

VSoE New Faculty Orientation

Steven O. Moldin, Ph.D.

DC Office of Research Advancement
Office of the Vice President of Research

August 16, 2018



USC DC Office



DC Office Goals

- Provide USC presence near funding agencies
- Identify large-scale funding opportunities
- Form collaborations within and outside USC to develop competitive applications
- Support proposal preparation
- Navigate federal bureaucracy



Where We Are



701 Pennsylvania Avenue, NW, Suite 540

Research Adv - Organization



DC Research Advancement Office

Steven Moldin - Background

- PhD, clinical psychology (Yeshiva U); genetics research (Columbia U); postdoc, genetics (Washington U St Louis)
- Faculty, Washington U School of Medicine
- Eleven years, senior NIH program official
 - 17 RFAs, PAs; 37 workshops
 - Mental disorders (autism, schizophrenia) genetics, genomics, neuroscience



DC Research Advancement Office

James Murday - Background

- PhD, solid state physics (Cornell U)
- Forty years in chemistry, physics and materials science at DoD's NRL & ONR
- Architect, US National Nanotechnology Initiative



DC Research Advancement Office

Allan Olson - Background

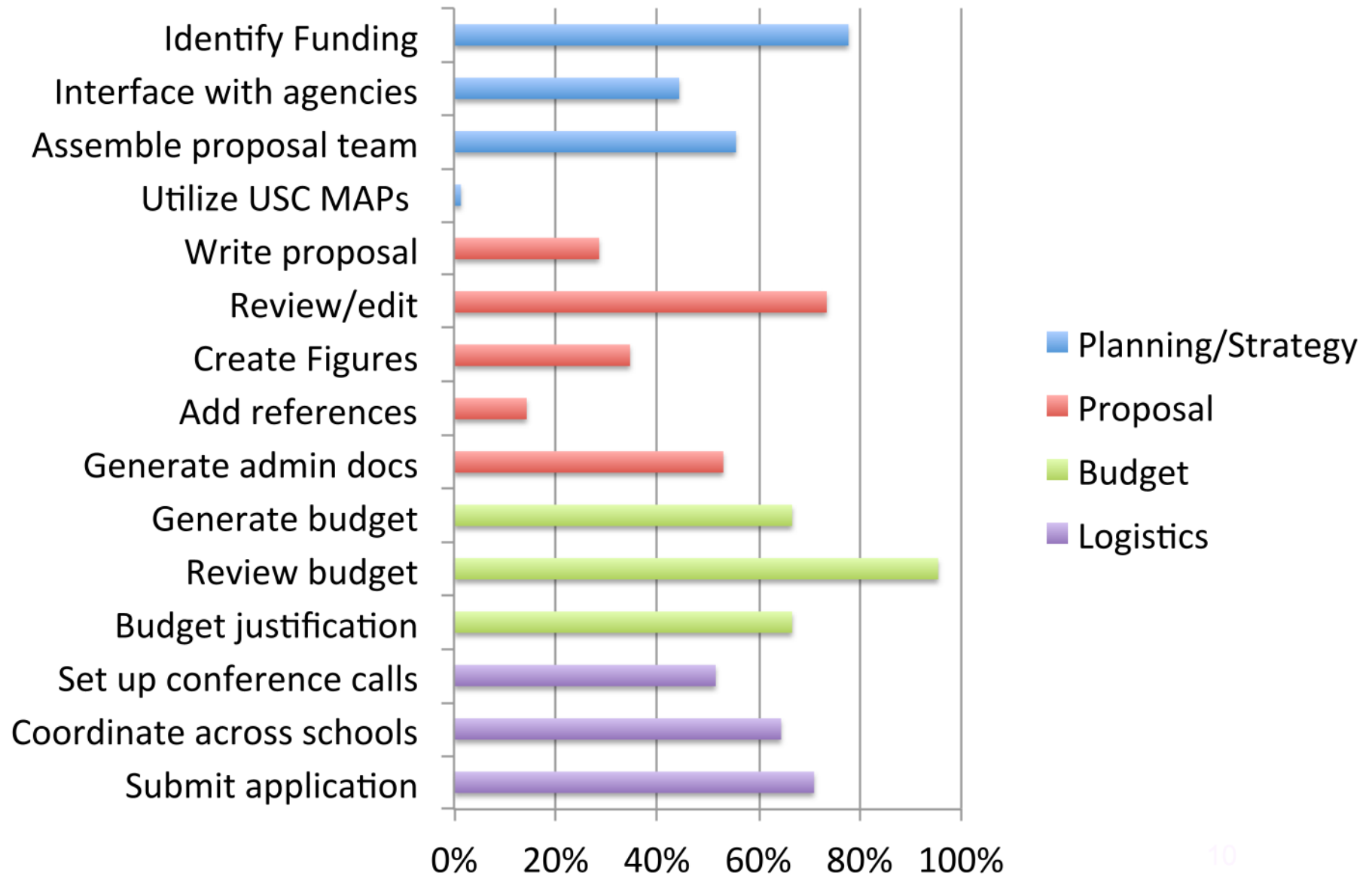
- Maintained senior leadership positions in private industry and the U.S. government involving research, strategic planning, program management, systems engineering
- Previous Director of Horizontal Technology Integration
- Holds degrees and certifications in program management, electrical engineering, contracting
- Certified Department of Defense and Federal Program Manager



