

What's Happening at NSF

Bill Easterling
NSF Assistant Director for Geosciences (GEO)
March 2018



Who is Bill Easterling?

My Vision for GEO

- ▶ GEO is a **powerful engine** that drives the pace and direction of fundamental scientific discoveries that enrich the base of usable knowledge society requires to cope with some of the most pressing challenges of our time.
 - Example: Innovations in Food-Energy-Water Systems.
- ▶ GEO is a **conduit of new knowledge**, and, just as importantly, improves the communication of that knowledge to educate students at all levels, to inform policy, and to increase public understanding of how the planet works, how people interact with earth systems and why that understanding is crucial for the betterment of society.
- ▶ GEO continues to **transform a collective workforce and student body** into a racially, ethnically, and gender-diverse set of disciplines wherein minorities and other underrepresented groups thrive professionally and personally in their lives.



Zero tolerance for sexual harassment at NSF

“The National Science Foundation (NSF) [does not tolerate sexual harassment, or any kind of harassment](#), within the agency, at grantee organizations, field sites, or anywhere NSF-funded science and education are conducted.” [Important Notice No. 144, Feb. 08, 2018.](#)

The Dawn of the Era of NSF's “Ten Big Ideas”

- ▶ Started with push from National Science Board
- ▶ Internal discussions among and between NSF directorates
- ▶ Beginning in FY18



10 Big Ideas for Future NSF Investments



Navigating the New Arctic
Build a cyber-enabled observing system to document the rapid changes throughout the Arctic region that have profound impacts on the global climate.



Harnessing Data for 21st Century Science and Engineering
Generate a world-wide data-enabled future for the U.S. through fundamental research and education in data science and systems.



Work at the Human-Technology Frontier: Shaping the Future
Understand how constantly evolving technologies are actively shaping our lives and how we in turn can shape those technologies, especially in the world of work.

RESEARCH IDEAS



Understanding the Rules of Life: Predicting Phenotype
Bridge the biggest gap in biological science by determining how an organism's genes interacting with the environment influences its unique characteristics.

The Quantum Leap: Leading the Next Quantum Revolution

Develop ways to understand and manipulate the fundamental behavior of matter and energy to create the technologies of the future.



Windows on the Universe: The Era of Multi-messenger Astrophysics

Extend our understanding of the cosmos by using NSF's unique facilities to observe the universe in previously impossible detail.

PROCESS IDEAS



Growing Convergent Research at NSF
Integrate knowledge, tools, techniques, and modes of thinking from widely diverse fields to address pressing societal problems and profound research questions.



NSF-Includes: Enhancing Science and Engineering through Diversity
Tap the innovation inherent in America's diversity to strengthen the U.S. science and engineering enterprise.



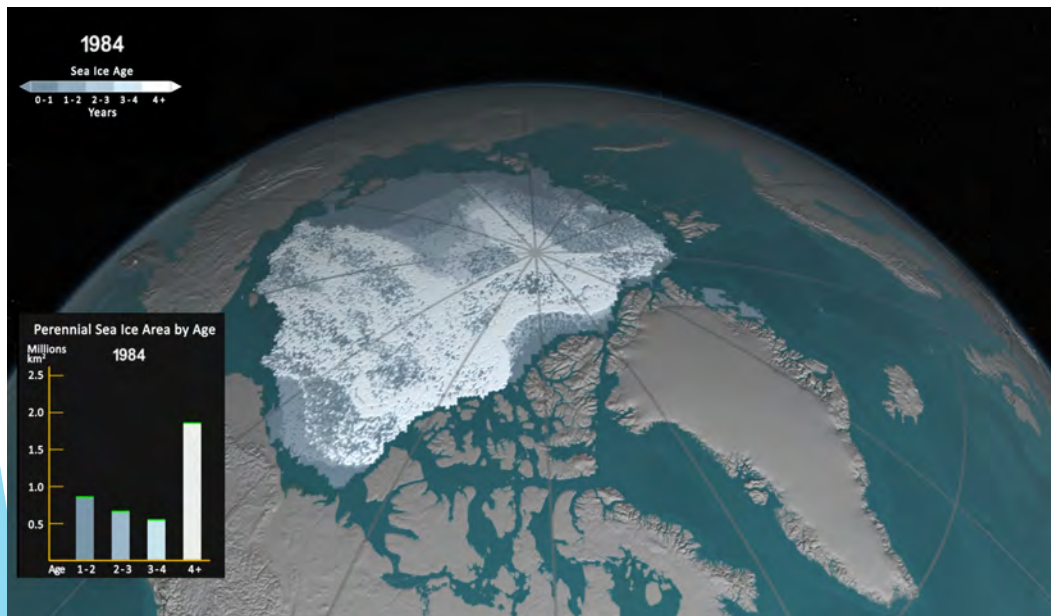
Mid-scale Research Infrastructure
Develop a nimble process to fund crucial scientific infrastructure projects that fall between traditional funding boundaries.



