Federal Agency Funding

Many of the significant discoveries made by University of California researchers originate with federally funded research. Projects funded by federal agencies have produced innovations and inventions that advance technology, improve global health and help drive the nation's economy. Many of the social service and training programs that UC manages throughout California also originate as federal funds, and come to UC indirectly through state agencies, private entities or other educational institutions as flow-through funds, also known as subawards.

Federal agencies represent UC's largest single source of funding for basic research that aims primarily to advance fundamental knowledge — the physical principles and processes that govern how the universe works, and how we, as humans, perceive and interact with it. What emerges from this basic research are new concepts and theories that often lead to practical applications that were not envisioned at the time the research was conducted.

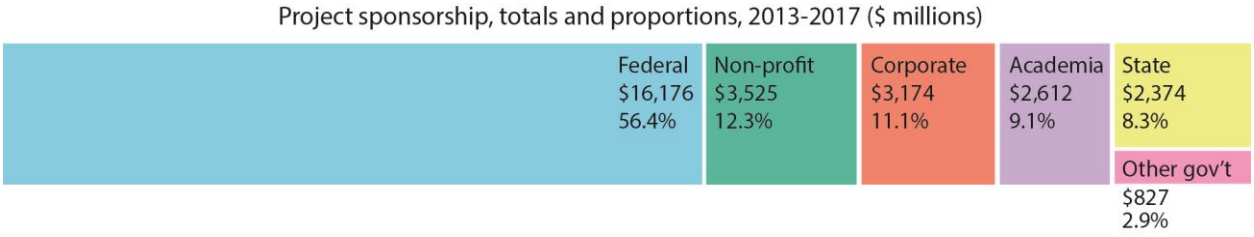
For example, one of the most promising new treatments for genetic diseases is a DNA-editing technology called CRISPR that derives from research by UC Berkeley Professor Jennifer Doudna. Named "2015 Breakthrough of the Year" by the journal *Science*, CRISPR emerged from work funded by a small National Science Foundation grant that Professor Doudna began well over a decade ago, long before anyone imagined how useful this approach would become. Since then, her work has received substantial support from both federal and private sources, has been licensed by startup companies, including one she founded, and holds great potential for medical, agricultural and other industrial applications.

"America has made big scientific breakthroughs for decades because federal funding allows scientists to pursue research that businesses would not fund because they have no immediate commercial application. Breakthroughs from federally-funded, curiosity-driven research have created not only new businesses, but entire new industries."

— Professor Jennifer Doudna

Federal research funding to UC spans all agencies and disciplines

UC is the nation's largest recipient of federal sponsored project funding for academic research and other university-based projects. Over the past five years, UC has received $16.2 billion (not adjusting for inflation) in federal project funds. Totals do not include flow-through funds.



UC receives sponsored project funding from many federal agencies and programs, but the largest single contributors are the National Institutes of Health (NIH) and the National Science Foundation (NSF), which together provide nearly three-quarters of UC's federal project funding.

Federal Agency	***Project Funding ($ millions)***
National Institutes of Health (NIH)	$9,324
National Science Foundation (NSF)	$2,460
Department of Defense	$1,381
Other Health & Human Services	$640
Department of Energy	$527
NASA	$476
Department of State	$271
Department of Agriculture	$256
Department of Education	$230
Department of Veterans Affairs	$161
Department of Commerce (Including NOAA)	$159
Department of the Interior	$99
Other federal agencies	$193
Total federal agency funding	***$16,176***

Historically, UC has received between six and seven percent of NIH awards to research universities and seven to eight percent of NSF funding. Of the $16.2 billion UC received from federal agencies, $14 billion was targeted for research, the rest for training and service projects. And with more than half of UC's federal funding coming from NIH, health-related disciplines receive the majority of the research

awards. Funding from other agencies, including the National Science Foundation, NASA and the Departments of Defense, Energy, Agriculture and Education support a broad range of research in other disciplines, including STEM, social sciences, humanities and the arts.

