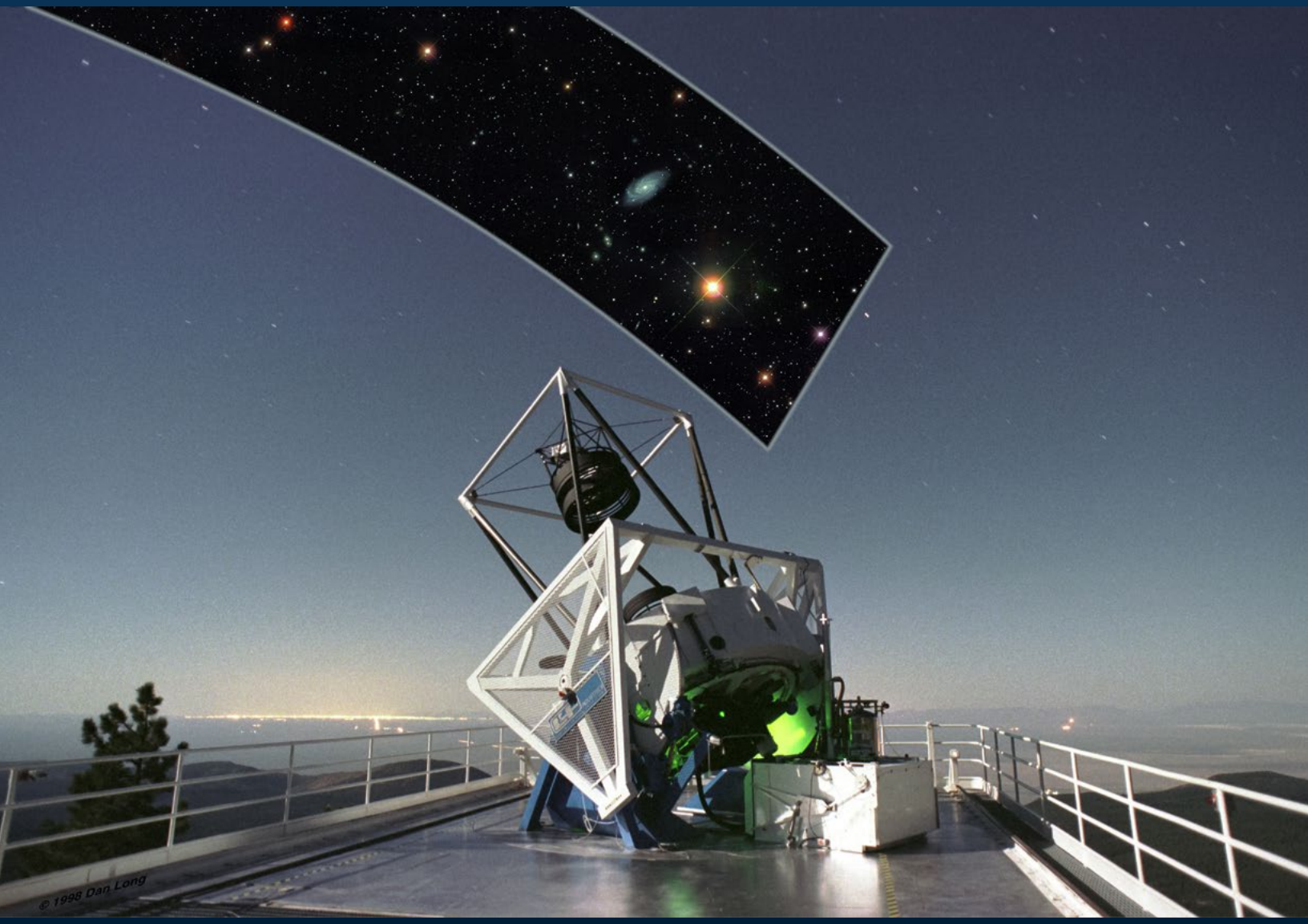
Alfred P. Sloan
FOUNDATION



2018 Annual Report

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Cover: The Sloan Foundation Telescope at Apache Point Observatory, New Mexico as it appeared in May 1998, when it achieved first light as the primary instrument of the Sloan Digital Sky Survey. An early set of images is shown superimposed on the sky behind it. (CREDIT: DAN LONG, APACHE POINT OBSERVATORY)

Preface

The **ALFRED P. SLOAN FOUNDATION** administers a private fund for the benefit of the public. It accordingly recognizes the responsibility of making periodic reports to the public on the management of this fund. The Foundation therefore submits this public report for the year 2018.

Mission Statement

The **ALFRED P. SLOAN FOUNDATION** makes grants primarily to support original research and education related to science, technology, engineering, mathematics, and economics. The Foundation believes that these fields—and the scholars and practitioners who work in them—are chief drivers of the nation's health and prosperity. The Foundation also believes that a reasoned, systematic understanding of the forces of nature and society, when applied inventively and wisely, can lead to a better world for all.

From the President

ADAM F. FALK

In 2018, for only the third time in history, the Nobel Prize in physics was awarded to a woman. Donna Strickland of the University of Waterloo was honored, alongside her collaborator Gérard Mourou, for the development of a revolutionary laser technique known as chirped pulse amplification. Hearing the news, I found myself torn between two impulses—on the one hand, to celebrate the long overdue recognition of the contributions extraordinary women have made to physics, and on the other, to bemoan the absurdity that Strickland is only the third woman ever to be so honored.

Six months later, in May 2019, the American Economics Association awarded the John Bates Clark Medal to a woman, Emi Nakamura of the University of California, for her seminal contributions in the field of macroeconomics. Presented since 1947 to an American economist under the age of 40, the Clark Medal is considered second in prestige only to the Nobel Prize. Nakamura is the fourth woman in this seventy-two-year history to receive the medal. Again, an announcement to both celebrate and bemoan. Change comes, but it is coming all too slowly.

At the Alfred P. Sloan Foundation, where we support research in basic science and economics, we are deeply concerned with the health of the communities of scholars who do this research. The historical exclusion of women, and the discrimination and disadvantage women scientists and economists have long faced, are fundamentally inconsistent with these communities being healthy ones. Gender equity in science and economics matters to us profoundly, both for reasons of fundamental justice and because sexism, by suppressing the contributions of half the human race, keeps some of the best research from being done at all.

Why is gender equality coming so slowly, particularly in fields like physics and economics? The reasons are multifold and complex, but the evidence is unambiguous that they do not include gendered differences in the distribution of talent or interest. Take a boy and a girl in high school with equal aptitude for and interest in physics or economics. A decade later, the boy is much more likely than the girl to be a physicist or an economist. The gender ratio gets more imbalanced at every educational level. There is something amiss *within the cultures of these fields*, messages (sometimes subtle, sometimes overt) that women don't belong. And these messages persist despite the great goodwill, the desire to do better, of many men and women in economics and the sciences.

This is a complex problem that has no single solution. Interventions are needed at every stage of development of a young researcher. But one particularly

critical phase is the years spent as an untenured professor, with the extraordinary pressure to prove oneself as a fully independent investigator while simultaneously learning to be an effective teacher and a good departmental citizen. Recognizing this, in 1955 Alfred P. Sloan himself established the Sloan Research Fellowships, one-time awards made to the most promising untenured faculty. We now name 126 Fellows each year, in eight areas of research, with an award level that will rise to $75,000 this fall. Because (unlike federal grants) the funds a Sloan Research Fellowship provides are completely unrestricted, they are a particularly valuable source of support for a faculty member. It's the kind of support that can help a talented young researcher stay in a field and develop her career even in the face of being in a small and perhaps unwelcomed minority.

Perhaps I should mention now that Donna Strickland was a Sloan Research Fellow. As was Emi Nakamura. As were the other three women (Susan Athey, Esther Duflo, and Amy Finkelstein) who have won the John Bates Clark Medal. To be sure, it would be ridiculous to imply that without the Sloan Fellowship these four distinguished scholars would not have achieved great things. Nonetheless we are proud to have supported them at a point when they were not yet famous, to have helped them along journeys not only of discovery but of changing the character of their fields.

More than half of the senior scholars who sit on the Sloan Research Fellowship selection committees are women, a fact we are very proud of as these committees have the critical job of determining which young scientists receive recognition and support. I suspect it is also part of the reason that the pool of young scholars nominated for Sloan Research Fellowships, as well as the ranks of the winners, are consistently more gender diverse than their fields as a whole. Support for individual women is an essential element of the Foundation's commitment to fostering gender equity.

But we also must take the opportunity to influence research culture in other, perhaps deeper, ways. In every grant proposal we consider, we ask the proposers to engage with gender diversity. If a grant is to support students or postdocs, what is the investigator's history of training women? If a grant is to support a conference, is there gender balance in the roster of speakers? If a grant is to support software development, is there diversity in the team that will do that work?

Creating a world of gender equality, and of equality of all kinds, requires these two complementary approaches. We must support individual scholars in navigating the environment that exists now, while at the same time insisting that the environment itself improve over time. Bring more women to the table, but also make the table a better, more welcoming, more rewarding place for women to be. We bring this dual philosophy to our grantmaking programs that are dedicated explicitly to improving representation in science and economics. The Sloan-supported University Centers of Exemplary Mentoring are built on this philosophy, and their success depends on how measures to improve diversity and those to improve inclusion reinforce and amplify each other.

The comprehensive nature of the problem of inequality and the multifaceted approach that is required to ameliorate it has led us to rename our Education and Advancement for Underrepresented Groups program the program in Diversity, Equity, and Inclusion in STEM Higher Education. The new name reflects better both the breadth of our efforts and the ineluctable interrelatedness of supporting diversity, insisting on equity, and fostering inclusion in the communities of scholars in which the Foundation is so deeply invested.

An essential core of that deep investment is a commitment to women, to the Donna Stricklands and the Emi Nakamuras, and all the women working in the labs, and libraries, and lecture halls where science is done. To those women we pledge our support and partnership in working hard to honor their contributions and make the institutions of science into better, more just, more welcoming places for women to be.

The Year in Discovery

SOME THINGS SLOAN GRANTEES LEARNED THIS YEAR

As a grantmaking institution, Sloan works to grease the wheels of scientific progress. Our day-to-day is about how to get good ideas funded; how to make sure this or that bright young researcher gets recognized; how to make sure this methodology or that piece of technology is being used most effectively. Rational inquiry is a process, and every day we work to make that process better.

But every day we also try to take a step back from the minutiae of scientific process and remind ourselves that research is about finding stuff out. At the end of all the grantmaking we do is some researcher somewhere trying to figure out how one tiny—or in the case of astronomers, not so tiny—piece of the world works. The work we fund is about discovery, and about how discovery can be a powerful tool for making the world a better place.

The Foundation has more than 1,600 active grants in its portfolio. Nearly every day a Sloan-funded researcher finds out something new. Here's some of what they learned in 2018.

Research

CHEMISTRY OF INDOOR ENVIRONMENTS

In late May 2018, researchers from 20 research groups representing 13 U.S. universities descended on a quiet patch of the University of Texas, Austin's J.J. Pickle Research Campus. The visitors came from every stage of the academic pipeline—professors, graduate students, postdoctoral fellows, undergraduates—and from an impressively diverse array of scientific and technical fields. There were chemists, and technologists, and data scientists, and all sorts of engineers—chemical, mechanical, environmental—more than 60 researchers, in all. The visitors brought equipment: a high-resolution time-of-flight aerosol mass spectrometer, an ultraviolet aerodynamic particle sizer, gas detectors capable of measuring trace amounts of carbon dioxide, methane, sulfur dioxide, and nitrogen oxides.

They also brought luggage. Because they were all there to spend a month at a home they wouldn't live in.

HOMEChem (House Observations of Microbial and Environmental Chemistry) was the world's largest scientific field project devoted to advancing our understanding of the fundamental chemistry that goes on inside a home. Although humans have become an indoor species over the past 100 years, very little is known about the chemistry of the built environments

we spend so much time in. What invisible molecular compounds are floating in the air and resting on the surfaces of our homes and offices and schools? How are those compounds changed by the cooking and cleaning and lounging humans do indoors?

Led by atmospheric chemist Delphine Farmer of Colorado State University and environmental engineer Marina Vance of the University of Colorado, Boulder, HOMEChem brought together researchers from all over the country to begin the search for answers to these questions. Instrumenting a 1,200 square foot manufactured home on the UT campus—it is estimated that some 22 million people, about 7 percent of the U.S. population, live in manufactured homes—Farmer, Vance, and their collaborators launched a monthlong series of coordinated experiments designed to catalog and measure how normal human activities alter the chemistry of the indoor environment. They staged stir fry dinners to measure how cooking affects airborne particulates; they scheduled and timed moppings to measure ammonia levels before and after the use of common household cleaning agents; they alternatively banned and then required makeup, lotions, and perfumes in house entrants, to measure how the things we rub on our bodies affect the air we breathe indoors.

Analysis is still underway and so it is too early to report the findings of these experiments—it may take up to two years to publish all that was learned during just that one month—but preliminary data suggest that the chemistry of indoor air is every bit as complex and dynamic as outdoor air, that it can change radically in short timeframes, that it can be much dirtier than we previously expected, and that human activities are major players in the indoor chemistry of a home.

Quite apart from the value of the scientific insights they generate, field experiments like HOMEChem play an important role in the development of a new field. First, they are unparalleled opportunities for community building and networking, as they allow extended interplay between scientists who normally have only limited opportunity to interact. Second, the need for cooperation in the field among a diverse array of disciplinary perspectives and instruments is an important incentive for the development of common standards, protocols, and norms regarding methodology, data collection, and analysis. Standards developed in early field experiments often propagate through an entire field, providing a shared understanding of what constitutes good work. Third, field experiments are a powerful instrument for scientific education and training. The uncontrolled setting in the field is a vivid illustration of both the challenges that beset a scientist when her experiments exit the lab and the imagination and innovation required to meet those challenges in circumstances not entirely under her control. Finally, field experiments are opportunities for leadership. Rarely are young scientists given the opportunity to demonstrate the intellectual and organizational leadership necessary to organize and coordinate a large, collaborative scientific project. Identifying such leaders is essential for any collaborative endeavor, and particularly so when one is developing a new, multidisciplinary field like indoor chemistry.

THE DEEP CARBON OBSERVATORY

As it enters its final year, the researchers at the Deep Carbon Observatory (DCO) continue to make amazing discoveries about the role carbon plays in the deep ecosphere.

The DCO's Deep Life Community is a global network of more than 300 scientists across 34 countries who are working to characterize the vastness and variety of the deep biosphere, the microbial life that makes its home deep beneath Earth's surface. In late 2018, Deep Life researchers led by Cara Magnabosco of the Flatiron Institute released a new computation of the size of the deep biosphere. Using a model built from hundreds of samples collected from all over the world, Magnabosco estimates that Earth's continental subsurface contains between 200 and 600 octillion cells. (An octillion is 10^{27}). The total biomass of carbon in these cells approaches between 15 and 23 billion tons. This places about 70 percent of all Earth's microbes in the subsurface.

Other DCO research is showing just how extraordinary this deep life is. *Geogemma barossii,* an organism found living in superhot methane vents on the ocean floor, was shown in a lab to be able to function and reproduce in temperatures as high as 121 degrees Celsius. This bests by a long shot even the hottest surface deserts, where the highest recorded surface temperature, registered in Iran's Lut Desert in 2005, is 71 degrees Celsius.

The other communities of the Deep Carbon Observatory, those concerned with the basic physics and chemistry of deep carbon, of the movement of carbon through the mantle and crust, and the origins and abundance of deep Earth hydrocarbons, made similarly interesting discoveries. It has long been known that rare, expensive blue diamonds—the Hope Diamond being the most famous—get their color from boron. Boron, however, is not naturally occurring in the deep mantle where diamonds form. Examining the

inclusions in 24 blue diamonds, a team led by Evan Smith, Steven Shirey, and Fabrizio Nestola found that diamond boron likely originates in pieces of the ocean floor subducted or forced down into the mantle at regions where tectonic plates collide. Other researchers shed intriguing light on a longstanding puzzle in geophysics: the relative lack of xenon in our atmosphere. Normally nonreactive with other elements, xenon should be more plentiful in our atmosphere than it in fact is. But DCO researchers showed that at extremely high temperatures and pressures, xenon interacts with iron and nickel, the two most prevalent elements in Earth's core. This reactivity could explain where the "missing" xenon is: hidden at the center of the planet, bonded to the iron and nickel in the core.

ECONOMIC INSTITUTIONS, BEHAVIOR, AND PERFORMANCE

Researchers funded through our economics program work on a wide range of issues, including behavioral macroeconomics, the drivers of scientific productivity, and the factors affecting innovation, all the while striving to move economics as a field toward greater transparency, reproducibility, and reliability.

Matthew Gentzkow—Sloan grantee, former Sloan Research Fellow, and winner of the 2014 John Bates Clark Medal—explored the extent to which Facebook has been successful in its attempts to reduce the sharing of fake news on the platform. He found that from 2016 to 2018, user engagement with content from disreputable sites fell by 65 percent from its 2016 peak, when Facebook users liked, shared, or commented on an estimated 200 million false stories in a single month. A similar drop in engagement with such sites was not visible on Twitter, suggesting that the decrease reflects Facebook-specific policies and actions as opposed to more general societal trends. Gentzkow's research also illustrates the importance of Sloan-sponsored work on facilitating access to administrative data by independent researchers.

Also in 2018, a team led by Sandro Ambuehl at the University of Toronto investigated what effect receiving financial advice from nonexpert peers has on a person's decision-making. In a series of experiments, subjects were asked to make financial decisions both with and without face-to-face communication with a peer. Surprisingly, subjects that received any type of peer-to-peer interaction made better financial decisions, but decision-making was most improved by subjects advised by a peer with *low* financial knowledge or competence. The result is evidence against the common-sense view that one good way to improve financial decision-making is to expose people to high-quality experts. The methodology also represents a significant advance in Sloan-sponsored work on behavioral welfare economics and nudging.

Looking at longitudinal data in four industries (agricultural yields, transistors, pharmaceuticals, and cancer research), a team led by John Van Reenen at MIT documented that the rate of growth in scientific productivity has been decreasing sharply, with increasing investment by companies resulting in decreasing return on investment over time. This puzzling result has attracted attention among economists and in the popular media and underscores the importance of the kind of research that the Sloan Foundation sponsors on the economics of the scientific enterprise.

In 2018, the U.S. Census announced that it would be adopting differentially private data protection mechanisms to ensure respondent privacy for the 2020 Census. Developed in part through Sloan Foundation grants, differential privacy provides conceptual frameworks and mathematical techniques for analyzing sensitive datasets while provably protecting the privacy of its subjects. While differentially private mechanisms are already in use by the private sector—Apple uses differential privacy when analyzing iPhone usage data—the Census announcement marks the first commitment by the U.S. government to use such tools to protect confidential information about American residents.

ENERGY AND ENVIRONMENT

Efficiently moving to a lower carbon future requires understanding the costs, benefits, and tradeoffs of the different ways of getting there. Researchers in our Energy and Environment program investigate those tradeoffs across various components of the energy system.

In 2018, the MIT Energy Initiative published *The Future of Nuclear Energy in a Carbon-Constrained World*, the latest installment in its influential "Future of..." series of reports. These reports assess energy issues from multiple disciplinary perspectives to document the current state and future prospects of key energy technologies. Each report goes on to identify promising, practical actions that policymakers, regulators, and others can take to help us move toward a brighter, cleaner energy future. The *Future of Nuclear Energy* report contains a host of such practical recommendations, including lowering construction costs of new nuclear plants through increased use of prefabricated elements, shifting toward reactor designs that incorporate inherent and passive safety mecha-

nisms, establishing shared testbed sites for novel reactor prototypes, and halting the decommissioning of existing nuclear plants by providing credits to zero-carbon emissions sources. The report's analysis of the state of U.S. domestic demand for nuclear power is less than rosy, and it predicts that unless these and other steps are followed, the U.S. will produce less and less of its power via nuclear over the coming decades. Given nuclear's utility in reducing carbon emissions, this would significantly hamper our ability to decarbonize power generation by mid-century.

Elsewhere in the program, a team led by researchers at the Environmental Defense Fund published in *Science* an independent estimate of the rate of fugitive gas emissions in shale oil and gas development, concluding that the methane production and delivery system leaks into the atmosphere approximately 2.3 percent of the total methane produced each year, some 13 million metric tons. This is about 60 percent higher than previous estimates produced by the Environmental Protection Agency.

The Council on Foreign Relations issued a collection of essays stemming from a Sloan-supported conference on how advances in digitization and information technology might impact our energy future. Thirteen energy system experts contributed analyses for this collected volume, and all agreed that advances in digital technologies, from smart grids to self-driving cars, have the potential to make the energy system radically more efficient. Whether they will actually have such an effect, however, is harder to predict. More efficient automated vehicles, for instance, may be a boon for reducing carbon emissions, but could also result in a vast increase in number of miles driven, offsetting any efficiency gains. Similarly, new data-driven algorithms have the potential to increase the efficiency of all sorts of power plants, including those that burn coal, potentially extending their profitable lifetimes. Whether these new technologies aid or hinder progress toward a clean energy future depends on the regulatory and policy environment in which they are developed and deployed. This collection of essays is one of the most comprehensive resources examining how digital innovation might impact the energy system.

MICROBIOLOGY OF THE BUILT ENVIRONMENT

Researchers supported through the Foundation's now completed Microbiology of the Built Environment program continue to uncover fascinating details about the complex microbial communities that live beside us in our homes, schools, and workplaces. Postdoctoral researcher Yun Shen, working at the University of Michigan, found that while showering can make your body clean, it can also make the air dirty. Her study showed that showering altered the biological composition of the air in a bathroom, transferring pathogenic bacterial species from the water to the air, where, potentially, they can be inhaled. She also found that this effect could be exacerbated or mitigated depending on the design of the showerhead.

Richard Shaughnessy at the University of Tulsa found that ventilation had little effect on the abundance of allergens in the air or on surfaces in a school, suggesting that educators who want to limit children's exposure can't just open the windows and must resort to traditional cleaning methods.

A study by researchers at the University of Oregon's Biology and the Built Environment Center showed that both natural and artificial light have a significant effect on the composition of bacterial communities in household dust, changing which microbes dominate the bright or shadowy parts of our homes.

SLOAN DIGITAL SKY SURVEY

Every year, hundreds of papers are written that use or cite data from the Sloan Digital Sky Survey, reporting exciting new findings about a dazzlingly diverse array of topics in astrophysics and astronomy. The year 2018 was no exception. Scientists working with SDSS data found that the iron content of a star may influence the orbital paths of its surrounding planets, published the first measurement of cosmic growth using redshift distortions from quasars, and released new measurements of the Milky Way indicating that our galaxy is roughly 200,000 light years across, twice the estimate arrived at in previous studies.

These findings are the result of SDSS's visionary policy, adopted since its first days, of releasing all its collected data to the public. That procedural innovation supercharged the impact of SDSS, making the Sloan Telescope one of the most cited instruments in all astronomy and resulting in more than 7,700 peer-reviewed papers using SDSS data.

That commitment to innovation continues to this day with SDSS's new FAST (Faculty and Student Teams) program. FAST is a mentorship initiative that identifies and recruits promising teams with underrepresented minority undergraduate students into the SDSS collaborative. It pairs them with dedicated mentoring teams within the SDSS collaboration and shares with them the excitement of working on cut-

ting edge astronomy and astrophysics research, all while preparing them for entry into graduate study. In 2018, SDSS reported the results of the program's first three years. In that time, 31 students were recruited into the program, including 19 women and 19 students from historically underrepresented groups. Of those 31, 10 went on to enter Ph.D. or master's programs in STEM, and an additional 7 are expected to apply this year. For programs of this kind, a conversion rate of over 50 percent is nothing short of remarkable, and these numbers represent a substantial increase in the number of underrepresented minority students pursuing graduate level training in astronomy. Partly in response to this success, the Foundation authorized a $530,000 grant extending and expanding the FAST initiative for another three years.

WORKING LONGER

Researchers funded through the Foundation's Working Longer program try to understand the complex machinery of costs, benefits, incentives, decisions, laws, and institutions that drive the labor market decisions of older Americans and the firms that employ them.

Analyzing more than 14 years of data from the expansive Health and Retirement survey, psychologist Ursula Staudinger found that individuals whose work or leisure time involved novel information processing (being exposed to new, previously unencountered problems to solve) had significantly slower declines in cognitive function as they aged. The work is an important landmark in developing our understanding of the mental health impacts of some forms of working longer.

A team led by Andrew Parker at the RAND Corporation also looked at HRS data to document the diverse variety of paths Americans take into retirement. Parker found that the "standard" retirement model of moving into full retirement from a full-time job is not actually all that standard, representing only about 40 percent of workers. For the majority, the transition to retirement took a variety of paths, including transitioning first to part-time work, re-entering the workforce after "retiring," or not retiring and remaining in the workforce past age 70. The work is a clear indication of the need to update popular myths about what retirement looks like.

