Academic Research Enhancement Award (AREA) Program

AASCU February 2016

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National Institutes of Health

National Institutes of Health
Office of Extramural Research

Goals of AREA program

- Support small scale research projects

- **Expose students in eligible environment to research**

  - **Undergraduate (preferably) and/or graduate**

    - R15 goals, requirements & review criteria do not apply to

      - High school students

      - Post-baccalaureate participants

      - Postdoc/residents/clinical fellows

Goals of AREA program

- Support small scale research projects

- Expose students in eligible environment to research

- **Strengthen the research environment of educational institutions that have not been major recipients of NIH research grant funds**

  - Not based on PUI vs. teaching intensive vs. research intensive vs. major research university

  - Not based on institution's endowment

  - Not based on students' financial need

Key features

- Project period is limited to 3 years

- Direct cost limited to $300,000 over combined 3 years

- Multiple PIs are allowed, if all eligible

- Research Strategy limited to 12 pages

- **Grants are renewable**

- Preliminary data not required but can be provided

Questions to determine fit

- **Does lab require >$100K/year?**
  - **Intended to be only NIH research grant**
- Will project improve eligible environment?
  - e.g., Are critical parts done elsewhere?
- Will project stimulate students' interests? (Will they consider a research career?)
  - Will students' roles in project simulate interest?
- Can project pragmatically be performed by undergrad/graduate students at the eligible institution?

Application logistics

- Funded through the R15 grant mechanism
  - Program Announcement (PA) Number: PA-13-313
  - Will be reissued due to Forms D (NOT-OD-16-004)
- Use CAYUSE or download forms from FOA:
  - PA-13-313 = Feb 25 & May 7 (Forms D)
  - PA-16-??? = June 25 & later
- All NIH ICs participate except FIC (Fogarty International Center) and NCATS (National Center for Advancing Translational Sciences)

Changes to R15 over time

- Considered career-sustaining, no longer stepping stone to R01
- Renewable (1997)
- Clear incorporation of R15 goals in review criteria
- Softened language about expected scientific impact
  - "Important scientific contribution"
- Must annually report progress & identify students even if unpaid

Funding Opportunity Description

- **Purpose**

  - Goals of the funding opportunity

- **Background**

  - Relevant background information

  - Importance of the funding opportunity

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Parent PA gives general description

Part 2. Full Text of Announcement

Section I. Funding Opportunity Description

Purpose

The National Institutes of Health (NIH) is continuing to make a special effort to stimulate research at educational institutions that provide baccalaureate and/or advanced degrees for a significant number of the Nation's research scientists, but that have not been major recipients of NIH support. Since Fiscal Year (FY) 1985, Congressional appropriations for the NIH have included funds for this initiative, which NIH has implemented through the Academic Research Enhancement Award (AREA) program. Based on the expectation that funds will continue to be available each year, the NIH invites applications for AREA (R15) grants through this Funding Opportunity Announcement (FOA). AREA funds are intended to support new and renewal biomedical and behavioral research projects proposed by faculty members of eligible colleges, universities, schools, and components of domestic institutions.

The AREA program will enable qualified scientists to receive support for small-scale research projects. These grants are intended to create a research opportunity for scientists and institutions otherwise unlikely to participate extensively in NIH programs that support the Nation's biomedical and behavioral research effort. It is anticipated that investigators supported under the AREA program will benefit from the opportunity to conduct independent research; that the grantee institution will benefit from a research environment strengthened through AREA grants and furthered by participation in the diverse extramural programs of the NIH; and that students at recipient institutions will benefit from exposure to and participation in scientific research in the biomedical and behavioral sciences.

The application should include plans to involve undergraduate or graduate students in the proposed research. However, the AREA program is a research grant program, not a training or fellowship program. The application should include plans to expose students to hands-on research and should not include training plans.

Research Objectives of the NIH Institutes and Centers

The AREA program website provides information about each of the participating Institutes and Centers (ICs), including each IC's AREA-specific research interests and staff contacts. For additional scientific program information and for pre-application guidance, a potential applicant is encouraged to contact the person listed for the particular NIH IC(s) with research interests relevant to the applicant's proposed topic.

In addition, applicants are encouraged to consult the Frequently Asked Questions website for more information about this program.

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Application instructions are in Part 2, Section IV, Part 2

Section IV. Application and Submission Information

1. Requesting an Application Package

Applicants must download the SF424 (R&R) application package associated with this funding opportunity using the "Apply for Grants.gov.

2. Content and Form of Application Submission

It is critical that applicants follow the instructions in the SF424 (R&R) Application Guide, except where instructed in this funding in the Application Guide is required and strictly enforced. Applications that are out of compliance with these instructions may b

For information on Application Submission and Receipt, visit Frequently Asked Questions – Application Guide, Electronic Sub

Page Limitations

All page limitations described in the SF424 Application Guide and the Table of Page Limits must be followed.

Required and Optional Components

The forms package associated with this FOA includes all applicable components, required and optional. Please note that sor submission of applications for this FOA. Follow all instructions in the SF424 (R&R) Application Guide to ensure you complete

Instructions for Application Submission

The following section supplements the instructions found in the SF424 (R&R) Application Guide and should be used for prep;

SF424(R&R) Cover

All instructions in the SF424 (R&R) Application Guide must be followed.

SF424(R&R) Project/Performance Site Locations

All instructions in the SF424 (R&R) Application Guide must be followed.

SF424(R&R) Other Project Information

All instructions in the SF424 (R&R) Application Guide must be followed.

