative Agreements
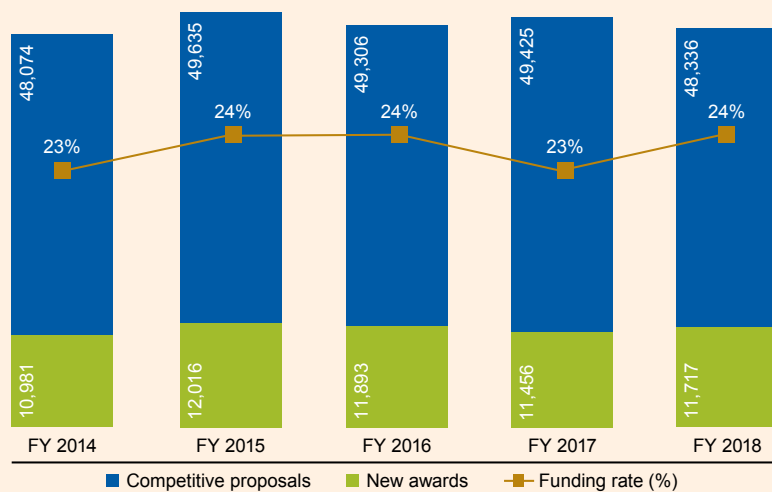$1,653 million (22%)

Grants
$5,440 million (73%)

Note: NSF Research and Education Programs include Research & Related Activities,
Education & Human Resources, and Major Research Equipment & Facilities
Construction appropriations.
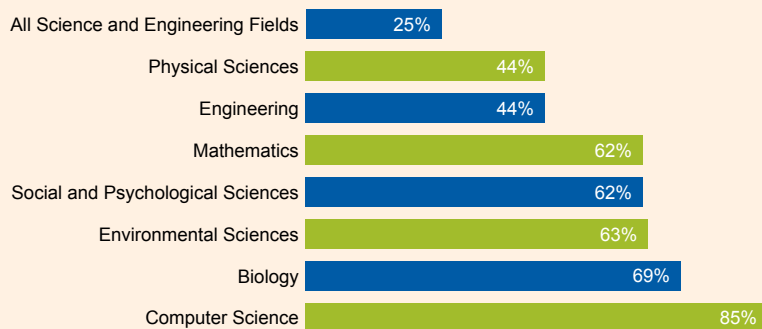Totals may not add due to rounding.

- NSF is funded primarily through six Congressional appropriations, which totaled $7,784 million in fiscal year (FY) 2018. 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 are provided to support the activities of the OIG and NSB. (Appropriations acronyms are spelled out in chart to the left.)

- Over 32,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers. Awards were made to over 1,800 institutions in 50 States, the District of Columbia, and 2 U.S. territories. These institutions employ many of America's leading scientists, engineers, and educators; and they train the leading innovators of tomorrow.

- Seventy-seven percent of support for research and education programs was to colleges, universities, and academic consortia. Awards were also provided to federally funded research and development centers and private industry, including small businesses. Other recipients included federal, state, and local governments; nonprofit organizations; 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.

- Most NSF awards (95 percent) were funded through grants or cooperative agreements. Grants can be funded either as standard awards, in which funding for the full duration of the project is provided in a single fiscal year, or as continuing awards, in which funding for a multiyear project is provided in increments. Cooperative agreements are used when the project requires substantial agency involvement (e.g., research centers, multi-use facilities). Contracts are used to acquire products, services, and studies (e.g., program evaluations) required for NSF or other government use.

How It's Spent
Number of NSF Competitive Proposals, New Awards, and Funding Rates

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Competitive proposals	48,074	49,635	49,306	49,425	48,336
New awards	10,981	12,016	11,893	11,456	11,717
Funding rate (%)	23%	24%	24%	23%	24%

■ Competitive proposals ■ New awards —■— Funding rate (%)

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

Field	Percentage
All Science and Engineering Fields	25%
Physical Sciences	44%
Engineering	44%
Mathematics	62%
Social and Psychological Sciences	62%
Environmental Sciences	63%
Biology	69%
Computer Science	85%

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 2016.