Surveying older Americans who are long retired, Andrew Caplin of New York University found a startling number, some 40 percent of workers in their 60s or 70s, were willing to re-enter the labor force. That number increases to 60 percent if a job offers flexibility in the hours worked. The finding suggests that there may be a significant mismatch in labor markets for older workers, with firms not offering the right mix of pay and benefits to capture worker interest.

Kathleen McGarry of University of California Los Angeles and Sean Fahle of State University of New York, Buffalo completed a study of families with workers who leave the labor force to care for elderly parents. At issue is whether the decision to become a full-time caregiver reflects a weakened attachment to the labor force generally. Creating a new dataset that merges HRS data with data from the Social Security Administration, McGarry and Fahle found that full-time caregivers have at least as strong as, and by some measures a stronger, relationship to the labor market than noncaregivers. Instead, their decision was driven mainly by the severity of their parents' caregiving needs and, interestingly, whether they had another family member, most typically a sister, who could help with the caregiving. Perhaps most importantly, McGarry and Fahle show that providing this care can be detrimental to the financial well-being of caregivers, even after caregiving ends. Over a term of 10 years, caregivers experience larger declines than noncaregivers in the probability of working and in earnings; and they see smaller increases in overall household wealth.

THE SLOAN RESEARCH FELLOWS

Alfred P. Sloan himself started the Sloan Research Fellowship program in 1955. It's a program born of humility. Sloan doubted his own ability to predict what the next great scientific breakthrough would be. Better, he thought, to find the smartest young scientific minds in America and then give them the freedom to follow whatever line of inquiry they found most promising. It's an approach that's been more successful than even Sloan himself imagined. Today, 47 Sloan Research Fellows have gone on to be awarded the Nobel Prize, 17 have won the Fields Medal in Mathematics, 19 have won the John Bates Clark Medal in economics, and 69 have been awarded the National Medal of Science.

The 2018 class of Sloan Research Fellows continues this tradition of support for some of the most exciting young researchers in the country. Konstantin Batygin is a Caltech astronomer whose work on eccentricities in the orbits of Kuiper Belt asteroids suggests that there's a ninth planet in our solar system hiding somewhere beyond Neptune. Rebecca Asch is an ocean scientist from East Carolina University who has documented how warming ocean temperatures

are causing some fish species to mate early, decoupling their breeding cycle from the seasonal phytoplankton blooms on which their young feed. At UCLA, neuroscientist Carolyn Parkinson discovered that you can use an fMRI (functional magnetic resonance imaging) scan to reliably detect if two people are friends by observing similarities in how they react to stimuli. And Yale's Joseph Shapiro conducted the first comprehensive study of the effects of the Clean Water Act, pulling together data from all 50 states to show convincingly that the Act significantly decreased water-borne pollutants in our lakes and rivers.

Diversity, Equity, & Inclusion in STEM Higher Education

Half the world is female. Far more than half the world is nonwhite. Yet science, engineering, mathematics, and economics all struggle to attract and retain women and people of color in anything like representative numbers. Our programs in higher education strive to address this problem with a two-pronged approach. One prong provides financial support and other resources directly to individual students from underrepresented groups. A second prong focuses on helping bring lasting change to educational institutions in ways that make them more diverse, equitable, and inclusive to all.

Through our Minority Ph.D. program, the Foundation has been supporting nine Centers for Exemplary Mentoring (UCEMs) since 2013. UCEMs are campus-based initiatives that provide scholarships, faculty and peer mentoring, professional development activities, and other resources aimed at promoting successful completion of graduate study. Called Sloan Scholars, supported students receive a full support package from their university and an additional stipend of between $10,000 and $40,000 to support their work. As of the close of the year, the nine UCEMs in aggregate were supporting 364 Sloan Scholars across the sciences, mathematics, and engineering, nearly half of whom are women, in addition to the 45 students who have already successfully completed their Ph.D. These students join the 1,730 scholars supported through Foundation grants and fellowships from 1995 through 2013, of whom 1,163 have earned their Ph.D. Sloan Scholars in the UCEM program are approximately 61 percent Hispanic/Latinx, 32 percent African American/Black, 3 percent American Indian/Alaska Native.

A similar program designed to support American Indian and Alaska Native scholars, the Sloan Indigenous Graduate Partnership (SIGP), operates on four separate campus systems across the United States. At the end of 2018, the Foundation was supporting 72 indigenous students pursuing advanced degrees in STEM fields, and 176 others have received advanced degrees, both master's and doctorates, since the program launched in 2003. The program is clearly making a difference. To put these numbers in context, in 2017, one out of every four American Indian or Native Alaska STEM Ph.D. recipients in the U.S. was a Sloan Scholar.

These are impressive numbers, and they make the Foundation one of the largest private supporters of minority graduate education in the country, but what's more impressive still are the people behind those numbers, the Sloan Scholars themselves. We are inspired by the achievements and stories of the Sloan Scholars—like Samuel Perez, an immigrant from the Dominican Republic who entered the University of South Florida's Ph.D. program in electrical engineering in 2010 after 20 years of active service in the U.S. Air Force. Dr. Perez received his Ph.D. in 2018.

While we are proud of our efforts to support graduates like Dr. Perez, we realize that bringing more diversity to scientific education is a national challenge that requires national action. That's why the Foundation partnered with the National Academies to fund the dissemination of their consensus study, *Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce*. This study lays out how Minority Serving Institutions—higher education institutions whose undergraduate population is significantly nonwhite and low income—are tremendously important nodes in the U.S. educational ecosystem. It goes on to make a compelling case that prudent investment in these institutions is essential to building a diverse, competitive, 21st century STEM workforce.

Digital Information Technology

The Foundation's technology-focused grantmaking programs address the tremendous opportunities and challenges created by the explosion in our ability to collect, store, manage, share, and analyze data.

In 2015, the Foundation made a $600,000 grant in support of Stan, a probabilistic programming lan-

guage that massively simplifies the use of Bayesian methods for the analysis of data. Bayesian techniques can be powerful alternatives to frequentist statistical analysis, but most modern computational languages and statistical packages implement Bayesian methods only cumbersomely. Using Sloan support, Andrew Gelman at Columbia University expanded and augmented Stan, a language explicitly designed to implement Bayesian methods elegantly. Over the three years of the grant, which concluded in 2018, Stan had 12 new feature releases, including implementation of Riemannian Manifold Hamiltonian Monte Carlo sampling as well as the creation of Stan interfaces for popular statistical platforms Mathematica, MATLAB, and Scala. The results have been impressive. Citations of Stan in Google Scholar, a key indicator that it is being used in published work, have increased fourfold since 2015.

Benjamin Nickolls and Andrew Nesbitt used Sloan funding to document and publish a data resource called librarie.io that maps the "dependencies" between hundreds of thousands of software projects. The open source dataset they created is a crucial resource for identifying the systemic vulnerabilities in software, so if a security vulnerability is identified in some software package or module, it can be easily determined which other software packages may share that same vulnerability. The dataset is already in use by several researchers and a data security consulting firm and the effort inspired Github to add a similar "dependency graph" feature to its social coding platform.

ORCID, a project to assign and propagate unique identifiers for every scientific and academic author, reached a major milestone in 2018: five million registered IDs. Started with the help of a $350,000 grant from the Sloan Foundation in 2013, ORCID is now a flourishing enterprise that is helping ease scientific communication and the dissemination of ideas through enabling unambiguous attributions of scientific authorship. In other milestone news, web annotation platform and former Sloan grantee Hypothes.is ended 2018 with more than four million annotations in its database, double the number just a year prior.

In the Foundation's Universal Access to Knowledge program, the Digital Public Library of America (DPLA) launched Open Bookshelf, a collection of more than 5,000 openly licensed eBooks available for free to the public. Open Bookshelf's growing library includes everything from public domain classics to academic titles to government publications like the Mueller Report. DPLA also continues to grow the DPLA Exchange, with nearly 300,000 titles available by the end of 2018. Wikimedia, which receives over 15 billion pageviews per month, has substantially increased its number of unique devices, pageviews, articles, and mobile edits, as well as funded women-centered editing projects. It continues to move ahead to digitize the metadata of over 50 million media files on Wikimedia Commons—the world's largest repository of freely licensed educational media—converting them to a structured and machine-readable format so that they become easier to view, search, edit, organize, and reuse.

Public Understanding of Science and Technology

Grantees in our programs in the Public Understanding of Science aim to create compelling works of art that bridge the two cultures of the sciences and the humanities and that explore the artistic possibilities that open when artists take science and technology seriously as inspiration. The year 2018 was a strong year for the Foundation's Public Understanding grantees.

Nine books were published in the Foundation's books program, including Carl Zimmer's *She Has Her Mother's Laugh* about the complex science of inheritance, the 26th volume of the *Correspondence of Charles Darwin*, and Seth Fletcher's *Einstein's Shadow*, about the quest to create the Event Horizon telescope, which in early 2019 succeeded in its mission to take the first radio photograph of a black hole. To mark the 200th anniversary of the publication of Mary Shelley's *Frankenstein*, the Foundation's New Media program partnered with Arizona State University and MIT on a project to produce an open source, interactive, annotated, digital version of the text. The year 2018 was also a very successful one for the Foundation's film program. Three feature films developed through the Foundation's comprehensive film pipeline were released to general audiences: *The Catcher was a Spy*, based on the true story of a professional baseball player who served as an OSS spy during the Second World War; *Radium Girls*, about the young women in the 1920s who were poisoned while painting watches with irradiated paints; and *To Dust,* a fictional story about a Hasidic man who becomes obsessed with the process of decomposition following the death of his wife. In theater, the Foundation's partnership with the Ensemble Studio Theatre resulted in a critically acclaimed mainstage production in May 2018 of *BUMP*, Chiara Atik's

play about the true-life story of a car mechanic who invented a device for helping deliver babies during difficult births. In television, a Foundation-supported documentary, *The Eugenics Crusade*, explored the sinister role eugenics and eugenic thinking have played in American history, an effort which garnered a 2019 Writers Guild Award for best documentary script.

The New York City Program

Since its founding in 1934, the Foundation has been proud to call New York City home. Grants in our New York City program seek to help the City and its residents flourish in ways connected to our larger mission to advance research and education in science, technology, and mathematics.

Many of the programs the Foundation funds in our New York City program honor exceptional New Yorkers. Since 1985, the Foundation has partnered with the Fund for the City of New York to honor lifelong New York City public servants with the Sloan Public Service Awards. The 2018 winners included Jane Bedell, who oversees the NYC Health Department's initiatives to create cultures of health in the City's poorest neighborhoods, and Sandy Bryant-Townsend, who oversees the City's administration of the Supplemental Nutrition Assistance Program. Similarly, the Sloan Awards for Excellence in Teaching Science and Mathematics reward and honor exceptional science and math instruction in New York City high schools. Winners in 2018 include Jonathan Rothman, a teacher with a passion for showing math's practical side, and Terrence McKiernan, a teacher who excites his students in the Bronx by showing them how biology can be a vehicle for advancing social justice in areas like water quality, insecticides, nutrition, and pollution.

Leading a team at New York University, Jane Carlton conducted a Sloan-funded study of protists in New York City pets and pests. Examining a sample of nearly 350 cats, dogs, rats, pigeons, and cockroaches, Carlton found a diverse protist community among urban animals, including several parasites that could potentially spread from animals to humans. She also found that there was significant intraspecies variation in what protists a pet or pest carried. It's an interesting study in its own right, but even more so when you remember that protists are carried *inside* animals, so the study required detailed examination of excrement. Here at Sloan, we can't decide if we're more impressed by the strength of Carlton's research or of her stomach.

Conclusion

Reading over this admittedly limited sample of our grantees' work, we are struck by how diverse their research interests are. The possibilities for discovery are everywhere—from the outer rim of the galaxy to the inner core of the Earth—and with them comes the possibility to drive forward our ability to make the world a better place. It was that hope—a better world driven by a better understanding of the world—that inspired Alfred P. Sloan to create the Sloan Foundation. And it is that hope that continues to animate us, and our grantees, to this day.

About the Grants Listing

Grants listed in this report are divided into three types.

Trustee Grants are grants for amounts greater than $125,000. All trustee grants are reviewed by an independent panel of experts and are presented quarterly to the Board of Trustees for approval.

Grants Made Against Prior Authorizations are grants in any amount made from funds set aside by the Board of Trustees to be used for specific purposes. Depending on the amount or subject matter of the grant, grants made against prior authorizations may or may not have been subject to external review by an independent panel of experts. For each authorization, the Foundation reports once yearly to the Board of Trustees about grants made against the authorized funds.

Officer Grants are grants for amounts less than or equal to $125,000. Depending on the amount or subject matter of the grant, officer grants may or may not have been subject to external review by an independent panel of experts. Officer grants made by the Foundation are reported to the Board of Trustees quarterly.

Grants are listed by program, then by grant type, then alphabetically by the name of the institution receiving the grant. Not all programs make grants of each type each year.

2018 Grants by Program

Sloan Research Fellowships

PROGRAM DIRECTOR: DANIEL L. GOROFF

Established in 1955 by Alfred P. Sloan Jr., these $65,000 awards accelerate scientific breakthroughs by providing support and recognition to outstanding early-career faculty based on their research accomplishments and promise in eight fields: chemistry, computer science, computational and evolutionary molecular biology, economics, mathematics, neuroscience, ocean sciences, and physics. An independent panel of senior scholars in each field selects fellowship winners. Since the beginnings of the program, some $439 million (2018$) has been awarded to more than 5,700 fellows, many of whom have gone on to highly esteemed careers: 47 Sloan Research Fellows have become Nobel Laureates; 17 have received the Fields Medal in mathematics; 18 Fellows have won the John Bates Clark Medal in economics; and 69 have been awarded the National Medal of Science. Hundreds of others have received notable prizes, awards, and honors in recognition of their major research achievements.

2018 Fellows

Boston University
Jennifer Balakrishnan, *MATHEMATICS*
Anushya Chandran, *PHYSICS*
Wen Li, *PHYSICS*

Brown University
Melody Chan, *MATHEMATICS*

California Institute of Technology
Konstantin Batygin, *PHYSICS*
Jim Fuller, *PHYSICS*
David Simmons-Duffin, *PHYSICS*

University of California, Berkeley
Anca Dragan, *COMPUTER SCIENCE*
Supreet Kaur, *ECONOMICS*
Markita Landry, *NEUROSCIENCE*
Raluca Popa, *COMPUTER SCIENCE*
Danny Yagan, *ECONOMICS*
Norman Yao, *PHYSICS*

University of California, Irvine
Jenny Yang, *CHEMISTRY*

Canadian physicist and former Sloan Research Fellow Donna Strickland was awarded the Nobel Prize in 2018 for her pioneering work on pulsed lasers, making her the third woman in history to win physics' highest honor.
(PHOTO COURTESY OF FLICKR USER BENGT NYMAN CC BY 2.0)

University of California, Los Angeles
Daniele Bianchi, *OCEAN SCIENCES*
Jingyi (Jessica) Li, *CEMB*
Hosea Nelson, *CHEMISTRY*
Carolyn Parkinson, *NEUROSCIENCE*
Ellen Sletten, *CHEMISTRY*

University of California, Riverside
Sandra Kirtland Turner, *OCEAN SCIENCES*

University of California, San Diego
Ludmil Alexandrov, *CEMB*
Elena Koslover, *PHYSICS*
Tongyan Lin, *PHYSICS*
Tenio Popmintchev, *PHYSICS*

University of California, Santa Cruz
Alexie Leauthaud, *PHYSICS*

Carnegie Mellon University
Chris Harrison, *COMPUTER SCIENCE*
Bryan Parno, *COMPUTER SCIENCE*
Andrew Pavlo, *COMPUTER SCIENCE*
Andreas Pfenning, *CEMB*
Venkat Viswanathan, *CHEMISTRY*

The University of Chicago
Timothy Berkelbach, *CHEMISTRY*
Mark Sheffield, *NEUROSCIENCE*

Columbia University
David Kipping, *PHYSICS*

Cornell University
Brett Fors, *CHEMISTRY*
Karthik Sridharan, *COMPUTER SCIENCE*
Jin Suntivich, *CHEMISTRY*

Dartmouth College
Treb Allen, *ECONOMICS*
Katherine Mirica, *CHEMISTRY*

Duke University
Lillian Pierce, *MATHEMATICS*

East Carolina University
Rebecca Asch, *OCEAN SCIENCES*

Georgia Institute of Technology
Vinayak Agarwal, *OCEAN SCIENCES*
Bilal Haider, *NEUROSCIENCE*
Lutz Warnke, *MATHEMATICS*

University of Georgia
Julia Diaz, *OCEAN SCIENCES*

Harvard University
Tristan Collins, *MATHEMATICS*
Finale Doshi-Velez, *COMPUTER SCIENCE*
Samuel Gershman, *NEUROSCIENCE*
Yaron Singer, *COMPUTER SCIENCE*
Stefanie Stantcheva, *ECONOMICS*

University of Illinois, Urbana-Champaign
Qian Chen, *CHEMISTRY*
Ying Diao, *CHEMISTRY*
Pinshane Huang, *PHYSICS*

Johns Hopkins University
Janice Chen, *NEUROSCIENCE*
Yi Li, *PHYSICS*
Suchi Saria, *COMPUTER SCIENCE*
Shigeki Watanabe, *NEUROSCIENCE*

University of Maryland, College Park
Maissam Barkeshli, *PHYSICS*

Massachusetts Institute of Technology
Isaiah Andrews, *ECONOMICS*
Tamara Broderick, *MATHEMATICS*
Riccardo Comin, *PHYSICS*
Kevin Esvelt, *CEMB*
Stefanie Jegelka, *COMPUTER SCIENCE*
Andrei Negut, *MATHEMATICS*
Gabriela Schlau-Cohen, *CHEMISTRY*
Alex K. Shalek, *CHEMISTRY*

Memorial Sloan Kettering Cancer Center
Daniel Bachovchin, *CHEMISTRY*

McGill University
Hamed Shateri Najafabadi, *CEMB*
Stuart Trenholm, *NEUROSCIENCE*

Michigan State University
Thomas Walpuski, *MATHEMATICS*

University of Michigan
Andrew Ault, *CHEMISTRY*
Eleanor Clowney, *NEUROSCIENCE*
Jia Deng, *COMPUTER SCIENCE*
Ada Eban-Rothschild, *NEUROSCIENCE*

University of Minnesota
Frank Albert, *CEMB*

New York University
Afonso Bandeira, *MATHEMATICS*
Joan Bruna Estrach, *MATHEMATICS*
Tianning Diao, *CHEMISTRY*
Miranda Holmes-Cerfon, *MATHEMATICS*

North Carolina State University
Tye Lidman, *MATHEMATICS*

University of North Carolina, Chapel Hill
Yaiza Canzani, *MATHEMATICS*

Northeastern University
Daniel Wichs, *COMPUTER SCIENCE*

Ohio State University
Zeynep Saygin, *NEUROSCIENCE*
Hannah Shafaat, *CHEMISTRY*

The Pennsylvania State University
Cui-Zu Chang, *PHYSICS*
Rebekah Dawson, *PHYSICS*
Xin Zhang, *CHEMISTRY*

Sloan Research Fellow Emi Nakamura of the University of California, Berkeley, won the John Bates Clark Medal in 2019 for her path-breaking contributions to macroeconomics. Awarded annually by the American Economic Association, the medal is widely regarded as the highest honor available to a U.S. economist under the age of 40.
(PHOTO COURTESY OF EMI NAKAMURA. PHOTO BY JEFFREY SCHIFMAN.)

University of Pennsylvania
Eduardo Azevedo, *ECONOMICS*
Shinjae Chung, *NEUROSCIENCE*
Iain Mathieson, *CEMB*

Princeton University
Todd Hyster, *CHEMISTRY*
Mary Stoddard, *CEMB*

Purdue University
Rajamani Gounder, *CHEMISTRY*

Rice University
James Chappell, *CEMB*

Rockefeller University
Li Zhao, *CEMB*

Rutgers, The State University of New Jersey
Jacquelyn Noronha-Hostler, *PHYSICS*
Shubhangi Saraf, *COMPUTER SCIENCE*

University of Texas, Austin
Alexander Huth, *NEUROSCIENCE*

University of South Florida
Xinfeng Liang, *OCEAN SCIENCES*

University of Texas, Austin
Joe Neeman, *MATHEMATICS*
Simon Peter, *COMPUTER SCIENCE*
Livia Schiavinato Eberlin, *CHEMISTRY*

Stanford University
Matteo Cargnello, *CHEMISTRY*
Arun Chandrasekhar, *ECONOMICS*
Julia Palacios, *CEMB*
Gordon Wetzstein, *COMPUTER SCIENCE*
Daniel Yamins, *NEUROSCIENCE*

University of Texas, El Paso
Skye Fortier, *CHEMISTRY*

Thomas Jefferson University
Timothy Mosca, *NEUROSCIENCE*

University of Toronto Scarborough
Robert Haslhofer, *MATHEMATICS*

University of Toronto
Arul Shankar, *MATHEMATICS*
Giulio Tiozzo, *MATHEMATICS*
Amar Vutha, *PHYSICS*

The University of Texas MD Anderson Cancer Center
Nidhi Sahni, *CEMB*

Vanderbilt University
Marcelo Disconzi, *MATHEMATICS*

Virginia Polytechnic Institute and State University
Frank Aylward, *OCEAN SCIENCES*

Washington University in St. Louis
Timothy Wencewicz, *CHEMISTRY*

University of Washington
Maya Cakmak, *COMPUTER SCIENCE*
Jiun-Haw Chu, *PHYSICS*
Arka Majumdar, *PHYSICS*
Jessica Werk, *PHYSICS*
Chelsea Wood, *OCEAN SCIENCES*

Yale University
David Breslow, *NEUROSCIENCE*
David Moore, *PHYSICS*
Joseph Shapiro, *ECONOMICS*
Stefan Steinerberger, *MATHEMATICS*
Yihong Wu, *MATHEMATICS*

Research

Chemistry of Indoor Environments

PROGRAM DIRECTOR: PAULA J. OLSIEWSKI

The Chemistry of Indoor Environments program aims to grow a new field of scientific inquiry focused on understanding the fundamental chemistry taking place in indoor environments and how that chemistry is shaped by building attributes and human occupancy.

Grants in this program aim to:

- **Generate new knowledge** by directly supporting original, high-quality research to identify indoor chemical sources, characterize the chemical and physical transformations taking place indoors, and determine how indoor chemistry is shaped by building attributes and occupancy;
- **Develop a modeling consortium** to improve the cohesiveness of the community and its ability to integrate findings;
- **Build a thriving, multidisciplinary research community** of chemists; environmental, civil, and mechanical engineers; architects; atmospheric scientists; microbiologists; and environmental health experts that will endure beyond the program's timeline;
- **Train the next generation of scholars** and introduce new voices into the field through educating and engaging graduate and postgraduate researchers;
- **Advance capacity for discovery** through development of new tools for data collection, sampling, analysis, and visualization;
- **Attract dedicated funding from federal agencies** by demonstrating the existence of important gaps in our scientific knowledge and the potential for federal intervention to fill them.

Trustee Grants

University of California, Berkeley

BERKELEY, CALIFORNIA

$780,000 over 36 months to expand understanding of the roles that microorganisms play in shaping the chemistry of indoor environments.

Project Director: Rachel I. Adams, Project Scientist

This grant funds a research project by Rachel Adams, research scientist at the University of California, Berkeley, to expand our understanding of how microorganisms shape the chemistry of indoor environments. Adams and colleagues will undertake a series of controlled chamber experiments to identify the boundaries of microbial production of chemical volatile organic compounds due to humidity on various surfaces fundamental to homes, including drywall, carpets, and wood. The team also plans to investigate the relative importance of growth substrate, including the dust matrix in which most household environmental microbes are embedded, and, by varying substrate and inoculum in a controlled manner, of microbial taxonomic identity. In addition to creating a more thorough inventory of MVOCs, these research activities will determine how changing environmental conditions underlie the microbial processes that determine chemical emissions.

This project will result in new knowledge about microbially mediated processes that impact the chemistry of indoor spaces. The results will be shared through peer-reviewed publications and presentations at meetings and workshops. Two undergraduate, one master's, and one Ph.D. student will be trained.

Colorado State University

FORT COLLINS, COLORADO

$253,684 over 36 months to develop and test software to identify isomers based on differences in binding energy using time-of-flight chemical ionization mass spectrometry.

Project Director: Delphine Farmer, Associate Professor

Mass spectrometry is a technique that ionizes chemical species and then sorts them by mass. While useful, spectrometry does not distinguish between chemical isomers, species with the same number and types of atoms as another chemical species. This is important; isomers possess distinct properties because their atoms are arranged into different chemical structures. Isomers may differ, for instance, in reactivity, vapor pressure, and the identity of products.