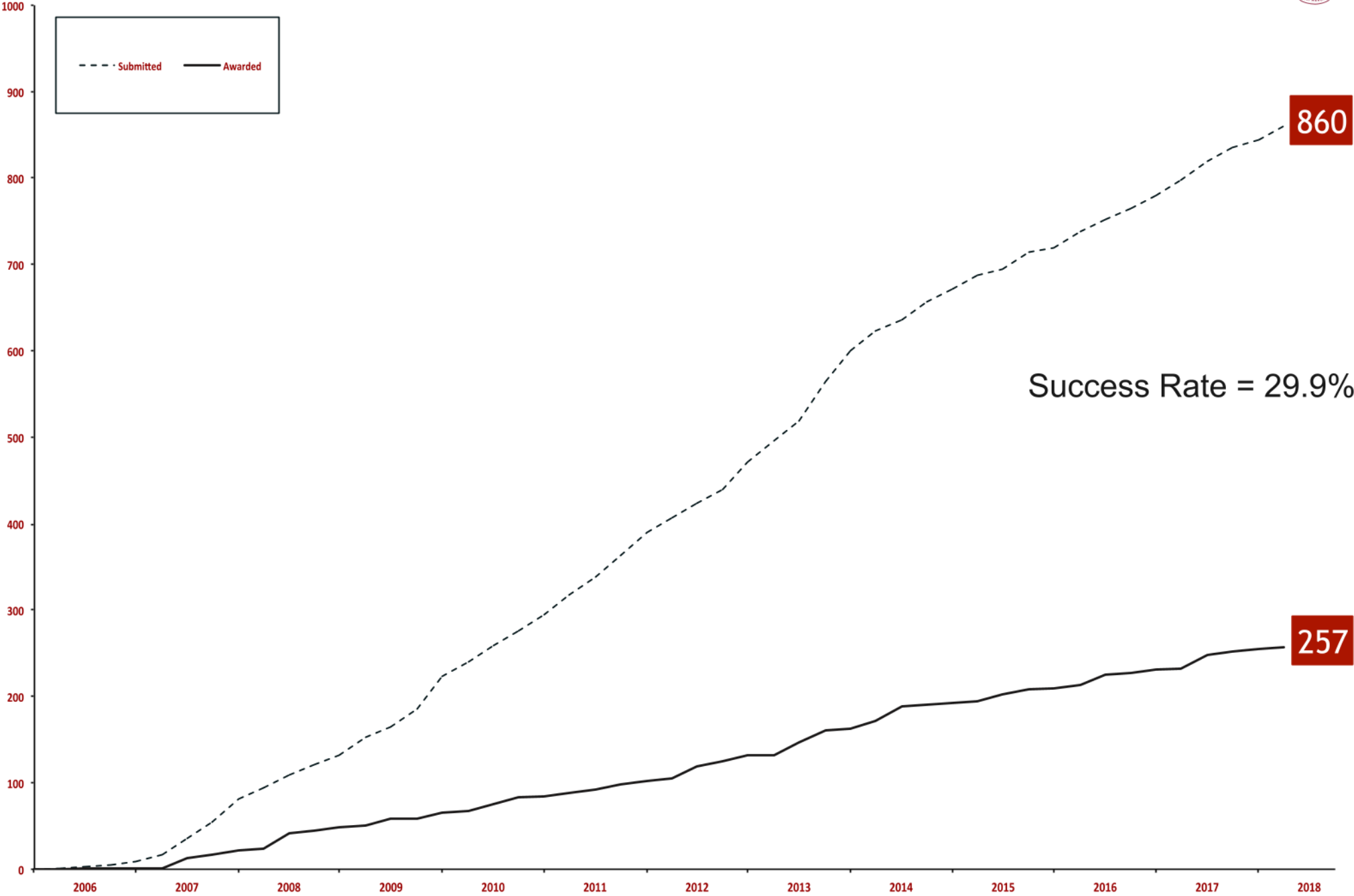
Research Advancement Services

- Strategic planning
- Proposal preparation - scientific
 - Help develop 'vision'
 - Help build collaborations (within & outside USC)
 - Writing, reviewing, editing
- Proposal preparation – logistic/administrative
 - Conference/video calls, meetings
 - Budgets, budget justifications, PARs
 - Biosketches, letters of support
 - References, figures
- Federal agency connections / advocacy / intel
- Faculty development

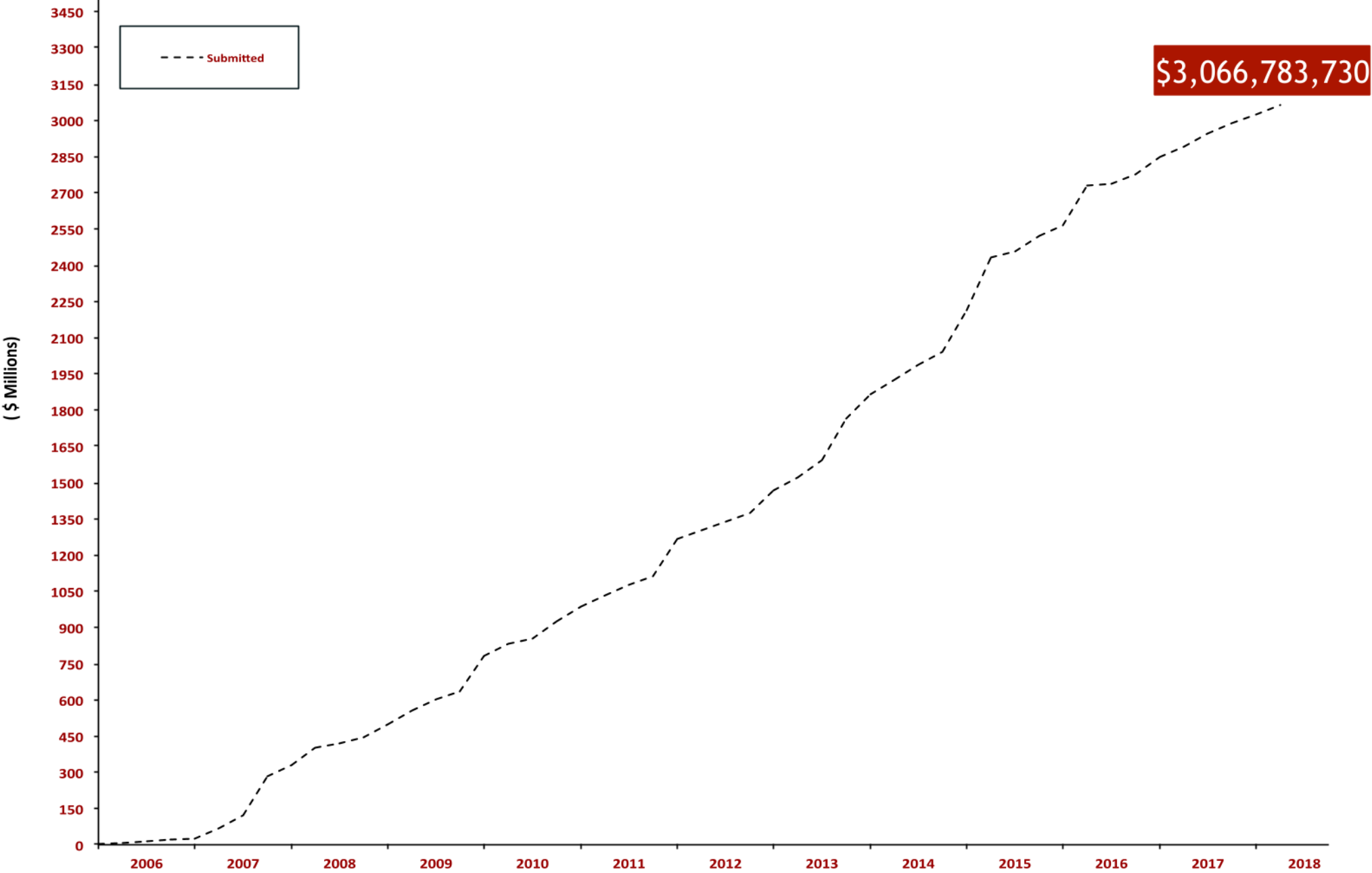
% of Assisted Faculty Who Have Utilized Research Advancement Services



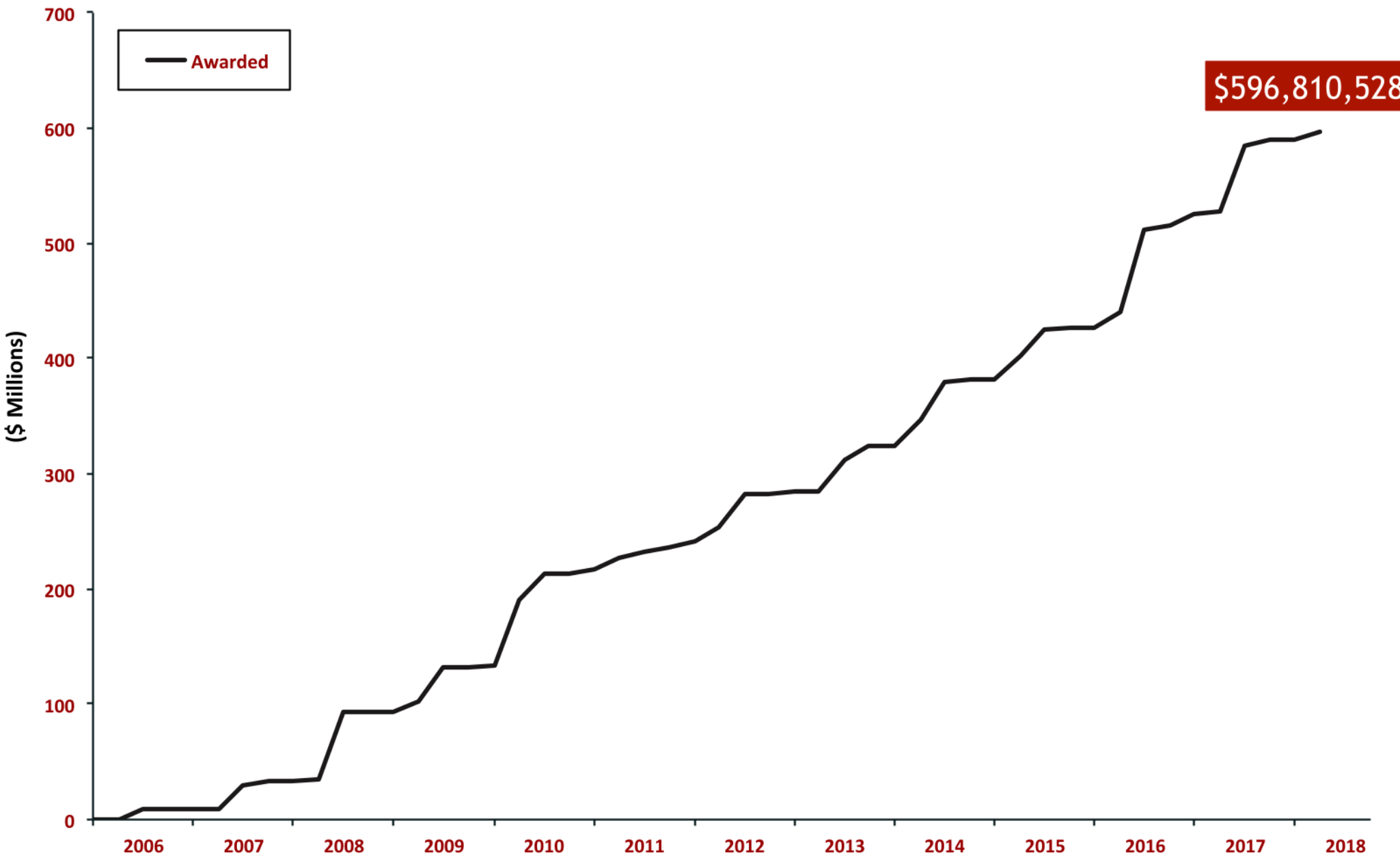
DC Office of Research Advancement Applications Submitted and Awarded



