



Public Research and Innovation Funding Actors in the USA



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Preface

The mission of the Swedish Foundation for International Cooperation in Research and Higher Education (STINT) is to internationalize Swedish higher education and research. STINT promotes knowledge and competence development within internationalization and invests in internationalization projects proposed by researchers, educators and leaderships at Swedish universities. STINT's geographic focus is on countries outside Europe.

In 2019, STINT extended its activities abroad by establishing a presence in North America as a complement to the office opened in China in 2018. In order to further promote academic partnerships with a continent that is in many ways at the research front, and to increase understanding of the knowledge systems of the USA and Canada, Dr Niklas Z Kviselius was appointed STINT's representative in North America. The aim of this initiative is to support the strategies, activities and networks of Swedish higher education institutions in relation to North America through contributing to their knowledge and skills and those of Swedish research funders regarding developments in higher education and research in the USA and Canada.

This report is by no means a comprehensive mapping of the complex research funding landscape in the USA. The emphasis is on giving an outside observer and potential future collaboration partner some familiarity with the U.S. system, rather than to critically analyze each actor's strengths and weaknesses. Key federal actors are introduced, as well as some of the most influential actors in three major states. The current focus and public sector direction of the U.S. science and innovation system are laid out, and recent trends are presented, based on budgeting.

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Dr Andreas Göthenberg
Executive Director, STINT

Stockholm, March 2022

Executive Summary

Focus on federal funding actors

This report mainly concerns the tax-payer funded federal share of research and development (R&D) funding in the United States of America (henceforth the U.S.) The federal government includes agencies such as the Department of Health and Human Services, the Department of Defense, the National Aeronautics and Space Administration, the Department of Energy, the National Science Foundation and the Department of Agriculture. The substantial funding from the business sector, as well as funding from state and local governments and from charitable giving through nonprofits or foundations, falls outside the scope of this report.

A global superpower under increased pressure

The U.S. has the most technologically powerful economy in the world and its firms are at or near the forefront of technological advances in areas such as information technology, pharmaceuticals, and medical, aerospace, and military equipment. Policy experts disagree about the lack of urgency after the fall of the Soviet Union, with the gradual shrinking of federal funding, reduced focus on national innovation policies, and a slow awakening to the global ambitions of the People's Republic of China. Compared to other countries, funding for universities, federal laboratories, and other innovation inputs is decreasing in the U.S. because of policymakers' unwillingness to prioritize this in the federal budget process. However, the state of U.S. industrial innovation and competitiveness has gained renewed attention after the economic downturns of the 2000s and the emergence of robust new technological competitors like China.

Still a powerhouse in research and higher education

The U.S. is one of the world's strongest science nations, with most of the top 100 universities in the world. During the period 2015–2019, the U.S. also had the largest average annual production of research publications. The U.S. government's expenditure on education is slightly less than 5% of gross domestic product (GDP), while expenditure on R&D is close to 3% of GDP. In comparison, Swedish expenditure is more than 7% of GDP for education and more than 3% of GDP for R&D. The higher education powerhouse of the U.S. constitutes the second largest higher education system after that of China, and the country is the top global destination for international students.

Current political will to invest in a science-led innovation economy

A research-friendly narrative is currently gaining ground in the U.S., with bipartisan leadership and robust proposals from both houses of congress and the Biden administration not only to keep the lights on in universities and laboratories, but to increase science funding and start investing better for the future. There is a call for greater public investment in use-inspired research that is driven by societal priorities like healthcare, sustainability, cybersecurity, education and more. These societal priorities necessitate targeted investments in key emerging technologies, including artificial intelligence (AI), autonomy and robotics, advanced materials and manufacturing, biotechnology, quantum computing and next-generation wireless. New legislation, such as the 2020 Endless Frontier Act and the 2021 National Science Foundation for the Future Act, is paving the way for increasing government funding of R&D as well as addressing challenges in science, technology, engineering and medicine (STEM) education at all levels. As a case in point, the budget of the National Science Foundation will more than double in the next five years, with a significant portion of the funding being devoted to a new directorate that, when legislated, will accelerate the process of turning basic research into new technologies and products.

Increased funding for science as a response to geopolitical uncertainty

Currently, increased competitiveness with China and other nations drives much of the national discourse on innovation in the U.S. The future of the U.S. economy is seen as dependent on investment in R&D and STEM education, if the U.S. is to maintain its advantage over China after falling behind during the Covid-19 pandemic. Simultaneously, China and the U.S. are among each other's largest research partners. The sitting administration tries to strike a balance between security and openness in managing scientific collaboration with China, Russia and other countries. As a case in point, the Biden administration has announced plans to better clarify how and when U.S. scientists should report their collaborative work with Chinese and other partners.

A practical note to EU-based researchers looking to collaborate with the U.S.

Swedish researchers who are collaborating or looking for collaborations with researchers based in the U.S. constitute one of the main target audiences of this report. This mapping will help to increase the understanding of policy makers, engaged at all levels of science diplomacy and international relations, for the funding landscape. However, it is not a complete, up-to-date manual for research funding opportunities. EU researchers have limited opportunities to obtain direct U.S.

funding for their projects, since most federal organizations only provide grants to researchers at U.S. institutions or require U.S. citizenship. The EU has sporadically mapped such specific opportunities via projects such as BILAT USA. The latest BILAT edition – BILAT USA 4.0 – highlights fourteen federal U.S. organizations that have awarded grants to international universities and/or researchers. For the most accurate and up-to-date information on public funding opportunities for U.S. entities in the U.S., the free, federally-supported, searchable databases SAM.gov and Grants.gov provide listings and links to all federal programs available to U.S. state and local governments; domestic public, quasi-public, and private profit and nonprofit organizations and institutions; specialized groups; and individuals (European Union 2016).

Overall Landscape

The U.S. Economy and Global Position at a Glance

A global superpower under increased pressure

The rise of the United States of America from a British colony into a global superpower emphasizes the country's innovation and embracing of productivity-enhancing technologies. Today the U.S. has the most technologically powerful economy in the world and its firms are at or near the forefront of technological advances in areas such as information technology, pharmaceuticals, and medical, aerospace, and military equipment. The U.S. is the world's largest importer and second largest exporter; it not only has the largest internal market for goods, but also dominates the services trade.

After the Second World War, the U.S. developed the world's arguably most effective national innovation system. The U.S. funded as much as 69% of annual global R&D in the period following World War II. Through a set of policies, and most importantly, vast government investment in R&D, mostly focused on maintaining a technological and military advantage over the Soviet Union, the U.S. became the clear global leader in science and technology.

Policy experts disagree about the lack of urgency after the fall of the Soviet Union, with the gradual shrinking of federal funding, reduced focus on national innovation policies, and a slow awakening to the global ambitions of the People's Republic of China. As a case in point, while much of the IT industry was still thriving in the 2000s, the U.S. lost over a third of its manufacturing jobs. The country went from running a trade surplus in high-technology products in 2000 to around a \$100 billion deficit a decade later (Congressional Research Service 2021). While the U.S. used to produce significant volumes of electronic products, including computers, much of that production has relocated to China.

Compared to other nations, funding for universities, federal laboratories, and other innovation inputs is decreasing in the U.S., because of policymakers' unwillingness to prioritize this in the federal budget process. However, the state of U.S. industrial innovation and competitiveness has gained renewed attention after the economic downturns of the 2000s and the emergence of robust new technological competitors like China.

The U.S. has also managed to efficiently commercialize radically new technology intended for military use, so-called dual-use technology. This dual-use approach has played an important role in U.S. financial growth – the creation of their largest

industries – and also been the foundation of the birth of the Internet, GPS technology, etc.

A strong and flexible economy will have to withstand slower population growth

Twelve years after the end of the 2009 recession, the U.S. economy is doing well on several fronts. GDP growth has fluctuated between 1.5 and 2.9% in recent years, peaking in 2018 with the best economic performance in a decade. However, the 2020 Covid-19 recession has widely been described as the most severe global economic downturn since the Great Depression. Gross national income per capita has steadily been increasing the last four years, but it should be noted that the U.S. was ranked 41st of 156 countries regarding income inequality in 2017, and the worst of all Western nations (STINT 2021).

The population of the U.S. is 332 million people, equivalent to 4.3% of the total world population. The slower population growth will accentuate the labor shortage and dampen demand for new housing and other durable goods, and a tight labor market is deemed to be a top business challenge in the following years. Slow population growth also indicates that employers will increase investments in robotics and automation to maintain or boost productivity.

In general, the U.S. population continues to grow older, with a median age above 40 in many states. Some states, such as Florida and Maine, have large elderly populations because people retire there. Aging boomers – the roughly 76 million people born between 1946 and 1964 – will have a major effect on the U.S. in coming decades, but are not the only reason for an overall aging population. Longer lives and record-low birth rates are other major factors.

Federal and state levels of U.S. government spending on programs benefiting older adults (Social Security and Medicare) is projected to rise from 7.9% of GDP in 2019 to nearly 10% in 2029, accounting for about two thirds of mandatory, non-defense federal spending. There is a need to address a shortage of caregivers as well, and recent restrictions on immigration have further added to the challenges in recruiting nursing home and home care workers (U.S. Department of Health and Human Services 2021).

Funding of Science and Innovation

Federal and state levels of U.S. government

In the U.S., the two major layers of government are at the state and national levels. The Federal Government comprises three distinct branches: legislative,

executive, and judicial. By the U.S. Constitution, their powers are vested in congress, the president, and the federal courts, respectively. Only the federal government can coin money, regulate the mail, declare war, or conduct foreign affairs. All powers not granted to the federal government are reserved for the states, which are also modeled after the federal government and consist of the same three branches: executive, legislative, and judicial. State and local governments spend most of their resources on education, health, and social service programs.

This U.S. system of government has evolved from the country's early days when states arguably had larger independence, and today the federal and state governments are intertwined to a substantial extent. The federal government can influence the states through the distribution of grants, incentives, and aid. State and local governments are eager to obtain federal dollars, even though much of this funding comes with strings attached. Federal and state levels are also commonly intertwined in the area of research and innovation funding, where states compete to attract the best federal funding, and many funding schemes depend on cooperation between federal and state governments.

Business funding of R&D as the overall driving force

This report mainly concerns the tax-payer funded federal share of funding of R&D in the U.S. The federal government includes agencies such as the Department of Health and Human Services, the Department of Defense, the National Aeronautics and Space Administration, the Department of Energy, the National Science Foundation and the Department of Agriculture.

However, funding needs to be contextualized. Two sectors – business and the federal government – have together accounted for more than 90% of U.S. R&D funding since 1955. This share has steadily decreased since the early 1960s, and since the early 1980s, business has been the major funder of R&D in the U.S. This shift in R&D funding resulted not from a reduction in federal government R&D expenditures, but rather from faster growth in business R&D expenditures (Congressional Research Service 2021).

Table 1 shows total U.S. R&D expenditures in 2018 by funding sector and the character of the work funded. Notably, federal R&D funding accounts for the largest share of basic research (40.7%) while business accounts for the largest shares of applied research (55.0%) and development (85.5%).

U.S. researchers also have rich funding opportunities via state and local governments and from charitable giving through nonprofits or foundations. This fund-

Table 1: U.S. R&D Funding by Sector and Character, 2019. Source: Congressional Research Service (2021)

Current dollars, in billions

Sector	Basic Research		Applied Research		Development		Total	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
Federal Government	43.9	40.7	41.8	33.5	53.2	12.6	138.9	21.2
Nonfederal Government	2.6	2.4	1.7	1.4	0.6	0.2	5.0	0.8
Business	33.0	30.6	68.7	55.0	362.1	85.5	463.7	70.7
Higher Education	13.6	12.6	5.9	4.7	2.3	0.5	21.8	3.3
Other Nonprofit	14.7	13.6	6.8	5.5	5.1	1.2	26.7	4.1
Total	107.8	100.0	124.9	100.0	423.4	100.0	656.0	100.0

ing is small in comparison with the federal funding, but can be both more flexible and better anchored in local needs. Examples of state funding actors are given for the three largest states towards the end of this report, while nonprofits and foundations fall beyond the scope of this report.

The U.S. continues to be a powerhouse in research...

The U.S. is one of the world’s strongest science nations with most of the top 100 universities in the world. During the period 2015–2019, the U.S. also had the largest average annual production of research publications. Measured by their field-weighted citation impact (FWCI), the average quality of US publications is 1.42 (STINT 2021). Although large countries tend to have more autarkic productions, the U.S.’s share of international co-publications is particularly low at 0.86. Strong science nations with large production volumes and resources can keep production within their borders in a way smaller countries are unable to.

The U.S. government’s expenditure on education is slightly less than 5% of GDP and expenditure on R&D is close to 3% of GDP. In comparison, Swedish expenditure is more than 7% of GDP for education and more than 3% of GDP for R&D (STINT 2021).