This grant will support work by Delphine Farmer, Associate Professor of Chemistry at Colorado State University, in collaboration with Ellison Carter, Assistant Professor of Civil and Environmental Engineering, to develop and test novel software for time-of-flight chemical ionization mass spectrometry that will allow researchers to identify isomers based on differences in binding energy.

Funded work includes software development, calibration, and validation using both individual isomers and mixtures of isomers, and field testing in an unoccupied residence.

The project will result in new software for both data acquisition and analysis, as well as field datasets, for sharing with the broader scientific community. The findings will be shared through publications from the instrument development component of the proposal, and additional publications when the instrument is used in an indoor study. The project will train at least one Ph.D. student in indoor chemistry and mass spectrometry instrument development.

Columbia University

NEW YORK, NEW YORK

$299,998 over 36 months to examine hydrolysis reactions on damp surfaces and the impact on indoor air quality.

Project Director: V. Faye McNeill, Associate Professor

Hydrolysis is a reaction in which water is used to break down chemical bonds. Preliminary evidence suggests hydrolysis reactions could be very important indoors, breaking down common man-made ester (MME) compounds like those found in PVC pipes, and diffusing the resulting degradation products into the air. This grant funds a project by V. Faye McNeill, Associate Professor of Chemical Engineering at Columbia University, to assess the impact of hydrolysis reactions of a range of man-made esters—occurring on damp indoor surfaces—on indoor air quality.

Grant funds will allow McNeill to adapt her outdoor atmospheric chemistry model, GAMMA (Gas-Aerosol Model for Mechanism Analysis), for application to the indoor environment. The adapted model, GAMMA-CIE, will introduce MME species, intermediates, and reaction products into the aqueous phase chemical mechanism, incorporate mass transfer between the aqueous and gas phases, and model oxidation in the gas phase.

In addition to this modeling work, McNeill will perform laboratory measurements to provide missing data for the MME hydrolysis cascade under alkaline conditions and will examine the effect of acidic pH and ionic content of the aqueous film on MME hydrolysis kinetics. Among the MME compounds to be characterized are Texanol, a component of latex paints; TXIB (trimethyl pentanyl diisobutyrate); BBzP (benzyl butyl phthalate); and DEHA (diethylhydroxylamine).

Last, McNeil will use the modified model to predict indoor air quality under typical domestic and commercial building scenarios. The model will simulate the fate of esters and the role of damp surfaces in realistic indoor conditions, providing new insights about indoor chemistry.

Indiana University

BLOOMINGTON, INDIANA

$743,509 over 36 months to examine radical concentrations and associated aerosol production in indoor environments.

Project Director: Phillip S. Stevens, Professor

Outdoors, strong ultraviolet light from the sun drives the photolysis of ozone, resulting in the production of hydroxyl (OH) radicals. Hydroxyl radicals, sometime referred to as "nature's vacuum cleaner" are highly reactive and short lived. They can react with volatile organic compounds leading to the formation of peroxy radicals. These radicals, in turn, react rapidly with a range of compounds, eventually producing secondary organic aerosols in the atmosphere. Yet much is unknown. Despite the absence of the strong ultraviolet light that drives oxidation reactions outdoors, there is preliminary evidence that indoor environments contain hydroxyl radicals. The pathways that generate these radicals and the role they play in indoor chemistry are mysteries.

Funds from this grant support an effort by Philip S. Stevens (Indiana University), in collaboration with Brandon Boor (Purdue University), to examine radical concentrations and associated aerosol production in indoor environments. The team aims to improve our understanding of oxidation chemistry in indoor environments through comprehensive measurements of radical concentrations, including their sources and sinks, as well as the impact of radical concentrations on aerosol production in several laboratories, chambers, and at least one residence.

The results of the studies will be shared through peer-reviewed journals and through presentations at meetings of the International Society of Indoor Air Quality and Climate, the American Chemical Society, and the American Association for Aerosol Research. At least four students will be trained.

Massachusetts Institute of Technology

CAMBRIDGE, MASSACHUSETTS

$299,424 over 36 months to develop a low-cost monitor for measurements of volatile organic compounds in the indoor environment.

Project Director: Jesse Kroll, Associate Professor

Test bed studies require Chemistry of Indoor Environment researchers to be able to make important indoor chemistry measurements quickly and at low cost. Unfortunately, there are no good low-cost sensors for volatile organic compounds (VOCs). This grant funds an effort to build one. It's an important effort. Many VOCs are harmful to human health and even those that aren't can react with oxidants, eventually leading to new particle and aerosol formation.

Over the next three years, Jesse Kroll—Associate Professor of Civil and Environmental Engineering and Associate Professor of Chemical Engineering at the Massachusetts Institute of Technology—will attempt to develop a low-cost monitor for measurements of volatile organic compounds in the indoor environment. The work plan has two major parts: the construction, characterization, and optimization of the VOC monitor, and the use of several such monitors in real indoor environments, providing both a proof-of-concept and initial measurements of indoor VOC levels.

The primary output of this project will be the monitor and associated algorithms as well as the associated research results. Descriptions of the optimized monitor design and calibration algorithms will be disseminated broadly via the peer-reviewed, open-access literature and conference presentations. At least one graduate student will be trained.

Max Planck Institute for Chemistry

MAINZ, GERMANY

$409,975 over 18 months to examine the role of humans and human emissions in indoor air chemistry.

Project Director: Jonathan Williams, Research Group Leader

This grant funds a research project by Jonathan Williams, research group leader, Max Planck Institute for Chemistry, in collaboration with Pawel Wargocki,

associate professor at the International Centre for Indoor Environment and Energy at the Technical University of Denmark (DTU) that will investigate the impact of exhaled and dermally emitted human emissions in climate chambers under different conditions of clothing, temperature, relative humidity, and ozone. Volatile organic compound (VOCs) emissions will be characterized by Williams and his team using state-of-the-art proton transfer reaction time-of-flight mass spectrometry (PTR-TOF-MS). Novel analytical techniques developed by Williams for outdoor use will be used to measure OH reactivity of the human emissions, which will account for any "missing" emissions.

Twin stainless steel climate chambers located at the DTU will be used to measure how human emissions vary between cold and dry versus hot and humid conditions, and how human emissions change with the presence of ozone and with different clothing. Williams' experiments will allow for the isolation of exhaled versus dermally emitted bio effluents and the contribution if each to OH reactivity will be separately measured. These measurements will allow Williams to make the first ever OH reactivity–based budget of the human-influenced indoor environment and will reveal what proportion of human emissions currently can be measured and what proportion is "missing."

This new knowledge will be shared through peer-reviewed publications and conference presentations. At least one postdoctoral fellow will be trained.

University of Michigan

ANN ARBOR, MICHIGAN

$300,000 over 36 months to examine the pH of indoor surfaces.

Project Director: Andrew Ault, Assistant Professor

This grant supports research by Andrew Ault, Assistant Professor of Environmental Health Sciences and Chemistry at the University of Michigan, to examine the pH of indoor surfaces and answer two related questions: "What are the properties of aqueous films on indoor surfaces?" and, more specifically, "What is the pH of surface water layers indoors?" To this end, Ault will determine the properties of water layers and range of pH values present on the surface of six common building materials—glass, concrete, drywall, latex painted drywall, carpet, and wood—as well as six associated proxy model systems—silicon dioxide, quicklime (cement)/limestone (aggregate), gypsum, synthetic rubber, nylon, and cellulose. Materials will be studied before and after aging for six months in a residential environment.

The project will determine the water and water layer properties (including island formation, structured water, and accessible water fraction) as a function of relative humidity (RH) for different materials, model systems, and aged samples. The project also will reveal the intrinsic pH of the samples as a function of RH, as well as the differences in pH for aged samples across spatial scales ranging from nano to macro. Last, Ault and his team will determine the sensitivity of pH to gaseous acids and bases and acidic aerosols and associated kinetics.

University of Saskatchewan

SASKATOON, CANADA

$729,933 over 37 months to examine photon fluxes, oxidants, and oxidant precursors in indoor environments.

Project Director: Tara Kahan, Associate Professor

Funds from this grant support a project by Tara S. Kahan, Associate Professor of Chemistry at the University of Saskatchewan, in collaboration with Jianshun Zhang, Professor of Mechanical Engineering at Syracuse University, to examine indoor photon fluxes and determine concentrations, sources, and sinks of indoor oxidants and oxidant precursors. The project will combine laboratory, field, and chamber studies to better understand oxidizing capacity from emerging precursors in residences. Kahan will investigate the sources and sinks of indoor oxidants by measuring oxidant precursor concentrations in three residences, measuring indoor photon fluxes under a range of conditions, and determining oxidant concentrations via chamber experiments that simulate indoor conditions.

The results will be shared through peer-reviewed publications in journals such as Environmental Sciences & Technology and Indoor Air. The team also plans to make presentations at conferences and meetings, including meetings of the International Society of Indoor Air Quality and Climate and the American Association for Aerosol Research. One postdoctoral scholar, three graduate students, and one undergraduate student will be trained during this project.

Virginia Polytechnic Institute and State University

BLACKSBURG, VIRGINIA

$312,170 over 24 months to develop and test a field-deployable gas chromatograph coupled to a chemical ionization mass spectrometer, GC- CIMS, to identify isomers.

Project Director: Gabriel Isaacman-VanWertz, Assistant Professor

Funds from this grant support a team led by Virginia Tech's Gabriel Isaacman-VanWertz to improve our ability to detect chemical isomers indoors through the development of a field-deployable gas chromatograph coupled to a chemical ionization mass spectrometer. This proposed research is divided into three technical tasks: First, Issacman-VanWertz will engineer the physical and technical interface between the major instrument components. Then he will characterize and calibrate the new instrument. Finally, he will deploy the instrument in an on-campus controlled indoor environment to examine emissions.

The team plans to share their findings through peer-reviewed articles and presentations at several scientific and professional conferences.

Washington University in St. Louis

ST. LOUIS, MISSOURI

$298,758 over 24 months to develop a chemically-resolved volatility and polarity separator for improved understanding of indoor air chemistry.

Project Director: Brent Williams, Associate Professor

Funds from this grant support a team led by Brent Williams of Washington University in St. Louis to improve our ability to collect and analyze indoor air samples through the development of a chemically resolved volatility and polarity separator. The project aims to build and test a new field-deployable automated instrument for the simultaneous measurement of organic gas and particle chemical composition. The work plan has three parts. First, Williams and his team will develop a modified volatility and polarity separator capable of detailed chemical characterization of the particle phase and gas phase of airborne indoor organic material. Next they will demonstrate the strengths of the new measurement capacity through controlled laboratory studies and through an indoor field study. Last, they will develop an open-access volatility- and polarity-separated chemical profile database of indoor sources and transformations, along with open-access data analysis codes for use by the indoor air research community.

Predicted outcomes of this project include the new instrument, the open access data base, and new knowledge about the composition of indoor air. The team plans to share their findings through multiple peer-reviewed publications and conference presentations on instrument development and through open-access chemical databases and analysis codes. One postdoctoral fellow and three graduate students will be trained.

York University

TORONTO, CANADA

$274,942 over 36 months to develop analytical platforms for the detection of reactive nitrogen indoors.

Project Director: Trevor VandenBoer, Visiting Professor

Reactive nitrogen species—nitrous acid (HONO), ammonia (NH3), and amines (NR3)—are present indoors. These reactive nitrogen species are important because of the associated chemical and physical transformations. Outdoors, amines are implicated in particle formation. And HONO is photolabile, which means it decomposes in the presence of light, generating the important oxidant hydroxyl radical. Hydroxyl radicals can then rapidly react with volatile organic compounds, leading to secondary aerosol formation. Detecting concentrations of these chemicals is vital to answering key questions about the chemistry of indoor environments, such as "What is the role of ammonia and amines in indoor chemistry?" and "To what extent do they contribute to new particle formation?"

This grant funds a team led by Trevor VandenBoer, Visiting Professor of Chemistry at York University, that aims to develop analytical platforms for the detection of reactive nitrogen indoors. The work plan has three parts. First, the team plans to develop new selective sampling methodologies for the passive collection of HONO, ammonia, and amines in indoor environments. Second, they plan to design and construct a real-time monitor for HONO and total reactive nitrogen that can discriminate between gas and particulate pools. Finally, they will validate the new methods both against traditional benchmarks and through deployment in various indoor environments.

The team plans to share their findings through peer-reviewed articles and presentations at several scientific and professional conferences. One postdoctoral fellow, three graduate students, and numerous undergraduates will be trained over the course of the project.

University of York

YORK, UNITED KINGDOM

$254,546 over 26 months to develop an open source model for investigating indoor gas-phase chemistry and expand science communications about indoor chemistry.

Project Director: Nicola Carslaw, Reader

Modeling is essential to the development of indoor chemistry as a field. Comprehensive, integrated physical-chemical models that include a realistic representation of how buildings influence indoor processes are needed to assess gaps in our understanding, to improve experimental design, to generate hypotheses for investigation, to guide measurements, and to indicate key species to quantify and the detection limits required for quantification.

The Modelling Consortium for Chemistry of Indoor Environments (MOCCIE) consists of six teams of investigators with expertise and models in six different areas: kinetic process modeling, gas-phase chemistry modeling, molecular dynamics simulations, modeling of indoor secondary organic aerosols and organic aerosols, computational fluid dynamics modeling, and modeling surface interactions and the role of clothing and textiles. MOCCIE has determined that the best way to ensure reproducible indoor chemical science is to strive to construct a fully integrated open source model. This requires converting each of the six existing MOCCIE models into an open source format.

Funds from this grant would support a project to convert Nicola Carslaw's gas phase chemistry model into a fully open source platform using the Python programming language. Additional funds support the construction of a new user-friendly interface to facilitate the model's use and production of supporting documentation.

In addition to the modeling work, Carslaw will work to expand science communications about indoor chemistry by engaging a U.K.-based freelance science journalist, Nina Notman. Notman will attend indoor chemistry events and conferences and give a plenary on science communication at the 2018 Indoor Air Conference.

Grants Made Against Prior Authorizations

In December 2017, the Trustees authorized the expenditure of up to $250,000 for small grants to facilitate the development of the Chemistry of Indoor Environment program. The following grants were made against this previously authorized fund.

College of William and Mary

WILLIAMSBURG, VIRGINIA

$50,000 over 12 months to develop the indoor surface extractor/collector.

Project Director: Rachel O'Brien, Assistant Professor

University of Colorado, Boulder

BOULDER, COLORADO

$125,000 over 12 months to provide partial support for an instrument to improve detection of volatile organic compounds.

Project Director: Joost de Gouw, Senior Scientist & Fellow

University of Michigan

ANN ARBOR, MICHIGAN

$24,269 over 12 months to support a workshop on indoor surface chemistry.

Project Director: Andrew Ault, Assistant Professor

University of Texas, Austin

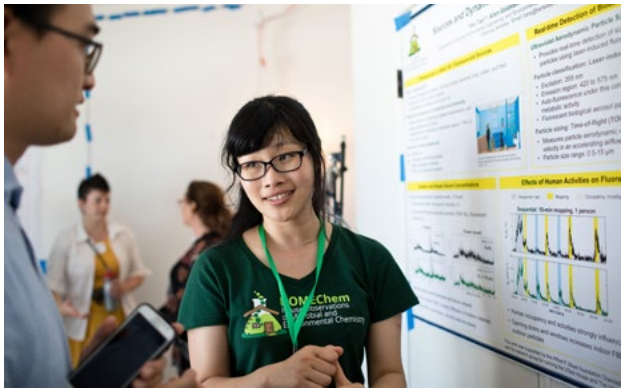
AUSTIN, TEXAS

$74,996 over 8 months to support HOMEChem documentation as a basis for education and outreach activities.

Project Director: Lea Hildebrandt Ruiz, Assistant Professor

Group photo of participants in the HOMEChem field experiment in front of the University of Texas test house. All in all, more than 20 research groups from 13 universities participated in the project. (PHOTO: CALLIE RICHMOND)

Erin Katz, an undergraduate at Drexel University, calibrates a high-resolution aerosol mass spectrometer for use during the HOMEChem experiment. (PHOTO: CALLIE RICHMOND)



Yilin Tian explains her work on the detection of fluorescent biological aerosol particles emitted indoors. Participation in HOMEChem is part of Dr. Tian's postdoctoral studies. (PHOTO: CALLIE RICHMOND)

Officer Grants

National Press Foundation

WASHINGTON, DISTRICT OF COLUMBIA

$5,540 over 3 months to demonstrate how HOMEChem activities can be translated for a lay audience via journalism.

Project Director: Sandy Johnson, President & COO

Advanced Science Research Center, CUNY

NEW YORK, NEW YORK

$30,746 over 8 months to support a workshop on nanoscale chemistry of indoor environments.

Project Director: Rein V. Ulijn, Director

University of Texas, Austin

AUSTIN, TEXAS

$76,000 over 18 months to analyze building performance data of the UTest House for HOMEChem.

Project Director: Atila Novoselac, Profressor

University of Texas, Austin

AUSTIN, TEXAS

$70,043 over 32 months to examine ozone reactions with four common indoor materials.

Project Director: Atila Novoselac, Profressor

Deep Carbon Observatory

PROGRAM DIRECTOR: PAULA J. OLSIEWSKI

The Deep Carbon Observatory (DCO) is a ten-year international collaborative research project that has aimed to radically transform our understanding of the quantities, movements, distribution, and properties of deep Earth carbon and its roles in the origin and limits of life, the creation of hydrocarbons, and the global carbon cycle.

Over the ten years of this program, ending in 2019, grantmaking sought to create an international, multidisciplinary community of geologists, mineralogists, geophysicists, chemists, biochemists, microbiologists, and technologists that would:

- Benchmark the current state of our understanding of deep carbon;
- Develop an ambitious, intellectually rigorous research agenda;
- Cooperatively raise funding and execute that research agenda;
- Synthesize and disseminate findings to the larger scientific community and the public;
- Strengthen the geophysical research community through the training of the next generation of young geoscientists and through the development of new instruments, models, and analytical methods.

While Sloan's grantmaking was completed in 2018, several key grants extend to the end of 2019 to allow the DCO community to complete its work, especially with regard to synthesis and the establishment of legacies. The Foundation's grants to the DCO focused on providing funds for organization, institutional infrastructure, data management, and early instrument development.

To learn more about the Deep Carbon Observatory, visit the project website at deepcarbon.net

Trustee Grants

University of California, Davis

DAVIS, CALIFORNIA

$750,000 over 21 months to lead the modeling and visualization activities of the Deep Carbon Observatory to achieve maximum contributions and legacies during the synthesis phase of the program.

Project Director: Louise Kellogg, Professor

One of the most far-reaching ambitions of the Deep Carbon Observatory is an omnibus modeling effort to integrate knowledge about the movements and transformations of carbon, an effort spanning the core, mantle, and crust over the four and a half billion years since Earth's formation. The prospect is daunting, ranging from molecular processes to lava flows, to continent formation, from diamonds, to microbes, to billions of tons of sinking sediments, from temperatures conducive for life to those that melt iron, from pressures allowing delicate films to form to those that crush carbon into diamonds, and from momentary events to those so slow that in comparison the adjective "glacial" describes the blink of an eye. In addition, the temptation to model the evolution of the planet, including the emergence of life and the biosphere, proved irresistible.

Funds from this grant provide continued support to the Deep Carbon Observatory Modeling Forum in its efforts to provide an intellectual framework for the DCO's modelers and to create key component models to speed and integrate their work. Over the next 21 months, the project team will continue its work developing open access platforms and tools for the modeling and visualization of deep carbon. Funded activities include software development, participation in the wider DCO's synthesis activities, the holding of a workshop on modeling and visualization, and a series of "immersion" workshops designed to introduce DCO researchers to immersive model visualization.

University of Cambridge

CAMBRIDGE, UNITED KINGDOM

$214,973 over 14 months to innovate observations of volcanic emissions with unmanned aerial systems.

Project Director: Emma Liu, Leverhulme Early Career Research Fellow

A vexing problem in studies of volcanism, and outgassing more generally, is that there is much that satellites cannot see, but it is terribly dangerous to get close enough to measure emissions of interest when things are most active—and usually very hot. Drones could vastly improve the completeness of monitoring of outgassing, affordably.

DECADE, the Deep Earth Carbon Degassing project, is a collaboration within the Deep Carbon Observatory that uses new and established technologies to determine accurate global fluxes of volcanic CO2 to the atmosphere. So far DECADE has installed CO2 monitoring networks on 20 of the world's 150 most actively degassing volcanoes. Funds from this grant support efforts by Emma Nicholson Liu to pioneer integration of drones into volcanic monitoring by experimenting with their use in monitoring a pair of previously uncharacterized emission sources in Papua, New Guinea. In addition to drone development, deployment, and analysis of data, the team plans two short movies for general audiences.

University of Cambridge

CAMBRIDGE, UNITED KINGDOM

$149,130 over 21 months to provide strategic vision and leadership of the Deep Carbon Observatory Synthesis Group for the 2019 program finale.

Project Director: Marie Edmonds, University Reader, Fellow

Funds from this grant provide 21 months of support for the continued operation of the Deep Carbon Observatory's Synthesis Group 2019 (SG 2019). Led by University of Cambridge geologist Marie Edmonds, SG 2019 is tasked with overseeing and managing the synthesis of the intellectual output of the DCO, bringing together into a coherent whole the diverse observations, insights, models, and datasets generated over the past 10 years by hundreds of DCO scientists across the globe. Funded activities include the writing of a decadal report summarizing the DCO's scientific and technical accomplishments; the planning and execution of several culminating events in 2019; the production of infographics, videos, and educational materials based on DCO insights; and the production of several synthesis papers for publication in high-value journals like Nature and American Mineralogist. Grant funds will provide administrative and travel support to Edmonds, allowing her to work closely and effectively with DCO leadership in the United States and around the world.

A DCO expedition launched in 2018 uses innovative unmanned aerial system technologies (drones) to measure carbon gas emissions at volcanoes in Papua New Guinea. These strongly degassing volcanoes are largely uncharacterized because their plumes are challenging to access using ground-based techniques. **(PHOTO: EMMA LIU)**

Carnegie Institution of Washington

WASHINGTON, DISTRICT OF COLUMBIA

$1,648,920 over 18 months to support the Secretariat of the Deep Carbon Observatory to bring the program to effective closure and assure its legacies.

Project Director: Robert M. Hazen, Executive Director, Deep Carbon Observatory

This grant provides operational and administrative support to the governing secretariat of the Deep Carbon Observatory (DCO), headquartered at the Carnegie Institution for Science, which is charged with coordinating and synthesizing the work of DCO's researchers, who number more than 1,300 and are spread across some 40 countries worldwide. Grant funds will offset operational costs of the international steering committee; provide support for the secretariat chairs, geoscientists Robert Hazen and Craig Manning; facilitate the DCO's grand finale in Washington, D.C. in October 2019; and support several activities aimed at securing the legacies of the DCO at the conclusion of Foundation funding.

Rensselaer Polytechnic Institute

TROY, NEW YORK

$468,737 over 14 months to continue to lead the data science and management dimensions of the Deep Carbon Observatory and contribute to program synthesis.

Project Director: Peter A. Fox, Constellation Professor

Peter Fox leads a team at the Rensselaer Polytechnic Institute (RPI) that both conducts original deep carbon research and provides data management services to the scientists working in the Deep Carbon Observatory (DCO). Funds from this grant will allow Fox and his crew to continue to lead these data science efforts for the final 15 months of the DCO.

To date, RPI researchers and tools have made possible breakthroughs by the DCO in, for example, understanding the "social life of minerals," that is, co-occurrence of minerals, especially carbon-based ones. And RPI efforts have led to fast adoption by DCO researchers of the Jupyter notebook, the popular, web-based interactive computational platform. Going forward, grant funds will support RPI efforts to stimulate and visualize DCO discoveries, and to assure that data, models, publications, and other information are archived and accessible.

University of Rhode Island

KINGSTON, RHODE ISLAND

$899,795 over 21 months to support Engagement: The Deep Carbon Observatory's Road to 2019.

Project Director: Robert Pockalny, Associate Marine Research Scientist

The core work of the Deep Carbon Observatory's engagement team, headquartered at the University of Rhode Island (URI), consists of community building and management. The team writes the DCO's newsletter, maintains a contact database of DCO-affiliated scientists, produces the DCO bibliography, handles educational and outreach partnerships with entities such as National Geographic and the Smithsonian, updates articles about the DCO and deep carbon science in Wikipedia, and conducts all media relations. As the DCO moves toward its planned conclusion in 2019, the engagement team will have additional responsibilities associated with the synthesis of DCO research and the effective communication of its import to the wider scientific community and the public. This grant continues operational support for the DCO's engagement team for 21 months.