Facilities and Other Resources: Include the following information:

- A profile of the students of the applicant institution/academic component and any information or estimate of the numbe or professional doctoral degree in the health-related sciences during the last five years.
- A description of the special characteristics of the institution/academic component that make it appropriate for an AREA meritorious research; (2) strengthen the research environment of schools that have not been major recipients of NIH s such environments to research. Include a description of the likely impact of an AREA grant on the PD(s)/PI(s) and the r
- Although it is expected that the majority of the research will be directed by the applicant investigator and conducted at th institution is permitted. For any proposed research sites other than the applicant institution, provide a brief description
- If relevant, a statement of institutional support for the proposed research project (e.g., equipment, laboratory space, rel

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Instructions for Application Submission

- Instructs applicant to follow instructions in the SF 424 (R&R) Application Guide
  - Updated as needed, 1-2 times per year
- Lists of all the forms available in the application package with additional FOA-specific instructions
- An applicant should be able to prepare an application by reading the SF424 (R&R) Application Guide and this section only

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R15-specific Budget Instructions

- Must include undergraduate (preferably, if available) and/or graduate students

- Specify in which parts of research students will be involved

- List number & level (e.g., undergraduate, junior)
  - Student selection criteria (e.g., completed Introductory Microbiology)

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R15-specific Facilities & Other Resources Instructions

- For institution or qualifying School

- *Not PI's experience*

- Profile of students

- \# who obtained Bachelor & went on to doctoral degree in health-related sciences in last 5 years

- Special characteristics that make it appropriate for 3 goals of AREA

- Impact of R15 on PI & institution

- Any institutional support

- Limited use of special facilities elsewhere

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Answers to Common Profile Questions

- Numbers and/or percentages OK

- Must include information for Institution.

- Allowable to include information on Department

- Ask admissions/alumni office for stats

- Be upfront if you have only partial data

- Not a diversity mechanism

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Sample Facilities & Other Resources

- Fictional sample of R15-specific instructions
- Example and tool
- Comments?
  - R151@mail.nih.gov

Profile[2]

Alar College is a highly selective liberal arts college[3] that confers the Bachelors of Arts and Bachelors of Science degrees. Alar College is dedicated to the excellence in undergraduate education, and there are no graduate programs. In the last five years, 85% of our graduates rank in the top 25% of their high school class[4]. Last school year 2125 students were enrolled. In the last five years, 15-20% of students have majored in science and math with approximately 400 students receiving bachelor's degrees[5]. In the last five year, 25% of those graduates have enrolled in PhD programs related to health sciences, 15% have enrolled in and/or graduated from doctoral programs for medicine, dentistry, veterinary medicine, or physical therapy, and 10% have enrolled in Masters programs related to health sciences. The Biology Department encourages undergraduate research and takes pride in its effectiveness in training undergraduate students through high-quality research opportunities, rigorous standards, and individual responsibility. In the past 5 years, 20 students have received the prestigious National

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[1] Follow the instructions in the SF424 R&R Application Guide for instructions not specific to R15.

[2] The instructions for this section are to provide *"A profile of the students of the applicant institution/academic component and any information or estimate of the number who have obtained a baccalaureate degree and gone on to obtain an academic or professional doctoral degree in the health-related sciences during the last five years."* This section addresses the review criteria, *"Does the application demonstrate the likely availability of well-qualified students to participate in the research project? Does the application provide sufficient evidence that students have in the past or are likely to pursue careers in the biomedical or behavioral sciences?"*

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Research Strategy

- Should address review criteria
  - Non-R15 specific research review criteria
  - R15-specific review criteria
- Demonstrate appropriateness of project and group, including students
- Describe supervision of students
- No fellowship-style training plans
  - e.g., Coursework, seminars, conferences

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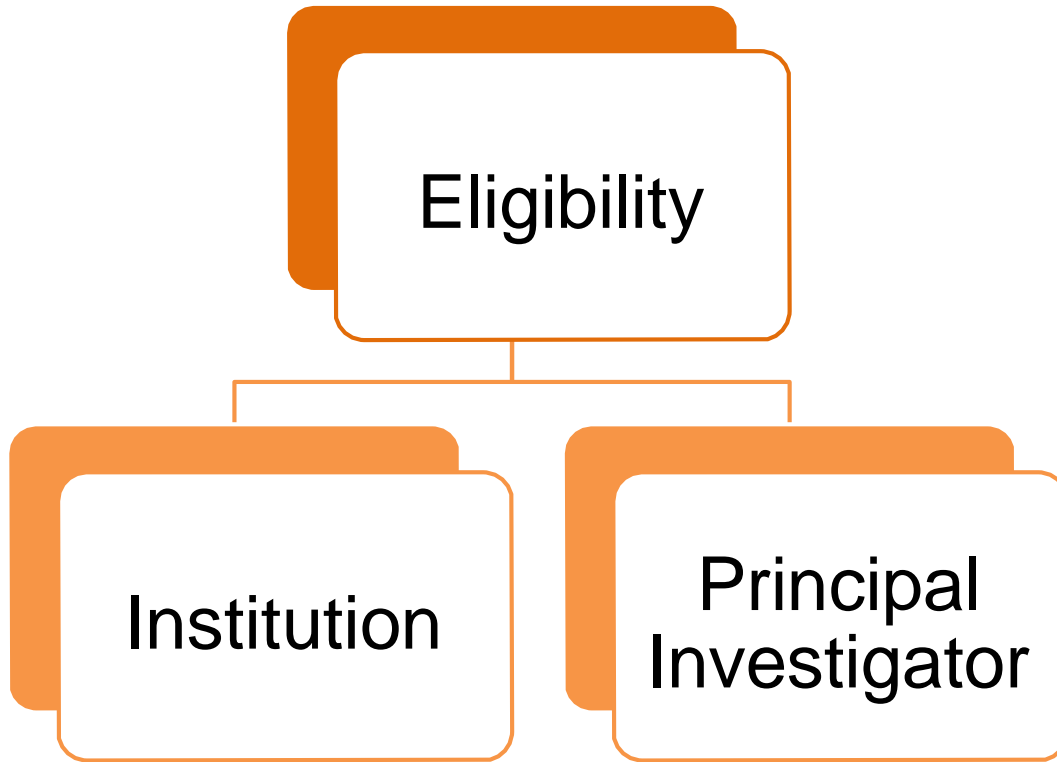
Eligibility

Eligibility = applicant institution and PI only

Eligibility ≠ collaborators

Where to find eligibility in the PA

Section III. Eligibility Information

1. Eligible Applicants

Eligible Organizations

Higher Education Institutions

- Public/State Controlled Institutions of Higher Education
- Private Institutions of Higher Education