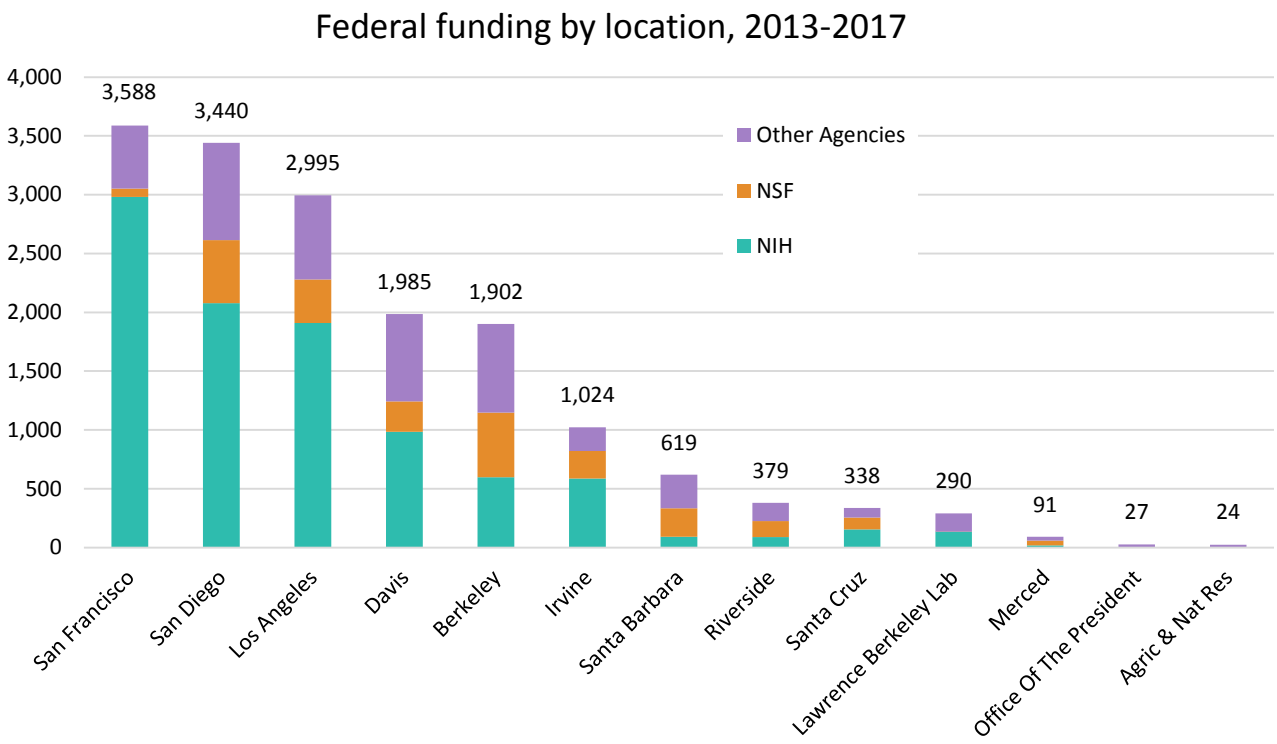
Health Science Fields	***Research Funding ($ millions)****
Medicine	$5,829
Other Health Professions	$428
Pharmacy	$212
Veterinary Medicine	$189
Public Health	$182
Dentistry	$138
Nursing	$68
Optometry	$35
Health Sciences Total	***$7,080***

Academic Disciplines	***Research Funding ($ millions)****
Physical Sciences	$2,055
Engineering	$1,412
Biological Sciences	$1,104
Agriculture & Natural Resources	$450
Computer & Information Sciences	$388
Interdisciplinary Studies	$244
Psychology	$208
Social Sciences	$159
Mathematics	$124
Education	$860
Arts Humanities	$21
Business & Management	$22
Academic Disciplines Total	***$6,272***

** About $630 million in federal research funding was not discipline-coded.*

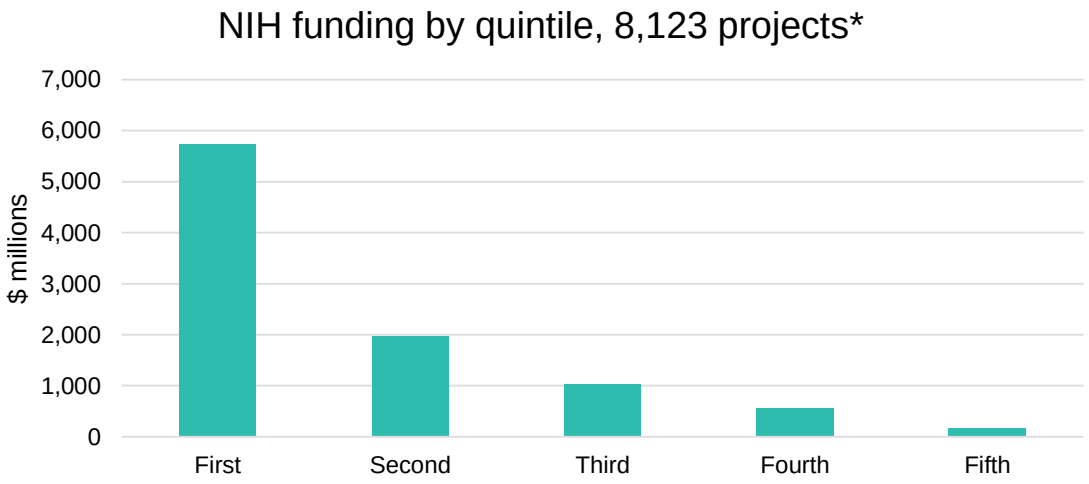
Federal funding varies by campus

Campuses with medical centers receive larger shares of federal agency funding because the largest single funding source is the National Institutes of Health, which strongly emphasizes medical and bioscience research. The exception is UC Berkeley, which receives substantial funding from NSF for basic research in physical, chemical and life sciences.