Grants Made Against Prior Authorizations

In October 2018, the Trustees approved the expenditure of up to $884,917 for grants in support of the Deep Energy, Extreme Physics and Chemistry, and Reservoirs and Fluxes research communities of the Deep Carbon Observatory. The following grants were made against this previously authorized fund.

University of California, Los Angeles

LOS ANGELES, CALIFORNIA

$312,000 over 12 months to complete and synthesize the work of the Deep Energy community of the Deep Carbon Observatory.

Project Director: Edward D. Young, Professor

University of California, Los Angeles

LOS ANGELES, CALIFORNIA

$104,166 over 12 months to lead and synthesize the activities of the Extreme Physics and Chemistry community of the Deep Carbon Observatory.

Project Director: Craig E. Manning, Principle Investigator

Carnegie Institution of Washington

WASHINGTON, DISTRICT OF COLUMBIA

$468,750 over 12 months to synthesize the work of the Reservoirs and Fluxes Community of the Deep Carbon Observatory.

Project Director: Steve Shirey, Research Staff Member, Geochemistry

Officer Grants

University of Arizona

TUCSON, ARIZONA

$125,000 over 12 months to integrate and synthesize knowledge of evolution of carbon minerals.

Project Director: Robert T. Downs, Professor

University of Sydney

SYDNEY, AUSTRALIA

$80,000 over 10 months to strengthen the deep carbon science community of Australia and to build further the tectonic ("GPlates") modeling platform for the deep carbon cycle.

Project Director: Sabin Zahirovic, Postdoctoral Research Associate

Economic Institutions, Behavior, and Performance

PROGRAM DIRECTOR: DANIEL L. GOROFF

The Foundation's program on Economic Institutions, Behavior, and Performance supports rigorous and unbiased research projects on U.S. economic structure, behavior, and performance whose findings inform and strengthen decision-making by regulators, policymakers, and the public.

Grants made through this program span three broad subject areas:

- **Behavioral Economics Theory and Applications**
  Projects in this area study households and individuals, specifically the role of "choice architecture" on their economic decision-making. Research topics include: behavioral macroeconomics; salience and attention; risk-taking and insurance markets; time inconsistencies and the annuity paradox; cognitive biases; behavioral applications to policy; experimental testing of nudges or other regulatory interventions and the measurement of their effects on welfare; obfuscated markets; consumer finance; and probabilities and perceptions of extreme events.
- **Economic Analysis of Science and Technology**
  Projects in this sub-program study universities and groundbreaking industries, specifically regarding human capital development and applications of information technology. Research topics include: the productivity of the scientific enterprise; labor markets for scientists and engineers; patterns of scientific publication, collaboration, and intellectual property protection; markets for scientific equipment and instrumentation; the economics of digitization; new developments in U.S. productivity dynamics and measurement; the economics of artificial intelligence, robots, and other autonomous technology; and the social returns on investments in research and development.

- **Empirical Economic Research Enablers**
  Projects in this sub-program study economic researchers, specifically with regard to their needs, opportunities, incentives, and professional practices. Research topics include: causal inference; persistent identifiers; data citation standards; identification and tracking systems for scholars; federal statistics; smart disclosure platforms for obfuscated markets; data and metadata management protocols; the mathematics of privacy; access to social science datasets containing sensitive information; the replicability of empirical research; the economics of knowledge contribution and distribution; and the challenges and opportunities associated with "administrative data" not originally collected for research purposes.

Trustee Grants

American Friends of Toulouse School of Economics

SALISBURY, MARYLAND

$300,000 over 36 months to build out an open-source platform for reproducibly running large-scale behavioral experiments both online and in the laboratory.

Project Director: Daniel Chen, Professor

The suite of open source software tools known as "oTree" makes it simple to conduct behavioral experiments online or in laboratories. (The word "Tree" in the name refers to decision trees, and the prefix "o" stands for "open.") Without the need for sophisticated programming, researchers can easily build and run games on oTree that test all kinds of hypotheses about human decision-making.

This grant funds a project by Toulouse economics professor Daniel Chen to expand oTree's capabilities. Planned improvements include handling large-scale experiments, supporting continuous-time games, integrating oTree with other open source tools, improving documentation, diversifying its users and funders, and enhancing its long-term sustainability.

oTree is a Sloan-supported platform that allows researchers to easily set up, manage, and analyze controlled behavioral experiments in economics, psychology and related fields.

American Statistical Association

ALEXANDRIA, VIRGINIA

$898,783 over 24 months to recruit, train, place, and support academic statisticians and data scientists who will work as AAAS Fellows in the federal government.

Project Director: Ronald Wasserstein, Executive Director

The American Association for the Advancement of Science (AAAS) has been running its Science & Technology Policy Fellows program since 1973. The idea is for scientists and engineers to spend a year in the federal government learning about and contributing to government policymaking. The program has earned great bipartisan respect in D.C., and there is intense competition both for fellowships and for fellows. Professional societies—including the Institute of Electrical and Electronics Engineers, the American Physical Society, and the American Society of Mechanical Engineers—routinely work with AAAS on identifying and funding candidates. This grant will support such a partnership between the American Statistical Society, the Joint Policy Board for Mathematics, and the AAAS to recruit, place, and support six scientific fellows with expertise in data science and empirical research techniques. Each fellowship is for two years.

A group of school children climb that stairs at the 2019 National Math Festival in Washington, D.C. The annual festival brings mathematicians together with the public to inspire and challenge attendees of all ages to see math in new and unexpected ways. (PHOTO: ALLISON SHELLEY)

University of Arizona

TUCSON, ARIZONA

$291,997 over 24 months to study gender differences in the choice of subfield specialization among academic economists.

Project Director: Ronald Oaxaca, Professor Emeritus

Women economists cluster more in certain subfields (e.g., labor, health, public economics) than in others (e.g., macro, theory, or international trade). This grant funds work by labor economists Ron Oaxaca and Eva Sierminska to analyze this gendered difference in career choices among professional economists.

Rigorously analyzing why men and women make career decisions differently requires holding unchanged as many factors as possible besides gender. Focusing on career choices in graduate school allows just that. Ph.D. candidates in the same program, for example, interact with the same group of professors and advisors, expect similar sets of potential salaries, and face the same specialization options. Grant funds are supporting the creation of a public use dataset, analysis of that dataset, development of a website about the project, and the production of two research articles and a less technical policy brief reporting the results of the analysis.

Brookings Institution

WASHINGTON, DISTRICT OF COLUMBIA

$993,178 over 24 months to organize, structure, and synthesize research on the measurement of productivity.

Project Director: Louise Sheiner, Policy Director, Hutchins Center

Between 1947 and 1973, U.S. productivity grew an average of nearly 3 percent per year. Since 2007, that rate has dropped to 1.3 percent. Since 2010, it has plummeted to 0.5 percent. China and India excepted, other countries around the world have experienced similar drops in productivity growth. Why? What is going on?

This grant funds a project by a team led by Louise Sheiner at the Hutchins Center on Fiscal and Monetary Policy at the Brookings Institution to shed light on this "productivity puzzle." Over the next two years, Brookings will conduct and commission original and rigorous research on productivity, engage with stakeholders at U.S. statistical agencies about the quality and limitations of existing productivity measurements, produce 10 to 12 peer reviewed papers, hold six conferences on this and related issues, produce a conference volume, and disseminate recommendations on how to improve research and statistics about economic productivity.

California Institute of Technology

PASADENA, CALIFORNIA

$308,614 over 25 months to develop, test, and apply neuro-economic models of how decision-makers switch between habit-driven and goal-seeking behaviors.

Project Director: Colin Camerer, Robert Kirby Prof. of Behavioral Economics

This grant supports a project by Caltech economist Colin Camerer to use insights from neuroscience to develop better predictions and explanations of consumer behavior. Camerer is developing, testing, and applying neuro-economic models of how people switch between behaviors that are habit-driven or routine on the one hand and behaviors that are goal-seeking and deliberative on the other—with particular focus on measuring the differences in price elasticities associated with one type of behavior vs. the other. Camerer will test the predictions of his model against a meta-analysis of previous results as well as in a field experiment using vending machines to measure economic variables, including price and quantity responses, and psychological variables, including response times and attention patterns.

California Polytechnic State University

SAN LUIS OBISPO, CALIFORNIA

$1,684,036 over 36 months to develop software and other computational research infrastructure for providing safe and secure access to sensitive data.

Project Director: Brian E. Granger, Associate Professor

This grant funds a project led by Brian Granger to expand and enhance Jupyter Notebooks—a powerful, popular, and open-source scientific computing platform—to enhance its handling of private, proprietary, or otherwise sensitive data. Planned features to be developed and implemented include a nuanced permissions structure that can be used to ensure that only properly credentialed individuals can see or manipulate data, stronger event logging and internal telemetry, and encryption of data both at rest and in transit.

To test the software, Granger will work closely with a wide variety of data holders including a U.S. company dealing with health data; a German warehouse for financial data; and NYU's Center for Urban Science and Progress (CUSP), which collect all kinds of municipal data. Grant funds support software development along with a host of dissemination activities that will promote and test Jupyter's expanded capabilities among researchers dealing with sensitive data.

University of California, Berkeley

BERKELEY, CALIFORNIA

$287,500 over 13 months to support a special semester on the foundations and applications of data privacy research.

Project Director: Shafi Goldwasser, Director

The Simons Institute for the Theory of Computing at the University of California, Berkeley regularly devotes a semester to a given research topic, inviting interested researchers to make progress on the selected topic by either visiting regularly or taking up residence. This grant supports a semester at the Simons Institute devoted to advancing the theory and practice of data privacy.

Funds will support visitors, events, and projects covering three themes: foundations of data privacy; interactions with other areas, such as statistics and geometry; and socio-technical aspects of data privacy—including modern privacy regulation, practical deployment challenges, and fairness, accountability, and transparency (FAT) issues. Program participants will include 23 senior visitors, 8 postdoctoral fellows, and over 20 graduate students. Expected outputs from this grant include a series of academic papers published by collaborating attendees and a white paper that describes findings and their implications for policy and practice.

University of Chicago

CHICAGO, ILLINOIS

$690,000 over 36 months to develop, debug, and disseminate macroeconomic models and software that do not assume rational expectations.

Project Director: Thomas Sargent, Distinguished Research Fellow

In economics, the assumption called "rational expectations" holds that the value of a variable expected by agents in a model matches the expected value predicted by the model. As a description of the decision-making processes of actual, real-life people, rational expectations models seem unrealistic. The idea nevertheless dominates much of contemporary economics, not least because it vastly simplifies the modeling process.

This grant funds work led by Nobel laureates Tom Sargent and Lars Hansen to develop a robust, mathematically rigorous alternative to rational expectations models. Sargent and Hansen envision agents not as utility maximizers with fully rational expectations, but rather as decision-makers using Bayesian reasoning to update their beliefs in light of uncertainty and limited information. The approach, while technically daunting, is very promising as a better description of real life. Grant funds will support the development, debugging, and dissemination of new models and of the software for analyzing them as well as a workshop, conference, and travel expenses for junior scholars participating in the project.

University of Chicago

CHICAGO, ILLINOIS

$399,974 over 24 months to study the complementarity between prediction algorithms and human decision-making.

Project Director: Jens Ludwig, McCormick Foundation Professor

On the one hand, more and more decisions are being made based on what machines can learn about us: who gets a loan, who gets into college, who gets

insurance, etc. On the other hand, people have many reservations about the fairness of algorithms, about algorithmic perpetuation of biases built into historical data, about the mis- or overinterpretation of statistical correlations, and more.

This grant funds work by economists Jens Ludwig from the University of Chicago and Sendhil Mullainathan from Harvard to study when, why, and how people should override recommendations based on artificial intelligence. The team will focus on how New York City judges decide to release or hold suspects before trial. Machine generated recommendations—ones that use facts about a suspect to predict whether that subject will commit a crime if released back into the community—are already in use. But judges are also privy to information about a subject that a typical algorithm is not, including a suspect's courtroom dress, demeanor, accompanying associates, etc. Ludwig and Mullainathan will study whether and how these additional factors affect both judicial predictions of suspect behavior as well as AI predictions of judicial behavior.

Columbia University

NEW YORK, NEW YORK

$209,610 over 22 months to conduct experiments on the behavioral welfare effects of heterogeneous nudging.

Project Director: Eric Johnson, Norman Eig Professor of Business

Nudging consists of changing how alternatives are presented in ways designed to help choosers select what they say they would ideally want. Substantial empirical evidence shows that nudges can significantly—and sometimes substantially—modify behaviors. Yet much remains mysterious about nudging, especially with regard to heterogeneous effects and behavioral welfare economics. How is it possible to create effective choice architectures when not everyone should be nudged the same way?

This grant funds a series of experiments by Eric Johnson of Columbia University. He has devised a series of experiments about what he calls "smart nudges." In contrast to the one-size-fits-all approach, these take into account how individuals differ. One idea is to set different defaults for different people depending on their background characteristics. Another technique, called "preference checklists," presents a prospective decision-maker with a list of criteria that other people sometimes take into account when considering similar choices. Checking off the criteria that the decision-maker thinks should apply in this case is a way of bringing to mind factors that might otherwise be forgotten or ignored. Johnson's hypothesis is that choice architectures that incorporate smart defaults and preference checklists will be welfare-enhancing compared to traditional one-size-fits-all nudges. Grant funds support the fielding and analysis of these experiments, and the publication of two papers on the results.

Dartmouth College

HANOVER, NEW HAMPSHIRE

$207,206 over 24 months to study, by running behavioral experiments, how consumers make decisions about insurance products like annuities.

Project Director: Erzo Luttmer, Professor

This grant funds work by behavioral economists Erzo Luttmer from Dartmouth and Dmitry Taubinsky from University of California, Berkeley, who are analyzing how behavioral biases might explain the annuity puzzle—the observation that annuities, as a financial product, are not nearly so popular as economic theory and people's stated preferences would predict them to be. Of the many possible explanations for the annuity puzzle, behavioral biases are not easy to study. Consumers who avoid annuitization might have privileged information and unobserved motivations (like making bequests, for example), or they may be systematically affected by behavioral biases that result in suboptimal choices. Teasing out what accounts for what is not just difficult, but also important for devising potential remedies.

Luttmer and Taubinsky have carefully designed a series of controlled experiments where real economic incentives are at stake, but where most other complications from the real world have been abstracted away, thus allowing them to isolate how subjects' psychological attitudes toward time and risk affect decision-making. By identifying the role behavioral mechanisms play in such decisions, this research will generate new insights about the annuity puzzle in particular, and also about the behavioral welfare economics of risk taking, saving decisions, and insurance markets more generally.

The Summer Institutes in Computational Social Science is a training and professional development program that exposes social and data scientists to the latest techniques and technologies in computational social science. In 2018, eight institutions participated, including the University of Cape Town, South Africa. **(PHOTO COURTESY OF VISSEHO ADJIWANOU/ UNIVERSITY OF CAPE TOWN.)**

Decision Science Research Institute

EUGENE, OREGON

$622,549 over 24 months to conduct surveys, measurements, and behavioral experiments about public perceptions of risk using new methods and technologies.

Project Director: Paul Slovic, President

Behavioral economists assume that people make decisions based on the perceived probabilities of events. Behavioral experiments, interpretations, and the policies they inform should therefore depend on information about popular perceptions about likelihoods. This grant funds work by Paul Slovic of the University of Oregon and co-principal investigator Howard Kunreuther of the Wharton School to field surveys that will collect data on public perceptions of the probabilities for a host of important events, including nuclear war, chemical attack, opioid addiction, school shootings, as well as the mass adoption of driverless cars or e-cigarettes. Opinions about more than a hundred hazards will be elicited. In addition, Slovic and Kunreuther will conduct textual analyses based on the frequency that Google News describes a given hazard using words with high emotional valence. Last, the team will field a series of experiments designed to probe how people act on those perceptions and what can be done to help everyone make better estimates and better decisions.

Duke University

DURHAM, NORTH CAROLINA

$385,631 over 24 months to launch an international summer school on Computational Social Science.

Project Director: Christopher Bail, Associate Professor

This grant supports the expansion of a popular seminar on computational social science, run by Matthew Salganik of Princeton University and Christopher Bail of Duke University. The instructional program, which takes place over the summer, involves lectures, group problem sets, and participant-led research projects. The seminar also includes outside speakers who conduct computational social science research in academia, industry, and government. Topics covered include text as data, website scraping, digital field experiments, nonprobability sampling, mass collaboration, and ethics. Interest in the program has been robust, with more than 10 times as many applicants as available slots each year. Sloan funds will allow lectures and course content to be broadcast via interactive video to six new satellite locations, including City University of New York; Northwestern; University of Colorado, Boulder; Seattle; Helsinki; and Cape Town. Additional satellite sites may be added in future years.

FPF Education and Innovation Foundation

WASHINGTON, DISTRICT OF COLUMBIA

$508,343 over 18 months to launch the Corporate-Academic Data Stewardship Research Alliance, a private company peer-to-peer network to accelerate privacy protective sharing of administrative data between businesses and academic researchers.

Project Director: Jules Polonetsky, Chief Executive Officer

According to a Sloan-funded survey, Chief Privacy Officers at major corporations like Amazon, AT&T, Comcast, Facebook, and General Electric say they are willing to share private data with independent scholars under two conditions. First, they want to take risks and institute policies that are similar to their peers. Second, to the extent that shared data helps academics gain insight into important societal issues, they want to be widely recognized for the role they played.

This grant funds a project by the nonprofit Future of Privacy Forum (FPF) to launch a peer-to-peer network of private sector C-suite leaders called the Corporate-Academic Data Stewardship Research Alliance. Members will collaborate in order to encourage, recognize, and honor model data-sharing arrangements between the private sector and academe. The network will hold regular phone conferences as well as quarterly in person meetings to discuss how to overcome the legal, practical, and technical barriers that hinder cooperation with independent scholars. The network will also develop and publicize a CEO-level award honoring those corporate leaders who have made pioneering data-sharing agreements with independent scholars. Grant funds will help defray operating costs of the new network for 18 months.

Georgetown University

WASHINGTON, DISTRICT OF COLUMBIA

$1,691,657 over 24 months to promote the safe and responsible use of administrative data in academic research by establishing an alliance whose member institutions intermediate between data producers and data users.

Project Director: Amy O'Hara, Research Professor

This grant provides funds for the creation and operation of the Administrative Data Research Institute (ADRI), a national membership organization designed to provide services and set standards for the global network of Administrative Data Research Facilities (ADRFs). An ADRF is a data intermediary, i.e., an institution that facilitates researcher access to private or sensitive data owned or held by corporations and government entities. To become a member of the new ADRI, member ADRF's would have to provably maintain high data standards and practices, particularly regarding data privacy and security. In return, the ADRI would provide member institutions with expert advice and leadership concerning the many technical, legal, political, or privacy challenges that data intermediaries face. Above all, the ADRI would help engender trust in at least three domains where it is much needed: among the member intermediaries when it comes to arrangements for linking their data; among the data producers when it comes to negotiating data use agreements with member intermediaries; and among the public and their policymakers when it comes to allowing administrative data containing sensitive information to be reused through member intermediaries for research purposes. Grant funds support initial start-up and operational costs of the new network for a period of two years.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$327,033 over 36 months to develop new statistical methods that improve both the identification of causal effects in observational studies as well as the generalizability of randomized experiments.

Project Director: Jose Zubizarreta, Assistant Professor

Harvard econometrician Jose Zubizarreta is developing new statistical methods for the extraction of causal inferences from large datasets. His methods flexibly adjust for covariates in observational studies while also yielding more stable causal estimates. For part of the research, Zubizarreta will investigate formal and theoretical properties of these methods. His team, however, based as it is at a medical school, will also work on specific applications. These require, for example, developing a new framework for the design and analysis of observational studies with discontinuities, or developing new methods that improve the degree of control (covariate balance) and statistical efficiency of randomized experiments that enhance their generalizability.

Zubizarreta plans to produce five peer-reviewed papers on these topics. In addition, all software, code, and examples will be produced in an open source programming language and made freely available, together with documentation and sample data, to the academic community and the public.

ideas42

NEW YORK, NEW YORK

$189,873 over 14 months to field test how machine-learning algorithms compare with traditional techniques for estimating heterogeneous effects in behavioral experiments.

Project Director: Josh Wright, Executive Director

Funds from this grant support research by Josh Wright, working in concert with economists Sendhil Mullainathan of the University of Chicago and Susan Athey of Stanford, to test innovative new machine learning techniques in economics field experiments. The group intends to investigate whether machine learning can improve randomly controlled trials in two ways. First, can machine learning enhance the assignment of subjects to control and treatment groups in ways that can lower necessary sample size without sacrificing rigor? Second, can machine learning techniques expand our ability to identify and analyze heterogenous treatment effects? Wright and his team will deploy state-of-the-art machine learning techniques in a series of actual economic field experiments and then share their findings via conferences, talks, and papers.

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$250,000 over 18 months to convene an international workshop that will plan global cooperation and coordination concerning Artificial Intelligence research and its applications.

Project Director: Gail Cohen, Senior Director

This grant funds an initiative by the National Academy of Sciences (NAS) to join with peer institutions from around the world to launch international dialogue about policies governing artificial intelligence (AI) and automation. Partners include the National Academy of Engineering, the Canadian National Research Council, the Royal Society, the Royal Academy of Engineering, the Chinese Academy of Sciences, and the Chinese Academy of Engineering. Participants will include government officials, industry leaders, and academic researchers from many different countries in addition to the United States, U.K., China, and Canada. Topics to be addressed include national security, data use and privacy, and legal and intellectual property conundrums related to AI. Grant funds will partially support a workshop and associated webcast, a subsequent workshop report, and the creation and dissemination of supplementary resources for participants and the public.

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$241,190 over 21 months to report on how social and behavioral insights can improve the reliability and reproducibility of scientific findings.

Project Director: Barbara Wanchisen, Director

This grant provides partial support to the National Academy of Sciences for a consensus report on how to use insights from the behavioral, social, and statistical sciences to improve the reliability and reproducibility of research. The project will include five committee meetings featuring various experts across the sciences, five commissioned papers on reproducibility, an expert panel on behavioral economics and the professional incentives facing producers and consumers of research, and a final consensus report. While the majority of the funding will be provided by NSF, this grant will provide supplementary support both for including economic perspectives in the study and for disseminating the final report.

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$241,690 over 36 months to build a research community on the economics of science by holding regular conferences and by other community-building activities.

Project Director: Paula E. Stephan, Professor

This grant supports the launch and operation of a new working group at the National Bureau of Economic Research (NBER) dedicated to studying the "economics of science." Led by Paula Stephan, the group will bring together top flight economists to share existing work and findings, identify new areas for research, examine methodological and data issues, and commission new research. Topics include incentives in the current system, how the structure of grants and review systems affects scientific risk taking, the costs and efficiencies of different research funding models, how to judge scientific quality, and how to measure return on investment in basic and applied science. Along with four meetings of the working group, the grant will fund administrative and planning costs, support for small research grants, and partnerships between the working group and institutions like research universities or other science funders.

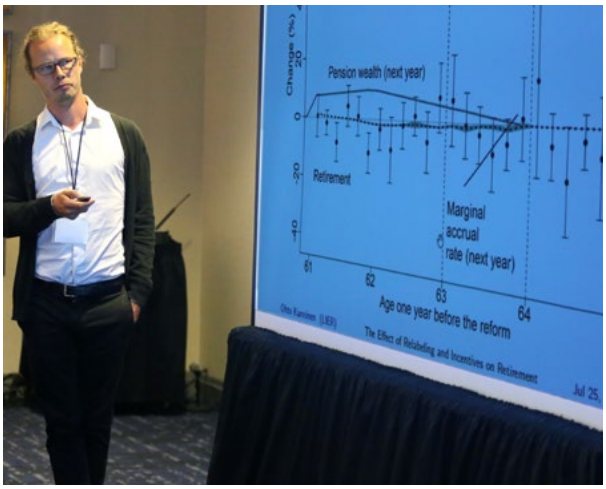
National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$914,250 over 36 months to develop an active and diverse research community that studies the economics of artificial intelligence.

Project Director: Avi Goldfarb, Ellison Professor of Marketing

This grant funds efforts by Avi Goldfarb, Joshua Gans, and Ajay Agrawal, three leading economists from the University of Toronto, and Catherine Tucker, Sloan Distinguished Professor of Management at MIT, to facilitate rigorous research on the economics of artificial intelligence (AI). Building on a successful conference on the economics of AI held in Toronto in 2017, the team plans to hold a series of three more annual conferences on related topics, commissioning papers for each conference, then publishing and disseminating the collected conference proceedings. Over three years, the team anticipates commissioning more than 50 academic papers. The team will also organize extensive training, support, and other services for graduate students and postdoctoral fellows interested in studying the economics of AI. The plan is to train more than 90 early-career researchers in advanced methodological and analytic techniques.