- During FY 2018, NSF evaluated over 48,300 proposals through a competitive merit review process and made over 11,700 new competitive awards. The number of competitively reviewed proposals, new awards, and funding rates have been relatively stable over the past 5 years.

- In FY 2018, an estimated 386,000 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 59 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.

FY 2018 Financial Management Performance Results	Results
Financial Statement Audit* • Unmodified opinion (21st consecutive "clean" opinion) • Material weaknesses	Yes None
Management Assurances • 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
Digital Accountability and Transparency (DATA) Act of 2014 • Compliance with the government-wide initiative to standardize and publish the federal government's varied reports and data compilations related to spending	Compliance
Grants Oversight and New Efficiency (GONE) Act • Timely closeout of expired financial assistance awards	Compliance
Improper Payment Elimination and Recovery Act (IPERA) • Improper payments reports	Compliance

* NSF's FY 2018 Independent Auditor's Report is in NSF's *FY 2018 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

In FY 2018, NSF published a new Strategic Plan, for FYs 2018-2022: *Building the Future: Investing in Discovery and Innovation*. This plan 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. The Strategic Plan contains six Strategic Objectives, which are comprehensive of all agency program activities. These Objectives underwent an annual Strategic Review in FY 2018.

	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 2018, seven performance goals were tracked, one of which was a 2-year Agency Priority Goal (APG).

- NSF set one APG in FY 2018 for achievement in FY 2019. APGs monitor progress in specific areas where near-term focus on agency execution can have the most impact. While progress was monitored on the APG, the goal had no specific target for FY 2018 performance.

- Of the six goals with targets in FY 2018, five fully or partially achieved their targets. The APG with no targets in FY 2018 is on track for achievement in FY 2019.

NSF's FY 2018 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 goals, and trends, along with a list of relevant external reviews. Performance data have been independently verified and validated.

Priority Goal	Status
APG: Expand public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security. 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.	NSF established the FY 2017 baseline and methodology for counting FY 2018 and FY 2019 partnerships.

FY 2018 Performance Goal	Result
1. Agency Priority Goal: Expand Public and Private Partnerships.	✓[1]
2. Ensure that key FY 2018 NSF-wide program investments are implemented and on track.	✓✓
3. Ensure program integrity and responsible stewardship of major research facilities and infrastructure.	✓✓
4. Use evidence-based reviews to guide management investments.	✓✓✓
5. Inform applicants whether their proposals have been declined or recommended for funding in a timely manner.	✗
6. Improve the quality of written reviews of NSF proposals.	✓✗
7. Foster a culture of inclusion through change management efforts resulting in change leadership and accountability.	✓✓

✓ = target met | ✗ = target not met
[1] The Agency Priority Goal is on track for FY 2019 achievement.

Management Challenges

For FY 2018, the NSF Office of the Inspector General (OIG) identified six management and performance challenges facing the agency:

- Managing major multi-user research facilities to ensure effective oversight.
- Managing effective business operations for payments, DATA Act reporting requirements, government records, and funds passed through to subrecipients.
- Managing and providing oversight of the Intergovernmental Personnel Act program that brings external researchers and educators to work temporarily at NSF.
- Managing a world-class scientific research program in Antarctica, with a focus on infrastructure modernization efforts.
- Managing information technology to ensure compliance with federal requirements and to protect against cybersecurity threats.
- Encouraging the ethical conduct of research through providing oversight and guidance on the implementation of responsible conduct of research requirements and training.

The OIG's memorandum on FY 2019 Management Challenges is in NSF's *FY 2018 Agency Financial Report*. NSF Management's report on the significant activities undertaken in FY 2018 to address these challenges is in NSF's *FY 2018 Agency Financial Report*.