The following types of Higher Education Institutions are always encouraged to Education:

- Hispanic-serving Institutions
- Historically Black Colleges and Universities (HBCUs)
- Tribally Controlled Colleges and Universities (TCCUs)
- Alaska Native and Native Hawaiian Serving Institutions
- Asian American Native American Pacific Islander Serving Institutions (AANAP

In addition, all organizations must meet the following two criteria:

- The applicant organization must offer baccalaureate or advanced degrees in
- The applicant organization may not receive research support from the NIH to costs) in each of 4 of the last 7 years.
- Note that the following activity codes are excluded: C06, S10, and all activity

Institutions with Multiple Schools or Colleges

For institutions composed of multiple schools or colleges, the criterion of financial institution (university or college) as a whole, but by the individual school/college or section) where the PD(s)/PI(s) has a primary appointment (e.g., School of Medicine

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Institution eligibility

- US institutions only

- Baccalaureate or advanced degree in biomedical or behavioral science

- Degree granting & accredited

- Public or private non-profit

- Receives less than $6 million per year in NIH support in 4 out of last 7 years

  - Everything except C06, S10, G series

    - Require institution receive grants in order to use products of C06, S10, Gs

Characteristics of eligible institutions and components

- 95% of eligible institutions & components never exceeded limit in any year (0/7)

- 93% would be still eligible if limit were halved

- Average/median annual support < $1 million

- On average half of R15 are the only R15 awarded to an institution that year

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PI eligibility

- <u>Primary</u> appointment at eligible institution
- Multiple PI OK if all eligible
- R15 intended to be only research grant
  - Eligible:
    - Also serve as Key Personnel on another grant
  - Not Eligible:
    - Also serve as PI of other NIH research grants at time of award
    - Also serve as Multiple PI on another NIH research grant at time of award
    - Research is broadly defined

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Second most common question

- Can I have an ineligible collaborator?

  - At ineligible institution

    - At ineligible component on home campus *or*

    - At another site

  or

  - PI of their own NIH research grant

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Can I have an ineligible collaborator?

- Eligibility answer: Yes, but it might impact your score
- Merit answer: ***But***
  - Majority of research should be directed by PI at grantee institution
  - Student profile & student inclusion are for applicant/eligible component
  - Consider the unique goals and criteria of the R15
    - <u>No one</u> can predict what level of involvement will be seen as counter to the R15 goals
    - Pre-PA-12-006, unique attributes not included in review criteria

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Where to find review criteria

Section V. Application Review Information

1. Criteria

Only the review criteria described below will be considered in the review process. As part of the NIH mission, all applications submitte evaluated for scientific and technical merit through the NIH peer review system.

For this particular announcement, note the following:

The objectives of the R15 program are to (1) provide support for meritorious research, (2) strengthen the research environment of sch available undergraduate and graduate students in such environments to meritorious research. Preliminary data are not required for a

Overall Impact

Reviewers will provide an overall impact score to reflect their assessment of the likelihood for the project to make an important scient opportunities to students, and to strengthen the research environment of the institution, in consideration of the following review criteri:

Scored Review Criteria

Reviewers will consider each of the review criteria below in the determination of scientific merit, and give a separate score for each. A likely to have major scientific impact. For example, a project that by its nature is not innovative may be essential to advance a field.

Significance

Does the project address an important problem or a barrier to progress in the field? If the aims of the project are achieved, how w improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or pre have a substantial effect on the school/academic component in terms of strengthening the research environment and exposing s

Investigator(s)

Are the PD(s)/PI(s), collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigatc appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have ac do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational experience in supervising students in research?

Innovation

Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical conc Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broa concepts, approaches or methodologies, instrumentation, or interventions proposed?

Approach

Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly n evidence that the project can stimulate the interests of students so that they consider a career in the biomedical or behavioral sci

If the project involves humans subjects and/or NIH-defined clinical research, are the plans to address 1) the protection of human individuals on the basis of sex/gender, race, and ethnicity, as well as the inclusion (or exclusion) of children justified in terms of th

Environment

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R15 are clustered for review

- Implemented in response to applicant feedback
- In one time Special Emphasis Panel of R15
    - Panels are grouped by scientific topic
- In study section with R01, R21, R03
    - Streamlined against R15 only
    - Reviewed sequentially, not mixed with other R
- Based on logistics to get best review for each cycle's applications
- Can still request study section in PHS Assignment Request Form/Cover Letter
- Can list expertise needed to review application

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Advice from PUI PIs

- Research Strategy should address feasibility with your students

- Involve first years & sophomores

- Involve students in training new students

- Multi-semester commitment

- Help students plan workload realistically

- Discuss criteria used to select students

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Advice from PUIs

- Consider a (part time/seasonal/dept) technician

- Lab classes should teach experimental design

- Consider cultural exposure to major research institutions in lieu of summer REU

- Assess what students need to participate (e.g., course credit, hourly pay)

  Consider collaborating if you don't have enough publications and/or expertise

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There is no winning formula

❖No one can give specifics of what will score well

❖Do not treat a successful [or not] application as an iron-clad template [of what not to do]

- How many students

- How many papers

- What % of a collaborator

- What % of special facilities

- What amount or type of institutional support

- What type of environment

• Impact on institution depends on environment

Build a vital research environment

- Consider the importance of collaborative research in establishing a successful research environment

- Do not feel pressured to apply if your project is not ready for peer review

  - Quality over quantity; submit best application

- "Facilities & Other Resources" section of application is CRITICAL

  - Profile of student body (what do they do after graduation)

  - Description of the institution and research environment (impact of AREA)

  - Letter of institutional commitment to research project

  - Maintain as resource & revise per Summary Statements

Strategies of Successful PIs

- Include a collaborator or consultant if you don't have the necessary expertise or resources