DC Office of Research Advancement Cumulative Dollars Requested



DC Office of Research Advancement Cumulative Dollars Awarded



Research Strengths

- Neuroimaging & Big Data Bioinformatics
- Aging & Alzheimer's Disease
- Biomedical Devices
- Environmental Health
- Health Policy
- National Security
- Information Science
- Quantum Computing
- Brain Computer Interfaces
- Children's Health
- Convergent Biosciences

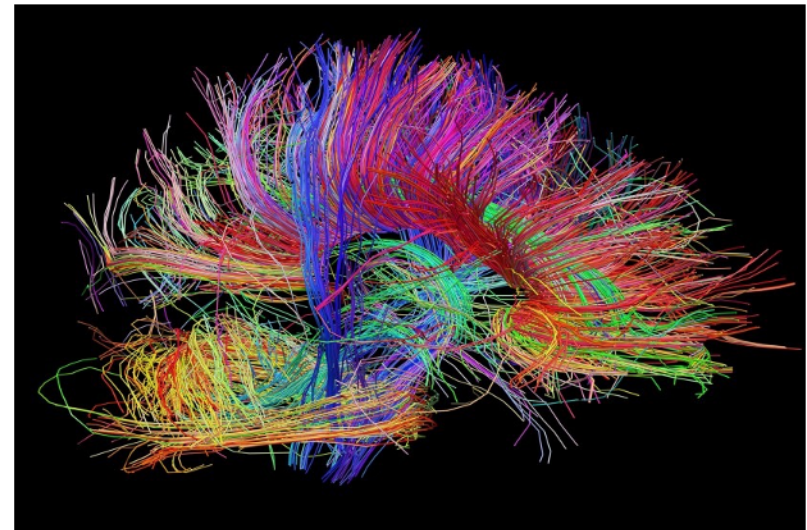
Neuroimaging & Big Data Bioinformatics

- NIH BD2K Centers of Excellence
- Viterbi/ISI data management centers
- funding from several NIH institutes
- NIDCR Craniofacial Research Hub
- NIH Transformative Research
Program: Dynamic Mapping of
Neural Synapses
- Mark and Mary Stevens
Neuroimaging and Informatics
Institute (\$50M endowment)
- State of the art equipment - 7
Tesla MRI scanner
- Brain & Creativity Institute
- Dana and David Dornsife Cognitive
Neuroimaging Center



Aging & Alzheimer's Disease

- Zilkha Neurogenetic Institute - world leader for basic neuroscience research
- NIA Alzheimer Disease Research Center (ADRC) - focuses on multi-ethnic communities in greater LA area
- Alzheimer's Therapeutic Research Institute (ATRI) - industry & NIH funding
- Laboratory of Neuro Imaging (LONI) - industry & NIH funding
- NIH funding of multiple training resources in demography & minority aging
- Research programs in digital, global, and personalized aging
- Major focus of USC health policy and neuroimaging research programs



Biomedical Devices

- NSF Engineering Research Center - Biomimetic MicroElectronic Systems
- Resource Center for Medical Ultrasonic Transducer Technology
- Center for Neural Engineering
- Biomedical Simulations Resource
- USC team led by Mark Humayun developed *Argus II*, a retinal prosthesis approved by FDA as first bionic eye in US
- Humayun to receive National Medal of Technology and Innovation from President Obama



Environmental Health

- NIEHS Southern California Environmental Health Sciences Center (SCEHSC) works to reduce the burden of adverse effects from the environment
- EPA/NIEHS Southern California Children's Environmental Health Center (SCCEHC) conducts studies on near-roadway air pollution's role in the development of obesity & metabolic abnormalities that increases risk of type 2 diabetes
- NIEHS/EPA Children's Health Study (CHS), one of the largest & most detailed studies of long-term effects of air pollution on children's respiratory health
- NIEHS/NIMHD Maternal And Developmental Risks from Environmental & Social Stressors Center (MADRES) studies low-income, urban minority communities in Los Angeles that have both high obesity rates & wide-ranging exposure to environmental pollutants



Cleaner Air = Healthier Lungs
USC Researchers find less pollution in LA area is associated with better lung function in children

USC CHILDREN'S HEALTH STUDY

2,120 Children

5 SoCal Communities

San Dimas, Upland, Mira Loma, Riverside, Long Beach

The infographic features a red background with white and yellow text. It includes a map of Southern California highlighting five study communities: San Dimas, Upland, Mira Loma, Riverside, and Long Beach. Below the map is a photograph of a city skyline under a hazy, orange-tinted sky, suggesting air pollution. At the bottom is a photograph of a modern USC building with a large 'USC' logo on its glass facade.

Health Policy

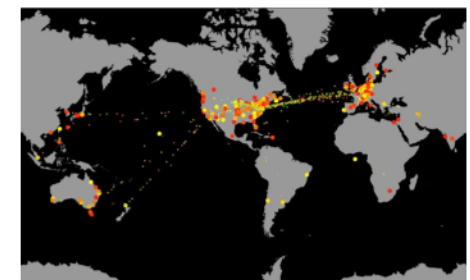
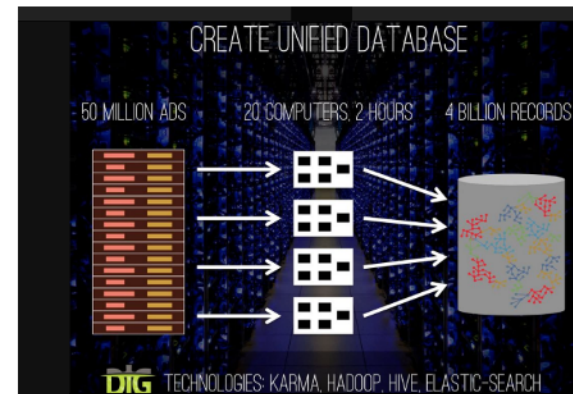
- Schaeffer Center for Health Policy and Economics: joint Pharmacy/Price
- Center for Economic and Social Research
- two NIH Roybal Centers: Health Policy Simulation & Health Decision Making & Financial Independence in Old Age
- NIA Research Center for Minority Aging Research
- NIA training program in the demography of aging
- Partnership between Schaeffer Center and Brookings
- US News & World Report “health policy and management”: Price School ranked third nationally



National Security

- DHS National Center for Risk and Economic Analysis of Terrorism Events (CREATE) (bridge funding to new competition)
- Cyber DEfense Technology Experimental Research Laboratory (DETER) shared testbed providing a platform for innovative cybersecurity technology
- DARPA Center for Rapid Automated Fabrication Technologies (CRAFT): faster & more secure chip design & fabrication
- DARPA Low Resource Languages for Emergent Incidents (LORELEI): exploiting language information for situational awareness
- IARPA Domain-Specific Insight Grafts (DIG): index fine grained data collection, organization & analysis of social and other media
- IARPA Graphics-Based Learning Approach Integrated with Vision Enhancements (GLAIVE): applying machine learning techniques to pattern recognition & computer vision