NIH supports both individual projects and research centers

The National Institutes of Health promotes medical research at UC and other universities through a strategic combination of funding for many individual research projects, and support for a few very large, long-term research programs and centers that involve multiple institutions through subawards. As a result, of the roughly 8,100 projects that NIH has funded at UC over the last five years, the top one percent of awards received the same funding — close to $1.5 billion — as the bottom 55% of awards. In terms of quintiles, the top 20% of awards received three times the funding as the second-highest quintile, and thirty times as much as the lowest quintile.



** Project-level analysis uses a threshold award value of $1,000 and above, and amounts are not adjusted for inflation.*

Quintile, of 8,123 projects	*Amount ($ millions)*	*Average Award*
First	$5,727	$3,531,000
Second	$1,962	$1,209,000
Third	$1,031	$636,000
Fourth	$555	$342,000
Fifth	$177	$109,000

The larger NIH program awards, especially those in the top one percent can funnel tens of millions of dollars to UC each year. Program awards, unlike the thousands of individual investigator awards to UC from NIH, may receive continuous funding for periods of five to seven years or even longer, before NIH again opens the program to competitive renewal. Some of these programs put UC in a grant management role, redistributing NIH's funding through subawards to other institutions nationwide as well as to UC researchers. These projects often include training and service components, but they are primarily research-oriented.

Clinical and Translational Institutes

The largest body of NIH program awards involves $286 million to support Clinical and Translational Science Institutes (CTSI's) at each of the five UC medical centers: $20 million at UC Davis; $21.6 million at UC Irvine; $48.3 million at UC San Diego; $80.4 million at UCLA; and $115.7 million at UC San Francisco. NIH funds a total of 62 such institutes in 31 states and the District of Columbia, and strongly encourages research collaborations and information-sharing. The UC Institutes, together with the other members of the consortium aim to accelerate the innovation pipeline and speed the development of research discoveries into effective therapies. Towards this objective, they provide research support, including infrastructure, training and services, through partnerships with industry, community organizations, governments, foundations and other research institutions.

UC Cancer Center Support Grants

Each year since 1971, the NIH's National Cancer Institute has provided programmatic and project support for academic and non-profit Cancer Centers nationwide. These grants provide core administrative support, plus funding for laboratory basic research, translational research and clinical studies. Each of the UC medical centers houses an NCI-designated Cancer Center. Over the past five years, NIH has provided nearly $125 million in Cancer Center support grants: $8.4 million to UC Irvine; $20.7 million to UC Davis; $24.1 million to UCLA; $29.1 million to UC San Diego; and $40.5 million to UC San Francisco.

AIDS Malignancy Consortium, and Centers for AIDS Research

UCLA has received $61 million from the National Cancer Institute over the past five years to conduct AIDS-related clinical trials. The Consortium was founded in 1995 to support clinical trials for AIDS-related cancers. There are 36 clinical trial sites worldwide, and in addition to UCLA, UC Davis, UC San Francisco and UC San Diego are also consortium members. AIDS research programs are also supported by the National Institute of Allergy and Infectious Diseases, through the Centers for AIDS Research (CFAR) program. Three UC medical centers host CFAR sites, receiving a total of $53.6 million over 5 years: UCLA $12.8 million; UCSD $16 million; and UCSF $24.7 million.

Research to increase use of antiretroviral therapy

While many of the large NIH awards support projects and programs with fairly broad research mandates, some of the larger awards focus on specific, critical health issues. The National Institute of Allergy and Infectious Disease provided $43 million to support an epidemiological project aimed at increasing use of antiretroviral therapy (ART) among eligible patients. The Streamlined ART Start Strategy, or START project, focuses on clinics in Uganda, and examines the social and behavioral factors, including cost and knowledge transfer, that may be barriers to timely initiation of antiretroviral therapy among HIV-infected adults.