- Understand the review criteria and the review criteria questions

  □ Each question should be addressed in the application

- In A1, respond thoroughly and diplomatically to all of the reviewer comments

- AREA grant is research award, not training award

  □ Focus on hands-on research not course work

  □ Describe PI's role in research & supervision

More Strategies of Successful PIs

- Address the AREA-specific programmatic goals in the application; these are reflected in review criteria
  - Support meritorious research
    - Research should contribute to the field
    - Results should be publishable

  - Expose students to research
    - Profile of available and former students at the institution
    - Experience of the investigator in working with students
    - How students will be incorporated into the research project
    - How students will benefit from this research experience

  - Strengthen the research environment
    - The suitability of the institution for an award
    - The impact the AREA grant will have on the institution

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Resources

- AREA Program Facebook page
  - https://www.facebook.com/NIHAreaProgram
- AREA Program FAQs
  - http://grants.nih.gov/grants/funding/area_faq.htm
- AREA mailbox
  - R151@mail.nih.gov
- Sample Facilities & Other Resources
  - http://grants.nih.gov/grants/funding/F-OR-annotate.pdf
- Institute/Center contacts
  - http://grants.nih.gov/grants/guide/contacts/parent_R15.html
- Strategic plans
  - http://report.nih.gov/strategicplans/

The 2017 Budget:
Investing in American Innovation

Kei Koizumi

Assistant Director for Federal R&D

White House Office of Science & Technology Policy

"Sixty years ago, when the Russians beat us into space, we didn't deny Sputnik was up there. We didn't argue about the science, or shrink our research and development budget. We built a space program almost overnight, and twelve years later, we were walking on the moon. That spirit of discovery is in our DNA."

- President Barack Obama
January 12, 2016

The 2017 Budget:

- Invests in R&D and innovation
- Accelerates the pace of innovation to create jobs
- Improves Americans' health through innovation
- Moves toward cleaner American energy
- Takes action on climate change
- Prepares students with STEM skills

Investing in R&D

- $72.4 billion for non-defense R&D.
- $80.0 billion for defense R&D.
- $72.8 billion for (basic and applied) research.
- $8.0 billion for the National Science Foundation (NSF).
- $5.7 billion for the Department of Energy (DOE) Office of Science.
- $826 million for the National Institute of Standards and Technology (NIST) laboratories.
- $19.0 billion for NASA.
- $700 million for U.S. Department of Agriculture competitively-awarded extramural research grants in the Agriculture and Food Research Initiative.

R&D in the President's 2017 Budget

(budget authority in billions of current dollars)	FY 2015 Actual	FY 2016 Enacted	FY 2017 Budget	Change FY 16-17
Total R&D	**138.3**	**146.1**	**152.3**	**4.2%**
defense	*71.7*	*76.6*	*80.0*	*4.4%*
nondefense	*66.5*	*69.5*	*72.4*	*4.1%*
Research	**66.0**	**68.9**	**72.8**	**5.7%**
defense	*10.9*	*10.9*	*11.8*	*7.9%*
nondefense	*55.2*	*58.0*	*61.0*	*5.2%*
Development	**69.7**	**74.5**	**76.7**	**3.0%**
defense	*60.5*	*65.3*	*67.6*	*3.5%*
nondefense	*9.2*	*9.1*	*9.1*	*-0.8%*

Federal Research by Agency, FY 1995-2017

in billions of constant FY 2016 dollars

Legend: NIH, NSF, DOD, DOE, NASA, USDA, All Other
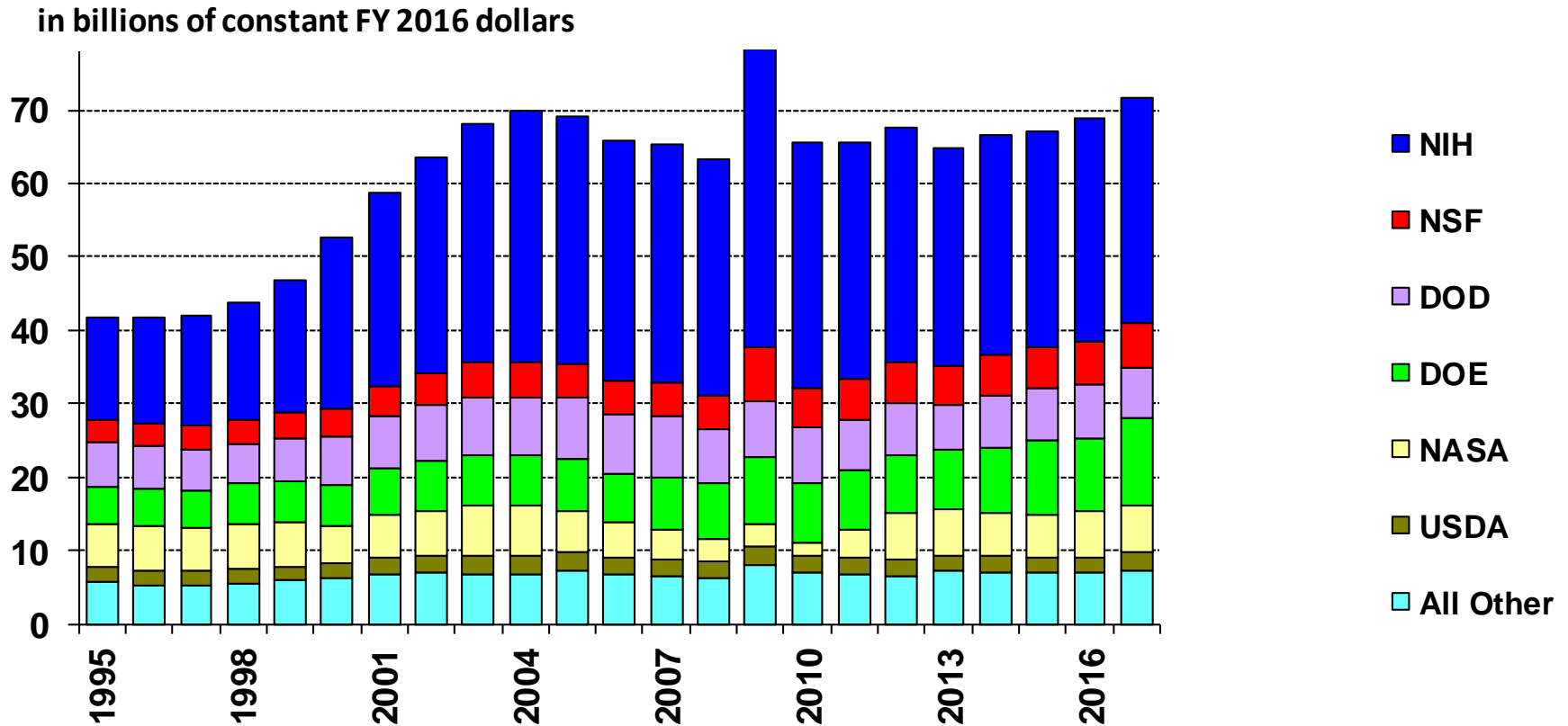
FY 2009 figures include Recovery Act appropriations.
Research includes basic research and applied research.
February 2016 OSTP