...as well as higher education

The higher education powerhouse of the U.S. constitutes the second largest higher education system after that of China, and the country is the top global destination for international students. However, during the Trump administration, immigration policy changed and made it harder for scientists and students to enter the country. Although it is not clear what long-term effects these policies

will have, it would be unsurprising if they have a lasting impact on American science. If not addressed by the current administration, the U.S may be placed at a competitive disadvantage in attracting graduate students and scientists.

The U.S. population is highly educated; more than 90% of the population (25 years or older) had attained upper-secondary education or higher, which is about 15% higher than in Sweden. About 45% of the population had attained tertiary education, while another 45% had attained upper-secondary education. By comparison, in Sweden about 40% of the population had attained upper-secondary and more than 30% tertiary education (STINT 2021).

The gross enrolment ratio (GER) for tertiary education is the ratio of students enrolled in tertiary education divided by the 5-year age group, starting from the official secondary school graduation age. The GER indicates the capacity of the education system to enroll students of a particular age group. In the U.S., the GER for tertiary education is 88.2%, which is very high internationally. The corresponding GER for Sweden is 67%.

With more than 4,500 accredited degree-granting higher education institutions (HEIs) nationwide, the U.S. higher education system is extremely diverse. There are no nationally standardized definitions of “university” or “college,” and the name of an institution alone may not indicate exactly what type of institution it is. The federal system of the U.S. has also resulted in the country’s highly decentralized education system.

U.S. higher education funding is complex, and many institutions have a wide variety of funding sources. Public institutions, which are under the authority of the states, have traditionally received most of their funding from state governments. Private institutions, which receive little or no direct government funding, have long relied on student tuition and fees for revenue.

The Ivy League is a group of eight historic private universities in the northeastern U.S., including Yale, Columbia, Princeton and Harvard, and is perhaps the most famous university alliance in the world. According to the 2020 QS World University Rankings, the highest ranked U.S. universities are the Massachusetts Institute of Technology (MIT; ranked first in the world), Stanford University (ranked second), Harvard University (ranked third), California Institute of Technology (Caltech; ranked fifth), and the University of Chicago (ranked tenth). The U.S. is globally the most popular study destination for international students. Most international students come from China and India. Students from South Korea and Saudi Arabia also constitute large groups at U.S. universities

and colleges. Although there is a large student population, U.S. students prefer to complete their tertiary studies domestically. The highest number of outbound students went to the United Kingdom.

Major Recent Trends in Research and Innovation

Current political will to invest in a science-led innovation economy

Investments in R&D have fueled broad U.S. prosperity since World War II. However, while the global outlook is uncertain, enabling broad-based participation in a science-led innovation economy requires political leadership and bold new strategies. Science proponents such as Farnam Jahanian, President of Carnegie Mellon University and previously at the NSF, have successfully argued in public that the U.S. R&D ecosystem is now at a critical moment. Jahanian seeks greater public investment in use-inspired research that is driven by societal priorities like health-care, sustainability, cybersecurity, education and more. These societal priorities necessitate targeted investments in key emerging technologies, including AI, autonomy and robotics, advanced materials and manufacturing, biotechnology, quantum computing and next-generation wireless (The Hill 2021).

This narrative seems to be gaining ground in the U.S., with bipartisan leadership and robust proposals from both houses of congress and the Biden administration not only to keep the lights on in universities and laboratories, but to increase science funding and start investing better for the future. At the beginning of 2021, President Biden for instance nominated Dr Lander to head the Office of Science and Technology Policy and also serve as his science advisor. This is the first time this position has formed part of the presidential cabinet.

Currently, research on emerging technologies is not deemed enough, but merely a necessary start. Scientific results have to be disseminated more effectively into society. The U.S. will need bolder strategies for transitioning discoveries from the laboratory to the market, with universities and national laboratories being used better to generate discoveries and innovations that catalyze economic growth and job creation. Novel public-private partnerships and university-adjacent entities capable of facilitating seamless fusion and transfer of ideas are sought after.

The U.S. must also build a broad-based science and technology workforce that is inclusive of all Americans. Every child should have access to training in digital competency and computational thinking, so that the number of graduate students and postdoctoral researchers in science and engineering is ultimately doubled.

Such discussions culminated in the 2020 Endless Frontier Act (eventually called the U.S. Innovation and Competition Act) and the 2021 National Science Foundation for the Future Act (U.S. House of Representatives 2021). When passed,

these acts will authorize increased funding and a new directorate within the NSF to lead these efforts. The legislation increases research funding of excellent research; advances R&D to address persistent challenges in STEM education across all education levels; addresses challenges in data accessibility and accountability, as well as threats that undermine the integrity of federally-funded research; and creates a new Directorate for Science and Engineering Solutions (SES) that will enable the NSF to take big risks and experiment with new approaches to accelerate the translation of science and technology into solutions to society's major challenges.

The National Science Foundation for the Future Act more than doubles the NSF budget in the next five years, from the current \$8.5 billion to \$18.3 billion in 2026. The bill strengthens the NSF's existing seven research and education directorates and devotes a significant portion of the funding to the establishment of an eighth, the SES. The SES budget will start at \$1 billion in 2022 and grow to \$5 billion by 2026.

The bill requires the NSF to select up to five focus areas – analogous to the list of ten “key technology areas” identified in the 2020 Endless Frontier Act – and periodically refresh the list. During the selection process, the director must consider the following “societal challenges”:

- Climate change and environmental sustainability
- Global competitiveness in critical technologies
- Cybersecurity
- National security
- STEM education and workforce
- Social and economic inequality

Existing science education and workforce training programs will grow by 50% over the 5-year term of the bill. The annual number of prestigious graduate research fellowships will increase from 2,000 to 3,000. The bill also orders a study on strengthening pre-college science education and another on ensuring that undergraduate science and engineering majors receive the training they need to fill high-tech jobs in industry after graduation.

As another recent example of political support for public research and innovation, the 2021 Department of Energy (DOE) Science for the Future Act provides similar policy guidance and funding increases for major research programs at the DOE's Office of Science (U.S. House of Representatives 2021). The bill intends to provide direct research funding for the Office of Science to enable the DOE to fund additional energy research projects outside of the research funded by the NSF. When

passed, the legislation will support Office of Science activities, including programs focused on:

- Materials and chemical science
- Bioscience
- Climate science
- Fusion energy
- Scientific computing
- High-energy nuclear physics

The bill also intends to improve STEM education and encourages efforts to align undergraduate STEM education with workforce needs. In addition, the bill provides resources for strengthening workforce development and teacher training. Specifically, the bill offers guidance for the Workforce Development for Teachers and Scientists program to broaden participation of underrepresented groups in STEM programs supported by the DOE. The bill increases funding for the DOE Office of Science by \$2.6 billion for a total of \$11.1 billion, which will grow to \$14.5 billion by the 2026 fiscal year (FY).

The seventeen DOE National Laboratories – the result of large investments in scientific research initiated by the U.S government during World War II – will continue to play a pivotal role in the U.S. science landscape. The National Laboratories take a multidisciplinary approach to addressing complex, large-scale challenges. The Laboratories are home to world-class research facilities and scientific departments – including a significant number of Nobel Prize Laureates – in conjunction with strong universities and surrounding industry.

The previous NASA lunar landing program offered several lessons in catalyzing and governing public–private funding to deliver results. The program stimulated innovation in multiple sectors while also strengthening the public sector’s capabilities. The Biden administration, like European governments, is tasked with facilitating missions that will solve the global grand challenges, starting with the fight against climate change. Simultaneously, the president needs to show that innovation and science for a green transition will strengthen the U.S. economy.

Increased funding for science as a response to geopolitical uncertainty

Currently, increased competitiveness with China and other nations drives much of the national discourse around innovation in the U.S. The future of the U.S. economy will be dependent on investment in R&D and STEM education, if the U.S. is to maintain its advantage over China after falling behind during the Covid-19 pandemic. Economic and national security depend on U.S. leadership in sci-

ence and technology. Competitiveness with China is deemed impossible if the U.S. does not unleash its STEM talent on the full range of challenges facing the nation. This should be seen in the light of the fact that China and the U.S. are among each other's largest research partners.

The Trump administration adopted fairly sharp rhetoric in this area, while the Biden administration is taking a more nuanced view. The sitting administration tries to strike a balance between security and openness in managing science collaboration with China, Russia and other countries accused of spying. In January 2022, the Biden administration announced plans to clarify how and when U.S. scientists should report their collaborative work with Chinese counterparts. In a guidance document, the National Science and Technology Council, led by White House Science Advisor Eric Lander, states that over the following 120 days, U.S. funding agencies are to develop model application forms that standardize what researchers should say about their international collaborations when seeking federal grants (Office of Science and Technology Policy 2022). This directive does not actually withdraw Trump-era policies, but rather clarifies their intent and implementation.

Federal Level – Ministries, Departments, and Agencies

Although the U.S. government system of checks and balances is widely known, a reminder of how decisions for public research and innovation actors take shape is in order.

The U.S. Constitution divides the federal government into three branches to make sure no individual or group will have too much power:

- Legislative – makes laws (Congress, comprised of the House of Representatives and the Senate)
- Executive – enforces laws (president, vice president, cabinet, most federal agencies)
- Judicial – evaluates laws (Supreme Court and other courts)

Each branch of government can change acts of the other branches and it is this ability of each branch to respond to the actions of the other branches that is referred to as the system of checks and balances. The executive branch includes the president, vice president, cabinet, executive departments, independent agencies, and other boards, commissions, and committees. The federal actors described briefly in this report are all under the control of the executive branch.

Executive Office of the President

Presidential decisions related to science and technology (S&T) largely rely on data and analysis from the Office of Science and Technology Policy (OSTP) and specifically on advice from the president's science advisor. The OSTP coordinates inter-agency R&D and is the one place in the federal government that focuses on the efficiency and impact of the collective federal S&T effort (Baker Institute 2016). Congress established the OSTP in 1976 and it advises the president and others within the Executive Office of the President on the scientific, engineering, and technological aspects of the economy, national security, homeland security, health, foreign relations, and the environment. The OSTP leads efforts across the federal government to develop and implement sound science and technology policies and budgets, and works with the private and philanthropic sectors, state, local, tribal, and territorial governments, the research and academic communities, and other countries toward this end.

The OSTP also assists the Office of Management and Budget with an annual review and analysis of federal R&D in budgets, and serves as a source of scientific and technological analysis and judgment for the president with respect to major

policies, plans, and programs of the federal government. The OSTP's Senate-confirmed director may also serve as Assistant to the President for Science and Technology.

The director co-chairs the President's Council of Advisors on Science and Technology (PCAST) and supports the cabinet-level National Science and Technology Council (NSTC), which is chaired by the president. The PCAST is an advisory body, established by executive order, and comprises leaders in science and technology (S&T) appointed by the president. It is co-chaired by the science advisor. The NSTC is a high-level council, also established by executive order, and chaired by the president. It includes the vice president, cabinet secretaries whose executive departments have significant S&T responsibilities, as well as the heads of several federal agencies that support significant R&D.

Many U.S. presidents have assigned a particularly high priority to S&T policy issues, appointing the science advisor early in the administration, consulting regularly with the science advisor on issues related to S&T policy and including the science advisor in cabinet and other high-level meetings (Office of Science and Technology Policy 2021).

Departments (Executive Agencies)

A number of departments and federal agencies across the government fund research. Some of these primarily perform their own, in-house research, while others grant funds to external organizations or individual researchers. In addition, the federally funded R&D centers, which include most of the U.S. National Laboratories, are funded by the government but operated by universities, nonprofit organizations, or for-profit consortia.

U.S. Department of Agriculture (USDA)

The Department of Agriculture (USDA) provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on sound public policy, science, and efficient management. The USDA's mission is to expand economic opportunity through innovation, helping rural America to thrive; promote agriculture production sustainability that better nourishes Americans while also helping feed others throughout the world; and preserve and conserve natural resources through restored forests, improved watersheds, and healthy private working lands. The 2020 USDA budget was \$20.8 billion, a \$3.6 billion or 15% decrease from the 2019 estimate.

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the world; and preserve and conserve natural resources through restored forests, improved watersheds, and healthy private working lands. The 2020 USDA budget was \$20.8 billion, a \$3.6 billion or 15% decrease from the 2019 estimate.

The seven strategic goals for FY 2018–2022 were:

1. Ensuring that USDA programs are delivered efficiently, effectively, and with integrity and a focus on customer service.
2. Maximizing the ability of American agricultural producers to prosper by feeding and clothing the world.
3. Promoting American agricultural products and exports.
4. Facilitating rural prosperity and economic development.
5. Strengthening the stewardship of private lands through technology and research.
6. Fostering productive and sustainable use of the National Forest System Lands.
7. Providing all Americans with access to a safe, nutritious and secure food supply.

The USDA conducts in-house research and matches state research funding. It comprises 29 agencies, of which the Agricultural Research Service (ARS) and the Economic Research Service (ERS) should be mentioned. The ARS is the USDA's chief scientific in-house research agency and try to find solutions to agricultural problems that affect Americans every day from field to table. The ARS funds some 660 research projects within fifteen national programs involving 2,000 scientists and postdocs and 90+ research locations, including overseas laboratories. The ARS has a budget of \$1.4 billion.