CREATE
The Nation's First Homeland Security Center

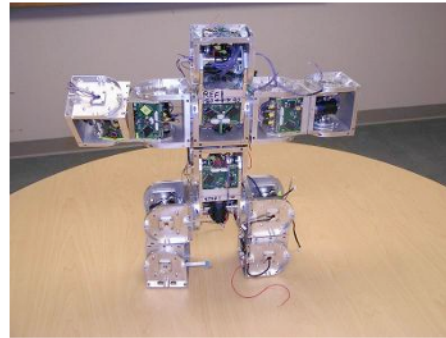


(a) CAD model

(b) Built part

Information Science

- Viterbi Information Science Institute (ISI) -cutting edge medical informatics, intelligent systems, computational systems, advanced electronics, configurable robotics, grid technologies, Big Data management & integration
- Institute for Creative Technologies (ICT) - 'virtual' humans, graphics, cognitive architectures, AI, emotion modeling
- Army Research Lab (ARL) West partnership
- Integrated Media Systems Center (IMSC)
- Leadership in virtual reality



Quantum Computing

- Center for Quantum Information Science and Technology (QCIST) led by Daniel Lidar
 - IARPA-funded program - USC Quantum Computation and Open Quantum Systems
- USC-Lockheed Martin Quantum Computing Center (QCC) at the Informational Sciences Institute: closing the gap between quantum computation and real life critical problems
 - D-Wave 2X™ one of two commercial adiabatic quantum optimizer worldwide



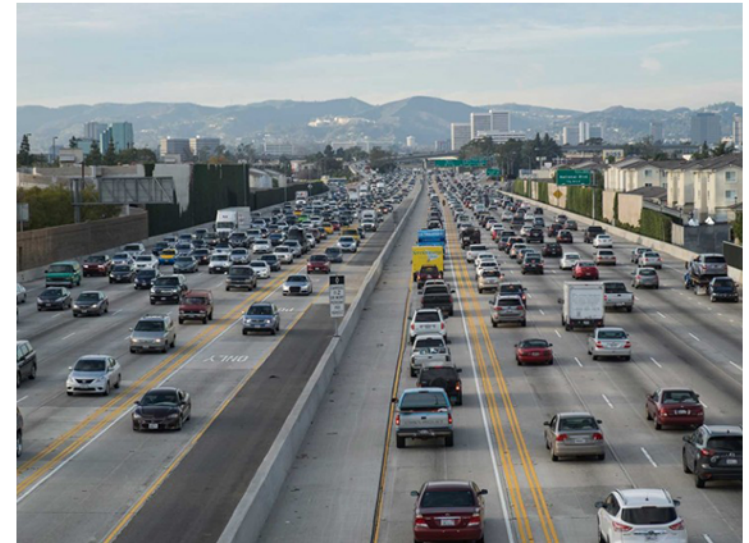
Brain-Computer Interface

- Neural Systems Engineering & Information Processing (NSEIP) Lab led by Maryam Shanechi:
 - Using algorithms modeling and in vivo experimentation to design closed-loop brain-computer interface (BCI) machines
 - US/UK multidisciplinary MURI to explore BCIs for enhanced decision making



Children's Health

- LA DREAMERs (**L**ife-course **A**pproach to **D**evelopmental **R**epercussions of **E**nvironmental **A**gents on **M**etabolic **R**espiratory health),
 - NIH Environmental Influences on Child Health Outcomes (ECHO)-funded initiative led by Frank Gilliland
 - Incorporates satellite and ground-based pollutant measurement to compare with biomarkers and health outcomes



Convergent Biosciences

- Michaelson Center for Convergent Bioscience (MCCB): 186 researchers from 17 labs and several other interdisciplinary initiatives, including:
 - MCCB Bridge Institute (Ray Stevens)
 - CSI-Cancer (Peter Kuhn)
 - Cellular Imaging (Scott Fraser)
 - Discovery Informatics (Carl Kesselman)
 - Drug Discovery (Charles McKenna, Steve Kay)
 - Center of Data, Algorithms and Systems for Health, DASH (Fei Sha)





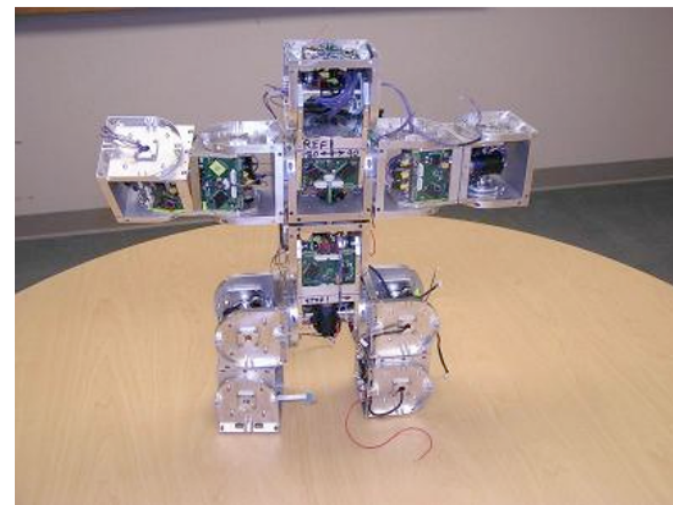
Unique USC Resources

- **Information Sciences Institute (ISI)**
 - \$60 million annually from >20 federal agencies / corporations
 - <http://www3.isi.edu/home>
- **Institute for Creative Technologies (ICT)**
 - US Army University Affiliated Research Center (UARC)
 - <http://ict.usc.edu/>
- **Clinical Resources**
 - <http://sc-ctsi.org/>
- **Schaeffer Center for Health Policy and Economics**
 - Recruited Nobel Laureate in Economics (Daniel McFadden)
 - >\$25 million in NIH grant support
 - <http://healthpolicy.usc.edu/>
- **School of Cinematic Arts**
 - #1 ranked cinema/film school (*US News and World Report*)
 - #1 game design program (*Princeton Review*)
 - <http://cinema.usc.edu/>
- **Outreach Partners**



Information Sciences Institute (ISI)

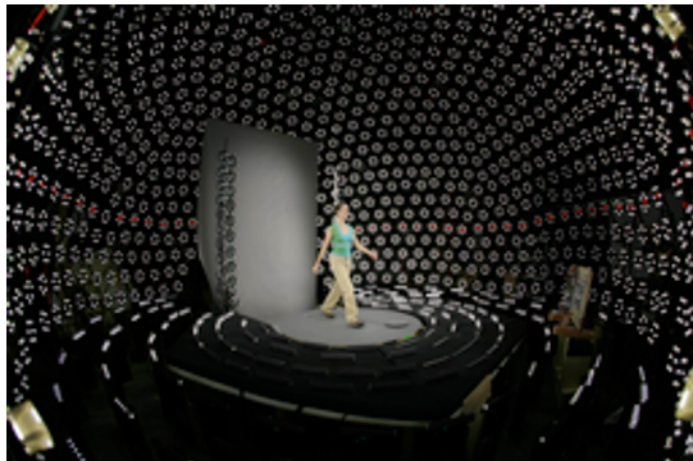
- Cutting edge computer and information science:
 - Medical Informatics
 - Intelligent Systems
 - Computational Systems
 - Advanced Electronics
 - Configurable Robotics
 - Grid Technologies
- Very large scale data management & integration
- \$60 million annually from >20 federal agencies / corporations
- DOD, DHS, DOE, NSF & NIH funding (NIGMS, NHGRI, NIMH, NHLBI)
- 350 engineers, research scientists, graduate students, and staff
- EHRs, electronic healthcare systems
- Developed Domain Name System (DNS) and “.com” address system
- **MOSIS** - low-cost prototyping & production volume service for VLSI circuit development





Institute for Creative Technologies (ICT)

- US Army University Affiliated Research Center (UARC)
- Biomedical research projects include:
 - Virtual Reality Augmentation (social skills training for autism)
 - Virtual Iraq/Afghanistan (PTSD assessment and treatment)
 - Virtual Humans (STEM education)
 - MedVR Lab (clinical training)
 - NeuroSim Lab (cognitive assessment)
- Paul Debevec (2009 Scientific and Engineering Academy Award)





USC Clinical Resources: Highlights

- Rehabilitation Medicine
 - #1 Physical Therapy department (*US News and World Report*)
 - #3 Occupational Therapy department (*US News and World Report*)
- Emergency Medicine Department
 - 150,000 annual visits
 - 28% of all trauma care in LA county
- Department of Urology
 - Urology Robotics Center of Excellence (Dr. Inderbir Gil)
- Department of Ophthalmology (retinal prosthesis; #11, *US News and World Report*)
- School of Pharmacy (#9, *US News and World Report*)
- NIH-funded CTSA (Dr. Thomas Buchanan)
- Public health focus (cancer epidemiology, preventive medicine, tobacco control)