Investing in Innovation for National Security

- $12.5 billion for DOD's Science & Technology (S&T) program of basic research, applied research, and advanced technology development.

- $3.0 billion for the Defense Advanced Research Projects Agency (DARPA) to maintain DOD's critical role in fostering breakthrough approaches for discovering promising technologies.

- The Budget invests in defense-related S&T across a diverse portfolio, including advanced manufacturing, energy, cybersecurity, robotics, a safe and secure nuclear arsenal, and autonomous and unmanned systems. The Budget promotes effective technology transfer from the Department of Defense.

- The Budget includes $318 million for civilian R&D to support innovative cybersecurity technologies.

Accelerating the pace of innovation to create jobs

Advanced Manufacturing in the 2017 Budget

Support advanced manufacturing R&D

- •$2.0 billion in advanced manufacturing R&D in the 2017 Budget.

- •These investments will expand R&D on innovative manufacturing processes, advanced industrial materials, and robotics.

Establish a national network of manufacturing innovation institutes

- The Budget builds on the 13 manufacturing innovation institutes already funded through 2016 with more than $250 million in additional discretionary funds to support 5 new institutes.

- The Budget includes a mandatory proposal of $1.9 billion to fund the remaining 27 institutes in the national network for a total of 45.

Accelerating Innovation for Industries of the Future

- The Budget provides strong support for R&D that is likely to create the foundations for the industries and jobs of the future. Examples include robotics, cyber-physical systems, big data, the Materials Genome Initiative, the National Nanotechnology Initiative, and engineering biology.

- The Budget supports investments in the National Strategic Computing Initiative, including from DOE ($285 million) and NSF ($33 million).

- The Budget expands our capabilities in the space industries of the future: $1.2 billion for the Commercial Crew program, $827 million for Space Technology, and $324 million for Advanced Exploration Systems to increase the capabilities of NASA, other government, and commercial space activities.

- The Budget proposes to simplify and expand the permanently-extended Research and Experimentation Tax Credit.

PRESIDENT OBAMA'S FINAL

STATE
★ OF THE ★
UNION

JANUARY 12, 9PM ET

"Last year, Vice President Biden said that with a new moonshot, America can cure cancer. Last month, he worked with this Congress to give scientists at the National Institutes of Health the strongest resources they've had in over a decade. Tonight, I'm announcing a new national effort to get it done."

- President Barack Obama
January 12, 2016

Improving Americans' health through innovation in life sciences, biology, and neuroscience

- The National Cancer Moonshot begins this year with $195 million in new NIH cancer activities. The 2017 Budget proposes $755 million for new cancer-related research activities in NIH and FDA.

- The 2017 Budget provides $309 million for the Precision Medicine Initiative with funding from HHS agencies.

- The BRAIN Initiative will continue with a Federal commitment of $195 million from NIH, and a total Federal investment of nearly $450 million.

- $33.1 billion for the National Institutes of Health (NIH) to support high-quality, innovative biomedical research.

"But even if the planet wasn't at stake; even if 2014 wasn't the warmest year on record – until 2015 turned out even hotter – why would we want to pass up the chance for American businesses to produce and sell the energy of the future?

Now we've got to accelerate the transition away from dirty energy. Rather than subsidize the past, we should invest in the future."

- President Barack Obama
January 12, 2016

Moving toward cleaner American energy

Mission Innovation

• The Budget supports the United States' participation in Mission Innovation. The 2017 Budget provides $7.7 billion in FY 2017 for clean energy R&D to meet the pledge to double clean energy R&D by 2021.

• $2.9 billion for DOE Energy Efficiency and Renewable Energy (EERE), $804 million for nuclear energy, and $500 million for ARPA-E.

Modernized electric grid

• $177 million for DOE Office of Electricity Delivery and Energy Reliability.

21st Century Clean Transportation Plan

• A new mandatory proposal for clean transportation system deployment, including R&D funding.

• Includes $200 million in DOT for safety research to accelerate the development of autonomous vehicles and $100 million in NASA R&D for low-carbon-emission aircraft.

Taking action on climate change in the 2017 Budget

- $2.8 billion for the U.S. Global Change Research Program (USGCRP).

- USGCRP supports research to improve our ability to understand, assess, predict, and respond to global change.

- The 2017 Budget supports an integrated suite of climate change observations, process-based research, modeling, sustained assessment, adaptation science activities, and climate preparedness and resilience strategies.

- USGCRP investments support the President's Climate Action Plan.

"The bipartisan reform of No Child Left Behind was an important start, and together, we've increased early childhood education, lifted high school graduation rates to new highs, and boosted graduates in fields like engineering. In the coming years, we should build on that progress, by providing Pre-K for all, offering every student the hands-on computer science and math classes that make them job-ready on day one, and we should recruit and support more great teachers for our kids."

- President Barack Obama
January 12, 2016

Preparing students with STEM skills

- $3.0 billion for Federal science, technology, engineering, and mathematics (STEM) education programs in the 2017 Budget.

- Agencies continue to implement the Federal STEM Education 5-Year Strategic Plan.