The ERS is the USDA's principal social science research agency. Each year, the ERS communicates research results and socioeconomic indicators via briefings, analyses for policymakers and their staff, market analysis updates, and major reports. The ERS's mission is to anticipate trends and emerging issues in agriculture, food, the environment, and rural development; and to conduct objective, high-quality economic research to inform and enhance public and private decision making. In 2019, the ERS had an annual budget of \$85 million.

Through the USDA's matching grant program, Federal State Marketing Improvement Program funds are matched and provided to State Departments of Agriculture and other appropriate state agencies to assist in exploring new market opportunities for food and agricultural products, and to encourage research and innovation aimed at improving the efficiency and performance of the marketing system.

Sustainable Agriculture Research and Education (SARE) is a USDA program through which competitive grants are given to research conducted cooperatively

by farmers, ranchers, researchers and agriculture professionals to advance farm and ranch systems that are profitable, environmentally sound and good for communities. SARE-funded research projects must include educational and outreach components in their designs to ensure that findings reach the target audience. They typically integrate economic analysis as a fundamental component of research and education.

U.S. Department of Commerce (DOC)

The Department of Commerce (DOC) creates the conditions for economic growth and opportunity. Their mission is to promote job creation, economic growth, sustainable development and improved standards of living for all Americans by working in partnership with businesses, universities, communities and the nation's workers. The DOC's budget for FY 2020 was \$12.2 billion, which was a \$1.0 billion or a 9.3% increase from the 2019 estimate.

The DOC's strategic plan for FY 2018–2022 contains five strategic goals and sets out its priorities:

1. Accelerating U.S. leadership.
2. Enhancing job creation.
3. Strengthening U.S economic and national security.
4. Fulfilling constitutional requirements and support economic activity.
5. Delivering customer-centric service excellence.

The DOC has twelve agencies under its jurisdiction, including the Economic Development Administration (EDA), International Trade Administration (ITA), and National Telecommunications and Information Administration (NTIA). Through these agencies, the DOC administers grants and conducts foundational R&D to foster innovation. The EDA is the only federal government agency focused exclusively on economic development and provides grants to support economic development in economically distressed communities across the nation, with the mission to promote innovation and competitiveness. The EDA's investment priorities include economic recovery and resilience, critical infrastructure, workforce development and exports. The EDA's Public Works and Economic Adjustment Assistance (EAA) programs offer resources to distressed communities and the award ceiling for FY 2020 was \$30 million. The Research and National and Technical Assistance (RNNTA) program funds research, evaluation, and national technical assistance projects that promote competitiveness and innovation in distressed rural and urban regions and for FY 2018–2020 program funding totaled \$3 million.

The ITA promotes international trade and its mission is to strengthen the international competitiveness of U.S. industry, promote trade and investment, and ensure fair trade and compliance with trade laws and agreements. The agency's funding opportunities come via the Market Development Cooperator Program (MDCP). The MDCP grants funds and gives technical assistance to projects that aim to support the global competitiveness of U.S. industries. The MDCP financial assistance awards go to trade associations and other nonprofit industry groups, and the individual award limit for projects is \$300,000.

The NTIA helps to expand broadband capabilities to all communities and as such ensures that the Internet remains an engine for continued innovation and economic growth. The grant programs administered by the NTAI aim to further the deployment and use of broadband and other technologies in the U.S. Two broadband grant programs are managed by NTIA: the Broadband Technology Opportunities Program (BTOP) and the State Broadband Initiative (SBI). With an investment of approximately \$4 billion, the agency supports projects in the deployment of broadband infrastructure, enhances and expands public computer centers, encourages sustainable adoption of broadband service, and promotes statewide broadband planning and data collection activities.

U.S. Department of Defense (DOD)

The Department of Defense (DOD) is responsible for overseeing all activities related to the country's defense and its headquarters are at the Pentagon. The mission of the DOD is to provide the services and military forces needed to deter war and to protect the security of the U.S. The department's organizational structure consists of the Secretary of Defense, who, under the direction of the president, exercises authority, direction, and control over the department. It is further organized into several departments, offices and organizations, including the three military departments: the Department of the Army, Department of the Navy and Department of the Air Forces.

In the National Defense Business Operations Plan (NDBOP) for FY 2018–2022, the DOD presents its three strategic goals:

1. Building a more lethal joint force.
2. Strengthening alliances and partnerships.
3. Improving performance and affordability through reform.

The DOD's budget for FY 2020 was \$718 billion, which is a 5% (or a \$33 billion) increase from 2019.

Efforts are made in research and innovation for the advancement of key technologies, scaling of AI, medical research, and enhancing the capabilities of the U.S. military forces. There are wide-ranging funding opportunities for research and innovation within the department and its offices and agencies.

The Congressionally Directed Medical Research Programs (CDMRP) fund biomedical research initiatives with relevance for service members, veterans and their family members. Some of the programs have a strong military health focus, while others have a more general focus.

The Air Force Office of Scientific Research (AFOSR), as part of the Air Force Research Laboratory (AFRL), manages the basic research investment of the U.S. Air Force. AFOSR's mission is to support Air Force goals of control and maximum utilization of air, space, and cyberspace. This is accomplished by investing in basic research efforts in scientific areas relevant to the Air Force. Central to AFOSR's strategy is the transfer of the fruits of basic research to industry, the suppliers of Air Force acquisitions; to the academic community which can lead the way to still more accomplishment; and to the other directorates of AFRL that carry the responsibility for applied and development research leading to acquisition. AFOSR distributes its basic research program investment through 1,200 grants at over 200 leading academic institutions worldwide, 100 industry-based contracts, and more than 250 internal AFRL research efforts. With its staff of highly trained scientists and engineers, AFOSR manages the Air Force basic research program via three key partnerships: university connections, the Small Business Technology Transfer (STTR) program, and Air Force Intramural Research. AFOSR supports research activities in areas such as chemistry and biological sciences, physics sciences, engineering and complex systems, and information and networks.

The AFOSR International Office (AFOSR/IO) supports the Air Force Defense Research Sciences Program (AFDRSP) by expanding the horizon of scientific knowledge through international liaison and leadership to discover, shape, and champion basic science that will create revolutionary breakthroughs to profoundly impact future Air Force fighting and peacekeeping capabilities. A main function of the office is to establish international research initiatives with world-class scientists and institutions to support AFOSR core and external programs, identifying and advocating international opportunities to work with AFOSR.

The AFOSR/IO administers the Engineer and Scientist Exchange Program (ESEP) which is a DOD effort to promote international cooperation in military research, development, and acquisition through the exchange of defense scientists and engineers. The program provides an opportunity for U.S. military and civilian sci-

entists to conduct research in foreign government laboratories and for foreign government military and civilian scientists to work in U.S. DOD laboratories. A prerequisite for establishing the program is a formal international agreement, a Memorandum of Understanding (MOU) with each participant nation.

The National Security Education Program (NESP) awards scholarships to U.S. undergraduate students, fellowships to U.S. graduate students, and grants to U.S. institutions of higher education. These awards are for study or program development in languages and regions critical to national security. The program's mission is to develop a pipeline of foreign language and culture expertise for the U.S. federal government workforce, thus helping to strengthen national security.

As part of the DOD, the Defense Advanced Research Projects Agency (DARPA) invests in breakthrough technologies by funding programs. DARPA comprises six technical offices and oversees about 250 R&D programs: the Biological Technologies Office, Defense Sciences Office, Information Innovation Office, Microsystems Technology Office, Strategic Technology Office, and Tactical Technology Office. DARPA publicizes funding opportunities primarily by posting Broad Agency Announcements (BAAs) that formally solicit proposals tied to program-specific areas of R&D. In addition to the program-specific funding opportunities, DARPA technical offices maintain an "office-wide" BAA that covers a range of technical areas of interest to each particular office. These funding programs are open to foreign participation.

U.S. Department of Education (ED)

The Department of Education (ED) is dedicated to establishing policies on federal financial aid for education, and distributing as well as monitoring those funds; collecting data on U.S. schools and disseminating research; focusing national attention on key educational issues; and prohibiting discrimination. Its mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access to education.

The ED's Strategic Plan for FY 2018–22 outlines four strategic goals:

1. Supporting state and local efforts to improve learning outcomes for all P-12 students in every community.
2. Expanding postsecondary educational opportunities, improving outcomes to foster economic opportunity and promoting an informed, thoughtful and productive citizenry.
3. Strengthening the quality, accessibility and use of education data through better

management, increased privacy protections and transparency.

4. Reforming the effectiveness, efficiency and accountability of the department.

The FY 2020 budget for the ED was \$62.0 billion, which is a 12% decrease compared to 2019.

The ED provides a variety of grant programs to individuals, HEIs, local education agencies, nonprofit organizations, state education agencies, and other agencies or organizations. The Institute of Education Sciences (IES) is the statistics, research, and evaluation arm of the ED. The mission of the IES is to provide scientific evidence on which to base education practice and policy and to share this information in formats that are useful and accessible to educators, parents, policymakers, researchers, and the public. The IES targets six areas:

1. Providing data that describe how well the U.S. is educating its students.
2. Conducting surveys and sponsoring research projects to understand where education needs improvement and how these improvements might be made.
3. Funding development and rigorous testing of new approaches for improving education outcomes for all students.
4. Conducting large-scale evaluations of federal education programs and policies.
5. Providing resources to increase the use of data and research in education decision making.
6. Supporting the advancement of statistics and research through specialized training and development of methods and measures.

Academic Improvement and Teacher Quality Programs (AITQ) administer several discretionary and formula grant programs. The mission of the AITQ is to provide funding to local and state educational agencies, HEIs, community and faith-based organizations, and other entities. The programs fund activities related to recruiting and retaining high-quality teaching staff; strengthening the quality of elementary and secondary education; testing and disseminating information on new approaches for improving educational results; improving literacy skills for children and students from birth through 12th grade; and raising the educational achievement of at-risk students, such as Native Hawaiian and Alaska Native children and youth.

U.S. Department of Energy (DOE)

The Department of Energy (DOE) was created when President Carter signed the Department of Energy Organization Act of 1977 into law. The mission of the DOE is to ensure U.S. security and prosperity by addressing the country's energy, environmental, and nuclear challenges through transformative science and technology solutions. Six outlined goals support the mission of the DOE:

1. Protecting human health and the environment.
2. Preserving, protecting, and sharing records and information.
3. Safeguarding former contractor workers' retirement benefits.
4. Sustainably managing and optimizing the use of land and assets.
5. Sustaining management excellence.
6. Engaging the public, governments, and interested parties.

The DOE budget for FY 2020 was \$31.7 billion, an 11% decrease from 2019. The DOE budget invests \$2.3 billion in securing energy independence and funding innovations for more affordable, reliable, and efficient energy sources; \$5.5 billion in science funding for cutting-edge R&D as well as state-of-the-art facilities at the DOE's National Laboratories; \$1.7 billion in early-stage technology R&D for affordable, reliable, and efficient renewable energy, nuclear energy, and fossil energy; and \$5.5 billion in funding for the Office of Science to support scientific research, as well as the construction and operation of open-access, scientific user facilities.

The DOE organization consists of a large number of program and staff offices such as the Office of Science and the Office of Energy Efficiency & Renewable Energy (EERE). In addition, several laboratories and technology centers and a few field sites operate under the DOE, such as the National Renewable Energy Laboratory (NREL), the National Energy Technology Laboratory (NETL), and the Oak Ridge Institute for Science and Education (ORISE).

The Office of Science is the U.S.'s largest supporter of basic research in the physical sciences, the steward of ten of the U.S. national laboratories, and the lead federal agency supporting fundamental research for energy production and security. Its mission is to deliver scientific discoveries and major scientific tools to transform understanding of nature and advance the energy, economic, and national security of the U.S. The Office of Science sponsors basic research at over 300 institutions across the country, including universities, national laboratories, nonprofits, and private sector institutions. They administer six programs in a broad range of disciplines: advanced scientific computing research, basic energy sciences, biological and environmental research, fusion energy sciences, high energy physics, and nuclear physics.

The Basic Energy Sciences (BES) program supports basic scientific research to lay the foundations for new energy technologies and to advance DOE missions in energy, environment, and national security. BES research emphasizes discovery, design, and understanding of new materials and new chemical, biochemical, and geological processes. The BES program is one of the largest sponsors of research in the physical sciences in the U.S and funds basic science at nearly 170 universities, national laboratories, and other research institutions. The Biological and En-

vironmental Research (BER) program supports scientific research and facilities to achieve a predictive understanding of complex biological, earth and environmental systems with the aim of advancing U.S. energy and infrastructure security. The program seeks to understand the biological, biogeochemical, and physical processes that span from molecular and genomics-controlled scales to the regional and global scales that govern changes in watershed dynamics, climate, and the earth system.