USC University of
Southern California



Unique Clinical Partners

- LAC+USC Healthcare Network
 - 600 beds
- Keck Medical Center of USC
 - Keck Hospital of USC
 - USC Norris Cancer Hospital/ NIH Comprehensive Cancer Center
- Children's Hospital Los Angeles (CHLA)
 - 347 beds



ChildrensHospitalLosAngeles

International Leader in Pediatrics



USC University of
Southern California



Schaeffer Center for Health Policy and Economics

- Established by donor gift in 2009
- Collaboration between USC School of Public Policy and USC School of Pharmacy
- Led by Stanford trained economist Dana Goldman
- Recruited Nobel Laureate in Economics (Daniel McFadden)
- Strong partnerships with Harvard, Stanford, Dartmouth, Boston University, Brookings Institution and RAND Corporation
- >\$25 million in NIH grant support
 - Behavioral Economics, Science of Medicare Reform, Health Policy & Simulation





School of Cinematic Arts

- #1 ranked cinema/film school in US
- Six Divisions
 - Critical Studies, Animation & Digital Arts, Interactive Media, Film & TV Production, Producing, Writing
 - #1 ranked game design program
- Interest in health
 - Health behavior game (RWJF)
 - Obesity prevention game (NIH)
 - Immunology education game (NSF)
 - Autism education project (AHRQ)
- Faculty awards include Oscars, Emmys, Golden Globes, Pulitzer, etc
- **Private donors** - e.g., George Lucas, Steven Spielberg, Jeffrey Katzenberg, Brian Grazer
- **Corporate donors** - e.g., Walt Disney, Microsoft, Electronic Arts, Warner Bros
- **Public & private funding** - AHRQ, NIH, USDA, Dept of State, Gates Foundation





Unique Outreach Partners

- **California Science Center (CSC)**
 - 1.4 million annual visits (370,000 children)
 - Two-thirds are Hispanic & African-American
 - Admissions-free venue allows for informal science education testbed
- **Natural History Museum of Los Angeles County**
 - > 35 million specimens, dating back 4.5 billion years
 - A basis for biodiversity studies
- **Los Angeles Unified School District (LAUSD)**
 - 2nd largest public school system in the U.S.
- **SETI Institute**
 - Funded by NASA, NSF, DoE, and numerous private donors
 - Potential for astrobiology & other science partnerships
 - Citizen Science outreach program



SETI INSTITUTE





Center for Excellence in Research (CER)

- **CER Research Advancement Workshops**

- Example workshops include:
 - THIS EVENT!
 - Developing NIH Applications (Dr. Steven Moldin)
 - Preparing and Submitting NSF Proposals (Dr. Phil Taylor)
 - Developing and Submitting a DoD and DoE Research Grant (Dr. James Murday)
- <http://research.usc.edu/about/vp/cer/>



- **Proposal Review Service**

- Peer-to-peer proposal review for applications to external funding agencies
- Notify Office of Research 4 weeks before proposal due date

Contact info: Silvia da Costa in the Office of Research (sdacosta@usc.edu or 213-740-6709)



Internal Funding from USC

- **Zumberge Fund Awards**



- **Interdisciplinary Awards (LARGE):**

Funding amount: \$85,000

Due Date: July 2015

- **Interdisciplinary Awards (SMALL):**

Funding amount: \$10,000

Due Date: Open

- **Individual Awards:**

Funding amount: \$30,000

Due Date: January 2016

- <http://research.usc.edu/for-investigators/funding/usc/zumberge/>



- **USC Collaboration Fund**



- Organization of workshops, seminars, online resources, etc.