- $4 billion for states and $100 million for districts in the 2017 Budget for Computer Science For All to increase access to K-12 CS courses. NSF and the Corporation for National and Community Service are starting the effort this year with more than $135 million in investments.

- NSF invests $332 million for graduate fellowships, $59 million for graduate traineeships, and $109 million for improving undergraduate education in the 2017 Budget.

THANK YOU

www.whitehouse.gov/ostp
@whitehouseostp

Backup Slides

Arctic Highlights in the 2017 Budget

Coastal Resilience

• The Budget proposes a $2 billion Coastal Climate Resilience program that provides resources over 10 years for at-risk coastal States, local governments, and their communities to prepare for and adapt to climate change.

• A portion of these funds would be set aside for unique circumstances some Alaskan communities are confronting such as relocation expenses for native villages threatened by rising seas and coastal erosion.

Denali Commission

• The Budget provides the Denali Commission $5 million to leverage and coordinate other Federal, State, and Tribal assistance (including about $250 million across the Budget) for developing and implementing solutions to climate impacts.

• The Budget also proposes additional flexibility by allowing the Denali Commission to use their appropriated funds toward the cost-share that some federal assistance program require.

Research & Observing

• $63 million for NSF's Arctic research program and $7 million for NOAA's Arctic Observing Network.

• These investments will lead to sustainable stewardship of the Arctic and strengthened decision-making based on science.

Icebreakers

• $150 million for the U.S. Coast Guard for design of a heavy, polar-class icebreaker, accelerating the start of production activities by 2 years to 2020.

NASA in the 2017 Budget

- $19.0 billion for the National Aeronautics and Space Administration (NASA), prioritizing research and development, space technology, and other initiatives enabling the increased use and exploration of space.

- Develops the building blocks for ambitious deep space exploration by providing $8.4 billion for human exploration and space operations.
  - Keeps Space Launch System rocket and Orion spacecraft on track to send astronauts on deep space missions in the 2020s and beyond.
  - Reaffirms NASA's commitment to its commercial crew program, which will provide safe and affordable transport for astronauts to the International Space Station.
  - Develops critical technologies for exploration, including new public-private partnerships to build habitat modules and systems that will enable extended duration human missions around the moon or to Mars.

- Improves our understanding of the Earth and the Universe.
  - Provides $2 billion for multiple Earth science missions to study Earth as a complex, dynamic system of diverse components.
  - Provides $3.6 billion for space science, including funding for the James Webb Space Telescope, the next Mars rover mission, and a mission to Jupiter's moon Europa.

Next-Generation High-Performance Computing

Delivering on the President's National Strategic Computing Initiative

Advance U.S. Leadership in High-Performance Computing

- Develop and deploy a capable exascale system that addresses 21st century applications.

- Advance core computing technologies and paradigms for a post-Moore's law world.

- Investments from multiple Federal agencies in the 2017 Budget, including DOE ($285 million) and NSF ($33 million).

Enable scientific discoveries, economic prosperity, and national security

- Broad deployment of NSCI will bring the economic and scientific benefits of HPC to more businesses, researchers, and government.

- Public and private-sector collaboration is key to NSCI developments.

Investing in Innovation for Cybersecurity

- The Budget includes $318 million for civilian R&D to support innovative cybersecurity science and technologies that support the goals in the 2016 Federal Cybersecurity R&D Strategic Plan:

    - Near-term advances that counter adversaries' asymmetrical advantages with effective and efficient risk management

    - Mid-term advances that reverse adversaries' asymmetrical advantages, through sustainably secure systems development and operation

    - Long-term advances for effective and efficient deterrence of malicious cyber activities via denial of results and likely attribution

- Achieving these goals strengthens the defensive elements of Deter, Protect, Detect, and Adapt.
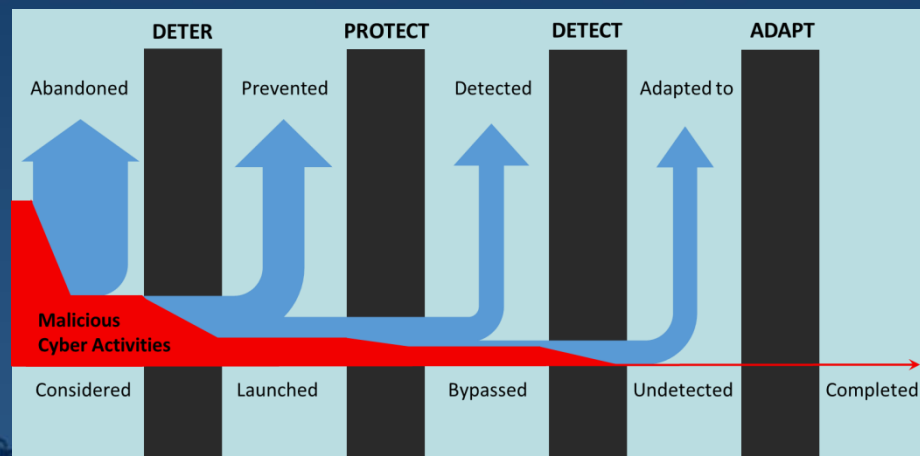
Creating Pathways to High-Growth Jobs in the 2017 Budget

Empowering workers to invest in skills training for in-demand jobs

Empower job seekers, trainers, providers, and researchers with good data to make smart choices

- $500 million to create Workforce Data Science and Innovation Fund to invest in technology and data analytics which tie training investments to employment outcomes.

- These investments will spur data products on jobs and skills to provide more comprehensive views of local labor market demands.

- New data standards, analytical data sets and open source data products will ensure continued innovation.

Empower States to share training and employment data for clearer picture of workforce investments

- $40 million in Workforce Data Quality Grants for states to integrate or bridge data systems and leverage common solutions to match training, earnings, and employment outcomes data.

- $2.5 million to modernize data collection on occupations and required job skills through the Occupational Information Network (O*Net).

- These investments will promote better skills matching for jobs across the public and private sector.