The Solar Energy Technologies Office (SETO) within the EERE funds early-stage R&D in three technology areas: photovoltaics, concentrating solar-thermal power, and systems integration. Its goal is to improve the affordability, reliability, and domestic benefit of solar technologies on the grid. The EERE also includes the Hydrogen and Fuel Cell Technologies Office (HFTO) whose mission is to research, develop, and validate hydrogen production, delivery, storage, and fuel cell technologies. In carrying out this mission, the HFTO selects R&D and other projects through open and competitive procurements and encourages collaborative partnerships among industry; universities; national laboratories; federal, state, and local governments; and non-government agencies. The EERE's State Energy Program (SEP) provides leadership to maximize the benefits of energy efficiency and renewable energy in each state through communications and outreach activities and technology deployment, and by providing access to new partnerships and resources. Additionally, the SEP helps states to improve the security of their energy infrastructure by assisting them with the development of state energy plans. The SEP provides financial and technical assistance to states through formula and competitive grants.

U.S. Department of Health and Human Services (HHS)

The U.S. Department of Health and Human Services (HHS) is the principal government agency for protecting the health of all Americans and providing essential human services, especially for those who are least able to help themselves. The mission of the HHS is to enhance the health and well-being of Americans by providing effective health and human services and fostering sound, sustained advances in the sciences underlying medicine, public health, and social services.

The HHS's Strategic Plan 2018–2022 outlines its efforts to address current human and health services issues. The plan contains five goals which guide the HHS in addressing specific national problems:

1. Reforming, strengthening, and modernizing the U.S. healthcare system.
2. Protecting the health of Americans where they live, learn, work, and play.
3. Strengthening the economic and social well-being of Americans across their lifespans.

4. Fostering sound, sustained advances in the sciences.
5. Promoting effective and efficient management and stewardship.

The FY 2020 HHS budget requested \$87.1 billion, a 12% decrease from the estimated 2019 level. The budget included \$1.5 billion for State Opioid Response grants, which fund prevention, treatment, and recovery support services in all states and territories. The budget maintained more than \$1 billion in the National Institutes of Health (NIH) for opioid and pain research.

The HHS has several grant programs offering funding for research related to human health, medicine and healthcare. The Administration for Children & Families (ACF) promotes the economic and social well-being of families, children, individuals and communities. ACF programs aim for instance to empower families and individuals to increase their economic independence and productivity; create partnerships with front-line service providers, states, localities and tribal communities to identify and implement solutions that transcend traditional program boundaries; and address the needs, strengths and abilities of vulnerable populations including people with developmental disabilities, refugees and migrants.

The mission of the Agency for Healthcare Research and Quality (AHRQ) is to produce evidence to make healthcare safer, of higher quality, and more accessible, equitable, and affordable, and to work within the HHS and with other partners ensure that evidence is understood and used. Grants from the AHRQ support research to improve the quality, effectiveness, accessibility, and cost effectiveness of healthcare.

The Procurement and Grants Office (PGO) of the Centers for Disease Control and Prevention (CDC) awards over 25,000 acquisition and assistance actions each year and obligates approximately \$11 billion in federal funds. The PGO aids in achieving the CDC's mission by quickly and effectively allocating funds to where they are needed.

The NIH provides financial support in the form of grants, cooperative agreements, and contracts. This assistance supports the advancement of the NIH mission of enhancing health, extending healthy life, and reducing the burdens of illness and disability.

U.S. Department of Homeland Security (DHS)

The mission of the Department of Homeland Security (DHS) is to secure the U.S. from a wide range of threats. The more than 240,000 DHS employees do jobs ranging from aviation and border security to emergency response, from cyberse-

curity analysis to chemical facility inspections. The vision of the DHS is to ensure that the country is safe, secure, and resilient against terrorism and other hazards. The FY 2020 President's Budget for the DHS provided \$51.68 billion in net discretionary funding.

The DHS has several grant programs to support research in the area of national security. The DHS's Science and Technology Directorate invests in scientific research leading to the development of new and innovative technologies. Technologies are developed and transitioned by the Directorate to enhance the mission capabilities of its customers.

A network of Technology Centers solicits R&D connections with the private sector. Collaboration also takes place with partners from a broad network of federal, state, local, tribal and territorial governments; national laboratories; industry innovators; and academia and international agencies to pinpoint capability gaps and build technologies and publish guidance to address them.

Under the DHS's Transit Security Grant Program, grants are provided to mass transit and passenger rail systems, intercity bus companies, freight railroad carriers, ferries, and the trucking industry to help to protect the critical transportation infrastructure against acts of terrorism and other large-scale events. The Federal Emergency Management Agency (FEMA) coordinates the federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror. FEMA offers both non-disaster grants and disaster assistance.

Other areas of interest for R&D collaborations with academia and industry include border security, chemical, biological and explosive defense R&D, cybersecurity or information analysis R&D, and the Covid-19 response.

U.S. Department of Housing and Urban Development (HUD)

The mission of the Department of Housing and Urban Development (HUD) is to create strong, sustainable, inclusive communities and quality affordable homes. The HUD works to strengthen the U.S. housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; and build inclusive and sustainable communities free from discrimination. The HUD administers a diverse array of programs including low-rent public housing, assisted multifamily housing, and tenant-based rental assistance. The 2020 President's Budget for the HUD was \$44.1 billion.

The mission of the HUD's Office of Policy Development and Research (PD&R) is to provide reliable and objective housing research and market data to constituents, as well as skilled analysis that assists departmental leadership in making informed policy decisions. The PD&R developed the HUD Research Roadmap, which integrates extensive input from diverse stakeholder groups to define a 5-year research agenda. This Research Roadmap identifies key research opportunities that the PD&R should highlight in congress budget requests and annual evaluation plans, while assuring strategic alignment to generate a robust pipeline of research.

The latest edition of this Research Roadmap highlights eleven prioritized areas: community development and place-based initiatives; core housing programs; disaster response and preparedness; fair housing; housing finance and affordable housing supply; housing and health; Indian and rural issues; self-sufficiency and economic opportunity; single family homeownership; vulnerable and special populations; and enhanced data and methods.

The HUD awards discretionary funding through over twenty grant programs that support HUD initiatives, including affordable housing development and preservation; community and economic development; environment and energy; fair housing; homelessness; homeownership; rental assistance; and supportive housing and services.

U.S. Department of the Interior (DOI)

The Department of the Interior (DOI) uses science to manage and sustain U.S. lands, water, wildlife, and energy resources, while honoring the country's responsibilities to tribal nations and advocating for U.S. island communities. The DOI plays a central role in how the U.S. stewards its public lands, increases environmental protection, pursues environmental justice, and honors nation-to-nation relationships with Tribes. One top priority is identifying steps to accelerate responsible development of renewable energy on public lands and waters. The DOI invests in climate research and environmental innovation to incentivize the rapid deployment of clean energy solutions, while reviewing existing programs to restore balance on U.S. public lands and waters to benefit current and future generations. The DOI's 2020 budget totaled \$29.6 billion, focusing on investments in creating jobs and economic growth, conserving natural resources, enhancing safety and security, promoting healthy forests and rangelands, increasing energy security, and rebuilding infrastructure.

Under the DOI, the U.S. Fish and Wildlife Service administers a variety of financial assistance programs that award grants and cooperative agreements to commer-

cial organizations, foreign entities, Indian tribal governments, individuals, HEIs, nonprofit organizations, and state and local governments. Indian Affairs provides services directly or through contracts, grants, or compacts to 567 federally recognized tribes with a service population of about 1.9 million American Indian and Alaska Natives. The National Park Service provides preservation assistance through a number of programs that support the preservation of the country's historic places and diverse history. The division administers grant programs to state, territorial, tribal, and local governments, educational institutions, and nonprofits in addition to providing preservation planning, technical assistance, and policy guidance. This work supports historic properties and place-based identity, key components to the social and economic vitality of communities. Additionally, the Native American Graves Protection and Repatriation Act (NAGPRA) Grants Program provides assistance to museums, Indian tribes, and Native Hawaiian organizations for the purposes of assisting in consultation, documentation, and repatriation of Native American cultural items. The DOI's U.S. Geological Survey provides a number of external research grants under the Earthquake Hazards Program, which funds research in order to provide earth science data and information essential to mitigate earthquake losses.

U.S. Department of Justice (DOJ)

The mission of the Department of Justice (DOJ) is to enforce the law and defend the interests of the U.S. according to the law; ensure public safety against threats foreign and domestic; provide federal leadership in preventing and controlling crime; seek just punishment for those guilty of unlawful behavior; and ensure fair and impartial administration of justice for all Americans. The DOJ employs around 115,000 staff and its FY 2020 Budget totaled \$47.4 billion.

The DOJ's FY 2020–2021 priority goals are combatting cyber-enabled threats and attacks, reducing violent crime (specifically gun violence), combatting the opioid crisis, and preventing and disrupting transnational elder fraud.

The National Institute of Justice (NIJ) is the research, development and evaluation agency of the DOJ. The NIJ aims at improving knowledge and understanding of crime and justice issues through science. To support its strategic and overarching research goals, the NIJ develops strategic research plans on topics within crime and justice that span three science offices. These plans build on existing research; input from practitioners, policymakers, and researchers; and the priorities of congress and the administration. The NIJ uses two main mechanisms to implement research: funding external research and conducting intramural research. The NIJ has outlined six strategic challenges:

1. Fostering science-based criminal justice practice – supporting rigorous scientific research to ensure the safety of families, neighborhoods, and communities.
2. Translating knowledge to practice – disseminating rigorous scientific research to criminal justice professionals to advance what works best in preventing and reducing crime.
3. Advancing technology – building a more effective, fair, and efficient criminal justice system through technology.
4. Working across disciplines – connecting the physical, forensic, and social sciences to reduce crime and promote justice.
5. Bolstering the research infrastructure – supporting new scholars, encouraging researchers from a broad array of disciplines to apply their work to criminal justice, and increasing the availability of research findings and data.
6. Adopting a global perspective – understanding crime in its social context within the U.S. and the world.

U.S. Department of Labor (DOL)

The mission of the Department of Labor (DOL) is to foster, promote, and develop the welfare of the wage earners, job seekers, and retirees of the U.S.; improve working conditions; advance opportunities for profitable employment; and assure work-related benefits and rights. The DOL promotes the welfare of workers, job seekers, and retirees by helping them to improve their skills, find work, and get back on their feet after job loss, injury, or illness, and by safeguarding their working conditions, health and retirement benefits, and pay. The DOL's FY 2020 discretionary budget was \$10.9 billion.

The DOL is engaged in a wide array of academic research funding. On behalf of the DOL, the Chief Evaluation Office (CEO) funds research grants to engage the academic community in efforts to build evidence on labor issues of importance to the Department. The Labor Research and Evaluation Grants aim to build the capacity of university-based researchers to rigorously examine labor-related issues while increasing awareness and understanding of these issues among program administrators, policy makers, and the public. The extramural research and training programs of the National Institute for Occupational Safety and Health (NIOSH) include diverse portfolios of investigator-initiated research, mentored research scientist career development awards, training programs, and small business innovation research projects. Multidisciplinary education and research centers and state surveillance programs complement the breadth and depth of extramural research and training at the NIOSH.

U.S. Department of State (DOS)

The Department of State (DOS) leads U.S. foreign policy through diplomacy, advocacy, and assistance by advancing the interests of the American people, their safety and economic prosperity. Its mission is to shape and sustain a peaceful, prosperous, just, and democratic world and foster conditions for stability and progress for the benefit of the American people and people everywhere. The Secretary of State, appointed by the president with the advice and consent of the senate, is the president's chief foreign affairs adviser. The Secretary carries out the president's foreign policies through the State Department, which includes the Foreign Service, Civil Service, and the U.S. Agency for International Development. The DOS's workforce includes some 13,000 members of the Foreign Service, 11,000 Civil Service employees, and 45,000 locally employed staff at more than 270 diplomatic missions worldwide. The President's Budget for FY 2020 totaled \$44.12 billion for the Department of State, Foreign Operations, and Related Programs (SFOPS) accounts.

The DOS Bureau of Educational and Cultural Affairs (ECA) offers research grants on the theme of internationalization, but is perhaps best known for its exchange programs. The ECA aims to increase mutual understanding between the people of the U.S. and the people of other countries by means of educational and cultural exchange that assist in the development of peaceful relations. The ECA awards grants and cooperative agreements to nonprofit organizations to support academic, cultural, and professional exchange programs that promote mutual understanding. ECA exchange programs engage youth, students, educators, artists, athletes, and rising leaders in the U.S. and more than 160 countries. In addition to exchange programs, the ECA also administers a variety of other initiatives that support cultural understanding by protecting cultural heritage across the globe and providing educational resources for people interested in learning about U.S. culture and the English language. The ECA is well known for its flagship exchange programs such as the Fulbright Program and the International Visitor Leadership Program.