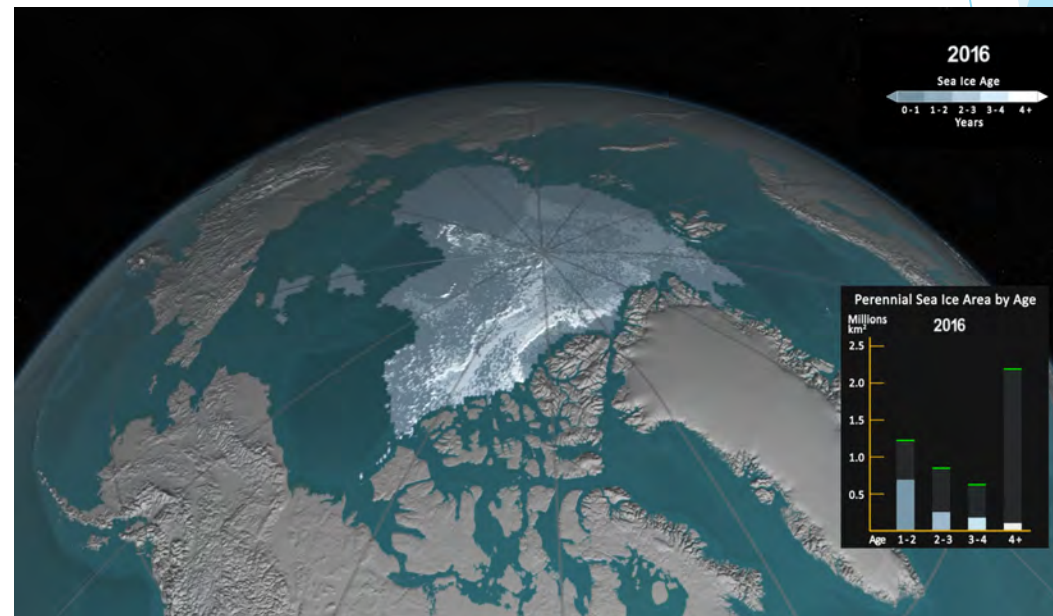
NSF 2050
Cultivate bold, forward-thinking research that transcends traditional approaches and pushes the frontiers of discovery and innovation for years to come.

NSF Big Ideas: Navigating the New Arctic (NNA)

- ▶ Dramatic changes in Arctic have wide-ranging and global implications.
- ▶ NSF investments will support:
 - ▶ Development of robust, integrated pan-Arctic observational network.
 - ▶ Research to foster comprehensive understanding and modeling of natural and human activities.
 - ▶ Partnering with state and local governments, indigenous peoples and international organizations.



1984

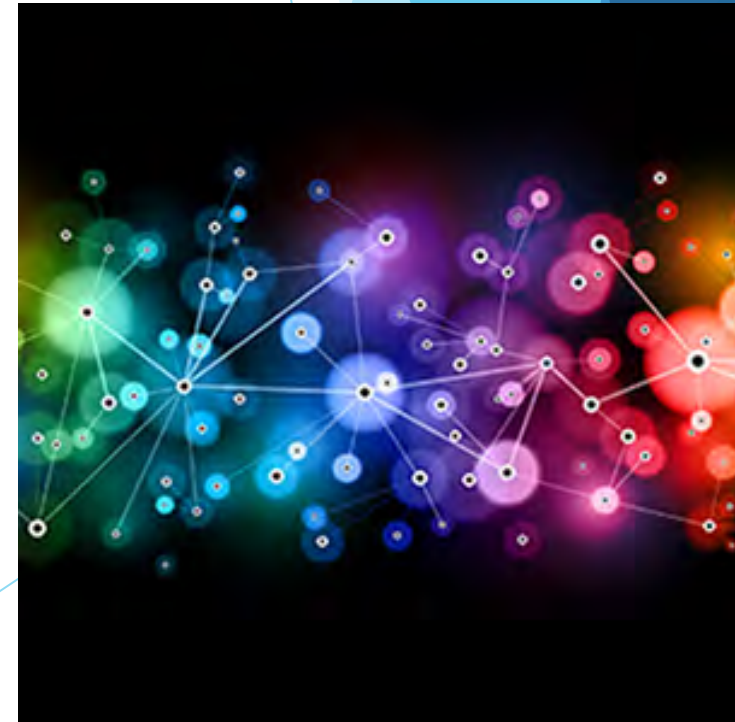


2016

Image credits: NASA

Growing Convergent Research at NSF

- Grand challenges will not be solved by one discipline alone.
- **Convergence** blends scientific disciplines in a coordinated, reciprocal way and fosters robust collaborations needed for successful inquiry.
 - Going beyond forcing old models to play together





Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)

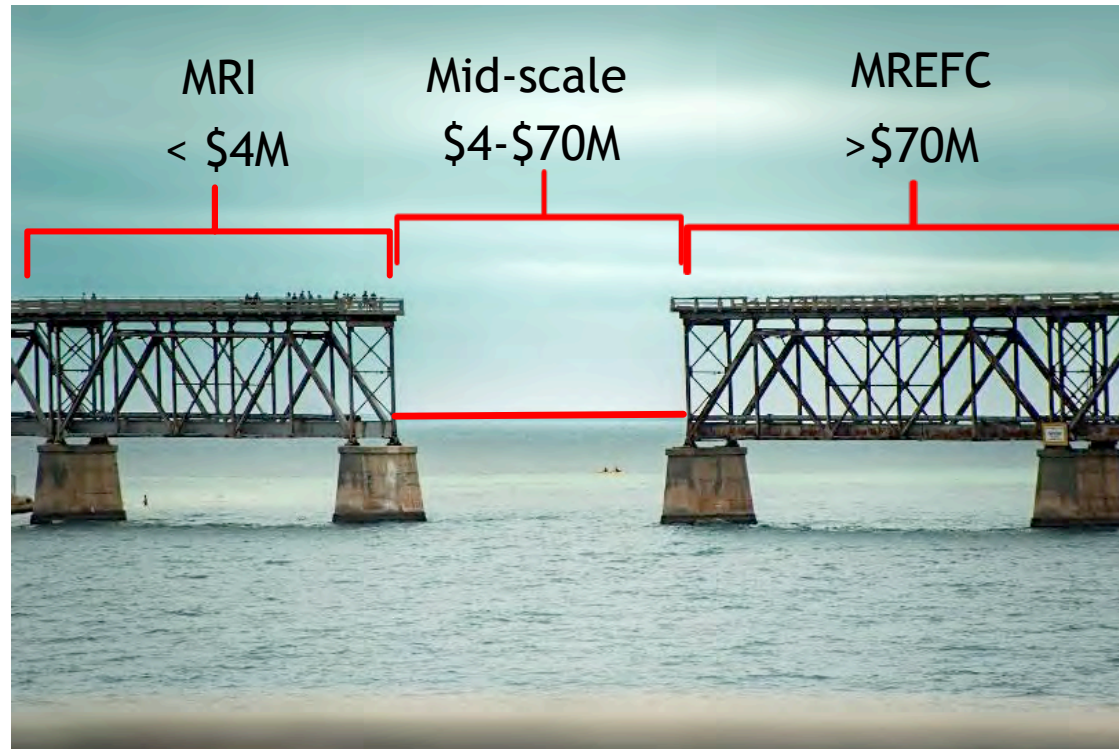
Premise: Feeding and energizing a world of 10 billion people undergoing global environmental changes will challenge resource systems.

Goal: Advance understanding of the FEW system and grow the scientific workforce.

- ▶ USDA is a partner in this ongoing investment area. FY 2017 awards focused on:
 - ▶ System Modeling.
 - ▶ Visualization and Decision support for Cyber-Human-Physical Systems.
 - ▶ Research to Enable Innovative Solutions.

Mid-Scale Infrastructure

- ▶ Gap between “major research instrumentation (MRI)” and Major Research Equipment and Facilities Construction (MREFC) results in missed opportunities.
- ▶ New agile process for funding experimental research capabilities in the mid-scale range. Recent Dear Colleague Letter.