Lab-to-Market Funding Highlights for 2017

Supporting Commercialization of Federally-Funded R&D

The President's Budget

- $50 million mandatory funding for Partnership Fund at EDA joining Federal labs, universities, and regional economic development organizations

- $35 million for R&D commercialization programs at NASA

- $30 million for NSF I-Corps to scale entrepreneurship training for Federally-funded scientist teams

- $8.4 million for DOE Office of Technology Transitions to expand Lab-to-Market collaborations

- $8 million for NIST to support government-wide Lab-to-Market projects, including open data on lab assets

Building on Progress

- $1.9 million for the Lab-to-Market Cross-Agency Priority (CAP) Goal for "lab partnering service" at DOE

- I-Corps expanding through 10 agency partnerships

Water S&T Highlights in the 2017 Budget

• $45 million of new funding for the Department of Energy to launch an Energy-Water Desalination Hub and conduct complementary R&D.

• $98.6 million for the Department of the Interior's WaterSMART program, which promotes water conservation initiatives, improved water data, and technological breakthroughs.

• $88 million for the National Science Foundation (NSF) to support basic water research to enhance the scientific and engineering knowledge base.

Earthquake Early Warning in the 2017 Budget

Making America resilient to potential disasters

Make an earthquake early warning system an operational reality

- $8.2 million for the USGS to transition the earthquake early warning demonstration project into an operational capability on the West Coast.

**Take a whole-of-government, whole-of-community approach**

- This investment is leveraged with state, university and private sector investments as part of a whole-of-government/whole community approach to achieving resilience.

Builds on more than 9 years of federal, state, university, and private-sector R&D investments

- USGS and partners have been conducting research to develop the ShakeAlert system since 2006.

- As of February 1st, it has moved to beta-test status in its transition toward full operations, when it will deliver fast, reliable, public warnings about oncoming earthquakes.

Shake Alert
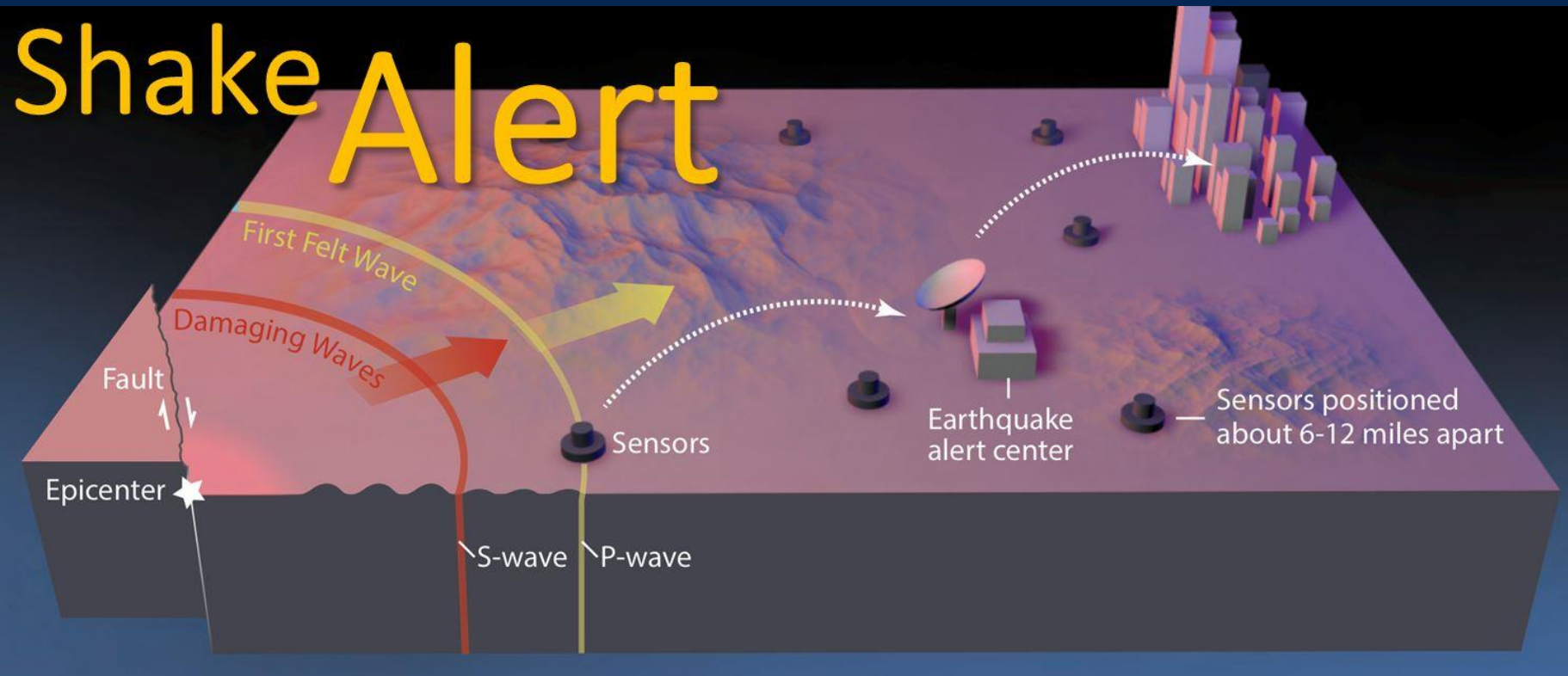
ShakeAlert will give enough warning time to slow and stop trains and taxiing planes, stop surgeries, stop elevators and open doors, shut down industrial processes, and ensure that people understand what is coming, stop dangerous activities, and drop, cover, and hold on.

Smart Cities Initiative in the 2017 Budget

Solving pressing urban challenges through innovation

Support core Smart Cities R&D

- •$28 million for Smart and Connected Communities research at NSF.

- •These investments will integrate new digital tools and engineering solutions into the physical world to solve urban challenges

- •Millions in related investments focused on cyber physical systems and the "Internet of Things."

Meet urban climate and energy goals

- • The Budget would create the Metropolitan Systems Initiative at DOE with $15 million in initial investment.