Economist Ohto Kanninen discusses his research on the effects of changing incentives on retirement rates at the 2018 Summer Institutes of the National Bureau of Economic Research in Cambridge, MA. (PHOTO BY MIKE LOVETT FOR NBER)

Pennsylvania State University

UNIVERSITY PARK, PENNSYLVANIA

$234,416 over 13 months to strengthen the microfoundations of macroeconomics by building and calibrating behavioral models of order-book activity in financial markets.

Project Director: John Liechty, Professor

An "order book" is a list of various traders' buy or sell instructions for a given financial instrument. A stock exchange uses such an order book to keep track of how many shares are being bid or offered at each potential price point. That information, in turn, determines the actual price quoted by the exchange at any moment in time. This grant funds work by John Liechty and Mark Flood to study the behavior of traders when they send messages to a financial exchange for inclusion in an order book. The researchers will model how trader behavior depends on available information and attentiveness, exploring how asymmetries in these qualities can have dramatic effects. Liechty and Flood will also focus very specifically on whether detailed order-book data could help financial regulators predict or mitigate systemic market failures.

Stanford University

STANFORD, CALIFORNIA

$647,671 over 24 months to study the behavioral welfare effects of online media consumption.

Project Director: Matthew Gentzkow, Senior Fellow

Funds from this grant support three different large-scale and randomized field experiments, devised by economists Matthew Gentzkow at Stanford and Hunter Allcott at New York University, that aim to help us better understand the various ways social media and smartphones impact our lives. In the first, Gentzkow and Allcott study the welfare implications of Facebook usage by measuring the impact of cutting off access to that platform. In the second experiment, the team studies how limiting smartphone access to social media and other apps affects the welfare of college students. The third experiment concerns the demand for "fake news" and investigates what happens to consumer behavior when incentives to find accurate information increase. Grant funds support the fielding and analysis of all three experiments as well as documentation of methods to enable easy replication by other scholars.

Grants Made Against Prior Authorizations

In June 2018, the Trustees authorized the expenditure of up to $1,500,000 for grants aiming to facilitate safe and responsible access to social media and related data by academic researchers. The following grants were made against this previously authorized fund.

Northeastern University

BOSTON, MASSACHUSETTS

$125,000 over 6 months to develop a plan for facilitating responsible and reproducible research on administrative data from multiple social media sources.

Project Director: David Lazer, Distinguished Professor

Social Science Research Council

NEW YORK, NEW YORK

$500,000 over 12 months to facilitate scholarly research on proprietary social media data through a process that incorporates peer reviews, ethical reviews, and privacy reviews.

Project Director: Alondra Nelson, President

In October 2017, the Trustees authorized the expenditure of up to $500,000 for grants that fund exploratory research and data gathering, especially abour risk, insurance, and regulated markets. The following grants were made against this previously authorized fund.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$125,000 over 36 months to compare, both theoretically and empirically, standard versus ideal ways of determining which kinds of statistical findings merit publication.

Project Director: Maximilian Kasy, Associate Professor

Stanford University

STANFORD, CALIFORNIA

$125,000 over 12 months to advance the design and implementation of causal inference techniques other than randomization in public policy evaluation.

Project Director: Margaret Levi, Director

Officer Grants

University of California, Berkeley

BERKELEY, CALIFORNIA

$20,000 over 3 months to support a workshop on improving the process and utility of eliciting expert forecasts of social science research results.

Project Director: Stefano DellaVigna, Professor

University of Chicago

CHICAGO, ILLINOIS

$20,000 over 12 months to support the work of a Committee for the Study of Digital Platforms in preparation for an international conference on antitrust and competition research.

Project Director: Luigi Zingales, Distinguished Professor

Cornell University

ITHACA, NEW YORK

$50,000 over 18 months to enhance the transparency, reproducibility, and replicability of empirical research in the social sciences by simplifying how authors can, when submitting a paper to a journal, also provide structured metadata about the provenance and archiving of code, data, and other supplementary materials.

Project Director: Lars Vilhuber, Senior Research Associate

University of Florida

GAINESVILLE, FLORIDA

$124,998 over 12 months to pilot the acquisition, ingestion, and standardization processes necessary to compile a national voter registration database for use by academics and officials conducting non-partisan research.

Project Director: Michael P. McDonald, Associate Professor

Fordham University

BRONX, NEW YORK

$7,500 over 6 months to support a global summit on anthropological contributions to research on business and economics.

Project Director: Timothy Malefyt, Clinical Associate Professor

George Washington University

WASHINGTON, DISTRICT OF COLUMBIA

$50,000 over 12 months to design, vet, and launch plans for federal agencies and private data holders to cooperate on improving federal economic statistics.

Project Director: Andrew Reamer, Research Professor of the Institute of Public Policy

University of Maryland, College Park

COLLEGE PARK, MARYLAND

$1,975 over 8 months to develop measurement tools for assessing public attitudes toward potential privacy protection techniques.

Project Director: Frauke Kreuter, Professor & Director

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$25,000 over 6 months to develop a shared vision and approach for a collaboration between NASEM, OECD and IAP to understand the impact of AI on work by assessing AI and robotics capabilities.

Project Director: Stuart W. Elliott, Scholar

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$110,527 over 36 months to produce papers, conferences, and a book on how administrative and other big datasets can enhance the calculation of official federal statistics.

Project Director: Katharine Abraham, Professor

Nesta

LONDON, UNITED KINGDOM

$20,000 over 6 months to hold a conference on experimental and evidence-based methods for studying discovery, innovation, and growth.

Project Director: Albert Bravo-Biosca, Director

Virginia Polytechnic Institute and State University

BLACKSBURG, VIRGINIA

$125,000 over 1 months to conduct technical research on improving the accuracy and cost-effectiveness of the 2030 Decennial Census and the American Community Survey.

Project Director: Sallie Keller, Professor

Energy & Environment

PROGRAM DIRECTOR: EVAN S. MICHELSON

Launched in early 2015, this program aims to advance our understanding about the economic, environmental, security, and policy tradeoffs associated with the increased deployment of low-and no-carbon resources and technologies across the energy system. Since its launch, the program has become a paradigmatic example of how the Foundation can achieve its mission by influencing a field, shaping the research questions that warrant further attention, supporting research across the social and natural sciences, training early career students, and partnering with other funders. The program has made substantial progress in each of five established outcome areas:

- **Generate Novel Research and Knowledge:** The primary focus of this program is to build an impartial economic, science, technology, engineering, and policy knowledge base as a public good.
- **Train Next Generation of Scholars and Practitioners:** An important program element is introducing new voices into the field and training the next generation of individuals capable of anticipating and addressing emerging energy challenges and opportunities.
- **Build Multidisciplinary Networks and Communities:** Grantmaking aims to strengthen existing research networks and create longstanding communities of practice that will endure beyond the program's timeline.
- **Educate Stakeholders and Disseminate Information for Decision-Making:** Grantmaking will encourage stakeholders to engage with high quality, impartial research when developing policies and practices that address the deployment of low- and no-carbon technologies and resources.

- **Attract Additional Resources:** This program aims to seed new ideas that stimulate additional support for research on these topics by government, industry, and philanthropy.

Using the energy system as a guiding framework, the Foundation investigates underexplored and targeted research questions in select areas. Regarding energy sources (supply), the program supports investigation and systemic analyses of the energy system and energy technology innovation. Regarding midstream infrastructure, the program examines multidisciplinary research on transmission and distribution systems along with studying the siting of energy infrastructure. Regarding energy use (demand), the program explores social science research in the area of transportation and empirical analyses of variable pricing and other behavioral interventions that may impact energy consumption.

The program includes support for additional cross-cutting opportunities, such as energy data analytics, disseminating research findings, and strategically organized convenings. Recently, the Foundation expanded the program to explore opportunities to support collaborative science and engineering research projects led by early- and mid-career scholars in two areas: the use of sensor technologies to monitor energy and environmental systems, and research on net-zero interventions and negative emissions technologies.

The program seeks to connect researchers and practitioners from different disciplines and sectors. Due to the significant funding available from both public and private sources for energy and environmental research, the Foundation is very selective in the grants it makes in this area. Support is only provided for non-partisan, balanced, evidence-based analysis, and the Foundation does not and will not support energy policy lobbying or advocacy.

Trustee Grants

University of California, Berkeley

BERKELEY, CALIFORNIA

$678,684 over 32 months to create the E2e Evidence-Based Policy Fellowship program that will bring energy efficiency program evaluation research capacity to state agencies.

Project Director: Catherine Wolfram, Professor

The E2e network is a consortium of scholars evaluating the impact of energy efficiency programs using randomized controlled trials and high-quality quasi-experimental research. Under the leadership of Catherine Wolfram (University of California, Berkeley), Michael Greenstone (University of Chicago), and Christopher Knittel (Massachusetts Institute of Technology), the network has grown since its 2012 launch to include nearly 30 affiliated faculty and has produced close to 40 papers on the cost-benefit impacts of energy efficiency programs.

Practitioners in state governments have started to take notice and there is a growing desire to infuse government evaluations of energy efficiency programs with the rigor that E2e researchers bring to their academic studies. This grant provides funds to place at least two "E2e Evidence-Based Policy Fellows" within select state energy agencies to serve as a resource to agency staff, to improve plans for evaluating energy efficiency programs, and to advise agency policymakers on the initial design and implementation of such programs. Fellows will be supervised on a daily level by an agency supervisor and will hold regular check-ins with the E2e faculty leads.

Carnegie Mellon University

PITTSBURGH, PENNSYLVANIA

$165,000 over 18 months to analyze the challenges and opportunities associated with upgrading and transforming high voltage transmission lines as compared with siting new transmission infrastructure.

Project Director: Granger Morgan, Professor

This grant supports a study examining whether the upgrading of existing electricity transmission lines can obviate the need to build new transmission infrastructure corridors. Under the leadership of Principal Investigator Granger Morgan, the research team will study different transmission line upgrading options, including re-engineering existing transmission lines to improve their carrying capacity or switching from high-voltage alternating current (HVAC) lines to high-voltage direct current (HVDC) lines. Data will be collected from state public utility commissions about proposed or planned transmission line upgrades. This information will then be analyzed using an engineering model of the transmission system to understand which transmission line corridors might be best suited to upgrading or current conversion based on their technical and economic specifications.

University of Chicago

CHICAGO, ILLINOIS

$605,281 over 24 months to support the training of early career scholars in developing a more detailed, granular approach to estimating damage functions that can contribute to providing more transparent estimates of the social cost of carbon.

Project Director: Michael Greenstone, Professor

The social cost of carbon (SCC) is defined as the cost to society in dollars of releasing the equivalent of one ton of carbon dioxide into the atmosphere. The SCC is a key input measure to almost every legally required cost-benefit analysis of energy and environmental regulation.

To properly quantify the SCC researchers need to improve the estimation of damage functions, the models that lay out how climate changes affect the economy. The Climate Impact Lab (CIL) at the University of Chicago, partnering with scientists at the University of California, Berkeley and Rutgers University, is developing the next generation of climate-economic damage functions. The new functions are orders of magnitude more advanced than existing integrated assessment models, providing a spatially detailed, granular set of damage functions for over 25,000 regions globally. Grant funds will support development of the CIL model, its computing infrastructure, and salary support for one postdoctoral and two predoctoral fellows participating in the project.

Colorado School of Mines

GOLDEN, COLORADO

$277,334 over 24 months to continue a summer school training program that provides early career economists and social scientists with an understanding of technological dimensions of electricity distribution systems.

Project Director: Ian Lange, Director, Mineral & Energy Economics

This grant provides support for a series of intensive, week-long summer training programs for early-career economists and social scientists to introduce these scholars to the technological and engineering dimensions of electricity distribution systems. This Colorado Technology Primer for Economists and Social Scientists has been well received and well attended by doctoral students, postdoctoral researchers, and assistant professors across several fields, including economics, public policy, and environmental sustainability. Topics covered include an introduction to power system planning and operation, distribution system principles, grid interface with bulk power supply, determinants of electricity demand, and opportunities and challenges presented by multidisciplinary research. Grant funds provide two years of operational support for the effort.

Columbia University

NEW YORK, NEW YORK

$400,591 over 24 months to continue the Energy Journalism Initiative and educate journalists on recent research topics and key findings related to energy economics, policy, security, and technology.

Project Director: Jason Bordoff, Founding Director

The Energy Journalism Initiative at Columbia University's Center on Global Energy Policy brings together nearly 20 journalists annually for a week-long seminar that introduces reporters to the latest research findings related to a wide range of energy issues. Topics covered at the seminar address issues such as energy economics, new technology development, energy policy, and energy security. Funds from this grant provide support for the operation of the Energy Journalism Initiative for two years, along with funds for expanded outreach and ongoing engagement with the energy journalism community.

Environmental Law Institute

WASHINGTON, DISTRICT OF COLUMBIA

$550,000 over 26 months to generate novel, multidisciplinary research to increase understanding of the energy and environmental impacts of the digital economy, with a focus on sharing platforms, artificial intelligence, and blockchain technologies.

Project Director: David Rejeski, Director, Technology, Innovation, and the Environment

There is substantial interest within the research community in studying the energy and environmental implications of the development and spread of new technologies. These technologies include digital sharing platforms like Uber and Airbnb, artificial intelligence and robotics, and distributed ledgers like Bitcoin. Questions abound. How might the use of autonomous vehicles for ride sharing affect vehicle miles traveled? What approaches might mediate the impact of blockchain energy use? Can digital ledger systems be used to track pollution effectively?

This grant supports efforts by David Rejeski of the Environmental Law Institute to build a multidisciplinary research community of scholars interested in studying these topics. Funds will support 8 to 10 small research projects to study questions about the environmental and energy impacts of new technologies. Projects will be selected by an independent expert review panel through an open solicitation process. In addition to direct research support, this grant provides funds to hold two workshops—one at the project's outset and the other at its conclusion—to bring the selected researchers together to share information about research methodologies, data sources, and potential challenges. It also funds the creation of a website to serve as a resource that will include informational bibliographies, publicly available data sources, and final research outputs.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$559,435 over 36 months to examine the role of technology and knowledge spillovers in the development of novel clean energy technologies.

Project Director: Venkatesh Narayanamurti, Benjamin Peirce Research Professor

Innovation in the energy sector often comes from unexpected places, utilizing research on problems or issues that are not directly energy related but that turn out to have application in the energy sector. Understanding these "knowledge spillovers," as they are called, is critical to gaining a complete picture about how new energy technologies evolve over time.

This grant funds a project led by Venkatesh Narayanamurti of Harvard University, Laura Diaz Anadon of the University of Cambridge, and Gabriel Chan of the University of Minnesota to investigate how knowledge spillovers contributed to three different low-carbon technologies—solar photovoltaics, lithium-ion batteries, and solid state lighting. The team will analyze patent data from the PATSTAT database to determine which innovations from other fields have led to significant advancements for the three aforementioned technologies. The researchers will then supplement this patent citation analysis with a bibliometric analysis of academic publications and with additional expert interviews and consultations. The team will then use existing engineering cost models to identify how various innovations from outside the energy sector contributed to cost reductions for each of the three technologies under study. In addition to academic research, the research team will prepare shorter commentaries and policy briefs aimed at informing policymakers and other nonspecialists about research results.

Massachusetts Institute of Technology

CAMBRIDGE, MASSACHUSETTS

$1,043,399 over 32 months to produce a comprehensive, multidisciplinary Future of Storage study that will consider the role key storage technologies might play in electricity systems over different time scales and service requirements.

Project Director: Robert C. Armstrong, Director

This grant provides partial support for a new report, The Future of Storage, which will bring together scientific, engineering, economic, and policy perspectives to describe the current state and future potential of technologies to store electricity and the differing roles these technologies might play in the evolving energy sector.

Part of MIT's well-regarded "Future of" series, the project will assemble a panel of top scholars from mechanical engineering, energy systems analysis, and economics to address a host of policy-relevant questions about electricity storage. Questions to be addressed by the study include what role storage might play in electricity systems over the near term (by 2030), midterm (by 2040), and long term (by 2050, and beyond); which storage technologies have the greatest potential for application over various time scales and service requirements; and what public policy, technology development, and market factors most influence the future of electricity storage. Grant funds will provide approximately one-third of the total study cost.

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$750,375 over 50 months to continue support for predoctoral research and training fellowships in energy economics.

Project Director: Meredith Fowlie, Associate Professor

This grant renews funding for a set of predoctoral fellowships in energy economics. In each of the past three academic years, Meredith Fowlie (University of California, Berkeley) and Ryan Kellogg (University of Chicago) have led a committee that solicits applications and selects a number of young academics for these two-year predoctoral fellowships. Selected fellows are generally in the final two years of their doctoral program and are conducting one or more studies examining different dimensions of the energy system. Previous fellows have come from an array of universities, including the University of Tennessee; University of Wisconsin, Madison; University of California, San Diego; and Cornell University, among others. The announcement for predoctoral fellowship applications is shared widely within the economics community, and the selection committee has received approximately 20 high-quality applicants each year. Funds from this grant will fund an additional two cohorts of three fellows each. In addition to covering stipend and tuition coverage, a small amount of money is provided for purchasing necessary data and for travel to professional meetings.

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$432,372 over 36 months to develop new dissemination channels for rigorous, nonpartisan research in environmental and energy economics through a new forums for research presentation and publication.

Project Director: Matthew Kotchen, Professor & Associate Dean

Funds from this grant support efforts by the National Bureau of Economic Research (NBER) to organize a series of conferences that would each showcase six papers by leading academic energy researchers that have been written for policy audiences and that are designed to address policy questions about energy or environmental policy. The conferences, held annually, will aim to strengthen relationships between academic energy researchers and their counterparts in the policy realm, with around 100 participants expected to attend each year. Following each conference, papers will be revised and published in an annual volume titled Environmental and Energy Policy and the Economy. In keeping with standard NBER practice, no explicit policy recommendations will be made by research published in this project. Grant funds will support the hosting of the annual conference and publication of the associated research volume for the next three years.

Pecan Street, Inc.

AUSTIN, TEXAS

$1,102,625 over 24 months to improve researcher access to critical energy data by enhancing data resolution and granularity, diversifying data linkages, and expanding geographic scope of instrumented homes.

Project Director: Suzanne Russo, CEO

Pecan Street is an independent nonprofit organization that is a leading provider of high-resolution residential energy use data to the research community. Through its testbed of volunteer instrumented homes, Pecan Street is able to collect disaggregated circuit-level energy use information at 15-minute, 1-minute, and, increasingly, 1-second intervals. This unique data set is then provided free of charge to the academic community, helping facilitate research known as nonintrusive load monitoring (NILM), which allows scholars to disaggregate household-level energy use based on the unique power "signature" of each monitored appliance.

Funds from this grant will allow Pecan Street to expand their data collection efforts through three interrelated projects. First, they will increase the number of homes within their existing test-bed in Austin, Texas that collect energy use data at 1-second intervals. Second, they will integrate additional data from Independent System Operators (or ISOs) around the country—information such as wholesale market pricing, forecasting, and generation information—that enriches the energy use data collected from the Pecan Street testbed. Third, Pecan Street will expand the number of instrumented homes in its network, adding in 100 additional homes in both upstate New York and the Bay Area of California.

Resources for the Future

WASHINGTON, DISTRICT OF COLUMBIA

$496,951 over 30 months to continue a postdoctoral researcher program that will train the next generation of scholars in energy and environmental economics and policy analysis.

Project Director: Kristin Hayes, Program Director

Funds from this grant continue support for postdoctoral researchers studying energy, natural resource, and environmental economics at the Washington D.C.–based nonpartisan think tank Resources for the Future (RFF). Grant funds will support one, two-year postdoctoral researcher position in each of the next two years, and RFF will raise matching funds to support a second postdoctoral fellow each year.

The RFF program has several important strengths. First, supported postdoctoral researchers will split their time between defined projects and independent research, allowing them the opportunity to build a strong list of publications that is vital to securing a longer-term university or other research position. Second, postdoctoral researchers will have the opportunity to build and expand their professional networks in policy, academic, and private sector circles, providing them with a broader range of subsequent career opportunities. Third, researchers will be trained in valuable skills like grant writing, public speaking, presenting material to policy audiences, and event organization, all of which will be critical for advancement in their careers. Fourth, RFF will draw on a deep roster of senior in-house scholars and its extended network of affiliated university faculty to provide job placement services and career guidance. To date, the placement record for postdoctoral researchers in this program has been strong. Fifth,

Panelists speak at the 2018 Energy Research Insights for Decisionmaking Conference in Washington D.C. Hosted by Resources for the Future and the Sloan Foundation, the conference was an opportunity for scholars to present policymakers with non-partisan research bearing on policy and regulatory issues related to the energy system. (CREDIT: KRISTINA SHERK PHOTOGRAPHY)

there are no other federally or philanthropically funded energy and environmental economics post-doctoral researcher positions of this kind, making the RFF program unique in the field.

Resources for the Future

WASHINGTON, DISTRICT OF COLUMBIA

$203,083 over 9 months to organize a Sloan Energy Conference that integrates research results across the energy system and disseminates findings to practitioners.

Project Director: Richard Newell, President

This grant provides support to the Washington D.C.–based nonpartisan think tank Resources for the Future (RFF) to organize and host a conference that brings together researchers, policymakers, and various stakeholders to discuss the state of academic research about the economic, environmental, security, and policy trade-offs associated with the increased deployment of low- and no-carbon resources and technologies and to share research findings and insights on these issues developed by researchers funded through the Sloan Foundation's Energy and Environment program. The conference will take place in late fall 2018, with nearly 100 participants drawn from academic, government, industry, and nonprofit sectors and will be structured as a series of research panels focused on topics such as energy efficiency, transportation, and transmission and distribution, which have become core areas of concentration within the Sloan Energy and Environment program. Additional thematic panels will be interspersed that advance methodological perspectives such as analyzing large-scale data sets and highlighting best practices to integrate research into decision-making. There will also be a dedicated session for students to present their work, along with a number of networking opportunities allowing participants to interact informally with one another. In addition to organizing and hosting the conference, RFF plans to record the event and potentially live-stream it.

Grants Made Against Prior Authorizations

In March 2018, the Trustees authorized the expenditure of up to $250,000 for grants in support of workshops and conferences that advance the development of energy and environment research and that involve the training of students and emerging practitioners. The following grants were made against this previously authorized fund.

Arizona State University

TEMPE, ARIZONA

$20,000 over 7 months to support student participation at the Energy and Society in Transition conference.

Project Director: Clark Miller, Professor

Boston University

BOSTON, MASSACHUSETTS

$50,000 over 17 months to organize an interdisciplinary conference that will launch the Ecological Forecasting Initiative.

Project Director: Michael Dietze, Associate Professor

Columbia University

NEW YORK, NEW YORK

$50,000 over 12 months to provide continuing support for the Center on Global Energy Policy's external speaker series and roundtable discussions to increase student and public understanding of key energy issues.

Project Director: Jason Bordoff, Founding Director

Council on Foreign Relations

NEW YORK, NEW YORK

$50,000 over 11 months to organize a workshop examining the economic, technical, regulatory and security impacts of climate risks on energy systems.

Project Director: Amy Myers Jaffe, Executive Director

University of Michigan

ANN ARBOR, MICHIGAN

$10,000 over 8 months to support participation of undergraduate and graduate students at the 2018 Transportation, Economics, Energy and the Environment (TE3) conference.

Project Director: Ellen Hughes-Cromwick, Sr. Energy Economist/Interim Assoc Dir

Stanford University

STANFORD, CALIFORNIA

$10,000 over 6 months to provide a final round of support for the participation of students and post-doctoral researchers at the 2018 Behavior, Energy and Climate Change Conference.

Project Director: James L. Sweeney, Professor

University of Texas, Austin

AUSTIN, TEXAS

$10,000 over 7 months to provide a final round of support for students from multiple disciplines to participate in the 2019 Austin Electricity Conference.

Project Director: Ross Baldick, Professor

United States Association for Energy Economics

CLEVELAND, OHIO

$10,000 over 6 months to support the participation of graduate students at the Ph.D. Day event at the 2018 USAEE North American conference in Washington, D.C.

Project Director: Sanya Carley, Associate Professor

In March 2018, the Trustees authorized the expenditure of up to $800,000 to support up to four multidisciplinary research projects examining the economics and engineering of electricity and natural gas transmission and distribution systems. The following grants were made against this previously authorized fund.

Michigan Technological University

HOUGHTON, MICHIGAN

$49,963 over 24 months to support a multidisciplinary research project that scopes the feasibility of using decommissioned mines as underground pumped-storage hydropower.

Project Director: Roman Sidortsov, Assistant Professor

University of Michigan

ANN ARBOR, MICHIGAN

$249,284 over 24 months to support a multidisciplinary research project that examines the impact of storage additions on transmission system frequency regulation.