U.S. Department of Transportation (DOT)

The mission of the Department of Transportation (DOT) is to serve the U.S. by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets vital national interests and enhances the quality of life of the American people, today and into the future. DOT budgets are dedicated to federal programs covering aviation, highways and highway safety, public transit, rail, maritime safety, pipelines and other related activities. The FY 2020 budget of \$142.6 billion in infrastructure spending provided \$86.6 billion in total budgetary resources for the DOT.

The DOT has an extensive portfolio of grant programs. Most funding is allocated to actual infrastructure buildout, but there is also funding for research and innovation, such as the Small Business Innovation Research (SBIR) Program. Each year, the SBIR Program solicits proposals from small U.S. businesses to improve various aspects of the national transportation system. SBIR-awarded contracts to qualifying small businesses spur research and commercialization of innovative transportation technologies to address DOT priorities.

The DOT invests approximately \$1 billion per year, as authorized by congress, into continually advancing the U.S.'s critical and complex transportation system through a rich array of research-related activities, including the awarding of contracts, grants and other forms of federal assistance to universities, laboratories, state and local transportation entities, small businesses and others.

On behalf of the Secretary of Transportation, the Research Development and Technology (RDT) Office of the Office of the Assistant Secretary for Research and Technology (OST-R) convenes the RD&T Planning Team that brings together the research directors of each of the DOT's modal operating administrations. In addition to representatives of the Office of the Secretary, the members of this group include the research leaders of the Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), Federal Motor Carrier Safety Administration (FMCSA), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), Maritime Administration (MARAD), National Highway Traffic Safety Administration (NHTSA), Pipeline and Hazardous Materials Safety Administration (PHMSA), and Great Lakes St. Lawrence Seaway Development Corporation (GLS).

With each federal authorization, the DOT creates and funds new research institutes through its University Transportation Centers (UTC) Program, which awards and administers grants to consortia of colleges and universities across the U.S. The UTC Program advances the state-of-the-art in transportation research and technology, and develops the next generation of transportation professionals. This congressionally-mandated program has been in place since 1987 to help address the country's ever-growing need for the safe, efficient, and environmentally sound movement of people and goods.

U.S. Department of the Treasury (TREAS)

The mission of the Department of the Treasury (TREAS) is to maintain a strong economy and create economic and job opportunities by promoting the conditions that enable economic growth and stability at home and abroad; strengthen national security by combating threats and protecting the integrity of the financial system;

and manage the U.S. government's finances and resources effectively. The TREAS is responsible for a wide range of activities such as advising the president on economic and financial issues, encouraging sustainable economic growth, and fostering improved governance in financial institutions.

The TREAS operates and maintains systems that are critical to U.S. financial infrastructure, such as the production of coin and currency, the disbursement of payments to the U.S. public, revenue collection, and the borrowing of funds necessary to run the federal government. The TREAS works with other federal agencies, foreign governments, and international financial institutions to encourage global economic growth, raise standards of living, and to the extent possible, predict and prevent economic and financial crises. The TREAS also performs a critical and far-reaching role in enhancing national security by implementing economic sanctions against foreign threats to the U.S., identifying and targeting the financial support networks of national security threats, and improving the safeguards of financial systems. The FY 2020 President's Budget for the TREAS was \$11.5 billion.

The TREAS mostly conducts in-house research, primarily via its Office of Financial Research. Several academic professors on its Financial Research Advisory Committee bring an academic perspective to the research agenda.

U.S. Department of Veterans Affairs (VA)

The mission of the Department of Veterans Affairs (VA) is to fulfill President Lincoln's promise "To care for him who shall have borne the battle, and for his widow, and his orphan" by serving and honoring the men and women who are U.S. veterans.

The VA carries out three main missions:

1. **Veterans Health Care.** The VA's Veterans Health Administration is the largest integrated healthcare network in the U.S., with 1,255 healthcare facilities serving 9 million enrolled veterans each year.
2. **Veterans Benefits.** Veterans can earn a range of benefits that help them to transition back to civilian life. Through the Veterans Benefits Administration, the VA helps to service members' transition out of military service, and assists with education, home loans, life insurance and much more.
3. **National Cemeteries.** The National Cemetery Administration (NCA) provides dignified burial services for veterans and eligible family members by maintaining more than 150 cemeteries as national shrines.

The VA's FY 2020 budget was about \$218.4 billion, with about half of that budget dedicated to discretionary funding and resources for healthcare, benefits and national cemeteries.

The VA ranks as one of the country's leaders in health research. Thousands of studies are conducted at VA medical centers, outpatient clinics, and nursing homes each year. The VA Research program consists of four main research services, which work together to address the full spectrum of veterans' health needs:

1. Biomedical Laboratory Research and Development conducts preclinical research to understand life processes from the molecular, genomic, and physiological level in regard to diseases affecting veterans.
2. Clinical Science Research and Development focuses on clinical trials and other research involving human volunteers to study new treatments, compare existing therapies, and improve clinical practice and care.
3. Health Services Research and Development supports research to improve the delivery of healthcare to veterans.
4. Rehabilitation Research and Development conducts research to create innovations that restore veterans who have become disabled due to injury or disease.

VA Research is different from research sponsored by other federal research agencies. The research agenda is set by the Office of Research and Development, with a current focus on suicide prevention, traumatic brain injury, precision oncology and military exposures.

VA Research is the only research program focused entirely on veterans' needs. VA Research is intramural, meaning that only VA employees can conduct research under the VA's sponsorship. Typically, VA researchers collaborate with academic institutions. This allows VA Research to identify the direct needs of patients at chair and bed side, and to find discoveries and innovations directly in-step with these needs – keeping the veteran at the center of healthcare from the very beginning. More than 60% of VA researchers are also clinicians who provide direct patient care, which is important because it allows VA Research to quickly move scientific discovery from the research setting to advancements in healthcare and to recruit the best and brightest healthcare professionals.

Independent Agencies

U.S. Agency for International Development (USAID)

U.S. foreign assistance has always had the twofold purpose of furthering U.S. interests while improving lives in the developing world. The Agency for International Development (USAID) carries out U.S. foreign policy by promoting broad-scale human progress while simultaneously expanding stable, free societies, creating markets and trade partners for the U.S., and fostering good will abroad.

USAID's mission is to with partners end extreme poverty and promote resilient, democratic societies while advancing security and prosperity. Because poverty is multidimensional, USAID works on several frontiers including to address hunger and food insecurity, illiteracy and innumeracy, ill-health, dis-empowerment, marginalization, and vulnerability. In over 100 countries, USAID focuses on:

1. Promoting global health.
2. Supporting global stability.
3. Providing humanitarian assistance.
4. Catalyzing innovation and partnership.
5. Empowering women and girls.

The FY 2020 President's Budget for the DOS and USAID was \$44.12 billion, which includes \$16.8 billion in assistance that USAID fully or partially manages through the Economic Support and Development Fund, Global Health Programs, Transition Initiatives, International Disaster Assistance, and USAID operational accounts.

Highlights from the 2020 budget included funding of \$1.8 billion in economic and security assistance for the DOS and USAID to promote a free, open, and secure Indo-Pacific region, and \$661 million for the DOS and USAID to counter malign Russian influence in Europe, Eurasia, and Central Asia and advance bilateral relationships and enhance Western cohesion in the region. The requested \$6.3 billion for humanitarian assistance (including resettlement) allows the U.S. to remain the largest single donor to crises around the world. The budget provided \$6.3 billion in global health investments, which includes \$4.3 billion for the President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund to fight AIDS, Tuberculosis, and Malaria, and \$2.04 billion for USAID global health programs (GHP-USAID). USAID and DOS Global Health Programs contribute to global efforts to support three goals: controlling the HIV/AIDS epidemic; preventing child and maternal deaths; and combating infectious diseases.

Corporation for National and Community Service (CNCS)

The mission of the Corporation for National and Community Service (CNCS) is to improve lives, strengthen communities, and foster civic engagement through service and volunteering. It was established in 1993 and is now the largest grant-maker for service and volunteering in the U.S., often working by supporting the nonprofit sector. One important cornerstone is strengthening the public-private partnerships that underpin all its programs. The agency engages more than 5 mil-

lion Americans in service through its core programs: Senior Corps, AmeriCorps, and the Social Innovation Fund.

The CNCS's FY 2020 budget was \$937 million and it leveraged more than \$1.26 billion in additional resources from the private sector, foundations, and local agencies. On February 10, 2020, President Trump submitted his FY 2021 budget request to congress, which included funding to provide for the orderly shutdown of the CNCS. For the past three years, congress has rejected the administration's call to eliminate the CNCS.

Environmental Protection Agency (EPA)

In simple terms, the mission of the Environmental Protection Agency (EPA) is to protect human health and the environment. The agency's origin was increasing concerns about environmental pollution in the 1960s, and the EPA was established in 1970 to consolidate a variety of federal research, monitoring, standard-setting and enforcement activities to ensure environmental protection. The EPA's FY 2020 budget was \$6.1 billion.

The EPA focuses its strategies on the areas of air, water, land, and chemicals. Over the next five years, the EPA will prioritize key activities to support attainment of the national ambient air quality standards (NAAQS) and implementation of stationary source regulations. For water, the EPA aims to modernize and update aging drinking water, wastewater and stormwater infrastructure. Under land, the EPA places particular emphasis on the top priority list of Superfund sites and will implement the Superfund Task Force's recommendations to accelerate the pace of cleanups and promote site reuse, while addressing risks to human health and the environment. The EPA's Superfund program is responsible for cleaning up some of the most contaminated land in the U.S. and responding to environmental emergencies, oil spills and natural disasters. For chemicals, the EPA prioritizes the safety of chemicals in the marketplace through implementation of the new Frank R. Lautenberg Chemical Safety for the 21st Century Act, which modernizes the Toxic Substances and Control Act (TSCA).

The EPA runs several competitive grant programs to accomplish its mission. One example is the Environmental Education Grants Program, which seeks proposals to support environmental education projects that promote environmental awareness and stewardship and help to provide people with the skills to take responsible actions to protect the environment. This grant program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques.

Federal Transit Administration (FTA)

The Federal Transit Administration (FTA) provides financial and technical assistance to local public transit systems, including buses, subways, light rail, commuter rail, trolleys and ferries. The FTA also oversees safety measures and helps develop next-generation technology research. As an agency within the DOT, the FTA is headed by an administrator appointed by the U.S. president. Transit services supported by FTA span many groups and provide wide-ranging benefits. Since 1964, the FTA has partnered with state and local governments to create and enhance public transportation systems, investing more than \$12 billion annually to support and expand public rail, bus, trolley, ferry and other transit services. The FTA's FY 2020 budget was \$12.4 billion.

The FTA funds a wide range of research on public transportation including on safety (research on technologies and practices that can reduce fatalities and injuries, improve safety culture, identify hazards and risk), new mobility (such as Unmanned Aerial Systems), and infrastructure (supporting transformative transportation infrastructure research and demonstration projects).

Institute of Museum and Library Services (IMLS)

The Institute of Museum and Library Services (IMLS) was established by the Museum and Library Services Act of 1996, bringing together federal programs dating back to 1956 with the basic common trait of seeing U.S. libraries and museums as important national assets. The IMLS points out that museums in the U.S. add more than \$50 billion to the U.S. economy annually, support more than 726,000 jobs, generate \$12 billion in tax revenue, and spur tourism from around the world. The IMLS engages in research, policy development, and grant-making.

The mission of the IMLS is to support libraries and museums to advance innovation, lifelong learning, and cultural and civic engagement. The IMLS is led by a director who is a presidential appointee confirmed by the senate and advised by the 23-member National Museum and Library Services Board, also appointed by the president. The IMLS budget for FY 2020 was \$252 million.

There is uncertainty about the continuation of the IMLS after 2020. The 2021 President's Budget Request proposed that congress eliminate funding for several independent agencies, including the IMLS. The budget proposal requested funding to cover IMLS administrative expenses for an orderly shutdown of the agency beginning on October 1, 2020.

National Aeronautics and Space Administration (NASA)

Established in 1958, the mission of the National Aeronautics and Space Administration (NASA) is to enable a safer, more secure, efficient, and environmentally-friendly air transportation system through aeronautics research; operate the International Space Station and prepare for human exploration beyond low Earth orbit; explore the Earth–Sun system, the solar system, and the universe beyond; and develop the crosscutting, advanced and pioneering new technologies needed for current and future missions, benefiting the aerospace industry and other agencies, and addressing national needs.

In FY 2020, NASA had a budget of \$22.7 billion, with a budget request of \$25 billion for 2021, one of the strongest budgets in its history. The increase is mainly due to the space race to return to the moon as well as preparing for Mars expeditions. NASA will send the first woman and next man to the moon in 2024, establishing sustainable exploration by the end of the decade as part of the Artemis program while getting ready for human exploration of Mars. Public–private partnerships in support of shared interests with industry are increasing in importance.

Supporting research in science and technology in a wide range of disciplines is an important part of NASA’s overall mission. NASA is guided by the recommendations of the National Academies of Sciences, Engineering, and Medicine (NASEM) and is responsive to national research priorities. The current strategic plan for research, Science 2020–2024, outlines four cross-cutting priorities: exploration and scientific discovery, innovation, interconnectivity and partnerships, and inspiration.