- • This investment will deploy data-driven tools to support the creation of low-energy, resilient infrastructure and will enable U.S. cities to achieve their climate and energy targets.

NOAA Coastal Resilience Grants

$20 Million in Competitive Grants in FY17

- These grants will support important projects that impact human and ocean health. National Ocean Policy regions, as well as other areas, will benefit.

- State, local, tribal, private, and NGO partners are all eligible for these grants.

- Projects could include
  - vulnerability assessments,
  - disaster preparedness, and
  - environmental restoration.

- Grants can also be used to implement marine regional plans through Regional Ocean Partnerships.

- $20 million represents a four-fold increase above the 2016 enacted level for these grants, which furthers both the need and enthusiasm for coastal resilience projects.

- Results will provide tangible examples and best practices for coastal resilience, from which communities can learn and benefit.

Federal Oceanographic Fleet Recapitalization Initiative

$230 Million in FY17

NSF

- $106 million to fund the construction of two Regional Class Research Vessels (RCRVs)
- Meet anticipated ocean science requirements for the U.S. East Coast, West Coast, and Gulf of Mexico.

NOAA

- $24 million to complete the construction of a Regional Survey Vessel (RSV)
  - part of a multi-year NOAA ship fleet recapitalization initiative.
  - RSVs conduct critical mission in areas including hydrography, fisheries sampling and acoustics, and ocean sensing and monitoring.
- $100 million in mandatory funding to acquire a second NOAA RSV

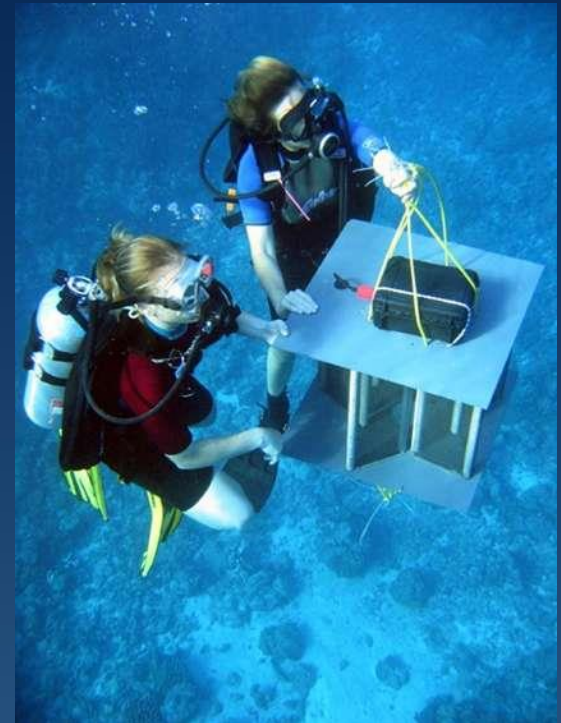Artist's rendition of the RCRV as constructed.

Ocean Acidification

NOAA

- Almost double the 2016 level ($12 million), to address this complex issue and increase our understanding of the consequences of ocean acidification on marine resources.

Less Acidic

More Acidic

Growing a Network of Agency Innovation Labs

- Over $10 million in funding for a network of agency innovation labs.

- Goal: Developing internal agency capacity to increase the effectiveness and efficiency of government operations.

- Innovation labs provide the resources, training and mandate for agency employees to tackle complex challenges with new approaches that improve performance through innovation.

Investing in research to help unlock the mysteries of the brain

The 2017 Budget builds on the past three years of investment with [$439] million for the BRAIN Initiative across six agencies:

1. NIH: [$195] million for projects to create a dynamic picture of the brain in action.

2. DARPA: [$118] million to provide neurotechnology-based capabilities to alleviate the burden of illness and injury.

3. NSF: [$74] million to generate an array of physical and conceptual tools to determine how healthy brains function across the lifespan.

4. IARPA: [$43] million for applied neuroscience research to advance understanding of the brain, develop non-invasive neural interventions, and build novel computing systems to employ neutrally-inspired components.

5. DOE (new): [$9] million to harness the power of the National Laboratories for tool development.

6. FDA: Supporting the BRAIN Initiative by enhancing the transparency and predictability of the regulatory landscape for neurological devices and assisting developers and innovators of medical devices
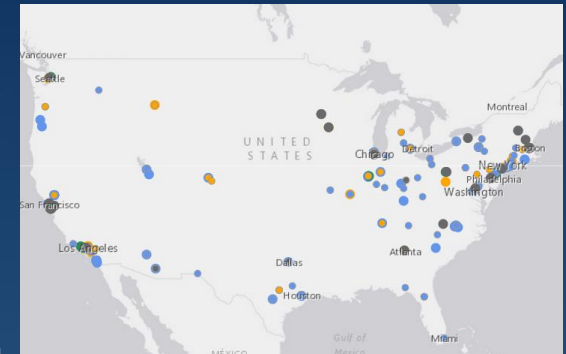
Federal Investment in the BRAIN
Initiative as of October 2015
Source: WhiteHouse.gov

Collecting high-resolution elevation data

- U.S. Geological Survey (USGS) coordinates the 3D Elevation Program (3DEP), an initiative to collect high-quality elevation data to inform land management, conservation, infrastructure development, agricultural practices, and other public and private decisions.

- The 2017 budget for the National Geospatial Program at USGS is $69.0 million, with program increases of $5.9 million above the 2016 enacted level, including $1.5 million for 3DEPAlaska mapping and $2.4 million for the national 3DEP program.

- Additional increases include $500,000 to use Light Detection and Ranging (LIDAR) data for landscape level assessments in the Chesapeake Bay, and $500,000 to use LIDAR data for improving disaster response regarding coastal infrastructure.

- Accelerating national elevation data coverage will enable decision-makers to manage infrastructure and construction, provide more accurate and cost effective application of chemicals in farming, help to develop energy resources, and support aviation safety and vehicle navigation.

- USGS and other federal agencies are also using a Broad Agency Announcement to coordinate the acquisition of elevation data to maximize the return on federal investment and avoid duplication.