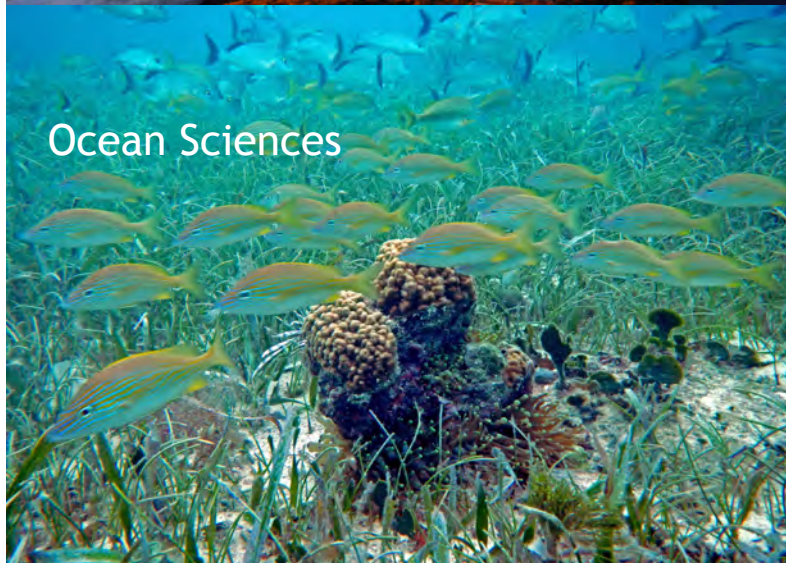
GEO Updates



Office of Polar Programs



Earth Sciences



Ocean Sciences



Atmospheric and Geospace Sciences

Fiscal Year 2019 GEO Budget Request

GEO Funding (Dollars in Millions)

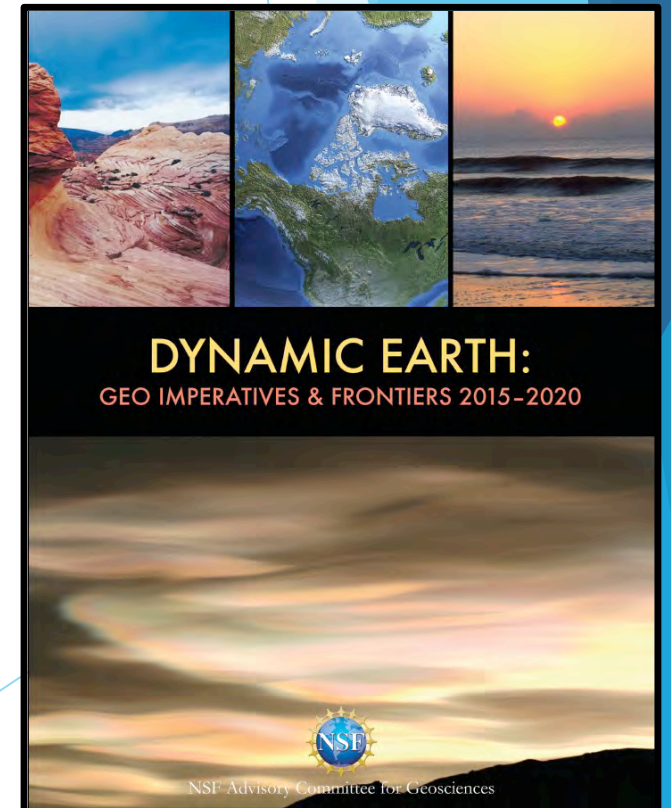
	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over FY 2017 Actual Amount	Change over FY 2017 Actual Percent
Atmospheric & Geospace Sciences (AGS)	\$253.37	-	\$239.30	-\$14.07	-5.6%
Earth Sciences (EAR)	179.13	-	169.23	-9.90	-5.5%
Integrative & Collaborative Education and Research (ICER)	76.38	-	104.95	28.57	37.4%
Ocean Sciences (OCE)	316.74	-	339.50	22.76	7.2%
Total	\$825.62	-	\$852.98	\$27.36	3.3%

Two Early Initiatives

1. Reexamine GEO's current research plan, *Dynamic Earth*
2. Launch a new research initiative on Coastlines and People (CoPe)

DYNAMIC EARTH - Report Refresh

- ▶ Capture emerging areas on the leading edge of the geosciences.
- ▶ Emphasize impacts of the GEO-supported research on our society and economy.
- ▶ Current report available on-line www.nsf.gov/geo/acgeo/geovision/index.jsp
- ▶ Send your input to geovision@nsf.gov



Coastlines and People (CoPe)