National Archives and Records Administration (NARA)

The National Archives and Records Administration (NARA) is an independent agency established in 1934 to identify, protect, preserve, and make publicly available the historically valuable records of all three branches of the federal government. NARA manages the federal government’s archives, administers a system of Presidential Libraries, operates museums, conducts education and public programs, provides oversight of government-wide records of management activities, and provides temporary storage of other agencies’ records on their behalf. NARA’s FY 2020 budget was \$358 million.

The National Historical Publications and Records Commission (NHPRC) is NARA’s grant-making affiliate. NARA, through the NHPRC, supports research of means to preserve authentic electronic records; assist archives through a network of state partners; preserve and make accessible records and archives; publish papers

documenting other eras and topics important to an understanding of American history; and improve professional education for archivists and historical documentary editors. Each year, congress appropriates up to \$10 million for grants in support of U.S. archives, and for projects to edit and publish historical records of national importance.

National Endowment for the Arts (NEA)

The federal National Endowment for the Arts (NEA) is the country's premiere arts agency whose mission is to ensure equal opportunities for everyone and every community to access and engage in arts. Established by congress in 1965, the NEA supports and funds art projects in communities nationwide through grants, initiatives and partnerships. The NEA is the only arts agency to provide access to art in all 50 states. This is accomplished by partnering with agencies at federal, state, regional and local levels, other art agencies, and private nonprofit organizations to fund projects or sponsor programs. A significant portion of the agency's grants target underserved communities with low-income populations who usually do not have the same opportunity to participate in arts.

The strategic framework for the period 2018–2022 contains four strategic goals:

1. Supporting art that meets the highest standards of excellence.
2. Cultivating public engagement with, and access to, various forms of excellent art across the U.S.
3. Promoting public knowledge and understanding about the contribution of the arts.
4. Enabling the NEA mission through organizational excellence.

The NEA is financed by the federal government, and for FY 2020 its budget was \$162.25 million, which is \$7.25 million more than its FY 2019 budget. The President's Budget for FY 2021 proposed the elimination of the NEA. More than 80% of the appropriation is distributed as grants and awards to organizations and individuals across the country.

Funds are allocated through six grant programs covering applications both for non-profit organizations and individuals: Grants for Arts Projects, Challenge America, Our Town, Research Awards, Creative Writing Fellowships, and Translations Projects. The Grants for Art Projects support projects that use the arts to unite and heal in response to current events; celebrate creativity and cultural heritage; invite mutual respect for differing beliefs and values; and enrich humanity.

The National Council on the Arts advises the Chairman of the NEA, who also

chairs the Council, on agency policies and programs. It reviews and makes recommendations to the Chairman on applications for grants, funding guidelines, and leadership initiatives.

National Endowment for the Humanities (NEH)

The National Endowment for the Humanities (NEH) is an independent federal agency established in 1965 by congress. The NEH's mission is to promote excellence in the humanities and make the humanities more accessible to people. This is achieved by funding grants to cultural institutions such as museums, archives, libraries, colleges, universities, public television, and radio stations, and to individual scholars.

The NEH is funded by the federal government. For FY 2020 the NEH's budget was \$162.25 million. The NEH consists of seven major divisions and offices that administer its grant programs. These are the Office of Digital Humanities, Office of Challenge Programs, Office of Federal/State Partnership, Division of Research Programs, Division of Education Programs, Division of Preservation, and Access and Division of Public Programs. For 2020, the NEH received an additional \$4.17 million of funding for its initiative A More Perfect Union, which supports humanities projects related to the upcoming 250th anniversary of the founding of the U.S., civics education and veteran programming.

The NEH has several major grant programs. The Division of Education Programs works to strengthen humanities education through programs aimed at pre-collegiate and post-secondary levels of study. Through intensive summer programs of reading and discussion with recognized scholars, individual teachers have opportunities to strengthen their mastery of the subjects they teach in history, philosophy, literature and languages, world cultures, art history, and political science, among others. The division has several grant programs to support institutional endeavors.

The Division of Preservation and Access Programs funds activities that preserve the country's cultural heritage and intellectual legacy held in libraries, archives, and museums. The division's grant programs recognize that good stewardship of cultural resources requires equal attention both to preservation and to access. All of the division's programs focus on ensuring the long-term and wide availability of primary resources in the humanities.

The Division of Public Programs supports a wide range of public humanities programs that reach large and diverse public audiences. These programs make use of

a variety of formats –interpretation at historic sites, television and radio productions, museum exhibitions, websites, and other digital media.

The Division of Research Programs supports scholarly research that advances knowledge and understanding of the humanities. Awards are made to scholars working on research projects of significance to specific humanities fields and to the humanities as a whole. For example, grants support projects as diverse as the deciphering and editing of the Dead Sea Scrolls, and the editing of the correspondence of Charles Darwin.

The NEH's Strategic Plan FY 2018–2022 presents its goals:

1. Providing opportunity and access for all Americans who wish to pursue knowledge in the humanities.
2. Simplifying the NEH grantee experience.
3. Aligning agency activities with NEH founding legislation and current administration priorities.
4. Coordinating federal government-wide cultural initiatives.

National Science Foundation (NSF)

The National Science Foundation (NSF) is an independent federal agency created by congress in 1950 to promote the progress of science; advance national health, prosperity, and welfare; and secure the national defense. The NSF is the only federal agency whose mission includes support for all fields of fundamental science and engineering, except for medical sciences. In many fields such as mathematics, computer science and the social sciences, the NSF is the major source of federal backing. More than 220 Nobel Prize winners had received support from the NSF at some point in their careers. The NSF does not hire researchers or directly operate laboratories. Instead, the NSF supports scientists, engineers and educators directly through their own home institutions.

The NSF supports an advanced research infrastructure that includes ships, planes and autonomous research platforms, astronomical observatories, particle accelerators, seismic observatories, U.S. research stations in Antarctica, and advanced cyberinfrastructure. Funding of facilities and equipment is through cooperative agreements with research consortia that have competed successfully for limited-term management contracts.

The NSF's annual budget was \$8.3 billion for FY 2020, and it is the funding source for approximately 25% of all federally-supported basic research conducted at U.S. colleges and universities. The introduction to this report, which highlights

trends in research funding, includes a discussion of a substantial recent boost to the NSF budget and mandate.

The NSF is divided into the following seven directorates that support science and engineering research and education:

- Biological Sciences
- Computer and Information Science and Engineering
- Engineering
- Geosciences
- Mathematical and Physical Sciences
- Social, Behavioral and Economic Sciences
- Education and Human Resources

Small Business Administration (SBA)

The U.S. Small Business Administration (SBA) is an independent federal agency created in 1953 with the purpose to help businesses with starting, building, and recovering. As the only cabinet-level agency dedicated to helping small businesses and entrepreneurs, its mission is to aid, counsel, assist and protect the interest of small businesses. The goal is to further the preservation of the principles of free competitive enterprise by strengthening the conditions of small businesses; this is achieved by providing counseling and capital, and contracting expertise.

The SBA receives funding from the government, and the budget has varied over time. The FY 2019 budget was \$1.25 billion. The initial budget for FY 2020 was \$1.17 billion, but the SBA received supplemental funding of over \$760.9 billion to further help small businesses to recover from the economic consequences of the Covid-19 pandemic.

The SBA has several funding programs through which small businesses can receive help. These funding programs are:

- Loans
- Investment capital
- Disaster assistance
- Surety bonds
- Grants

The SBA provides limited grant funding to eligible community organizations to promote entrepreneurship and certain businesses in specific industries. The SBA does not offer loans directly to small business owners; instead it partners with

lenders, organizations and institutions and sets guidelines for loans and thus reduces risk for lenders and makes it easier for small businesses to access capital. The exemption is for businesses that suffer from declared disaster, in which case the SBA does provide low-interest loans. The SBA also matches investors' funds (\$2 to \$1) by investing in small businesses. The agency further offers grants to businesses through their grants programs: the Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer Program (STTR).

The STTR is an important small business program that expands funding opportunities in the federal innovation R&D arena. Central to the program is expansion of the public-private sector partnership to include joint venture opportunities for small business and the U.S.'s premier nonprofit research institutions. The most important role of the STTR is to foster the innovation necessary to meet the scientific and technological challenges faced by the U.S. in the 21st century. The SBIR is a highly competitive program that encourages small businesses to explore their technological potential and provides the incentive to profit from its commercialization. By including qualified small businesses in the country's R&D arena, high-tech innovation is stimulated and the U.S. gains entrepreneurial spirit as it meets its specific R&D needs.

Social Security Administration (SSA)

The Social Security Administration (SSA) is a federal agency that delivers a broad range of Social Security services and benefits such as retirement, disability, Medicare, and survivor benefits. The mission of the SSA is to provide financial protection to the public through the means of Social Security services. The SSA is one of the largest anti-poverty programs in the U.S., working to keep millions of people above the poverty line. The agency offers, beside services online, also services through regional offices, field offices, teleservice centers, processing centers, hearing offices, and at U.S. embassies around the world.

The SSA administers grant programs such as Research and Demonstrations Grants and Service Grants. The former program focuses on research aiming to improve the management and administration of the SSA; this could include doing economic, social and demographic research on relevant topics to the SSA programs. The latter program offers grants to those in their efforts to return to work and to gain self-sufficiency. Such services include early referral for rehabilitation services, and greater use of employers and others in the rehabilitation and placement process. Congress sets the SSA's administrative budget and for FY 2020 it was \$105.5 million.

The SSA's Strategic Plan FY 2018–2022 outlines three strategic goals:

1. Delivering services effectively.
2. Improving the way the agency does business by using data and modern methods to ensure service demands are met and efficient and effective service is reinforced.
3. Ensuring stewardship and the efficient administration of their programs, by focusing on three major areas: improving program integrity; enhancing fraud prevention and detection activities; and improving workforce performance and increasing accountability.

State Level – Three Important States

The following briefly maps the research funding ecosystems of three states: California, Texas, and New York. These three states consistently spend most on R&D in the U.S., in absolute amounts. California, Texas, and New York are also the top three states in the U.S. based on GDP (or the equivalent Gross State Product, GSP) and house some of the most acclaimed public as well as private research institutions and major innovation ecosystems. California has the largest GDP of any state and by itself accounts for about 15% of the country's total GDP. Together these three states accounts for approximately 28% of the U.S. population and 30% of the U.S. economic activity measured as GDP.

Below, a background on the economic conditions is followed by an overview of the states' governance of research and innovation and some important actors in the funding ecosystem of each state.

California

With over 39.5 million residents, California is the most populous and the third-largest U.S. state by area. Sacramento is the state capital, while Los Angeles is the most populous city in California and the second-most populous in the U.S. (after New York City). San Francisco, with nearly a quarter of the population density of Manhattan, is the most densely populated city in California and one of the most densely populated cities in the U.S. California's population showed a net decrease in 2020, for the first time since 1900, with most leaving for Texas, Nevada, and Arizona. Along with the rest of the U.S., California's immigration pattern has also shifted over the course of the late 2000s to early 2010s. Immigration from Latin American countries has dropped significantly, with most immigrants now coming from Asia (Ibisworld 2021a; StatsAmerica 2021).

California's economy ranks among the largest in the world. As of 2019, the GSP was \$3.2 trillion (\$80,600 per capita), the largest in the U.S. California is responsible for a seventh of the U.S. GDP. As of 2018, California's nominal GDP is larger than that of all but four countries (the U.S., China, Japan, and Germany). With the development of Silicon Valley in the late 1970s, California became a world leader in the manufacture of computers and electronics. The San Francisco Bay Area, which includes Silicon Valley, has for decades served as the world's flagship hub for technology, innovation, and entrepreneurship. This status was earned through a collaborative relationship between the region's research universities, venture capital firms, and technology and life sciences companies, which combined

have produced an unparalleled track record of revolutionary change and technology commercialization. California has also retained its dominance in the aerospace industry, the film and television industry, and in agriculture. Services are still the dominant economic sector in California and tourism is a consistent source of income. More than a quarter of the state's land area is preserved as recreational areas, national seashores, or wildlife refuges (Bay Area Council Economic Institute 2019).

The DOD, the HHS, NASA, and the DOE supply most of the federal support for science awarded to California. California has the highest level of state government R&D expenditures in the U.S.

California is home to a range of federal laboratories and field centers spanning several U.S. agencies, departments, and bureaus. Six of the largest are the Ames Research Center and Jet Propulsion Laboratory run by NASA, the Lawrence Berkeley National Laboratory, the Lawrence Livermore National Laboratory, the Sandia National Laboratories/California, and the SLAC National Accelerator Laboratory, all of which are DOE National Laboratories.

There are over 281 universities and colleges in California. Highly ranked research universities in the state include Stanford University; the University of California, Berkeley; the University of California, Los Angeles; the University of Southern California; the University of California, San Diego; and the California Institute of Technology.