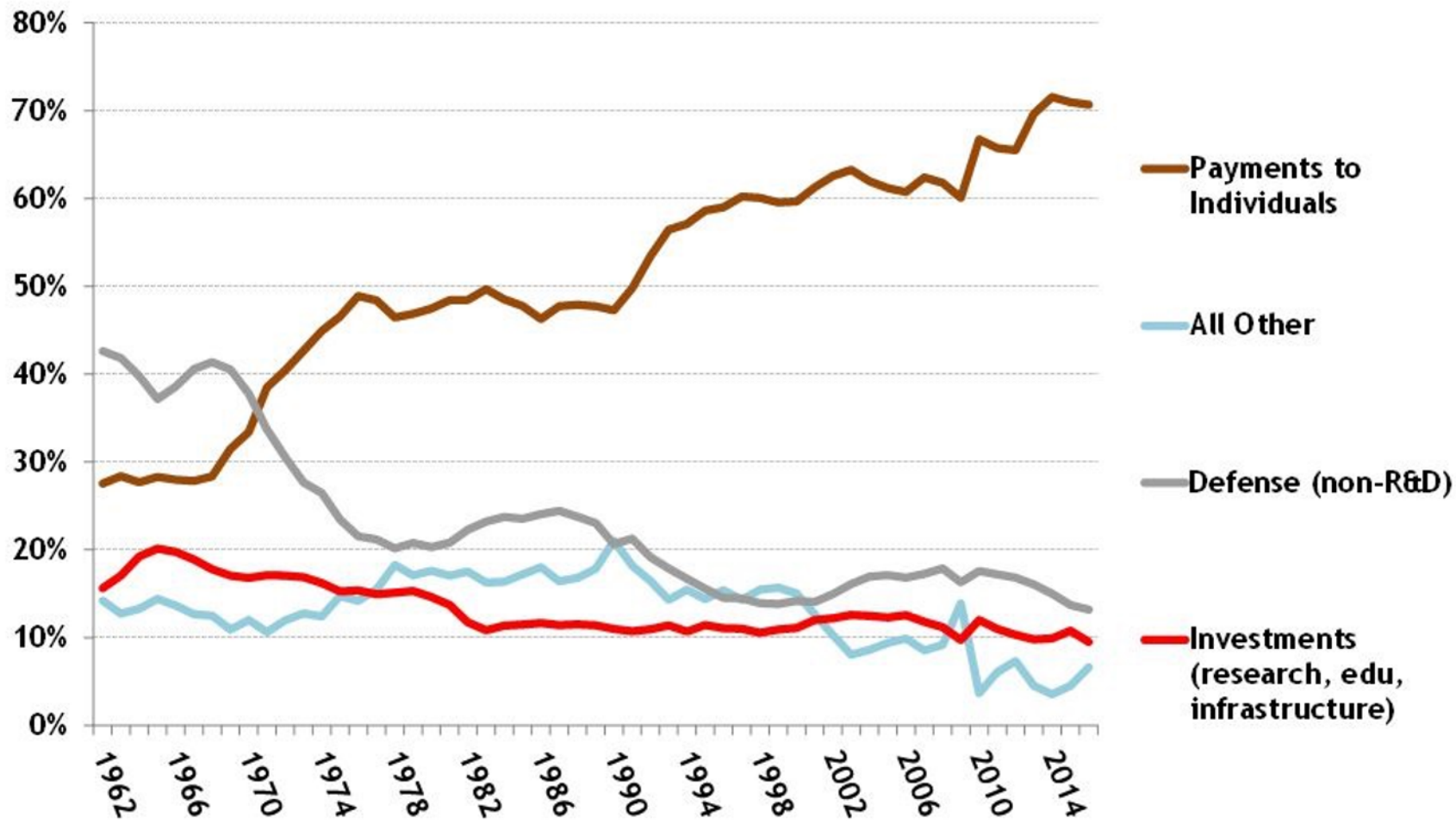
Funding amount: \$30,000

Due Date: February 2016

- <http://research.usc.edu/for-investigators/funding/usc/collaboration/>

Composition of the Federal Budget

Outlays as share of total budget, 1962 - 2016

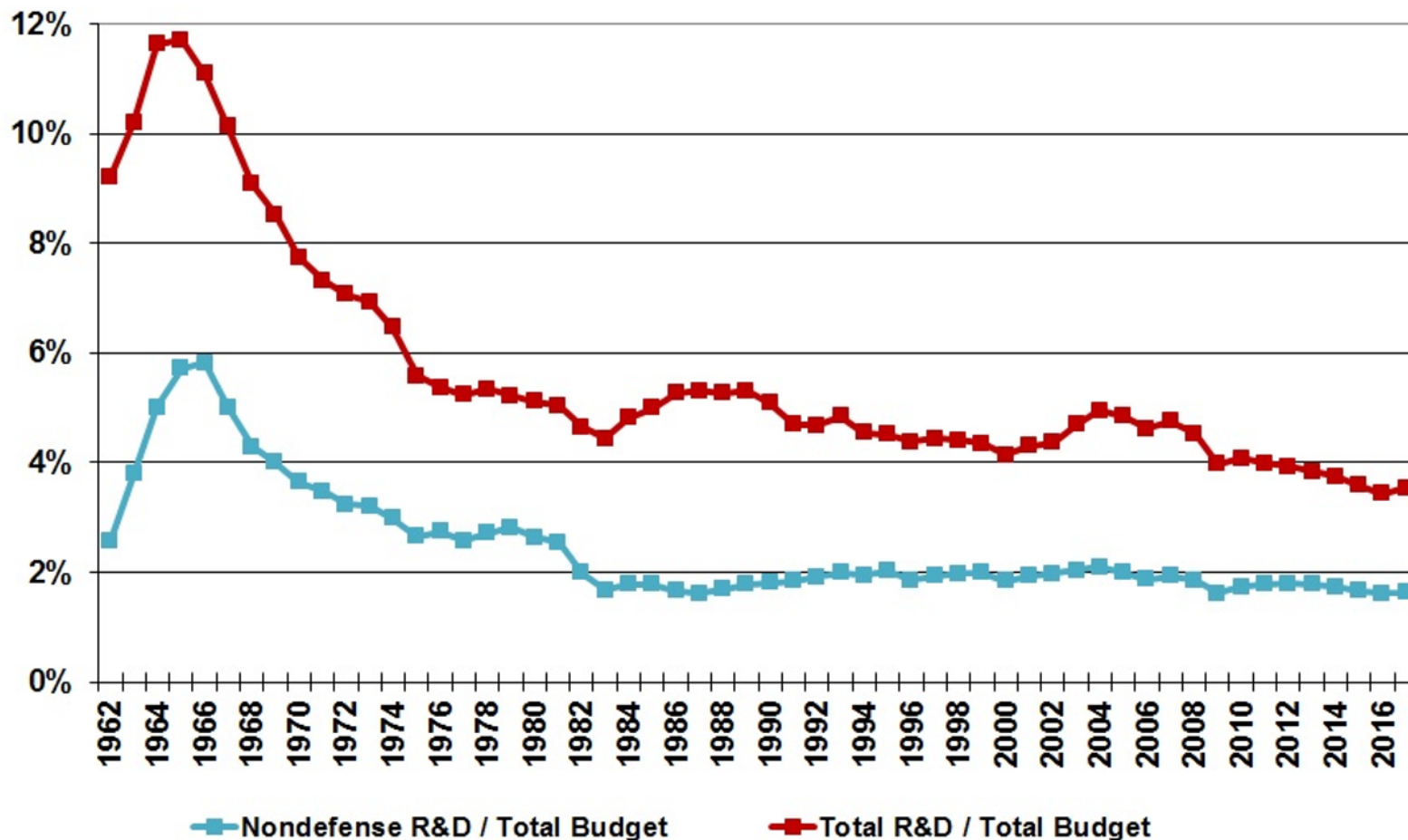


Source: *Budget of the United States Government, FY 2016*. "Investments" include outlays for R&D, education and training, direct nondefense infrastructure, and other grants, primarily for transportation. "Payments to Individuals" are primarily entitlement programs like Medicare, Medicaid, and Social Security, but also include many other public assistance programs. © 2015 AAAS



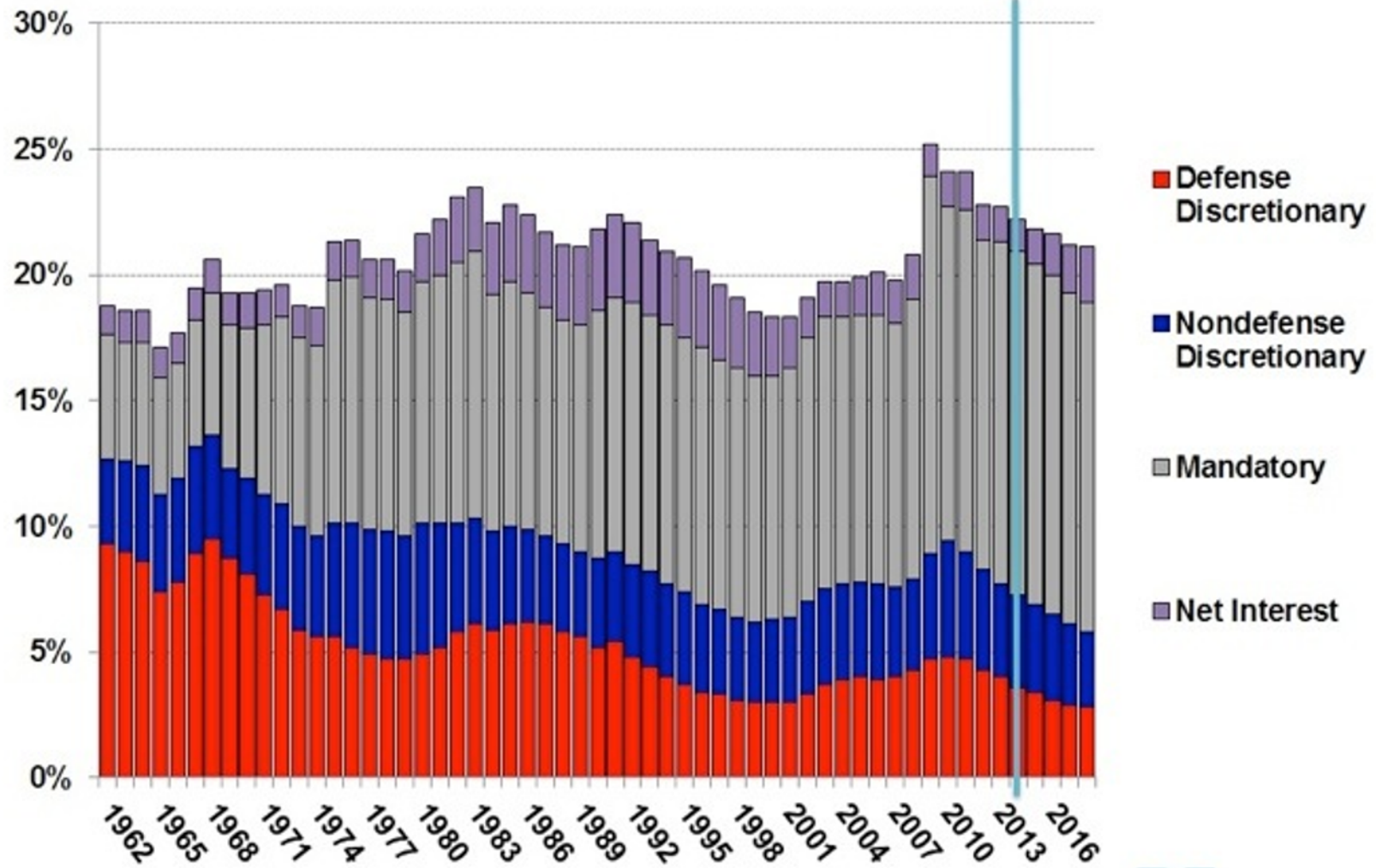
R&D as Percent of the Federal Budget:

FY 1962-2017, in outlays



Source: *Budget of the U.S. Government FY 2017 Historical Tables*. FY 2017 is the request. © 2016 AAAS

Federal Spending as a Percent of GDP, 1962 - 2018



Source: Budget of the U.S. Government FY 2014.
© 2013 AAAS



US Federal Revenues & Expenditures 2000-2020

Source: CBO (data after 2009 are projections)