Urban flooding



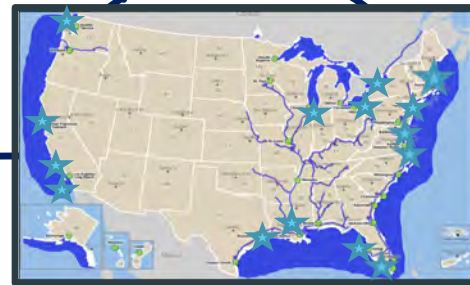
Trans-ocean subduction zones



Sea-level rise

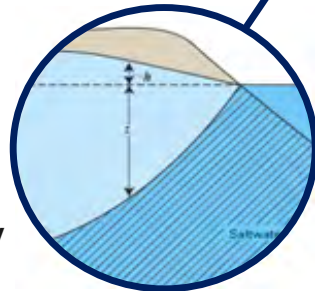


Severe storm surge



★ Major cities

Coastal hydrogeology



Tsunamis triggered by earthquakes



Developments in the Ocean Sciences

1. NRC Decadal Survey: *Sea Change*
2. Regional Class Research Vessels (RCRVs)

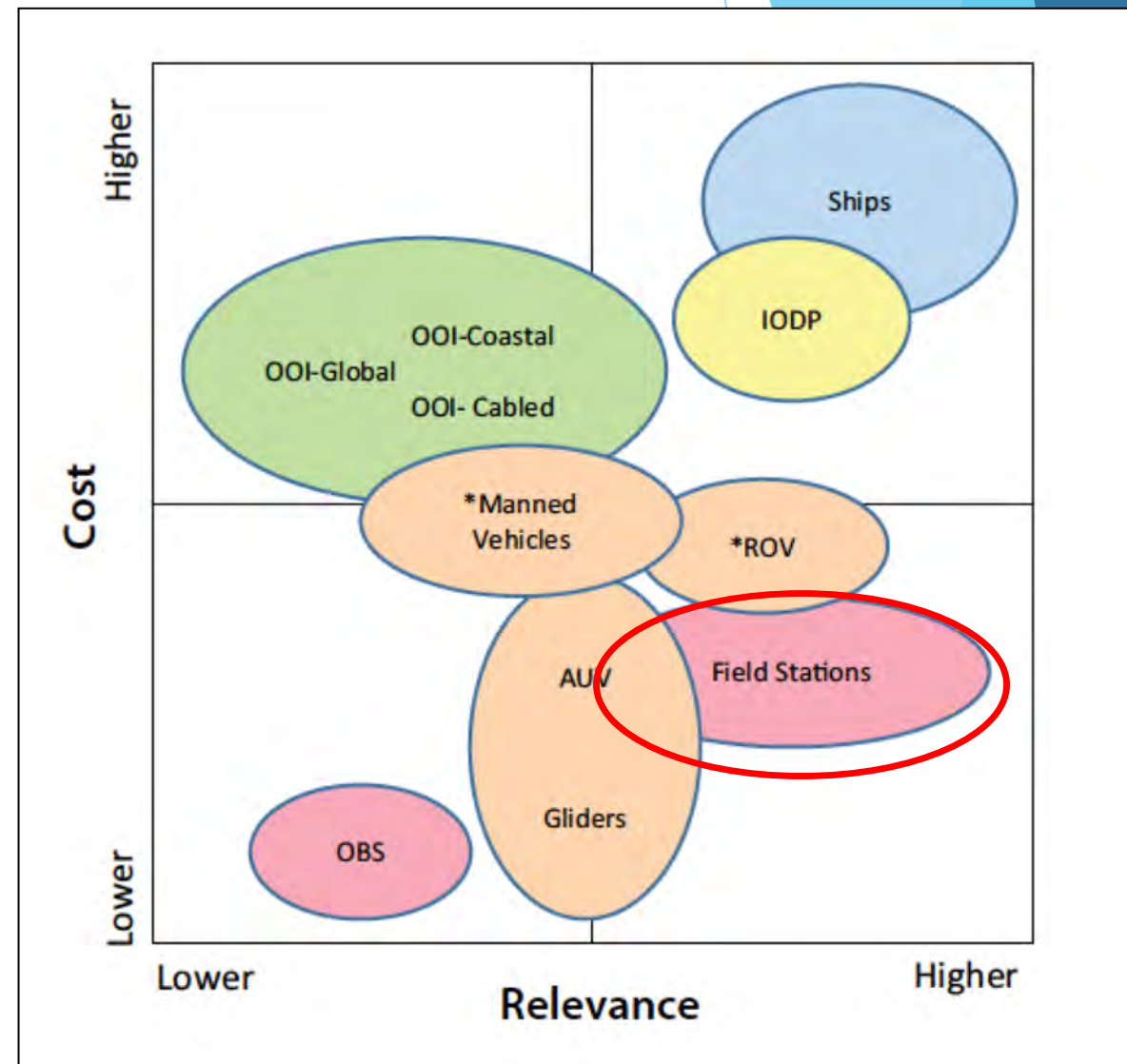
Decadal Survey of Ocean Sciences 2015-2025 (Released January 23, 2015; NSF Reply May 11, 2015)

Eight science theme priorities (next slide).

Led to rebalancing of internal budget within OCE.

- Decrease infrastructure “...to no more than 40-50% of the total annual program budget.”
- Increase science

From Report:



Sea Change: 8 Science Priorities

OOI is critical to addressing these science priorities:

- Rates, mechanisms, impacts, etc....sea level rise.
- Coastal, estuarine ecosystems and linkages.
- Ocean biogeochemistry & physics...and climate.
- Biodiversity & resilience of ecosystems, & changes.
- Marine food webs in the coming century.
- Formation and evolution of ocean basins.
- Geohazards (earthquakes, tsunamis, landslides, volcanoes).
- Subseafloor biosphere; biogeochemical cycles & life.