Below, some examples of major current California state research and innovation funding initiatives and actors are discussed.

California Council on Science and Technology (CCST)

At the center of science policy in California is the California Council on Science and Technology (CCST). The CCST is a nonpartisan, nonprofit organization that was established in 1988. The government resolution directed the CCST “to respond to the Governor, the Legislature, and other entities on public policy issues related to science and technology.” In practice, this means that the CCST engages S&T experts across California's research enterprise, including through formal partnerships with the University of California (UC), California State University (CSU), California Community Colleges (CCC), Stanford, the California Institute of Technology (Caltech), and the six federal laboratory partners described above. Policymakers should use the CCST during policy development to obtain data and advice from subject area experts, during the legislative process to find experts for testimony at policy, fiscal, select committee, and other hearings, and during imple-

mentation and regulatory enforcement to access current science to review standards, technologies, efficacy, and relevance.

California Air Resources Board (CARB)

The California Air Resources Board (CARB) is charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change. From requirements for clean cars and fuels to adopting innovative solutions to reduce greenhouse gas emissions, California has pioneered a range of effective approaches that have set the standard for effective air and climate programs for the U.S. and the world. While the EPA sets nationwide air quality and emissions standards and oversees state efforts and enforcement, CARB focuses on California's unique air quality challenges by setting the state's own stricter emissions standards for a range of statewide pollution sources including vehicles, fuels and consumer products. CARB performs inhouse and external research on the causes and effects of air pollution problems – and potential solutions. The comprehensive CARB research program was established by the state legislature in 1971 and it sets health-protective ambient air quality standards, and addresses the causes, sources, health effects and possible solutions to California's air quality challenges. CARB continually looks to partner with other state agencies, local air districts, the EPA and other well-known research groups for co-funding opportunities.

Department of Conservation (DOC)

With a team of scientists, the Department of Conservation (DOC) administers a variety of programs vital to California's public safety, environment and economy. The services the DOC provides are designed to balance today's needs with tomorrow's obligations by fostering the wise use and conservation of energy, land and mineral resources. The DOC comprises five divisions: Land Resource Conservation; Mine Reclamation; the California Geological Survey; Geologic Energy Management; and the State Mining & Geology Board. The Division of Land Resource Protection (DLRP) within the DOC serves as the state's leader in conserving California's irreplaceable agricultural lands. The DLRP administers around ten grant programs on topics such as transformative climate communities and forest health watershed coordination.

California Department of Education

The California Department of Education is an agency within the Government of California that oversees public education. The California Department of Education serves the state by innovating and collaborating with educators, schools, parents,

and community partners. The State Board of Education is the governing and policy-making body, and the State Superintendent of Public Instruction is the non-partisan elected executive officer.

The California Department of Education mainly operates a number of programs that provide funds to schools and other organizations for a variety of educational purposes. It also looks to external resources to advance its agenda – for example the CA Digital Divide Innovation Challenge. The Challenge is an open, global competition that mobilizes inventors, entrepreneurs, researchers, and other innovators from public and private sectors to develop technology and strategic partnerships for universal affordable broadband internet access across the state.

California Energy Commission

The California Energy Commission is leading the state to a 100% clean energy future for all. As the state's primary energy policy and planning agency, the Energy Commission is committed to reducing energy costs and environmental impacts of energy use while ensuring a safe, resilient, and reliable supply of energy. Established in 1975 by the Warren–Alquist Act to respond to the energy crisis of the early 1970s, the agency's research, programs and policies remain crucial today as the state plans for 100% clean energy and carbon neutrality by mid-century. The Energy Commission has two primary R&D programs: the Electric Program Investment Charge (EPIC) and the Natural Gas Research Program. Combined, these two programs award approximately \$150 million in funding for new projects every year. Funding for these programs comes from, and must benefit, California's electric and natural gas ratepayers. The California Energy Commission also runs the Clean Energy Hall of Fame Awards, an annual event designed to honor the leadership and outstanding achievements of Californians who help to advance the state's clean energy goals.

Department of Fish and Wildlife (DFW)

The Department of Fish and Wildlife (DFW) helps to manage California's wildlife resources in a trifurcated system that divides wildlife management between the state legislature, the Fish and Wildlife Commission (which theoretically sets policy) and the department, which implements it. Established within the Natural Resources Agency, the department manages and protects the state's fish, wildlife and native habitats while overseeing their recreational, commercial, scientific and educational use. The mission of the DFW is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The DFW ad-

ministers several grant programs with funding on topics such as drought response, fish and wildlife management, watershed restoration, planning and protection, and oil spill prevention and response.

California Department of Forestry and Fire Protection (Cal Fire)

The California Department of Forestry and Fire Protection (Cal Fire), which is part of the state's cabinet-level Natural Resources Agency, has two major missions related to wildlands: to protect the state's grass-, brush- and tree-covered lands from fire and to protect the state's harvestable timber on non-federal lands from improper logging activities. Cal Fire is also the largest fire department in the state, providing full fire protection for many of its citizens by directly supplying services or contracting out services for dozens of cities and counties. Cal Fire provides varied emergency services in 36 of the State's 58 counties via contracts with local governments. Preventing wildfires in the state is a vital part of Cal Fire's mission. Because of Cal Fire's size and major incident management experience, it is often asked to assist or take the lead in disasters. Cal Fire manages eight demonstration state forests that provide for commercial timber production, public recreation, and research and demonstration of good forest management practices. Additional forestry programs include urban forestry, archeology, and pest management.

Cal Fire runs several grant programs, divided into areas including business and workforce development, forest improvement, and fire prevention. Through the Forest Health Research Program, CAL FIRE for example funds scientific studies that provide critical information and tools to forest landowners, resource agencies, fire management organizations and policy makers on a variety of priority topics related to forest health and wildfire in Californian ecosystems. Funding is offered for four types of projects: general research, research occurring in demonstration state forests, graduate student research, and science synthesis/tool development.

California Department of Transportation (Caltrans)

The Department of Transportation (Caltrans) oversees California's transportation networks. Caltrans manages more than 50,000 miles of the state's highway and freeway lanes, provides intercity rail services, permits more than 400 public-use airports and special-use hospital heliports, and works with local agencies. Caltrans carries out its mission through six primary programs: Aeronautics, Highway Transportation, Mass Transportation, Transportation Planning, Administration and the Equipment Service Center. The Division of Research Innovation and System Information (DRISI) funds research on a wide variety of topics to provide a safe and reliable transportation network that serves all people and respects the environment.

The DRISI's extensive research program emphasizes customer participation throughout the research selection process and effective deployment and customer ownership of the research products. Caltrans additionally supports eight University Transportation Centers conducting dedicated transportation research, with funds from the DOT's national University Transportation Center Program.

California Department of Water Resources (DWR)

The mission of the Department of Water Resources (DWR) is to sustainably manage the water resources of California, in cooperation with other agencies, to benefit the state's people and protect, restore, and enhance the natural and human environments. The DWR is in charge of planning, designing, constructing and operating the state's water delivery system of storage facilities, pumping plants, hydroelectric power plants, canals, pipelines and aqueducts known as the State Water Project. The DWR, which forms part of the state Natural Resources Agency, is also responsible for updating the California Water Plan every five years and is the lead state agency in formulating the Bay Delta Conservation Plan. The DWR offers a number of grant and loan programs that support integrated water management activities addressing environmental stewardship, water supply reliability, public safety, and economic stability. Public agencies are eligible for most of these grant and loan programs, but other applicants may also be eligible, depending on the program. Examples of area programs include Floodplain Management, Protection and Risk Awareness Grants. The Division of Environmental Services applied research projects seek innovative solutions for the water management and environmental challenges faced by the DWR. Projects are conducted in coordination with partners to optimize resources and expertise.

California Sea Grant Program

California Sea Grant is a collaboration between the National Oceanic and Atmospheric Administration (NOAA), the State of California and universities across the state to create knowledge, products and services that benefit the economy, the environment and the citizens of California. California Sea Grant is one of 34 state programs founded in 1973 and funded by the National Sea Grant College Program, part of the NOAA. Matching funds come from the state and private sources. California Sea Grant is administered by the Scripps Institution of Oceanography at the University of California, San Diego. California Sea Grant provides the following services on coastal and marine science and policy issues: grant and fellowship opportunities for scientists and graduate students; complete proposal solicitation, review, and grant administration services; extension specialists dedi-

cated to impartial research and outreach for coastal stakeholders and communities; news and library services; and a connection to a nation-wide network of Sea Grant experts and partners. California Sea Grant issues competitive state and federal research awards that meet three strategic focus areas: healthy coastal and marine ecosystems; sustainable fisheries & aquaculture; and resilient coastal communities and economies.

Texas

With more than 29.1 million residents in 2020, Texas is the second-largest U.S. state by both area (after Alaska) and population (after California). The state capital is Austin, with Houston as its most populous city, and the fourth largest in the U.S. The state has three cities with populations exceeding one million: Houston, San Antonio, and Dallas. These three rank among the ten most populous cities of the U.S. The population in Texas is steadily growing, with a 16% increase between 2010–2020. The state has a high share of foreign-born residents (over 17%) and the major country of origin of Texan immigrants is Mexico (55% of immigrants) (Ibisworld 2021b; StatsAmerica 2021).

In 2019, Texas had a GDP of \$1.9 trillion, the second highest in the U.S. after that of California. This positions the state as the world's ninth largest economy. Texas's large population, an abundance of natural resources, thriving cities and leading centers of higher education have contributed to a large and diverse economy. The state is ranked first for revenue generated from total livestock and livestock products, and second for total agricultural revenue, behind California. Since the discovery of oil reserves, Texas's economy has reflected the state of the petroleum industry. Energy has been a dominant political and economic force within the state. Texas is also a leader in renewable energy commercialization; it produces the most wind power in the U.S. With large university systems coupled with initiatives like the Texas Enterprise Fund and the Texas Emerging Technology Fund, a wide array of different high-tech industries have developed in Texas.

Total research expenditures at Texas HEIs amounted to \$6.39 billion for FY 2020, based on the institutions' annual financial reports. The share of funding by source was 45% federal, 20% private, 17% state and local, and 19% internal institutional sources. Total research expenditures increased overall by \$743 million (13.2%) from FY 2019. Texas ranked third among the states in total research expenditures, with \$5.98 billion, behind California (\$10.51 billion) and New York (\$7.09 billion) (Texas Higher Education Coordinating Board 2021).

There are 170 colleges and universities in Texas. Highly ranked research universities in the state include the University of Texas at Austin, Texas A&M University, Texas Tech University, and the University of Houston.

Below, some examples of major current Texas state research and innovation funding initiatives and actors are discussed.

Texas Higher Education Coordinating Board (THECB)

The Texas Higher Education Coordinating Board (THECB) oversees all public post-secondary education in the state. The THECB coordinates state financing of Texas higher institutions via funds and programs such as the Texas Research University Fund (TRUF), the Core Research Support Fund (CRSF), the Texas Comprehensive Research Fund (TCRF), the Texas Research Incentive Program (TRIP), and the Governor's University Research Initiative (GURI). As an example, the GURI, created in 2015, awards matching grants to public universities and health-related institutions to assist in recruiting distinguished researchers, such as Nobel laureates and National Academy members, from institutions outside Texas (Texas Education Code, Chapter 62, Subchapter H). The purpose is to enhance the national and global economic competitiveness of Texas. The Texas Economic Development and Tourism Office, within the Office of the Governor, administers the fund.

Cancer Prevention and Research Institute of Texas (CPRIT)

Texans voted in 2007 to create the Cancer Prevention & Research Institute of Texas (CPRIT) and to invest \$3 billion in the state's unprecedented fight against cancer. On November 5, 2019, Texas voters approved a constitutional amendment to continue the CPRIT's work and invest an additional \$3 billion in finding and funding cancer research and prevention opportunities in the state. The CPRIT is now a \$6 billion, 20-year initiative – the largest state cancer research investment in the history of the U.S. and the second largest cancer research and prevention program in the world. The CPRIT offers several funding opportunities for promising cancer research, product development, and prevention programs. The CPRIT advances its mission by awarding merit-based, peer reviewed grants to Texas-based entities and institutions for cancer-related research, product development and the delivery of cancer prevention programs.

Humanities Texas

Humanities Texas advances education through programs that improve the quality of classroom teaching, support libraries and museums, and create opportunities for lifelong learning. Founded in 1973 as the state affiliate of the NEH, Human-

ities Texas is one of fifty-six state and jurisdictional humanities councils in the U.S. It is a nonprofit, educational organization supported by federal and state appropriations, as well as by foundations, corporations, and individuals. Humanities Texas grants enable communities throughout the state to develop programs of local interest promoting history, culture, and education. Since 1974, Humanities Texas has awarded more than 4,260 grants supporting a wide range of public humanities programs, including lectures, oral history projects, museum exhibitions, teacher institutes, reading programs, and documentary films.