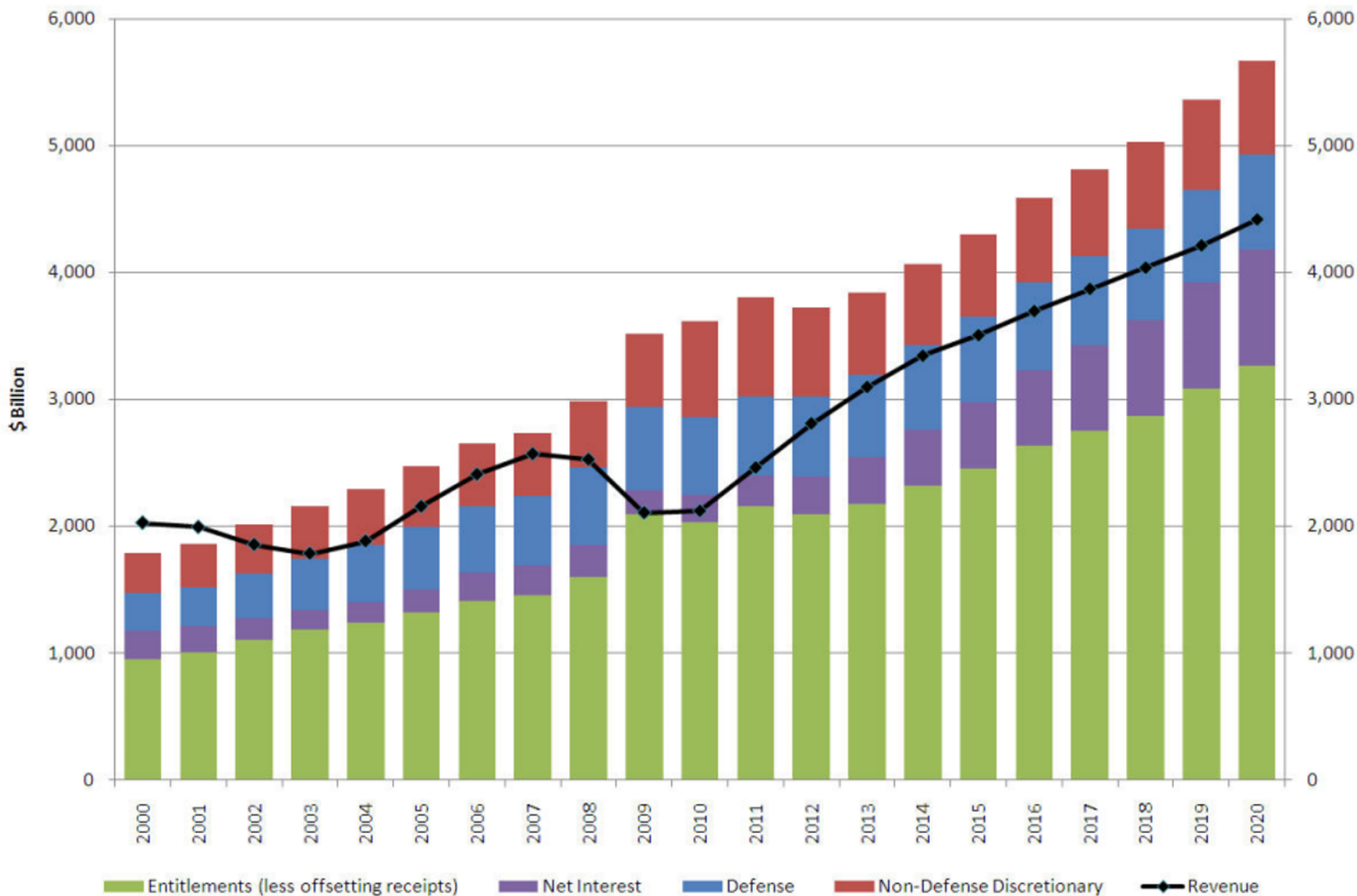
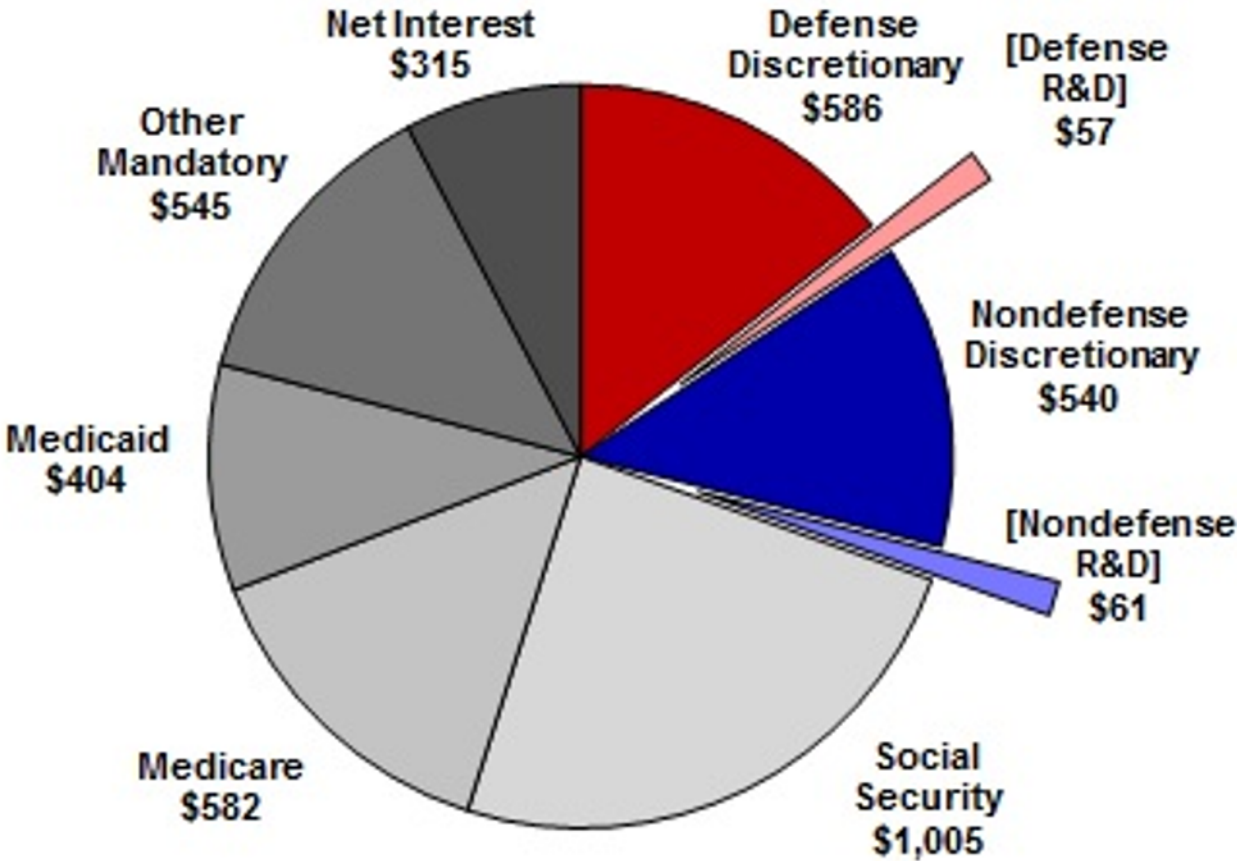