RCRV

- ▶ Modernization of US Academic Research Fleet top priority for NSF and the Office of Naval Research (ONR)

Will yield (among others):

- ▶ Fundamental research in the US coastal zone and continental shelf.
 - ▶ Supports all eight science themes in *Sea Change* report.
 - ▶ New technologies not on older vessels
-
- ▶ In January 2018, NSF issued a solicitation (NSF18-534) for operator selection for RCRV #2 and #3
-
- ▶ proposal deadline of April 19, 2018.



OCE Division Director Recruitment

Nationwide search for OCE Division Director.

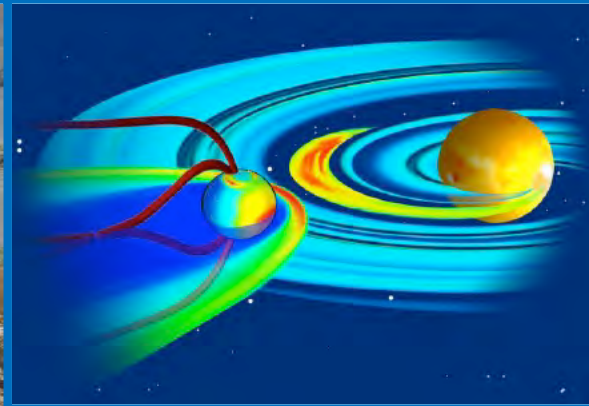
Responsibilities include:

- ▶ Leadership and management of Division programs.
- ▶ Assisting GEO AD in carrying out Division-wide responsibilities such as budget preparation, oversight and management, recruitment of scientific staff, and leadership and guidance to administrative and support staff.
- ▶ Representing OCE in a variety of NSF-wide and interagency activities related to research and education, and in interactions with the community.

<https://www.usajobs.gov/GetJob/ViewDetails/483044800>

Closing Date 02/27/2018

Thank you!



BACKGROUND SLIDES

The background features a complex, abstract design of overlapping, semi-transparent blue triangles and polygons. The colors range from light sky blue to deep navy blue. The shapes are layered, creating a sense of depth and movement. The design is primarily concentrated on the right side of the slide, with some shapes extending towards the center.

NSF by the Numbers

“A Nation that creates and exploits new concepts in science and engineering and provides global leadership in research and education.”

- NSF's Strategic Plan for 2014-2018: Investing in Science, Engineering, and Education for the Nation's Future



\$75 B
FY 2017 actual



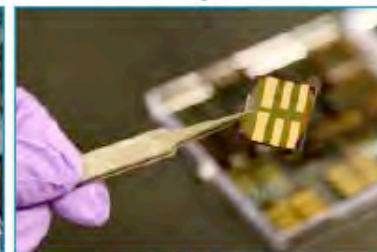
93%
funds research, education
and related activities