Project Director: Catherine Hausman, Assistant Professor

Pennsylvania State University

UNIVERSITY PARK, PENNSYLVANIA

$250,000 over 24 months to support a multidisciplinary research project that examines the impact of variable wind generation on transmission systems.

Project Director: Chiara Lo Prete, Assistant Professor of Energy Economics

Washington State University

PULLMAN, WASHINGTON

$249,785 over 24 months to support a multidisciplinary research project that examines the impact of demand response programs on distribution systems.

Project Director: Anamika Dubey, Assistant Professor

Officer Grants

University of California, Berkeley

BERKELEY, CALIFORNIA

$124,966 over 24 months to create a publicly accessible panel dataset of residential electric utility rates for all United States utilities to develop more refined electricity cost models.

Project Director: Severin Borenstein, E.T. Grether Professor

Center for Strategic and International Studies

WASHINGTON, DISTRICT OF COLUMBIA

$124,475 over 12 months to support research and workshops in the Energy in America project to examine how energy impacts the United States economy at multiple levels and the changing role of energy development on job creation.

Project Director: Sarah Ladislaw, Director & Senior Fellow

Johns Hopkins University

BALTIMORE, MARYLAND

$65,456 over 9 months to assess the completeness and comprehensiveness of existing United States energy infrastructure datasets.

Project Director: Sarah Jordaan, Assistant Professor

Massachusetts Institute of Technology

CAMBRIDGE, MASSACHUSETTS

$125,000 over 12 months to provide final support in completing the first phase of a project examining the component costs of battery chemistries and train the next generation of scholars in energy systems analysis.

Project Director: Jessika Trancik, Professor

New York University

NEW YORK, NEW YORK

$20,000 over 9 months to assess whether mandatory building energy audits in New York City contribute to meaningful reductions in building energy use.

Project Director: Katrina Wyman, Sarah Herring Sorin Professor of Law

University of Texas, Austin

AUSTIN, TEXAS

$50,000 over 18 months to support the 2018 Energy Journalism Workshop in order to inform journalists covering energy and environmental issues of novel research findings.

Project Director: Varun Rai, Director

Yale University

NEW HAVEN, CONNECTICUT

$20,000 over 12 months to support the publication of a special issue of the Journal of Industrial Ecology applying life cycle assessment analysis techniques to emerging energy technologies.

Project Director: Reid Lifset, Research Scholar and Editor In Chief

Microbiology of the Built Environment

PROGRAM DIRECTOR: PAULA J. OLSIEWSKI

This program aims to grow a new multidisciplinary field of scientific inquiry focused on understanding the microbial ecology of the built environments in which human beings work, live, and play.

Grantmaking pursues a series of mutually reinforcing strategies.

- **Generate new knowledge** by directly supporting original, high-quality research on the microbial ecology of the built environment.
- **Build a thriving, multidisciplinary research community** of biologists, engineers, architects, and technologists that will endure beyond the program's timeline.
- **Train the next generation of scholars and practitioners** and introduce new voices into the field through educating and engaging graduate and postgraduate researchers.
- **Develop community-wide research protocols and norms.**
- **Advance capacity for discovery** through development of new instruments and tools for data collection, sampling, analysis, and visualization.
- **Attract dedicated funding from federal agencies** by demonstrating the existence of important gaps in our scientific knowledge and the potential for federal intervention to fill them.

Major grantmaking is this program is scheduled to conclude in 2019.

Researchers at the University of Oregon's Center for Biology of the Built Environment used these airtight microcosms to study how different wavelengths of light affect microbial community composition in dust. (PHOTO COURTESY OF THE UNIVERSITY OF OREGON)

Grants Made Against Prior Authorizations

In December 2017, the Trustees authorized the expenditure of up to $250,000 for grants in support of the aims of the Microbiology of the Built Environment program. The following grants were made against this previously authorized fund.

University of California, Davis

DAVIS, CALIFORNIA

$101,430 over 12 months to develop a business plan to sustain the activities of the Microbiology of the Built Environment Network.

Project Director: Jonathan Eisen, Professor

Cornell University

ITHACA, NEW YORK

$125,000 over 21 months to provide renewed support to examine how disinfectants may promote antibiotic resistance through horizontal gene transfer.

Project Director: Ilana Brito, Adjunct Assistant Professor

Officer Grants

Cold Spring Harbor Laboratory

COLD SPRING HARBOR, NEW YORK

$67,000 over 12 months to support a Banbury meeting on the Microbiology of the Built Environment.

Project Director: Rebecca Leshan, Director

Murdomo Institute, Inc.

WALNUT, CALIFORNIA

$50,000 over 12 months to support Community of Microbes, a dynamic, augmented reality-enabled interactive experience that introduces audiences to microorganism ecosystems.

Project Director: Amanda Phingbodhipakkiya, Director

Virginia Polytechnic Institute and State University

BLACKSBURG, VIRGINIA

$30,000 over 9 months to support a workshop on Viruses in the Built Environment.

Project Director: Linsey C. Marr, Charles P. Lunsford Professor

Sloan Digital Sky Survey

PROGRAM DIRECTOR: EVAN S. MICHELSON

The Sloan Digital Sky Survey (SDSS) is one of the most productive, detailed, and highly cited telescopic surveys in the history of astronomy, pioneering an innovative model of scientific collaboration that has broadly influenced how institutions work together, how instruments are built, how data are shared, how scientists are trained, and how the public can be engaged in astronomical discovery. Every SDSS phase aims to answer fundamental questions in astronomy, astrophysics, and cosmology by expanding our understanding of the large-scale evolution and structure of the universe, the formation of stars and galaxies, and the history of the Milky Way. SDSS remains the Sloan Foundation's longest-running basic science research program and is one of the flagship research enterprises for which the Foundation is known throughout the scientific community.

In cooperation with the Astrophysical Research Consortium, the Foundation has helped build and operate the Sloan Foundation Telescope and associated instruments at Apache Point Observatory in New Mexico to observe and archive information on millions of stars, galaxies, quasars, and other cosmological phenomena. The fourth phase of SDSS (SDSS-IV), led by Michael Blanton of New York University, has over 50 collaborating institutional partners. SDSS-IV continues the survey's rich tradition of cutting-edge data collection by partnering with the du Pont Telescope at the Las Campanas Observatory in Chile, allowing for observations of regions of the sky not visible from the Northern hemisphere and helping to fully realize the truly global nature of the collaboration.

The forthcoming fifth phase of SDSS (SDSS-V), led by Juna Kollmeier of the Carnegie Observatories, is scheduled to begin observations in 2020. SDSS-V already has over 30 collaborating institutional partners and has received additional funding by other science philanthropies. SDSS-V will further expand the collaboration between these two observatories to create one of the most extensive spectroscopic observation programs in operation through the middle of the next decade. SDSS-V will study the forces shaping the origin, structure, and future of galaxies; the nature of supermassive black holes that sit at the center of the Milky Way and other galaxies; and the role interstellar and intergalactic regions play in celestial evolution. The data collected will be prodigious: infrared spectra of over six million stars in the Milky Way, optical spectra of over four hundred thousand black holes, and over twenty-five million optical spectra of interstellar gas. Both SDSS-V telescopes will be equipped with rapidly reconfigurable fiber positioning technologies that will dramatically reduce the time it takes to observe the spectra of an observed object, allowing SDSS to complement and augment many other astronomical research programs that are examining stars, galaxies, exoplanets, and black holes.

All SDSS data continues to be released to the public on an annual basis under open principles. Data from the SDSS survey has been used in over 8,700 papers that collectively have been cited over 455,000 times in the literature. The collaboration is also working to influence the culture of astronomy by including programmatic activities to engage underrepresented minorities through its Faculty and Student Team (FAST) initiative that aims to increase the number of underrepresented minority scholars pursuing doctoral degrees in astronomy and astrophysics.

Trustee Grants

Astrophysical Research Consortium

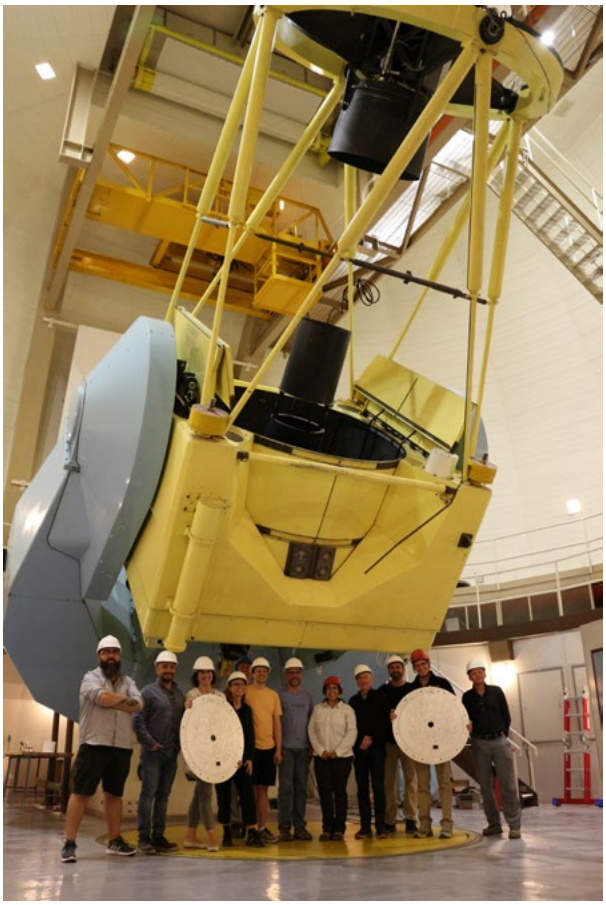
SEATTLE, WASHINGTON

$530,000 over 38 months to continue support for the Faculty and Student Team (FAST) program within the Sloan Digital Sky Survey (SDSS) that aims to increase the number of underrepresented minority students and faculty in the collaboration and increase the number of students purs.

Project Director: Michael Blanton, SDSS-IV Director

In 2015, the Sloan Digital Sky Survey established a Faculty and Student Team (FAST) program to improve on the low numbers of underrepresented minorities (URMs) both in the SDSS collaboration itself and in astronomy as a whole. The FAST program introduces clusters of faculty and students (mainly URMs) from non-SDSS-participating universities into the collaboration, usually with one faculty member supervising anywhere from one to three undergraduates or one graduate student. These faculty-student teams are then paired with mentors from the SDSS collaboration to help them become full members of the collaboration. To date, institutions sending FAST teams to SDSS include DePaul University, New Mexico State, University of California San Diego, Texas Tech, and two from City University of New York (Hunter College and Staten Island).

Funds from this grant will allow the addition of three new FAST teams to the project, each completing a three-year term. Each FAST team faculty lead receives salary support for approximately one summer month in their first year of participation, and students on each team receive financial support through the entire period of FAST program participation. A dedicated SDSS FAST science liaison oversees the day-to-day operation of the program.



Sloan Foundation staff and grantees visit the du Pont Telescope at Las Campanas Observatory in Chile. Close cooperation with the Chilean astronomical community is an essential element of the next phase of the Sloan Digital Sky Survey. (PHOTO: STEFANIE WACHTER)

Working Longer

PROGRAM DIRECTOR: KATHLEEN E. CHRISTENSEN

The goal of the Working Longer program is to expand and deepen scholarly, policy, and public understanding of older Americans' labor market activities and to identify ways in which institutional adjustments may facilitate employment of those who need or want to work beyond conventional retirement ages. Launched in 2010, our Working Longer program examines one of today's most pressing social issues: the aging of the U.S. workforce. According to the U.S. Bureau of Labor Statistics, by 2020, one of four people working will be 55 years old or older. Research in this multidisciplinary program is creating a body of knowledge about how well the labor market functions for older workers, the companies that employ them, as well as what can be done to support and strengthen this shift in how Americans work. Adjusting U.S. labor market institutions for the new demographic realities is a tier-one challenge for the 21st century.

Grants in this program aim to

- Fund original, high quality scientific research that examines both the supply and demand sides of older worker labor markets;
- Evaluate policy options to remove barriers to working longer;
- Identify critical labor market institutions' activities that reflect a deeper understanding of the consequences of an aging workforce;
- Create new federal and administrative data sources that bear on answering questions about older workers;
- Foster a robust, thriving multi-disciplinary community of scholars investigating issues at the intersection of aging and work;
- Advance in-depth, insightful coverage in top media outlets of issues related to the delayed retirement, economic security, and working longer.

Trustee Grants

Boston College

CHESTNUT HILL, MASSACHUSETTS

$450,048 over 36 months to strengthen Network member engagement of the Sloan Research Network and successfully transition to a new structure and leadership.

Project Director: Jacquelyn Boone James, Director

The Sloan Research Network on Aging & Work (SRNAW) is the only multidisciplinary research network focused on the aging of the workforce in the United States and abroad. Bringing together 235 members from 21 countries and more than 24 disciplines including economics, psychology, sociology, and management studies, SRNAW is a critical communication hub for the development of shared theories, frameworks, and research projects on aging and work. Funds from this grant support continued operation of the network along with activities designed to increase and strengthen member engagement in SRNAW. Additional grant funds support the development of plans for sustainable long-term financing of the network.

Boston College

CHESTNUT HILL, MASSACHUSETTS

$249,626 over 24 months to produce research and inform policy-makers about the role that non-traditional jobs play for older workers.

Project Director: Alicia H. Munnell, Director

This grant will support four integrated research projects on the role played by nontraditional work arrangements—defined as jobs that lack benefits and that have significant wage and hour volatility—in the labor market decisions of older workers. Led by Alicia Munnell, director of the Center for Retirement Research at Boston College, three of the projects focus on workers in their 50s and early 60s who may consider themselves too young to retire. The first project examines the extent to which the apparent rise in nontraditional employment for older individuals reflects the loss of traditional jobs to globalization and automation. The goal is to learn how the spread of these pressures to more industries could increase nontraditional work. To the extent that more older workers hold nontraditional jobs, the second project explores how these jobs are part of late-career employment patterns. Do these workers move back into traditional employment, for example—and, if so, after how long—and how often and for how long do they stay in nontraditional work for the remainder of their careers. The third project addresses the question of whether older nontraditional workers obtain access to retirement savings vehicles and health insurance through other sources, such as their spouses, public programs, or their own initiative. The fourth project focuses on an older group of workers—those in their 60s who are old enough to retire but are still working—and examines the extent to which nontraditional jobs help these workers improve their retirement security relative to retiring early.

Brookings Institution

WASHINGTON, DISTRICT OF COLUMBIA

$697,678 over 18 months to develop and justify specific, actionable policy reforms to encourage increased saving and enable longer working lives, as well as to identify policy reforms to enable consumers to have greater access to and understanding of retirement products in the p.

Project Director: Martin Neil Baily, Senior Fellow/Economic Studies

This grant provides partial funding for a project led by Martin Baily of the Brookings Institution to develop a new paradigm for work and retirement that incorporates working longer as an essential tool for increasing retirement security. Baily aims to develop the case for specific, actionable policy reforms that will encourage increased saving and enable longer working lives, as well as identifying policy reforms to enable consumers to have greater access to and understanding of retirement products in the private market.

First, Baily will commission a series of detailed policy proposals that will be then presented in public forums—three public forums with three papers presented at each—directed at educating federal and (where appropriate) state policymakers. Each of the nine papers commissioned for the policy series will offer practical recommendations grounded in research that can be adopted by policymakers and private-sector actors. Suggested topics include how to make jobs more flexible, training for older workers, reducing the tax penalty for working longer, age discrimination, annuities, reverse mortgages, and long-term care insurance.

Peter Gosselin, contributing reporter at ProPublica, talks about his work covering employment discrimination against older workers at an event hosted by Hunter College. (PHOTO: BEN OHENE/HUNTER COLLEGE)

After the briefings, Baily (with co-principal investigator Benjamin Harris) will then author a report that will lay out a comprehensive new vision for retirement. This will include three complementary components: reform of labor market policies to accommodate longer lives; creation of more robust private insurance markets and better products; and changes to the saving landscape, particularly for the growing population without access to traditional retirement accounts (for instance, freelance workers).

University of California, Berkeley

BERKELEY, CALIFORNIA

$219,875 over 24 months to shed new light on the prevalence and nature of independent contracting (including gig work), with a focus on documenting how both pre- and post-retirement older workers combine independent contracting with other sources of income.

Project Director: Annette Bernhardt, Director

This grant funds a project led by Annette Bernhardt and Jesse Rothstein at the University of California, Berkeley to study the incidence and characteristics of independent contracting using tax return data for California from 2013 to 2017. The study will focus, in particular, on how both pre- and postretirement older workers combine independent contracting with other sources of income.

Analyzing both W-2s and 1099s, Bernhardt and her team will look closely at persons with both types of incomes, permitting an assessment of whether independent contracting is the main or supplemental work activity. The richness of the dataset will also allow preliminary analysis of trends and patterns into and out of independent contracting work over time and correlations between independent contracting and race, gender, ethnicity, and age. The linked dataset created will also provide a significant resource to the state of California, to other states wanting to broaden data sources on independent contractors, and to researchers who can apply to use the datasets in their own work.

University of California, Los Angeles

LOS ANGELES, CALIFORNIA

$262,374 over 24 months to answer questions about how California's workforce system serves older workers in terms of training and its effectiveness.

Project Director: Till von Wachter, Associate Professor

This grant funds a project by Till von Wachter, professor of economics at UCLA and faculty director of the California Policy Lab at UCLA, to examine how retraining programs affect employment outcomes among older workers. Four research questions are at the core of von Wachter's work: How has the incidence of employment instability and unemployment evolved for older workers? How well has the workforce system, particularly its job training opportunities, served older unemployed workers? What are the outcomes of job training and other services for older workers, in terms of employment and earnings? Has the ability of the system to improve older workers' outcomes increased after recent legislative reforms?

To shed light on these questions, Von Wachter has gained unprecedented access to a comprehensive linked dataset covering California's workforce at the individual level. These data include quarterly earnings records for individual workers for each employment relationship, including identifiers for the employing establishment; quarterly employment, wage bill, and detailed industry affiliation for establishments; individual Unemployment Insurance (UI) claims, with detailed information on duration of claim, benefits received, worker demographics, occupation, and education; and detailed information on type of workforce service received, including type of training and job search assistance, the dates of service, as well as information from intake and exit interviews with caseworkers.

Von Wachter's work has the potential to advance understanding of how to use training to increase labor force participation of older workers and could inform local and national policymakers interested in improving the workforce system.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$561,331 over 24 months to develop a better and more cohesive understanding of current and future trends in aging and labor force participation in the United States and to impart that information to the general public.

Project Director: Lisa Berkman, Director

Changes in health, family, and work may make working longer difficult if not risky for substantial sections of the future U.S. population. This grant supports a community of scholars to produce 12 papers involving original research that will introduce a new framework for understanding current and future trends in working longer. The resulting volume—published either as a book or in a high-impact special journal issue—will examine multiple contexts that shape Americans' likelihood of working longer, with emphasis on two cross-cutting themes of change across cohorts and heterogeneity across population subgroups, which have not been sufficiently studied to date.

Under the leadership of Lisa Berkman of Harvard, this project will bring together a multidisciplinary group of distinguished scholars and invite them to collaborate with promising junior scholars, inviting the next generation of researchers to critically examine conventional thinking in this area. Grant funds will support three meetings so that authors can integrate objectives, gain important feedback from each other, and present their results in a policy-relevant setting. The project's goals are threefold: to publish original research that brings critical, new perspectives to the scholarship on working longer; to build a new, intergenerational community of scholars who will set the agenda for future research; and to disseminate high-impact findings that have the potential to influence policymakers and public discourse.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$421,285 over 48 months to renew an interdisciplinary, postdoctoral training program called the "Sloan Fellowship on Aging and Work" that addresses the challenges of aging societies and labor force participation.

Project Director: Lisa Berkman, Director

Funds from this grant provide four years of continued support for a multidisciplinary postdoctoral fellowship program at the Harvard Center for Population and Development Studies (HCPDS) at Harvard's School of Public Health. The Harvard fellowship program is designed to provide opportunities for seminars, mentorships, and speakers, with the goal of catalyzing a Cambridge-based research community for scholars of aging and work that will become part of the growing community of researchers focused on the intersection of aging and work. Grant funds will provide stipend support for two two-year fellowships along with subsidiary funds to support the fellows' travel and research needs.

University of Maryland, College Park

COLLEGE PARK, MARYLAND

$499,637 over 42 months to inform the design of questions to learn about alternative work arrangements among the population age 50 plus and provide new evidence on the role of these arrangements in older adults' work lives.

Project Director: Katharine Abraham, Professor

This grant funds work by Katharine Abraham and John Haltiwanger of the University of Maryland and Susan Houseman of the Upjohn Institute to bring greater precision to our understanding of how to define and count the "alternative workforce," and to gain deeper understanding of the roles the different types of alternative work arrangements play in older workers' lives.

Partnering with Gallup, Abraham and her team will field a nationally representative telephone survey of adults aged 18 to 80, asking them about their non-traditional work arrangements. The team will then create a new dataset by linking survey responses with administrative data from tax filings and household surveys. The new dataset will allow the team to probe how alternative work arrangements fit into the labor market behavior of older workers. Questions of interest include whether and to what extent alternative work arrangements are used during periods of traditional unemployment; whether they are a prelude to re-entry into the traditional workforce; the extent to which they are used to supplement retirement income, to offset the risk of 401(k)s, or to balance elder care responsibilities with the need to earn money; and what role the social aspects of work and its capacity to help structure one's days play in the decision to take up an alternative work arrangement. These questions beg a more fundamental one: are these arrangements positive choices or options of last resort for older Americans?

The created dataset will be made publicly available for use by other researchers and the project team expects

Ruth Finkelstein, Executive Director of the Brookdale Center on Healthy Aging, speaks at *Working Longer: Prospects and Problems* about employment discrimination and reframing barriers to working longer. **(PHOTO: BEN OHENE/ HUNTER COLLEGE)**

the project to produce at least two peer reviewed papers, as well as a series of policy briefs and presentations aimed at both scholars and policymakers.

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$253,000 over 24 months to support a two-year phase of collaborative study on facilitating work at older ages.

Project Director: Kevin Milligan, Professor of Economics

This grant funds a research network of economic scholars studying issues at the intersection of aging and work. Led by Kevin Milligan of the University of British Columbia, the network includes David Cutler of Harvard, Ellen Meara of Dartmouth, John Shoven of Stanford, Nicole Maestas of Harvard, Arie Kapetyn of University of Southern California, and Sita Slavov of George Mason, among others. Grant funds will support an annual workshop for network members and various other convenings allowing them to set a common research agenda, share ideas, and discuss and inform each other's research. Over the next two years, network members will address various aspects of three topics: How public policy incentives affect work at older ages; what aspects of the workplace and employer practices can sustain work at older ages; and how older workers fit into the overall labor market. Overall, grant funding will support the production of at least eight academic papers on these topics.

Urban Institute

WASHINGTON, DISTRICT OF COLUMBIA

$376,162 over 24 months to assess and better understand the labor supply, economic and health impacts of Paid Family Leave policies on older working adults who provide care to elderly family members.

Project Director: H. Elizabeth Peters, Institute Fellow

The aging of the population and the concomitant demands on families to provide elder care raise important questions about the effectiveness of state-level Paid Family Leave (PFL) policies, which purport to protect adults who provide care to aging parents and spouses. This grant to H. Elizabeth Peters at the Urban Institute funds a study of how well PFL policies in California and New Jersey protect caregivers.

The study will examine two separate sets of questions. First, Peters and her team will begin by examining differential outcomes on labor supply, economic well being, and health for older caregivers in states with PFL programs and states without, and within states both before and after the establishment of the programs. Second, the team will employ focus groups to explore and explain the curiously low utilization rate of PFL policies by workers.

Grants Made Against Prior Authorizations

In December 2015, the Trustees approved the expenditure of up to $350,000 for grants aiming to deepen understanding of the demand and supply sides of the older worker labor market. In March 2018, the Trustees authorized the expenditure of an additional $250,000 for the same purpose. The following grants were made against these previously authorized funds.

Georgia State University Research Foundation

ATLANTA, GEORGIA

$107,931 over 18 months to conduct research on the returns to later-age degrees (for individuals 50 and older) in terms of wage premiums, employment stability, and retirement income.

Project Director: Sally Wallace, Interim Dean/Professor

Manufacturing Institute

WASHINGTON, DISTRICT OF COLUMBIA

$125,000 over 12 months to study upskilling strategies among manufacturers for aging workforce and explore best practices on how these companies have been able to successfully extend the working years of this group.

Project Director: Chad Moutray, NAM Chief Economist and Director

National Bureau of Economic Research

CAMBRIDGE, MASSACHUSETTS

$97,348 over 19 months to ascertain current policies of large companies toward older employees working beyond traditional retirement ages.