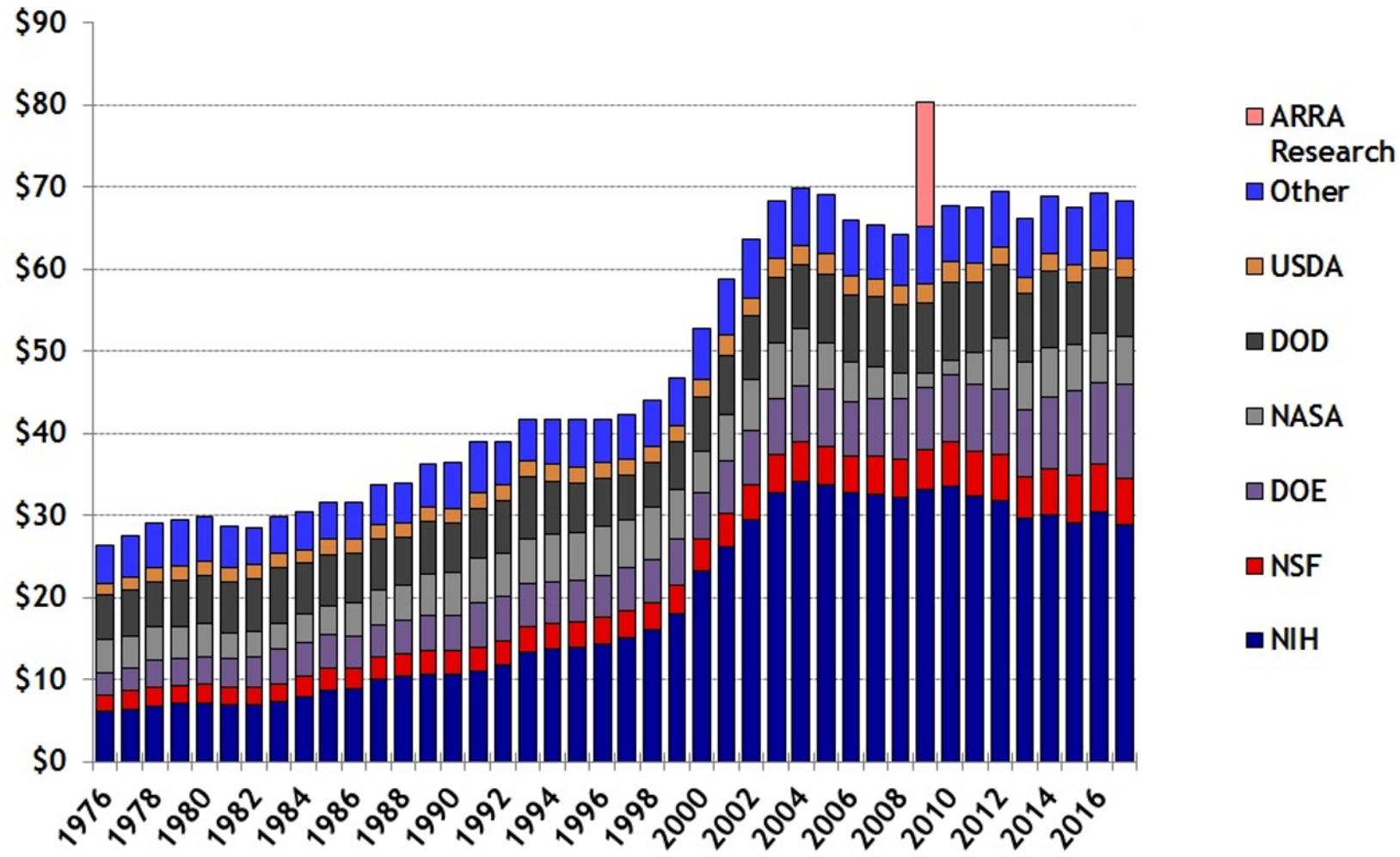
Figure 1: Composition of the FY 2018 Budget
Total Outlays = \$4.1 trillion
outlays in billions of dollars



Source: *Budget of the United States Government FY 2018*. © 2017 AAAS

Trends in Research by Agency, FY 1976-2017

Billions of constant FY 2016 Dollars

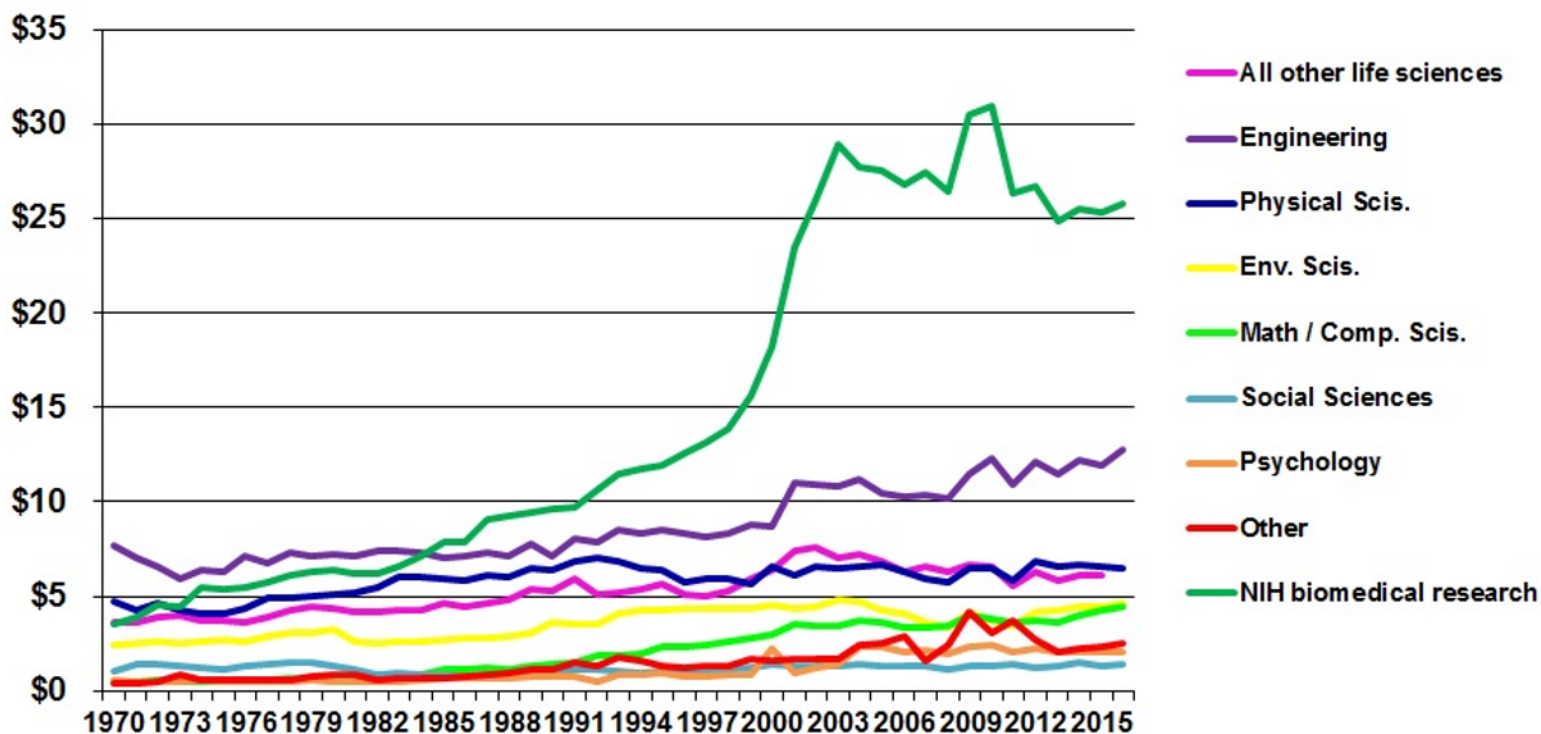


Source: 1975-1994 figures are from the NSF federal funds survey; remainder is from AAASR&D reports. FY 2016 are estimates, FY 2017 is the President's request. © 2016 AAAS



Trends in Federal Research by Discipline, FY 1970-2016

obligations in billions of constant FY 2016 dollars



"Other" includes research not classified (includes basic research and applied research; excludes development and R&D facilities). Life sciences are split into NIH support for biomedical research and all other agencies' support for life sciences.

Source: National Science Foundation, *Federal Funds for Research and Development* series. FY 2015 and 2016 data are preliminary. Constant-dollar conversions based on OMB's GDP deflators. © 2016 AAAS



Federal Funding

Research Support

- DOD Young Investigator Program (DOD YIP)
- NSF Faculty Early Career Development Program (NSF CAREER)
- DOE Early Career Research Program
- NIH individual fellowship and career development awards (pre- and postdoctoral; clinical and basic; mentored and non-mentored)
- NIH Transformative Research Awards (R01)
- NIH Pioneer Award Program (DP1)
- NIH Director's New Innovator Award Program (DP2)
- NIH & NSF institutional training grants (T32, NRT)

Lab Infrastructure Support

- NIH Shared Instrumentation Grant Program (S10)
- NSF Major Research Instrumentation Program (MRI)
- DOD Defense University Research Instrumentation Program (DURIP)



DC Office for Research Advancement

Additional questions, advice:

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