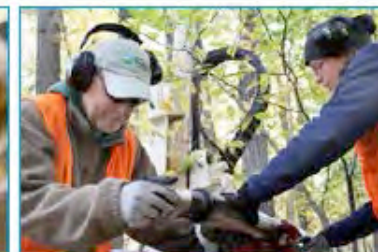
50,000+
proposals received



12,000
awards funded



2,000
NSF-funded institutions



362,000
NSF-supported
people



225,000
proposal reviews
conducted



53,800
students supported
by GRF since 1952



223
NSF-funded Nobel
Prize winners

**NATIONAL SCIENCE FOUNDATION
SUMMARY TABLE
FY 2019 BUDGET REQUEST TO CONGRESS**
(Dollars in Millions)

NSF by Account	FY 2018			FY 2019 Request change over FY 2017 Actual	
	FY 2017 Actual	Annualized CR	FY 2019 Request	Amount	Percent
BIO	\$742.22	-	\$738.16	-\$4.06	-0.5%
CISE	935.93	-	925.42	-10.51	-1.1%
ENG	930.92	-	921.43	-9.49	-1.0%
<i>Eng Programs</i>	731.87	-	722.86	-9.01	-1.2%
<i>SBIR/STTR</i>	199.05	-	198.57	-0.48	-0.2%
GEO	825.62	-	852.98	27.36	3.3%
MPS	1,362.43	-	1,345.32	-17.11	-1.3%
SBE	270.89	-	246.19	-24.70	-9.1%
<i>SBE Programs</i>	219.70	-	195.00	-24.70	-11.2%
<i>NCSES</i>	51.19	-	51.19	-	-
OISE	48.96	-	48.50	-0.46	-0.9%
OPP	467.85	-	534.54	66.69	14.3%
IA	420.27	-	536.72	116.45	27.7%
U.S. Arctic Research Commission	1.43	-	1.42	-0.01	-0.7%
Research & Related Activities	\$6,006.51	\$5,992.67	\$6,150.68	\$144.17	2.4%
Education & Human Resources	\$873.37	\$874.02	\$873.37	-	-
Major Research Equipment & Facilities Construction	\$222.78	\$207.58	\$94.65	-\$128.13	-57.5%
Agency Operations & Award Management	\$382.06	\$327.76	\$333.63	-\$48.43	-12.7%
National Science Board	\$4.27	\$4.34	\$4.32	\$0.05	1.2%
Office of Inspector General	\$15.10	\$15.10	\$15.35	\$0.25	1.6%
Total, NSF	\$7,504.10	\$7,421.47	\$7,472.00	-\$32.10	-0.4%

OFFICE OF POLAR PROGRAMS (OPP)

\$534,540,000
+\$66,690,000 / 14.3%

OPP Funding
(Dollars in Millions)

	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over FY 2017 Actual	
				Amount	Percent
Research	\$119.05	-	\$113.56	-\$5.49	-4.6%
CAREER	0.50	-	1.24	0.74	146.4%
Long Term Ecological Research (LTER)	2.29	-	3.49	1.20	52.1%
Education	2.46	-	0.79	-1.67	-67.9%
Infrastructure	346.34	-	420.19	73.85	21.3%
Antarctic Infrastructure Modernization for Science (Construction)	-	-	103.70	103.70	N/A
Arctic Research Support and Logistics	45.06	-	39.33	-5.73	-12.7%
IceCube Neutrino Observatory (IceCube)	3.50	-	3.50	-0.00	-0.0%
U.S. Antarctic Facilities and Logistics	215.71	-	193.61	-22.10	-10.2%
U.S. Antarctic Logistical Support	69.28	-	71.00	1.72	2.5%
Geodesy Advancing Geosciences and EarthScope	1.52	-	1.29	-0.23	-14.9%
Seismological Facilities for Advancement of Geoscience and EarthScope	1.70	-	1.26	-0.44	-25.9%
Polar Environment, Safety, and Health (PESH)	6.61	-	6.13	-0.48	-7.2%
Facilities Development and Design Total	2.97	-	0.37	-2.60	-87.5%
Antarctic Infrastructure Modernization for Science (Concept and Design)	2.97	-	0.37	-2.60	-87.5%
Total	\$467.85	-	\$534.54	\$66.69	14.3%

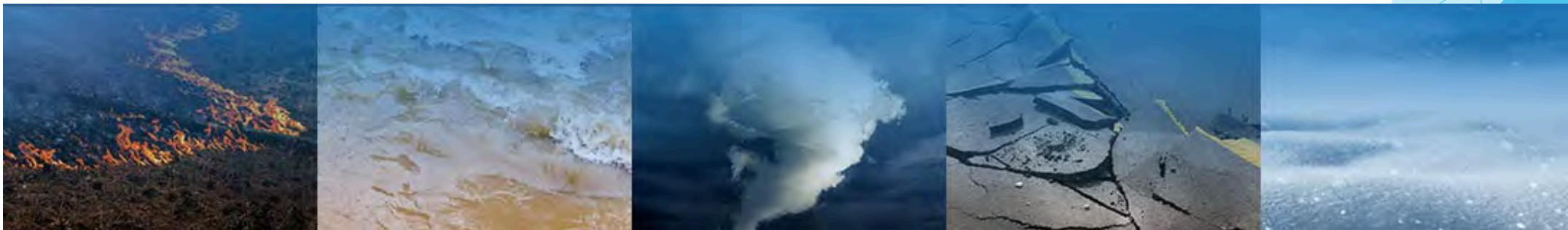
NSF Natural Disaster Response

[nsf.gov/naturaldisasters/](https://www.nsf.gov/naturaldisasters/)