For More Information

NSF Budget and Performance Website
www.nsf.gov/about/performance

NSF FY 2018 Agency Financial Report
www.nsf.gov/publications/pub_summ.jsp?ods_key=afr

NSF FY 2018 Annual Performance Report
See Performance chapter of NSF FY 2020 Budget Request to Congress
www.nsf.gov/about/performance

Report to the National Science Board on NSF's Merit Review Process FY 2016
www.nsf.gov/nsb/publications/2017/nsb201726.pdf

NSF Research and Education Discoveries
www.nsf.gov/discoveries

NSF FY 2018 Progress Report on OIG Management Challenges *(See Appendix 2B of NSF FY 2018 Agency Financial Report)*
www.nsf.gov/publications/pub_summ.jsp?ods_key=afr

Building the Future: Investing in Discovery and Innovation, NSF Strategic Plan for FY 2018–2022
www.nsf.gov/about/performance/strategic_plan.jsp

FY 2018 NSF Senior Management

Office of the Director (O/D)
France A. Córdova, *Director*
Vacant, *Deputy Director*
F. Fleming Crim, *Chief Operating Officer*

O/D Offices:

Office of Diversity & Inclusion
Rhonda Davis, *Head*

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 (Acting)*

Directorate for Computer & Information Science & Engineering
James Kurose, *Assistant Director*

Directorate for Education & Human Resources
William (Jim) Lewis, *Assistant Director (Acting)*

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*

Office of Information & Resource Management
Wonzie L. Gardner, *Head (Acting)*

Other Designated Senior Officials

Affirmative Action Officer
Rhonda Davis *(Office of Diversity & Inclusion)*

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

Chief Human Capital Officer
Dianne Campbell-Krieger *(Office of Information & Resource Management)*

Chief Information Officer
Dorothy Aronson *(Office of the Director)*

Chief Officer for Research Facilities
James S. Ulvestad *(Office of the Director)*

National Science Board Members in FY 2018

Diane L. Souvaine, *Chair*
Tufts University

Ellen Ochoa, *Vice Chair*
Lyndon B. Johnson Space Center *(retired)*

John L. Anderson
Illinois Institute of Technology

Deborah L. Ball*
University of Michigan

Roger N. Beachy
Washington University, St. Louis

Arthur Bienenstock
Stanford University

Vinton G. Cerf*
Google Incorporated

Vicki L. Chandler
Minerva Schools at KGI

Ruth A. David*
Analytic Services Incorporated *(retired)*

W. Kent Fuchs
University of Florida

Inez Y. Fung*
University of California, Berkeley

Robert M. Groves
Georgetown University

James S. Jackson
University of Michigan

G. Peter Lepage*
Cornell University

W. Carl Lineberger
University of Colorado

Stephen L. Mayo*
California Institute of Technology

Victor R. McCrary
University of Tennessee, Knoxville

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

Geraldine L. Richmond
University of Oregon

Anneila I. Sargent
California Institute of Technology

Maria T. Zuber
Massachusetts Institute of Technology

Member *ex officio*:

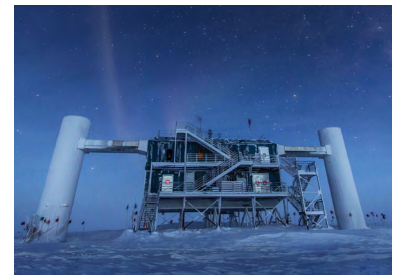**France A. Córdova**
National Science Foundation

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

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

*Appointment ended on May 10, 2018.

Research and Education Highlights

Mystery Solved: Where high-energy cosmic neutrinos begin. An international team of researchers recently discovered the first evidence of one source of high-energy cosmic neutrinos. They initially used data gathered from NSF's IceCube Neutrino Observatory in Antarctica. Detectors, buried deep in the ice, captured the signature blue light, that results when neutrinos, particles smaller than an atom, interact with ice molecules. The detection initiated a global alert to a network of ground- and spaced-based telescopes. The team traced the neutrino source to a blazar, a giant galaxy with a massive black hole at its core and a jet of elementary particles and light that shoots out from the core. The discoveries of multi-messenger astrophysics open a new way to explore the mysteries of the universe.