Project Director: Robert L. Clark, Research Associate

Officer Grants

Center for Economic and Policy Research

WASHINGTON, DISTRICT OF COLUMBIA

$115,750 over 12 months to analyze the effect of and additional contracting layer, Managed Services Providers (MSPs) on lead firms and workers engaged in non-standard work arrangements.

Project Director: Eileen Appelbaum, Co-Director

Hunter College Foundation

NEW YORK, NEW YORK

$125,000 over 12 months to expand upon a just-completed, Sloan-funded project to produce enterprise journalism about the trends, structures, and programs shaping the work lives of older Americans.

Project Director: Peter Gosselin, Reporter

RAND Corporation

SANTA MONICA, CALIFORNIA

$125,000 over 7 months to pilot a new approach to collect linked worker-firm data in which both workers and employers provide information about the determinants of the length of working life.

Project Director: Peter Hudomiet, Economist Associate

San Francisco State University

SAN FRANCISCO, CALIFORNIA

$124,833 over 19 months to examine the effects of the Work Progress Administration (WPA) on long-term work, disability, and retirement outcomes.

Project Director: Sepideh Modrek, HEI Assistant Professor

Higher Education

Diversity, Equity, and Inclusion in STEM Higher Education

PROGRAM DIRECTOR: ELIZABETH S. BOYLAN

Alfred P. Sloan demonstrated in words and actions his concern about the underrepresentation of women and racial and ethnic minorities in STEM fields and in economics. Grantmaking under successive Foundation presidents over the past 6+ decades has continued this commitment to promoting successful educational and career progress for individuals from historically underrecognized and marginalized populations in the United States.

The Foundation believes that all people deserve to be welcomed for their potential to become full partners and vital contributors to the scientific enterprise. The Foundation commits itself to supporting women and racial and ethnic minorities, who historically have been marginalized in these fields, to achieve success in a wide variety of careers in science and economics. It also commits to catalyzing institutional change to diversify STEM and economics faculties to expand the cohort of underrepresented graduates who succeed in these professions.

The Foundation's interests in STEM education focus exclusively on the higher education sector, with an emphasis on graduate education. Projects aimed at early- to mid- career professionals from underrepresented groups are of interest, as are initiatives proposing novel or underexplored mechanisms to build institutional capacity for diversity, equity, and inclusion. Research projects may be invited that explore barriers to entry to STEM and economics higher education or the workforce, or that promote strategies affecting the performance and fulfillment of students.

Projects targeting K-12 science education, informal science education, or K-12 science educators are not considered.

Trustee Grants

Association of American Universities

WASHINGTON, DISTRICT OF COLUMBIA

$301,550 over 48 months to construct more student-centered educational environments for all graduate students by active institutional and departmental support for a variety of career options and for increased inclusion of students from underrepresented groups.

Project Director: Tobin Smith, Vice President for Policy

Funds from this grant support a multidimensional national effort by the Association of American Universities (AAU) to help make U.S. graduate education more student-centered. The need for such an effort stems from a recognition that the organization of much of graduate education has been too focused on the singular goal of research productivity at the expense of preparing doctoral students for a broader array of professional careers inside and outside the academy. AAU will run a pilot program at 8 universities drawn from its 62 highly respected member institutions. Over the course of three years, two departments from each university will conduct analyses to support the development and implementation of action plans to provide greater support for students' pursuits of diverse Ph.D. career pathways. The project will also increase transparency by making Ph.D. and career outcomes data readily available, and foster cross-institutional learning and broad dissemination of effective strategies and practices through workshops, virtual webinars, and activities aimed at fostering more student-centered educational environments for all doctoral students.

Sloan Scholar Anita Moore-Niall receives her doctorate from Michigan State University in Earth, Atmospheric and Planetary Sciences. (PHOTO: MICHIGAN STATE UNIVERSITY)

Johns Hopkins University

BALTIMORE, MARYLAND

$450,000 over 48 months to fund the Open Chemistry Collaborative in Diversity Equity (OXIDE) to advance diversity and inclusion, and reduce diversity inequities throughout the academic career ladder in chemistry departments nationwide.

Project Director: Rigoberto Hernandez, Gompf Family Professor of Chemistry

The OXIDE project, based at the Johns Hopkins University, aims to advance diversity and inclusion throughout the academic career ladder in chemistry. OXIDE collects data, disseminates it to the broad chemistry community, and holds department chairs accountable for their success or failure to promote diversity in their departments. This "top-down" strategy to promote change has been shown to be successful for industry. OXIDE's accountability strategy is largely executed at NDEW, the National Diversity Equity Workshop, an intensive two-day meeting that has been held biennially by OXIDE since 2011. Funds from this grant will support two more NDEWs, in 2019 and 2021, and the annual publication and dissemination of data on diversity equity statistics in chemistry for four years. OXIDE's target objectives for the project period include the participation of approximately 60 chemistry department chairs in the biennial NDEW, an increase in chairs' proficiency in the value proposition for advancing diversity and addressing known barriers to diversity equity; an increase in departmental efforts that are managed by the chair that advance local diversity equity outcomes; and a transition in organizational funding from heavy reliance on grant support to substantial reliance on funds provided by the institutions of the participants.

University of Michigan

ANN ARBOR, MICHIGAN

$1,061,264 over 38 months to establish a collaboration of 11 large R-1 universities that will accelerate and enhance efforts to improve foundational courses in STEM through learning analytics research into, and development of, equitable and inclusive STEM curricula and teaching practices.

Project Director: Timothy McKay, Arthur F. Thurnau Professor of Physics

A recent study of undergraduates across five Big Ten research universities found that women in large classes in biology, chemistry, physics, accounting,

Leaders, administrators and faculty from the Sloan Indigenous Graduate Partnership convene during a site visit to the University of Alaska, Anchorage in January 2019. **(PHOTO: CHRIS AREND/ AREND PHOTOGRAPHY)**

and economics performed about a third of a grade point lower (e.g. A- to B+) than similarly situated men. Understanding the basis for this gendered performance difference has the potential to contribute to a better understanding of the poorer persistence patterns of women and other demographic groups in STEM, and to the development of means by which those differences can be eliminated.

This grant funds an effort by University of Michigan physicist Timothy A. McKay to assemble a broad coalition of university collaborators to jointly undertake further research and interventions. The acronym for the project is SEISMIC, for the Sloan Equity and Inclusion in STEM Introductory Courses project, appropriately reflecting the opportunity for powerful disruption of an entrenched system.

SEISMIC will bring together 11 institutions, each contributing a team of approximately 10 faculty members, students, and staff. The teams will examine all introductory STEM courses on all campuses through common analytics and engage in parallel data analysis, data sharing, coordinated experiments, a continuous exchange of speakers (about 60 per year), and extended annual summer meetings. Attention will be paid to the diversity of institutions chosen. Gender will continue to be an object of study, and the project will also examine other student demographics including race/ethnicity, first-generation (first-gen) college students, and various forms of intersectionality, e.g., Latina women or first-gen men. A planning meeting and three annual collaboration summer meetings will be held to accelerate research, build community, and enhance the spread of ideas. Results will be disseminated broadly through presentations at national professional meetings and publication in several peer-reviewed articles that will reach broad STEM and STEM-education audiences.

National Action Council for Minorities in Engineering, Inc.

WHITE PLAINS, NEW YORK

$2,870,643 over 36 months to support the Alfred P. Sloan Minority Ph.D. Program (MPHD) through Phase 3 renewal grants for University Centers of Exemplary Mentoring (UCEMs) at Massachusetts Institute of Technology, University of California, San Diego and the University of Illinois.

Project Director: Michele Lezama, President & CEO

This grant to the National Action Council for Minorities in Engineering funds three-year renewals for the University Centers of Exemplary Mentoring (UCEM) at the Massachusetts Institute of Technology (MIT); University of California, San Diego; and the University of Illinois at Urbana-Champaign. UCEMs are the primary funding model for the Sloan Foundation's Minority Ph.D. (MPHD) program. NACME provides the administrative and fiscal support for management of all Sloan funding for UCEMs.

Funds granted to each UCEM are used primarily for $40,000 scholarships for underrepresented minority doctoral students. Between the three schools, an estimated 61 students will receive such scholarships over the next three years, with a similar number of "matching" students receiving support from each UCEM's host institution. Additional grant funds support programmatic expenses associated with the recruitment, retention, and mentoring of these students and activities to promote their successful completion of graduate study.

New York Academy of Sciences

NEW YORK, NEW YORK

$401,144 over 36 months to expand the developing pilot program, Science Alliance Leadership Training (SALT), to train 90 diverse, advanced doctoral students to lead institutional change through acquisition of strong entrepreneurial, interpersonal, and technical skills.

Project Director: Alejandro de la Puente, Associate Director

Funds from this grant provide support for three years of continued operation of the New York Academy of Science's Science Alliance Leadership Training (SALT) program. The program aims to provide leadership training to a yearly cohort of 30 early-career scientists drawn from members of the NYAS Science Alliance. Cohorts are intentionally selected to promote diversity and prior cohorts have included significant numbers of women and underrepresented minorities. Supported activities for each cohort include a five-day intensive workshop followed by monthly webinars for nine months to expand and reinforce leadership skills. Additional funds will support a longitudinal analysis of program participants to enable rigorous evaluation of program impacts.

Northeastern University

BOSTON, MASSACHUSETTS

$247,641 over 36 months to support an intensive, year-long academic leadership program for 40-50 mid-career STEM faculty of color from a consortium of seven Boston-area universities.

Project Director: Debra L. Franko, Senior Vice Provost for Academic Affairs

This grant provides two years of support for a new multi-institutional leadership development program for mid-career STEM faculty of color in the Boston area. Participating universities include Northeastern University, Boston University, the T.H. Chan School of Public Health at Harvard, Massachusetts Institute of Technology, Suffolk University, Tufts University, and the University of Massachusetts, Boston.

Successful applicants to the program will attend an initial, four-day workshop that focuses on self-assessment, skills building, and creation of a networked cohort. The workshop will be followed with individualized mentoring by seven institutional leaders about governance and successfully navigating the institutional structure of a university. Finally, participants will develop team projects that they will execute, evaluate, and then present to a group of provosts and deans. All program participants will be tracked for two-years after completion of the program to gauge its effects.

University of Puerto Rico, Mayagüez

MAYAGÜEZ, PUERTO RICO

$498,065 over 41 months to enhance the research skills and productivity of Ph.D. candidates in 8 STEM fields at UPR-Mayagüez to compensate for campus damage during Hurricane Maria (2017).

Project Director: Rodolfo J Romañach, Professor of Chemistry

In 2017, Hurricanes Irma and Maria hit Puerto Rico, devastating the island and disrupting most scientific research and education. Sloan responded by granting $4,000 to each of 35 chemical and chemical engineering graduate students at the University of Puerto Rico Mayagüez (UPRM) and Rio Piedras, allowing them to use the funds in whatever way they saw fit to best continue their educations. Disruptions continue, however, and this grant to the University of Puerto Rico provides enhanced funding to help doctoral STEM students continue their educations in the wake of Maria and Irma. Grant funds will allow 24 doctoral students to conduct research for four to six months at a collaborating mainland laboratory; support a lecture series at UPRM; and provide travel funds for faculty to attend scientific conferences and meetings and for graduate students to visit mainland campuses for supplementary mentoring, including practice job talks. Additional funds will support data collection and analysis that will allow evaluation of program impacts.

Grants Made Against Prior Authorizations

In October 2016, the Trustees authorized the expenditure of up to $250,000 to provide support for conferences, workshops, and pilot studies that advance the Sloan Foundation's goals with respect to increasing diversity across STEM higher education and the STEM professions. In October 2017, the Trustees approved the expenditure of an additional $250,000 for the same purpose. The following grants were made against these previously authorized funds.

University of California, Berkeley

BERKELEY, CALIFORNIA

$20,000 over 12 months to support a Summit for ~100 graduate students and 20-50 experienced researchers in economics from underrepresented groups to build tools and networks to support diversity, inclusion, and equity in the field.

Project Director: Martha Olney, Teaching Professor of Economics

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$110,000 over 10 months to disseminate broadly the new National Academies report on Sexual Harassment of Women to various stakeholders, and to motivate and document change at 2-year and 4-year colleges and universities.

Project Director: Thomas Rudin, Director

Brown University

PROVIDENCE, RHODE ISLAND

$33,500 over 12 months to support the 2018 Blackwell-Tapia Conference providing early-career minority mathematicians with enhanced understanding of their field, networking with peers, and interactions with senior researchers.

Project Director: Brendan Hassett, Director, Institute for Computational and Experimental Research in Mathematics

Sloan Scholar Samuel Perez receives his Ph.D in electrical engineering from University of South Florida System President Judy Genshaft. An immigrant from the Dominican Republic, Dr. Perez completed an advanced degree after serving 20 years in the US Air Force. (PHOTO: GRADIMAGES PHOTOGRAPHY.)

Officer Grants

American Association for the Advancement of Science

WASHINGTON, DISTRICT OF COLUMBIA

$112,800 over 12 months to provide infrastructure funding to update legal guidance for colleges and universities on diversity, equity, and inclusion (DEI) in STEM and to assist with the pilot phase of SEA Change, a voluntary, metrics-based self-assessment system.

Project Director: Shirley M. Malcom, Senior Advisor

Georgia State University Research Foundation

ATLANTA, GEORGIA

$125,000 over 13 months to develop programming establishing the CASA Science Fellows Program, a STEM PhD Pipeline for Georgia State University students.

Project Director: Kyle Frantz, Professor of Neuroscience & Director of CASA

John Jay College of Criminal Justice, CUNY

NEW YORK, NEW YORK

$124,991 over 18 months to develop a model educational program and supportive community for the persistence of women graduate students in STEM through the presentation of the play, "Truth Values," with associated workshops, mentoring, and networking activities.

Project Director: Silvia Mazzula, Associate Professor of Psychology

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$65,000 over 4 months to broadly disseminate to various stakeholders the new National Academies report, "Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce".

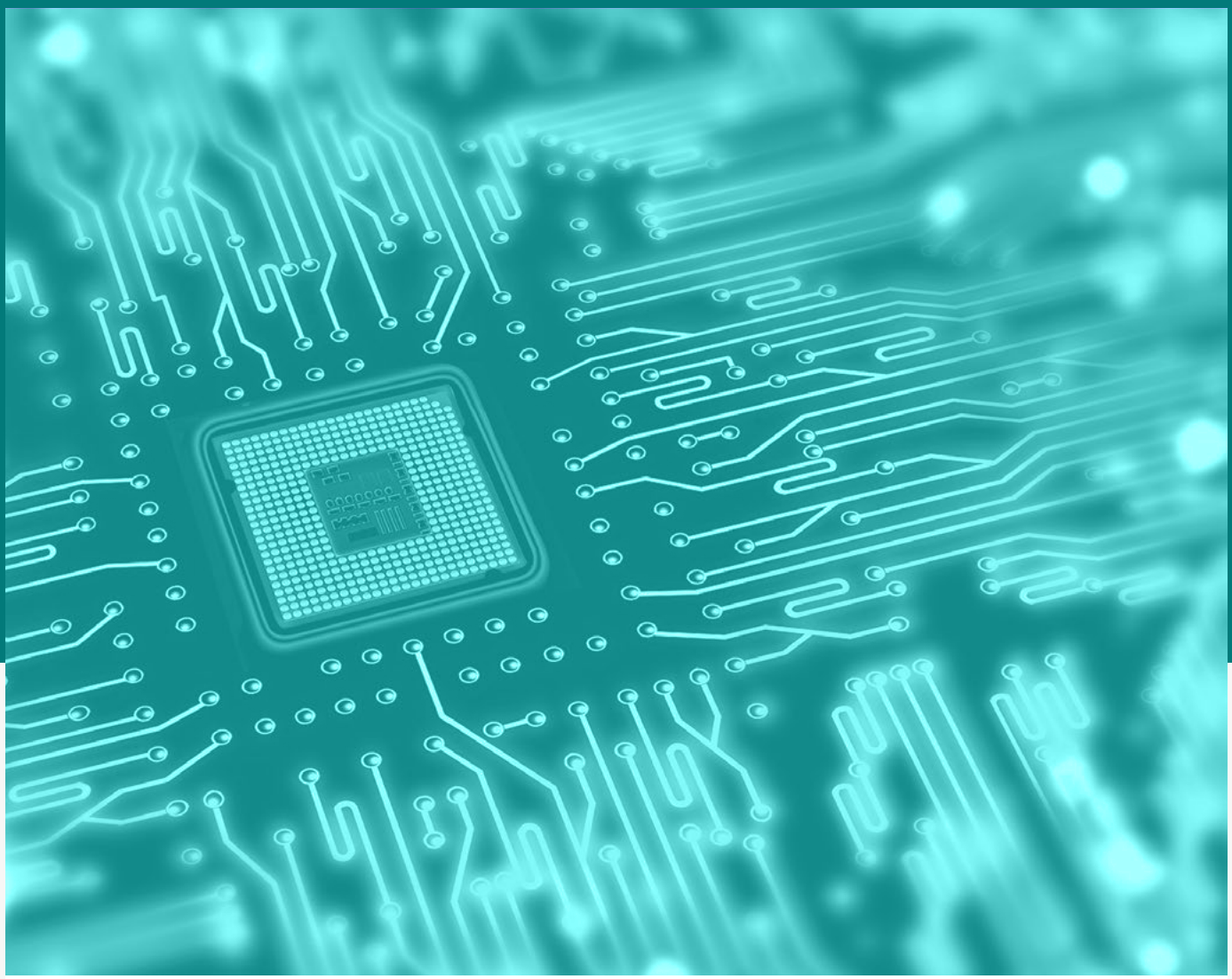
Project Director: Leigh Miles Jackson, Senior Program Officer

Western Michigan University

KALAMAZOO, MICHIGAN

$19,200 over 6 months to provide travel grants to attendees at a 2.5-day working group meeting hosted by HHMI.

Project Director: Charles Henderson, Co-Director, Center for Research on Instructional Change in Postsecondary Education



Technology

Data and Computational Research

PROGRAM DIRECTOR: JOSHUA M. GREENBERG

The goal of this program is to accelerate scientific discovery by helping researchers fully exploit the opportunities created by recent advances in our ability to collect, transmit, analyze, store, and manipulate data. Grantmaking aims to support the efficient management and sharing of research data and code at every point in the scientific pipeline—from acquisition through analysis to archiving—and to grow the current and future scientific data workforce.

Grants in this program fall into four broad categories:

- **Software grants** support technology development projects ranging from building of prototypes, to iterative redevelopment, to providing resources for scaling;
- **Training grants** support workforce training and curricular initiatives as well as targeted efforts to speed adoption of new technologies by research communities;
- **Research grants** bring historical, ethnographic, and economic research methods to bear on our understanding of how scholars use technology and how technology is changing scholarship;
- **Community grants** build networks for knowledge exchange across research disciplines and help strengthen institutions that incubate sustainable research and software projects while producing the next generation of data scientists.

Trustee Grants

Code for Science and Society

PORTLAND, OREGON

$609,500 over 12 months to support better use of spreadsheets in research through continued development of software that is user-friendly, designed to integrate with existing open tools and languages, customizable by discipline, and supportive of best practices in data managemen.

Project Director: Nokome Bentley, Project Director

Stencila is a spreadsheet tool that enables researchers to execute Python, R, or SQL code from within individual cells alongside data and Excel-style formulae. The promise of a platform like Stencila is that it allows researchers who are comfortable in Excel to exploit the universe of disciplinary and statistical libraries in open source languages like Python and R without having to wholly embrace a different way of working. Funds from this grant support efforts by New Zealand–based scientist Nokome Bentley to expand the power and user base of Stencila. Plans involve identification of and outreach to researchers most likely to find Stencila useful, the implementation of several new features designed to ease adoption of the platform, the further growth of a community of committed open source developers, and efforts to diversify the project's funding base.

City College of New York - CUNY

NEW YORK, NEW YORK

$250,000 over 24 months to develop an open source framework for prototyping 3D scientific visualization applications using game engines.

Project Director: Huy Vo, Assistant Professor

Major video game rendering engines are capable of rich 3D environmental rendering and physics simulation, not to mention built-in virtual and augmented reality capabilities. They are, however, rarely utilized in scholarly research, in part because researchers who have explored their use for data visualization have had to manage the arduous task of configuring and structuring their research data in order to load it into the game engine.

This grant funds a two-year initiative by Huy Vo of the City College of New York to dramatically lower barriers to the use of game engines for scientific visualization. In the first year, Vo will develop a standardized workflow and open source plug-in for the popular Unity 3D gaming engine that will enable the easy importation of research data, generation of geometries, and construction of interactive visualizations. In year two, Vo will pilot the plug-in himself in two research collaborations (one with CUNY researchers on climate adaptation and the reliability of power sector infrastructure, one with AT&T Research Labs on mobile antenna placement). He will also use it as the platform for student projects in a CUNY data visualization course.

Johns Hopkins University

BALTIMORE, MARYLAND

$536,063 over 12 months to support the adoption of the SciServer research data platform by new scientific communities.

Project Director: Alexander Sandor Szalay, Professor

Adapted from SkyServer, the data portal for the Sloan Digital Sky Survey, SciServer is an open source data management and archiving platform aimed at meeting the data management needs of large research collaborations at a disciplinary or interdisciplinary scope. These collaborations often have unique data management challenges anchored to a particular instrument, facility, type of data, or field campaign that are unmet by archiving and management platforms built to serve as generic data archiving platforms. SciServer, in contrast, is built to integrate datasets and lower barriers to aggregate querying and analysis. Funds from this grant provide one year of operating support for SciServer as the project's founder, Alexander Szalay, seeks to diversify and stabilize the platform's funding base.

University of Minnesota

MINNEAPOLIS, MINNESOTA

$526,438 over 36 months to launch and expand a cross-institutional staffing model for curating disciplinary research data.

Project Director: Lisa Johnston, Co-Director Digital Conservancy

One crucial component of the current and future data workforce is the data curators who steward and curate research data in the interests of reproducibility and reuse. Academic libraries seeking to increase data curation support face a structural problem, however: it's simply not possible to hire an expert data curator for every discipline. From 2016 to 2018,

Attendees of the 2018 Moore Sloan Data Science Environments Summit . The Summit brings together leaders of the Moore-Sloan Data Science Environments, along with leaders in the data science community for workshops, networking events, lightning talks, and panels about developments in academic data science. **(PHOTO: ROBIN BROOKS, ESCIENCE INSTITUTE)**

seed funding from the Sloan Foundation was used to plan a network that could facilitate the sharing of disciplinary data curation expertise across a cohort of partner universities. Funds from this grant support the launch and expansion of this Data Curation Network over the next three years. Initial participating institutions include Cornell; Duke; Johns Hopkins; Penn State; and the universities of Minnesota, Michigan, and Illinois at Urbana Champaign. The grant will support a modest amount of each participating data curator's time, a network coordinator to be based at the University of Minnesota under the supervision of principal investigator Lisa Johnston, annual meetings of the network, and a business consultant to test business models and plan for sustainability beyond the funded launch period.

New York University

NEW YORK, NEW YORK

$186,897 over 18 months to investigate how academics are using Git hosting platforms and how those platforms can be better adapted to academic needs.

Project Director: David Millman, Assistant Dean

The grant funds work by a team at the NYU Libraries including David Millman, director of Digital Library Technology Services, and Vicky Steeves, reproducibility librarian, to examine how researchers use the popular code versioning site Github and its underlying technology platform Git. The team will document the ways in which current Git-based systems are incompletely serving the needs of academic researchers and libraries during the software design process. This will include a gap analysis, landscape research, user study, and development of functional requirements to improve Git from the standpoint of academic research. The result will be a set of recommendations to more overtly align Git platforms with academic institutions and incentive structures.

Open Knowledge Foundation

CAMBRIDGE, UNITED KINGDOM

$749,624 over 36 months to support adoption and use of a lightweight data packaging standard in order to reduce the frictions experienced in the acquisition, sharing, use, and reuse of research data.

Project Director: Paul Walsh, Head of Technical Product

In 2015, a Sloan Foundation grant to Open Knowledge led to the creation of the "frictionless data" standard, a set of protocols for packaging tabular datasets in uniform ways that could be used, if adopted widely enough, to greatly simply the logistics of exporting, transporting, and importing data.

This grant funds efforts by Open Knowledge to broaden adoption of the frictionless data standard through outreach to scholarly organizations, data platforms, analysis tools, and specific research fields. Over the three-year grant period, Open Knowledge will use grant funds to conduct outreach and support activities, structured partly as high-touch field/context-specific pilots, and partly as broader outreach and engagement to the wider user community.