The Texas Governor's Office

As the chief authority of the executive and legislative branch of the state government, the governor of Texas heads the state government and is the commander in chief of the Texas National Guard. The Governor's Office administers over 30 grants, ranging from the Spaceport Trust Fund (under the Texas Economic Development & Tourism Office) to terrorism preparedness programs, and justice programs. The flagship funding initiative is the Texas Enterprise Fund (TEF), labeled the largest "deal-closing" fund of its kind in the U.S. Awards are made as a cash grant used as a financial incentive tool for projects that offer significant projected job creation and capital investment, and when a single Texas site competes with another viable, out-of-state option. Companies must be principal applicants for the TEF.

Texas Commission on Environmental Quality (TCEQ)

The Texas Commission on Environmental Quality is the state's environmental agency. It was created by the Texas Legislature in 1991, after combining the Texas Water Commission and the Texas Air Control Board to provide synthesis and cohesion in environmental standards. The agency focuses mostly on promoting clean air and water and the safe management of waste in Texas. It also serves as a watchdog for the protection of the state's natural resources. The TCEQ offers state and federal funding opportunities to a variety of groups, individuals, and governmental entities to carry out programs supporting their mission. One such grant program is in air quality research and planning, aimed at identifying, inventorying, and monitoring of pollution levels; modeling local pollution levels; and identifying, quantifying, and implementing appropriate local pollution reduction controls.

Texas Department of Agriculture (TDA)

The Texas Legislature established the Texas Department of Agriculture (TDA) in 1907. The TDA's key objectives are to promote production agriculture, consumer protection, economic development and healthy living. The agriculture commis-

sioner oversees the TDA and is elected every four years. The TDA Grants Office is responsible for administering numerous state and federal grants, loans and cooperative agreements available to farmers/ranchers, universities and schools, nonprofits and private entities across the state. The office also provides financial assistance to agricultural producers, especially young farmers and ranchers, to expand their production capabilities.

Texas Parks and Wildlife Department (TPWD)

The Texas Parks & Wildlife Department (TPWD) oversees and protects wildlife and their habitats. In addition, it is responsible for managing the state's parks and historical areas. Its mission is to manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing, and outdoor recreation opportunities for the use and enjoyment of present and future generations. The TPWD provides outdoor recreational opportunities by managing and protecting wildlife and wildlife habitat and acquiring and managing parklands and historic areas. The TPWD is tasked with conducting and overseeing many state- and federally-funded research projects annually. Each year, the Wildlife Division identifies its top research priorities, and research proposals on these topics are solicited from qualified department and university staff. External researchers can apply for funds through the Conservation License Plate Grant Program, State Wildlife Grants, and/or Traditional Section 6 Grants. Projects funded through these programs assist in the conservation and recovery of listed species and inform evaluations of the status of Species of Greatest Conservation Need.

Texas Department of Health Services Grant Funding (DSHS)

The Texas Department of State Health Services (DSHS) was created in 2003 by House Bill 2292 of the 78th Texas Legislature through the merging of four state agencies: the Texas Department of Health, Texas Department of Mental Health and Mental Retardation, Texas Health Care Information Council, and Texas Commission on Alcohol and Drug Abuse. The DSHS provides state-operated health-care services, including hospitals, health centers, and health agencies. The DSHS Funding Information Center helps organizations in Texas to pursue public health funding opportunities by disseminating funding information. The Funding Information Center (FIC) was established in January 1990, particularly to serve as a statewide clearinghouse for information on funding to support HIV/AIDS-related programs. The DSHS's Mental Health and Substance Abuse Division, along with the Public Policy Research Institute at Texas A&M University, coordinates the Texas School Survey, a program consisting of two surveys on drug and alcohol abuse, an annual one at the local school-district level and a biennial statewide sur-

vey. The statewide survey, the Texas School Survey of Substance Use, is the largest survey of its kind to be conducted in the U.S. The DSHS Center for Health Statistics responds to requests for data from a variety of internal users and external stakeholders.

Texas Department of Transportation (TxDOT)

The Texas Department of Transportation (TxDOT) is generally associated with the construction and maintenance of the state's immense state highway system; however, it is also responsible for overseeing aviation, rail, and public transportation systems in the state. TxDOT is one of the state's largest departments in terms of the number of subordinate offices – it maintains 25 geographical districts throughout the state. The TxDOT offers several programs that provide funding to local communities, other government agencies and select groups to aid in the development of transportation projects and services. Funding programs are for example in the areas of elderly individuals and individuals with disabilities, and the Traffic Safety Program. The TxDOT's Public Transportation Division also administers coordinated state and FTA grant programs for public transportation.

New York

New York State has a population of more than 20 million people, making it the fourth most populous state in the U.S., with approximately 44% of its population living in New York City (the most populous city in the country) and 40% on Long Island. Until the 1960s, New York was the country's leading state in nearly all population, cultural, and economic indices. Its displacement by California started in the middle of that decade and was caused by an enormous population growth rate that has persisted on the West Coast, rather than by a large decline in New York itself. Texas overtook New York as the second most populous state in 2000. However, the population of New York keeps growing, and one reason for this growth is that the state is a leading recipient of migrants from around the globe with one of the largest international immigrant populations in the country. Its size, high profile, vibrant economy, and cosmopolitan culture continue to act as a magnet for talent from across the U.S. and the world (Ibisworld 2021c; StatsAmerica 2021).

New York's gross economic product exceeds those of all but a handful of countries globally, and its GDP of \$1.7 trillion ranks third in size behind that of the larger states of California and Texas. If New York State were an independent nation, it would rank as the 11th largest economy in the world, right behind Canada. The service sector predominates, though manufacturing is also important. New York

City dominates the economy of the state as the leading center of advertising, banking, finance, media and publishing in the country. Manhattan in New York City is the world's leading center of banking, finance, and communication. It is home to the New York Stock Exchange (NYSE) on Wall Street. Many of the world's largest corporations are headquartered in Manhattan. The New York City metropolitan region's high-technology and entrepreneurship ecosystem is known as Silicon Alley. High-tech industries, including digital media, biotechnology, software development, game design, and other fields in information technology, are growing.

At \$7.09 billion, New York's total research expenditures rank second of the U.S. states, behind those of California (\$10.51 billion). New York also ranks second in the country for higher education R&D in science and engineering fields, sixth for federal R&D obligations, and third for the number of utility patents issued to state residents. New York's higher education system comprises 309 colleges and universities. Highly ranked research universities in the state include Cornell University, Columbia University, New York University and the U.S. Military Academy.

Below, some examples of major current New York state research and innovation funding initiatives and actors are discussed.

Empire State Development's Division of Science, Technology and Innovation (NYSTAR)

NYSTAR, the Division of Science, Technology and Innovation of Empire State Development (ESD), is tasked with advancing technology innovation and commercialization in New York State and plays an integral role in the ESD's economic development strategy by overseeing funding for university research centers. The ESD is the umbrella organization for New York's two principal economic development public-benefit corporations, the New York State Urban Development Corporation (UDC) and the New York Job Development Authority (JDA).

The ESD provides assistance to businesses through NYSTAR's Centers of Excellence, Centers for Advanced Technology, Innovation Hot Spots, New York State Certified Business Incubators, Science + Technology Law Center, and other assets. State-supported high-tech areas include advanced materials, biotech and life sciences, renewable energy, materials processing, optics and imaging, software and digital media, and electronics technologies.

One of NYSTAR's priorities is attracting federal funding into New York, either directly through the division or through funded centers and partners. NYSTAR funds fifteen Centers for Advanced Technology (CATs) to encourage greater collaboration between private industry and universities in the development and ap-

plication of new technologies. The CAT program, created in 1983, facilitates a continuing program of basic and applied research, development and technology transfer in multiple technological areas, in collaboration with and through the support of private industry. NYSTAR also funds thirteen Centers of Excellence to foster collaboration between the academic research community and the business sector, in order to develop and commercialize new products and technologies, promote critical private sector investment in emerging high-technology fields in New York State, and create and expand technology-related businesses and employment. One example is the Center of Excellence in Nanoelectronics and Nanotechnology (CENN) at SUNY Polytechnic Institute.

New York State Department of Environmental Conservation

The New York State Department of Environmental Conservation guides and regulates the conservation, improvement, and protection of New York's natural resources; manages Forest Preserve lands in the Adirondack and Catskill Parks, state forest lands, and wildlife management areas; regulates sport fishing, hunting and trapping; and enforces the state's environmental laws and regulations. The department has twelve offices: Administration; Air Resources, Climate Change & Energy; Communications; General Counsel; Hearings and Mediation Services; Internal Audit and Investigation; Legislative Affairs; Natural Resources; Public Protection; Regional Affairs and Permitting; Remediation and Materials Management; and Water Resources. The department also administers competitive grants for environmental protection and improvement that are available to municipalities, community organizations, not-for-profit organizations and others. Grants are given in the areas of solid and hazardous waste, water protection, wildlife protection, land and forest protection, and environmental justice.

New York State Department of Health (NYSDOH)

New York relies on a county-based system for the delivery of public health services. The New York State Department of Health (NYSDOH) promotes the prevention and control of diseases, environmental health, healthy lifestyles, and emergency preparedness and response; supervises local health boards; oversees reporting and vital records; conducts surveillance of hospitals; does research at the Wadsworth Center; and administers several other health insurance programs and institutions. The Wadsworth Center is a science-based community committed to protecting and improving the health of New Yorkers through laboratory analysis, investigations and research, as well as laboratory certification and educational programs. As the state's public health reference laboratory, Wadsworth responds to urgent public health threats as they arise, from bioterrorism to SARS to synthetic cannabi-

noids to Legionella outbreaks; develops advanced methods to detect microbial agents and genetic disorders; and measures and analyzes environmental chemicals. Wadsworth Center administers legislatively authorized extramural funding programs that support New York State investigators studying specific topics, including breast cancer, multiple sclerosis, and spinal cord injuries.

Empire State Stem Cell Board

The mission of the Empire State Stem Cell Board is to foster a strong stem cell research community in New York State and to accelerate the growth of scientific knowledge about stem cell biology and the development of therapies and diagnostic methods. The New York State Stem Cell Science program (NYSTEM) was launched in 2007 to support stem cell research across the state. NYSTEM supports basic, applied, translational and other research and development activities to advance scientific discoveries in stem cell biology by making awards to institutions across the state. In addition to supporting a range of research, NYSTEM supports infrastructure, scientific training, and educational initiatives.

New York State Education Department (NYSED)

The New York State Education Department (NYSED) is responsible for the supervision of all public schools in the state and all standardized testing, as well as the production and administration of state tests and Regents Examinations. In addition, NYSED oversees higher education, cultural institutions such as museums and libraries, vocational rehabilitation, and the licensing of numerous professions. The department primarily manages the distribution of aid to localities throughout New York but may also support extramural research. Institutions receiving support through NYSED include public and private elementary and secondary schools, public and independent colleges and universities, libraries, and museums.

New York City Department of Design and Construction (DDC)

The New York City Department of Design and Construction (DDC) builds many of the civic facilities in New York City. As the city's primary capital construction project manager, it provides new or renovated facilities such as firehouses, libraries, police precincts, and courthouses, and manages the city's sewer systems, bioswales and water mains. The department works closely with other city agencies, as well as with architects and consultants. The DDC administers the city-wide Town+Gown program created in 2009–2010. Town+Gown is a university–community partnership program that brings academics and practitioners together to create actionable knowledge in the built environment. Town+Gown aims at increasing evidence-based analysis, information transfer, and understanding of the

built environment using New York City's built environment as a laboratory for practitioners working in the city's physical spaces, and academics in the built environment disciplines.

New York State Energy Research and Development Authority (NYSERDA)

The New York State Energy Research and Development Authority (NYSERDA), established in 1975, is a New York State public-benefit corporation. NYSEDA offers information and analysis, programs, technical expertise, and funding aimed at helping New Yorkers increase energy efficiency, save money, use renewable energy, and reduce their reliance on fossil fuels. NYSEDA professionals are charged with protecting the environment and creating clean-energy jobs. NYSEDA collaborates with businesses, industry, the federal government, academia, the environmental community, public interest groups, and energy market participants to reduce energy consumption and greenhouse gas emissions. Examples of research include areas such as biomass clean power innovation, clean transportation, electric power transmission and distribution, energy efficiency, water and wastewater, and wide energy.

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STINT, The Swedish Foundation for International Cooperation in Research and Higher Education, was set up by the Swedish Government in 1994 with the mission to internationalise Swedish higher education and research.

STINT promotes knowledge and competence development within internationalisation and invests in internationalisation projects proposed by researchers, educators and leaderships at Swedish universities.

STINT promotes internationalisation as an instrument to:

- Enhance the quality of research and higher education
- Increase the competitiveness of universities
- Strengthen the attractiveness of Swedish universities

STINT's mission is to encourage renewal within internationalisation through new collaboration forms and new partners. For example, STINT invests in young researchers' and teachers' international collaborations. Moreover, STINT's ambition is to be a pioneer in establishing strategic cooperation with emerging countries in research and higher education.



STINT

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