Credit: NSF IceCube Neutrino Observatory

Robotic float tracks ocean data. Southern Ocean data is critical to understanding how carbon dioxide interacts with the polar oceans. However, obtaining that data is challenging because the ocean is one of the world's most turbulent. To overcome this hurdle, NSF-funded researchers developed an array of robotic floats. Diving and drifting in the waters around Antarctica, the floats collect valuable details and beam their findings back to shore via satellite. A recent study using float data suggests that open water nearest the sea ice surrounding the southernmost continent releases significantly more carbon dioxide in winter than previously believed. By increasing the amount of data collected and its specificity, the floats are helping researchers refine carbon dioxide models and understand seasonal and multiyear trends.
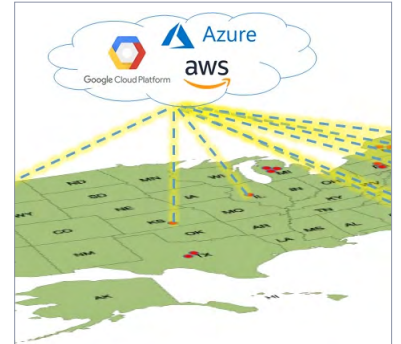

Credit: Greta Shum, ClimateCentral

Advancing new drug therapies with light. A biosensor developed by NSF-funded researchers could help advance high-throughput testing for new drug evaluation. Made of a phosphorescent gel, the biosensor measures oxygen levels for organ-on-a-chip systems; these are small, biological structures that mimic a specific organ function. Monitoring oxygen levels is important because normal levels signal health and abnormal levels signal disease. Until the biosensor, researchers lacked tools to retrieve data from the chip systems in real time. Now, rather than destroying the tissue, researchers can flash infrared light at the biosensor. In response, the sensor emits its own infrared light, depending on the oxygen level. Lag times last just microseconds, but with them researchers can measure oxygen concentrations down to tenths of a percent.

Credit: Kristina Rivera, NCSU/UNC

Tech industry joins with NSF to problem-solve data challenges. NSF joined with leading cloud providers Amazon Web Services (AWS), Google Cloud Platform (GCP) and Microsoft Azure to provide access to cloud computing services to researchers in data science and engineering. NSF provided nearly $30 million through its Critical Techniques, Technologies and Methodologies for Advancing Foundations and Applications of Big Data Sciences and Engineering (BIGDATA) program, which funds novel research in computer science, statistics, computational science and mathematics to advance the frontiers of data science. AWS, GCP and Microsoft Azure each committed up to $3 million in cloud computing resources for selected BIGDATA projects, beginning in FY 2017 and continuing for a 3-year period. IBM Cloud joined the collaboration in FY 2018, similarly committing $3 million over 3 years. NSF's collaboration with the technology industry through BIGDATA will leverage cloud computing to drive creative and principled approaches to address data management, modeling and analysis of big data, and apply novel techniques to solve data-intensive domain science and engineering problems.

Credit: NSF

Training students for the growing unmanned aircraft systems market. Through the NSF-funded Geospatial Technician Education-Unmanned Aircraft Systems Faculty Institute, high school teachers and faculty members are learning how to plan and fly manual and autonomous unmanned aircraft system (UAS) missions. The week-long training enables the educators to establish coursework for Virginia's community colleges. Thus far, the project helped five colleges in the Virginia Community College System to offer UAS courses for credit, and three additional colleges to offer non-credit courses. NSF's Advanced Technological Education Program funds the UAS training activity, with the goal of promoting the education of technicians to meet STEM workforce demands through faculty professional development, curriculum development and pre-college activities at 2-year colleges. More than 200 students completed courses at one school, Mountain Empire Community College. The project seeks to meet the emerging demand for trained UAS technicians. In 2013, the Association for Unmanned Vehicle Systems International released a report that projected more than 100,000 new jobs in UAS by 2025.

Credit: Chris Carter, Virginia Space Grant Consortium