NSF funding for research and graduate training

The National Science Foundation is UC's second-largest source of project funding, with about $2.5 billion in award funding coming to UC over the past five years. As with NIH, a number of the largest awards from NSF support long-term programs and centers that explore the frontiers of science across all disciplines. One major difference between NSF and NIH project funding is that more than 10% of NSF award funding, or about $266 million is specifically designated for training the next generation of scientific researchers through graduate research fellowships. NIH also supports training, but primarily for postdoctoral fellows, whose positions are funded as part of individual awards, whereas NSF provides institutional grants to each campus to support graduate education.

Another major difference between funding from these two agencies is that NIH awards tend to be much larger than NSF awards, because biomedical research and clinical trials are more costly than projects in non-medical disciplines. The median NSF award, of nearly 5,000 awards, is about $285,000, compared to $639,000 for NIH, with over 8,100 awards.

Listed below are some of the larger or most significant programs or research projects receiving NSF support over the last five years.

Program or project description	*Location*	*2013-17 funding ($ millions)*
Gateways to Discovery: Cyberinfrastructure for the Long Tail of Science (Supercomputer Center)	UC San Diego	$36.9
Center for Cellular Construction	UC San Francisco	$24
Kavli Institute for Theoretical Physics	UC Santa Barbara	$23
UC Center for Environmental Implications of Nanotechnology	UC Los Angeles	$22.9
The Center for Chemistry at the Space-Time Limit (CASTL)	UC Irvine	$16
Center for Energy Efficient Electronics Science (E3S)	UC Berkeley	$15.1
Sequencing of the Aegilops Tauschii genome	UC Davis	$9.3
Southern Sierra Critical Zone Observatory	UC Merced	$5
Integrative analysis of plasticity in cell fate determination in plants	UC Riverside	$4.5
Secondary Science Teaching with English Language and Literacy Acquisition (SSTELLA)	UC Santa Cruz	$2.9

Major federally funded programs

While NIH and NSF are UC's two most significant sources of contract and grant funding, some of the largest federal projects are funded by other agencies, including NASA, the Department of State's Agency for International Development, the Commerce Department's National Oceanic and Atmospheric Administration (NOAA), and the Department of Defense's Office of Naval Research. Listed below are a few of the major projects supported by these agencies over the last five years.

- NASA's Ionospheric Connection Explorer project (ICON) is being managed by UC Berkeley, with funding of over $132 million. This project involves the construction of a spacecraft to study the ionosphere, which is where the Earth's weather meets the weather of space. The ICON launch is scheduled for December, 2017.
- The U.S. Agency for International Development has partnered with the UC Davis School of Veterinary Medicine's One Health Institute to oversee the PREDICT program — a surveillance effort for early detection of pathogens that could migrate from animal to human populations and cause global pandemics. This UC project has received about $124 million in funding since 2013.

- NOAA has provided about $81 million over the past five years to the Scripps Institution of Oceanography at UC San Diego to manage the Cooperative Institute for Marine Ecosystems and Climate. This program, which began in 2010, coordinates marine research among five UC campuses (UC San Diego, UC Davis, UCLA, UC Santa Barbara and UC Santa Cruz), two California State Universities (Cal State LA and Humboldt State), and units within NOAA. CIMEC's research focus is on how climate affects marine and coastal ecosystems.
- The U.S. Department of Veterans Affairs has long-standing arrangements with UC medical centers to provide the highest level of healthcare services to veterans, at both UC and VA medical facilities. The largest of these relationships is with UCLA, and involves over $20 million per year in affiliation agreements between the institutions for overall operations, and Interagency Personnel Agreements (IPAs) to secure the services of individual practitioners.
- The Centers for Disease Control and Prevention (which is part of US Department of Health and Human Services, but distinct from NIH) provided $27 million to UC San Francisco to oversee community-level HIV prevention and treatment programs in Kenya.

While each of these major, long-term programs is separately funded and managed, they do not operate in isolation, but are an integral part of the research and service community at UC. They share findings, discoveries and best practices with researchers and practitioners engaged in thousands of other research and service projects that are also underway, both on their local campuses and systemwide. And, through publications, conferences, patents, industry startup and information networks, the knowledge that is created through these efforts can have global effects.

Federal funding prospects

UC's research enterprise conducts nearly one-tenth of all academic research nationwide, and generates knowledge and innovations that are beneficial on a global scale. Federal support for research and other programs at UC, as well as at other universities, is currently the subject of considerable debate and controversy in Congress. Funding for NIH appears likely to increase for federal FY 2018, through by how much remains to be decided. NSF, however, is likely to see its appropriations for academic research and programs decline by about 10%. Environmental and climate science at EPA, Department of Energy, NASA and NOAA—amounting to about $200 million each year to UC — could be dramatically curtailed.