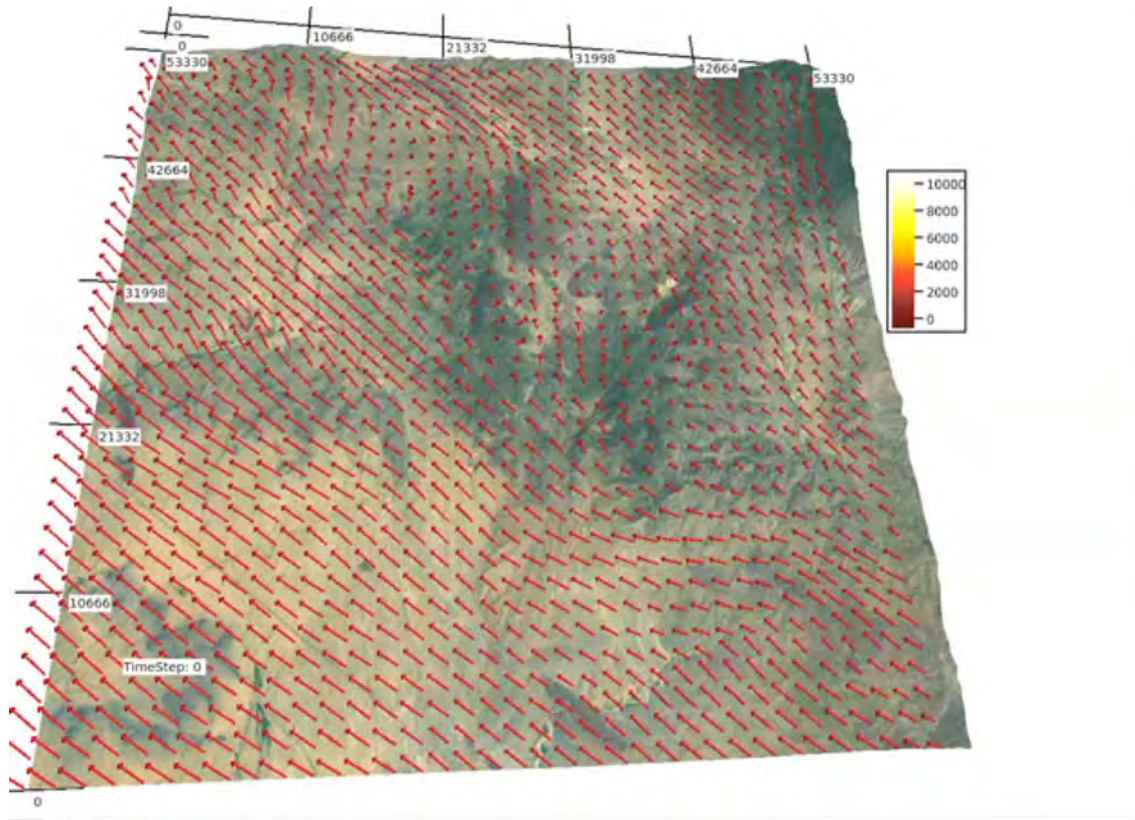
- Nearly 60 awards made totaling \$5.3 million in response to recent hurricanes.
- RAPID: Effects of Hurricane Harvey's extraordinary rain event on sedimentation at tidal inlets of Galveston Bay, TX.
- **Risk & Resilience Investment Area**
 - Prediction of and Resilience Against Extreme Events (PREEVENTS)



PI: W. Sager, U of Houston, OCE-1763088



Little Bear Mountain Fire that Killed 19 Granite Mountain Hotshots



Navigating the New Arctic awards

Initial focus areas include: New observing systems, coastal erosion, transportation, food security and community resilience

Three Research Coordination Networks awards

- ▶ University of Colorado
- ▶ Penn State
- ▶ University of Alaska-Anchorage

Three Workshop awards

- ▶ University of Nebraska
- ▶ Carnegie Mellon
- ▶ University of New Hampshire



Harnessing the Data Revolution for 21st Century Science and Engineering

- Fundamental research in data science and engineering - all Directorates
- Accelerating data-intensive research
- Preparing a 21st-century data-capable workforce.

GEO Example:

- Predict severe storm tracks with real-time data assimilation into tuned, validated models



Broadening Participation

NSF's Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES), is a multi-stage, multi-year initiative.



Lighter Side of Geim's Genius

- ▶ Only scientist to win a Nobel and an Ignobel Award
- ▶ Ignobel Award—makes you laugh and then makes you think
 - ▶ 2015 prize to Keele University psychologists “for confirming the widely held belief that swearing relieves pain.”
- ▶ Also from Friday Night Experiments: powerful magnets to levitate a live frog
 - ▶ Refutes notion that metallic composition of living tissue too small for magnets to overcome gravity!



The Long, Strange Trip to Graphene

- ▶ Keynote talk to Materials Science Workshop at Penn State
- ▶ Andre Geim—University of Manchester Physicist
- ▶ Friday Night Experiments: lab works on “crazy things that probably won’t pan out at all, but if they do, it would be really surprising.”
- ▶ Story of graphene—the thinnest, strongest, most conductive material in existence.
- ▶ Nobel Prize
- ▶ The power of taking a risk to pursue pure curiosity!