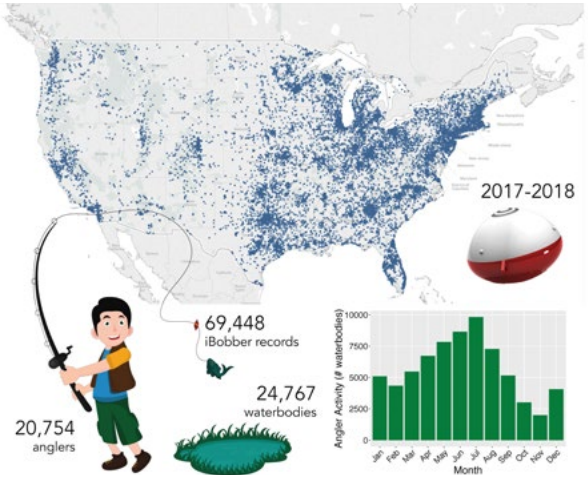
SUNY Polytechnic Institute

ALBANY, NEW YORK

$197,851 over 12 months to support the scaling-up of a community of scholars and practitioners focused on technology maintenance.

Project Director: Andrew Russell, Professor

In 2016, Andrew Russell (now Professor and Dean of Arts & Sciences at SUNY Polytechnic Institute) and Lee Vinsel (now Assistant Professor of Science, Technology, and Society at Virginia Tech) hosted a three-day workshop, "The Maintainers," held at the Stevens Institute for Technology, that included presentations from a handful of practitioners who were responsible for maintenance of technological infrastructure such as aerospace, transportation, information technology, and the military. Interest in the workshop was robust and a second workshop followed in 2017, also well attended. This grant provides support to Russell and Vinsel for plans to grow and formalize the set of experts, researchers, and practitioners interested in issues of technological maintenance. Over the next year they request funds to develop two pilot "maintenance communities," one of "information maintainers" and the other of "maintainers in the workforce." Through these two pilot communities Russell and Vinsel hope to produce a blueprint for how maintainer communities might be effectively structured. Additional grant funds support preparatory work in advance of a 2019 Maintainers conference.



Ecololgist Julian Olden used data from the iBobber, a smart depth finder used by fisherman, to track fishing and boating activity in the U.S. Boating is a major vector for freshwater species invasion across the country. (GRAPHIC COURTESY OF JULIAN OLDEN)

University of Nebraska, Omaha

OMAHA, NEBRASKA

$449,423 over 26 months to advance understanding of open source project health and sustainability and how people and organizations prosper from open source work.

Project Director: Matt Germonprez, Associate Professor

This grant supports research by information scientists Matt Germonprez (University of Nebraska) and Sean Goggins (University of Missouri) to develop and test rubrics for the evaluation of the health of online, open source development communities. Building on previous work that resulted in the successful Community Health Analytics for Open Source Software (CHAOSS) project and using a rich dataset drawn from GitHub and other sources, Germonprez and Goggins will investigate how definitions of the health of an online community might rightly vary depending on the type of community in question or type of project being jointly developed, how the injection of money into an online development community influences individual contributor behavior, and how individual decisions by contributors impact overall community health.

University of Vermont

BURLINGTON, VERMONT

$683,273 over 36 months to lower barriers to large-scale research computing through the development of a distributed, volunteer, in-browser system for elastic computing resources.

Project Director: Josh Bongard, Professor

Distributed volunteer computing has not changed substantially since the late 1990s when the SETI@Home project offered a downloadable screensaver that used spare PC computing cycles to analyze radio astronomy data, and thereby allowed hundreds of thousands of citizens to participate in the search for extraterrestrial intelligence. Computer scientist Josh Bongard at the University of Vermont proposes to bring that idea of volunteer computing into the inter-

net era by building a volunteer computing platform that lives in the web browser, allowing users who visit a special webpage to contribute computing capacity and/or disk storage to computational researchers.

This grant will provide three years of support to Bongard and his team for the initial build out and deployment of the platform, which could complement or provide an alternative to local supercomputing facilities and cloud services from companies like Amazon or Microsoft.

University of Washington

SEATTLE, WASHINGTON

$420,815 over 24 months to improve the capacity of data infrastructures to provide access to and sharing of sensitive qualitative data.

Project Director: Nicholas Weber, Assistant Professor

The conversation around data privacy and what constitutes appropriate access to sensitive data for research purposes has generally focused on quantitative data. Social scientists who work in whole or part with qualitative data have largely been left out of the data privacy conversation, and platforms for archiving ethnographic, interview, video, and other qualitative data haven't yet engaged issues of cross-study search or analysis.

This grant funds a two-year study led by Nic Weber and Carole Palmer of the University of Washington School of Library and Information of the privacy dimensions of qualitative research data. The project aims to produce a set of functional and technical specifications that will enable appropriate access to and sharing of qualitative data. Weber and Palmer will gather a broad set of use cases from both research case studies and scenario-focused interviews, which will then inform the initial design of a data curation protocol that ensures the contextual integrity of sensitive data collections and enhances the propensity of sensitive data to be reused. That protocol will then be implemented in both a tool for researchers to easily generate structured provenance metadata for sensitive qualitative data and a set of functional and technical requirements that will be piloted at Syracuse University's Qualitative Data Repository.

The 2018 student fellows of the Data Science for Social Good program at the University of Washington eScience Institute. For ten-weeks over the summer, fellows collaborate with working data scientists on projects that use data to help solve concrete problems in public health, crime prevention, sustainable urban planning, education, and social justice. **(PHOTO: ROBIN BROOKS, ESCIENCE INSTITUTE)**

Grants Made Against Prior Authorizations

In March 2018, the Trustees approved the expenditure of up to $250,000 for grants in support of conferences, workshops, and software development in the Data and Computational Research program. The following grants were made against this previously authorized fund.

Code for Science and Society

PORTLAND, OREGON

$34,300 over 10 months to partially support the production of a handbook on best practices for open source academic software communities.

Project Director: Danielle Robinson, President

Columbia University

NEW YORK, NEW YORK

$20,000 over 12 months to partially support a summit of data science leadership across US universities.

Project Director: Jeannette M. Wing, Avanessians Director and Professor of Computer Science

Community Initiatives

SAN FRANCISCO, CALIFORNIA

$19,500 over 6 months to partially support the first CarpentryCon.

Project Director: Tracy Teal, Executive Director

University of Idaho

MOSCOW, IDAHO

$20,000 over 18 months to support the first U.S. Semantic Technologies Symposium.

Project Director: Xiaogang Ma, Assistant Professor

North Carolina State University

RALEIGH, NORTH CAROLINA

$48,002 over 14 months to co-fund a workshop on data science within Land Grant Universities.

Project Director: Marc Hoit, Vice Chancellor

University of North Carolina, Chapel Hill

CHAPEL HILL, NORTH CAROLINA

$38,337 over 24 months to increase the participation of social science data archives i n the Research Data Alliance.

Project Director: Jonathan Crabtree, Assistant Director

NumFOCUS

AUSTIN, TEXAS

$20,000 over 6 months to support travel to and attendance at JuliaCon2018 by underrepresented minorities in computing who are users of and contributors to the Julia programming language.

Project Director: Jane Herriman, Chair of Diversity

NumFOCUS

AUSTIN, TEXAS

$20,000 over 6 months to support travel by students and junior faculty to a workshop focused on the development of scientific software using the R statistical computing language.

Project Director: Karthik Ram, Project Lead

Public Lab

CAMBRIDGE, MASSACHUSETTS

$50,000 over 8 months to partially support the 2018 Gathering on Open Scientific Hardware.

Project Director: Shannon Dosemagen, Executive Director

Rhizome

NEW YORK, NEW YORK

$19,800 over 6 months to help support a version of Wikibase that is easily deployed and used by institutions small and large, and to create a community of practice around Linked Data modeling.

Project Director: Dragan Espenschied, Preservation Director

In March 2018, the Trustees approved the expenditure of up to $500,000 in support of multidisciplinary research projects on the economics and maintenance of digital infrastructure. The following grants were made against this previously authorized fund.

Arizona State University Foundation

TEMPE, ARIZONA

$36,942 over 12 months to study the economics and maintenance of digital infrastructure through case studies of the funding and impact of software instruments in stellar astrophysics.

Project Director: Frank Timmes, Professor

University of California, Berkeley

BERKELEY, CALIFORNIA

$138,035 over 12 months to study the economics and maintenance of digital infrastructure by investigating the invisible work that sustains widely used open source projects.

Project Director: Stuart Geiger, Postdoctoral Scholar

University of Canberra

BRUCE, AUSTRALIA

$135,373 over 18 months to study the economics and maintenance of digital infrastructure by exploring the relationship between waged and volunteer labor in open source projects.

Project Director: Mathieu O'Neil, Associate Professor

Carnegie Mellon University

PITTSBURGH, PENNSYLVANIA

$49,500 over 24 months to study the economics and maintenance of digital infrastructure by testing the impact of non-financial and reputational incentives on open source participation.

Project Director: Erina Ytsma, Assistant Professor

University of Washington

SEATTLE, WASHINGTON

$139,993 over 20 months to study the economics and maintenance of digital infrastructure by measuring the underproduction that results from misalignment of supply and demand of open source labor.

Project Director: Benjamin Hill, Assistant Professor

Officer Grants

University of California, Office of the President

OAKLAND, CALIFORNIA

$20,000 over 6 months to support a workshop exploring institutional workflows to enable access, preservation, and sharing of sensitive data.

Project Director: Guenter Waibel, Associate VP & Executive Director

Carnegie Mellon University

PITTSBURGH, PENNSYLVANIA

$249,942 over 12 months to study the joining trajectories and social network positions of male and female developers in open source digital infrastructure projects.

Project Director: Laura Dabbish, Associate Professor

Code for Science and Society

PORTLAND, OREGON

$123,240 over 7 months to support community engagement and beta testing of Stencila Sheets.

Project Director: Nokome Bentley, Project Director

Computer scientist Magdalena Balazinska gives a presentation at the University of Washington's 2018 Data Science Summit in 2018. Topics addressed at the summit included data science challenges and opportunities in global health, astronomy, opthamology, and election security. (PHOTO: ROBIN BROOKS, ESCIENCE INSTITUTE)

Hopewell Fund

WASHINGTON, DISTRICT OF COLUMBIA

$20,000 over 6 months to partially support a second summit of data science leadership across US universities.

Project Director: Micaela Parker, Program Coordinator

Johns Hopkins University

BALTIMORE, MARYLAND

$19,124 over 12 months to develop a framework for updating the Digital Curation Centre Curation Lifecycle Model.

Project Director: G. Sayeed Choudhury, Associate Dean for Research Data Management

Miller-McCune Center for Research Media and Public Policy

SANTA BARBARA, CALIFORNIA

$50,000 over 6 months to support travel by academic researchers to the 2019 Social Science Foo Camp.

Project Director: Geane DeLima, President

Scholarly Communication

PROGRAM DIRECTOR: JOSHUA M. GREENBERG

The goal of this program is to empower researchers by supporting the development and adoption of new resources for managing the increasingly diverse array of digital communication channels, enabling scientists to more effectively locate relevant research, network with other researchers, and disseminate their work to the scientific community and the public. Grantmaking aims to improve the discovery and review of diverse scholarly materials and establish new forms of publication connecting data, research software, and analysis—particularly to support the reproducibility of research.

Grants in this program fall into four broad categories:

- **Software grants** support technology development projects ranging from building of prototypes, to iterative redevelopment, to providing resources for scaling;
- **Training grants** support workforce training and curricular initiatives as well as targeted efforts to speed adoption of new technologies by research communities;
- **Research grants** bring historical, ethnographic, and economic research methods to bear on our understanding of how scholars use technology and how technology is changing scholarship;
- **Community grants** build networks for knowledge exchange across research disciplines and help strengthen institutions that incubate new forms of scholarly communication.

Trustee Grants

American Association for the Advancement of Science

WASHINGTON, DISTRICT OF COLUMBIA

$649,893 over 24 months to continue to promote the professionalization and institutionalization of the role of the community engagement manager in scientific societies and large-scale research collaborations.

Project Director: Joshua Freeman, Chief Digital Media Officer

In 2015 the Foundation funded a pilot Community Engagement Fellows program at the American Association for the Advancement of Science. The program is run by longtime scientific community manager Lou Woodley, who led a yearlong planning process to develop a curriculum that tailors community engagement skills training to the scientific research context, and then recruited the first cohort of fellows for the 2017 calendar year. Drawn from professional societies and large scientific collaborations, fellows came together for in-person workshops at the beginning, middle, and end of the fellowship year, as well as for regular webinars and other online discussions. A robust program evaluation made clear that the fellowship year wasn't just extremely effective for the participants, it also led to tangible investments in and foregrounding of community management by many of the host organizations. This grant funds a continuation of the Community Engagement Fellows program, which includes funds for administration, for the recruitment and support of the 2019 fellows cohort, and for a shorter-term "visiting scholars" program that could draw on program alumni and other community management professionals.

Aspiration

SAN FRANCISCO, CALIFORNIA

$448,800 over 12 months to reduce barriers to data publication by providing context-specific guidance on sharing best practice, including suitable repositories.

Project Director: Kristen Ratan, Co-founder, Collaborative Knowledge Foundation

Recent years have seen a proliferation of policies coming from research funders, universities, and publishers intended to prod scientists toward more proactive archiving, citation, and data sharing practices. The mere presence of a policy, however, doesn't guarantee compliance, so the Foundation has looked to support technologies that make it easier to adopt best practices in research data and software management.

The grant funds work by the Collaborative Knowledge Foundation and the California Digital Library to develop DataSeer, an open sourced rule-based platform that would be able to automatically identify data referenced explicitly or implicitly in a grant proposal, data management plan, or draft article and suggest appropriate repositories for deposit of that data. By providing nudges and suggestions at specific targeted moments in the research lifecycle (like the creation of a data management plan, submission of a grant proposal, or submission of a manuscript), DataSeer has the potential to substantively improve proactive data sharing and archiving by researchers, while reducing the costs of compliance checking for funders, libraries, and publishers.

Center for Open Science

CHARLOTTESVILLE, VIRGINIA

$499,431 over 24 months to implement and test features to signal credibility and trust on preprint services.

Project Director: Brian Nosek, Co-Founder

The Center for Open Science's (COS) preprint platform was designed to serve a variety of scholarly communities, especially lowering barriers to entry for those disciplines new to preprint publication whose needs were not being served by the larger, more highly powered preprint servers like arXiv. This grant funds a project by COS founder Brian Nosek to use the COS preprint platform as the setting for a series of experiments that will test how user trust is affected by different preprint platform features. Nosek proposes to use the launch of already-planned features like annotation and visual icons to run a set of experiments on the assignment of trust by readers of scientific research. While the budget includes some technical development, the bulk of the requested funding will support the COS "metascience" team to take a mixed-methods research approach, combining surveys with analysis of usage data from the preprint servers to understand the impact of annotation and "reproducibility badges" on readers' perceptions of trustworthiness of individual preprints and of the preprint server overall.

Columbia University

NEW YORK, NEW YORK

$384,633 over 24 months to develop a global, scalable, and sustainable technical and organizational infrastructure for persistent unique identifiers of physical scientific samples.

Project Director: Kerstin A. Lehnert, Senior Research Scientist

The International Geo Sample Number (IGSN) grew out of an initial need to foster better citation of geological samples. As of mid-2018, there are over 6.5 million individual physical specimens represented within the IGSN, and a network of 25 IGSN "allocating agents" across five continents. After a number of years of growth within geoscience, the IGSN is confronted with increased interest from other disciplines; for example, the IGSN has already been used to register IDs for biological specimens and archaeological artifacts. Rather than encourage the development of a number of different discipline-specific registries, Lehnert and an international team of collaborators plan to redesign IGSN to support physical samples and specimens from across the sciences. Funds from this grant support technical development of the IGSN platform and a series of working meetings to bring together current IGSN registrars, other stakeholders, and persistent identifier (PID) experts to strategically plan the organizational and technical future of the initiative.

Harvard University

CAMBRIDGE, MASSACHUSETTS

$499,697 over 24 months to improve the ability to curate and verify replication datasets within the Dataverse data archiving platform through a suite of software containerization and metadata tools, and to support the development of a new data curation service at the Harvard Dat.

Project Director: Merce Crosas, Chief Data Science & Technology Officer

This grant funds a series of four projects by Mercè Crosas, Chief Data Science and Technology Officer at Harvard's Institute for Quantitative Social Science to expand and improve software handling capabilities of the Dataverse open source data repository platform. First Crosas will integrate Dataverse with Encapsulator, an open source tool that allows the creation of a computational "time capsule" that preserves the exact computational environment used to conduct a piece of data analysis. Second, Crosas will create links between Dataverse and Code Ocean, a computational reproducibility platform that was spun out of Cornell Technion's incubator program. Third, Crosas will develop a set of metadata versioning and exploration tools that will increase incentives for data curation by returning richer usage statistics to data providers and publishers. Finally, Crosas will model and pilot a fee-based curation service that would allow the sustainable scaling of data and code curation in Dataverse. This work, like all other development on and organizational innovation within the Dataverse community, will be freely available and useful to the dozens of other institutions running the software to power their own data archives.

National Information Standards Organization

BALTIMORE, MARYLAND

$197,372 over 18 months to support the implementation of MathML in the open source Chromium browser.

Project Director: Todd A. Carpenter, Executive Director

Somewhere between 50% and 60% of internet users use Google Chrome to browse the web. Chrome, unfortunately, doesn't natively display mathematics using the standard XML markup language MathML. This forces sites like Wikipedia to generate static images of mathematical notation from the underlying MathML when Chrome can't render the markup on its own. Not only does this have implications for accessibility, it also inhibits the development of innovative new interfaces and applications that would rely on dynamic interaction with mathematical notation via browser-based programming languages like JavaScript.

Funds from this grant will support a project led by the National Information Standards Organization to implement full MathML rendering in Chromium (the open source codebase underlying the Chrome web browser). Technical development will be undertaken by developers at Igalia, an open source software consultancy that has played a key role in MathML integration in other major web engines.

University of North Carolina, Chapel Hill

CHAPEL HILL, NORTH CAROLINA

$501,416 over 36 months to improve the ability to curate and verify replication datasets within the Dataverse data archiving platform by integrating computational notebooks and software containerization with data curation workflows.

Project Director: Jonathan Crabtree, Assistant Director

This grant funds a project led by Jonathan Crabtree, Director of Cyberinfrastructure at the University of North Carolina's Odum Institute, to improve and expand the capabilities of the Dataverse open source data repository platform. Odum is responsible for executing and implementing the Replication and Verification Policy for the American Journal of Political Science (AJPS) and uses Dataverse as the underlying platform where authors who publish in AJPS can upload their data and software code to ensure results may be replicated. Because Dataverse was originally designed for data and not software, however, the process can be unwieldy and time consuming. Crabtree and his team plan to use the Jupyter computing platform and the open source software "containerization" toolkit Docker to create a "Confirmable Reproducible Research (CoRe2) environment" for Dataverse that would combine the ability to containerize computational research with communication and workflow tools. This would greatly speed and partially automate the process of verifying that submitted research results can be verified using the code and data uploaded.

Grant funds will provide support for this project for three years.

University of Pittsburgh

PITTSBURGH, PENNSYLVANIA

$582,852 over 36 months to develop software and services for transforming mathematical results as they appear in journal article abstracts into formally structured data that machines can read, process, search, check, compute with, and learn from as logical statements.

Project Director: Thomas Hales, Andrew Mellon Professor

Computers do nothing but process logical statements. Mathematics consists of nothing but such statements. It would be reasonable to assume, then, that computers would be adept, perhaps uniquely, at reading, understanding, and cataloging the academic literature of mathematics. Not yet. People and machines, it turns out, speak different mathematical languages. If computers are to help manage mathematical knowledge, they need to be taught how to read math papers.

The grant funds efforts by mathematician Thomas Hales to begin that instruction. Hales has raised an international army of graduate students and postdoctoral researchers, which he plans to unleash on the abstracts of thousands of mathematical papers. They will carefully translate the definitions and results that appear in these abstracts into formal programming language. These formalized abstracts—"fabstracts," for short—can then be used to train machine learning algorithms to "read" textual mathematics.

Wikimedia Foundation

SAN FRANCISCO, CALIFORNIA

$200,000 over 36 months to support three years of workshops, hackathons, and outreach at the intersection of academic citation, bibliographic metadata, and Wikipedia.

Project Director: Dario Taraborelli, Head of Research

This grant provides three years of support for gatherings of WikiCite, a project within the Wikipedia ecosystem designed to both improve citation within Wikipedia and to expand the Wikidata project in ways useful to the scientific community. Grant funds will support a dedicated annual WikiCite meeting, as well as a series of smaller satellite meetings at other Wikimedia events. The organizers will also maintain a strong presence at other scholarly communication meetings, bringing the energy and technical sophistication of the Wikimedia community to bear on innovation in scholarly communication more broadly.

Grants Made Against Prior Authorizations

In March 2018, the Trustees authorized the expenditure of up to $250,000 for grants in support of conferences, workshops, and software development in the Scholarly Communication program. The following grants were made against this previously authorized fund.

Cold Spring Harbor Laboratory

COLD SPRING HARBOR, NEW YORK

$67,100 over 1 months to support a Banbury meeting on signals of trust within scholarly communication.

Project Director: Rebecca Leshan, Director

FORCE11

SAN DIEGO, CALIFORNIA

$20,000 over 12 months to partially support the 2018 Future of Research Communication and eScholarship meeting.

Project Director: Cameron Neylon, President

Hypothesis Project

SAN FRANCISCO, CALIFORNIA

$12,000 over 3 months to partially support a workshop and hackathon to develop a joint roadmap for open science software tools.

Project Director: Dan Whaley, CEO

Internet Archive

SAN FRANCISCO, CALIFORNIA

$20,000 over 6 months to partially support participation in the 2018 Decentralized Web Summit.

Project Director: Wendy Hanamura, Director

Lyrasis

ATLANTA, GEORGIA

$20,000 over 6 months to conduct a feasibility study to assess the potential for development of the open source SimplyE ebook platform to serve the academic community.

Project Director: Robert Miller, Chief Executive Officer

National Federation of Abstracting & Information Services

ANNAPOLIS, MARYLAND

$16,000 over 11 months to partially support a workshop on blockchain applications in scholarly communications.

Project Director: Marcie Granahan, Executive Director

National Science Communication Institute

SEATTLE, WASHINGTON

$20,000 over 10 months to support two regional meetings on the future of scholarly communication as well as the launch of the Research & Scholarly Communication Network.

Project Director: Glenn Hampson, Executive Director

University of Pennsylvania

PHILADELPHIA, PENNSYLVANIA

$48,784 over 12 months to support continued development of Manubot, a git-native authoring tool for scientific manuscripts.

Project Director: Daniel Himmelstein, Postdoctoral Researcher

University of Zurich

ZURICH, SWITZERLAND

$19,610 over 14 months to encourage standardization of survey instruments in the domain of studies about people's Internet uses to allow for more comparison and replication.

Project Director: Eszter Hargittai, Professor & Chair

Officer Grants

Code for Science and Society

PORTLAND, OREGON

$65,780 over 12 months to support further development of PREreview, a platform to improve the training of scientists in peer review practices.

Project Director: Daniela Saderi, Co-Founder

Ithaka Harbors Inc

NEW YORK, NEW YORK

$20,000 over 17 months to partially support the second Bowen Colloquium.

Project Director: Catharine Bond Hill, Managing Director

Universal Access to Knowledge

PROGRAM DIRECTOR: DORON WEBER

The goal of the Universal Access to Knowledge program is to harness advances in digital information technology to facilitate the openness and accessibility of all knowledge in the digital age for the widest public benefit under fair and secure conditions. Current grantmaking focuses on identifying and crafting solutions to the commercial, legal, and institutional barriers to universal access to knowledge and on supporting broadly collaborative efforts such as the Digital Public Library of America (DPLA), championed by the Foundation since its inception, to become the leading repository for the nation's—and ultimately the world's—scientific and cultural heritage in all its forms. The DPLA serves as a link to thousands of libraries and cultural institutions across the country, and it contains millions of digitized items.

The Foundation supports DPLA's work on the Open eBooks Initiative, launched in 2016 with First Book, the New York Public Library, and the White House to provide low-income students with popular and classic eBooks for free. In 2016, the Foundation made a grant to leverage DPLA's national network for the creation of a free eBook collection, Open Bookshelf, available in 50 states and a pilot eBook marketplace, the DPLA Exchange, for thousands of libraries and schools. Both Open Bookshelf and the DPLA Exchange have launched and contain 5,000 and 300,000 books, respectively.

Since 2008, the Foundation has been the lead funder and trusted advisor to Wikipedia, which is now the largest encyclopedia in human history and the fifth largest website in the world, available in 299 languages, and a model of open, collaborative text production. Most recently, the Foundation made a grant to transform Wikipedia Commons' media files from free text into machine-readable,

structured data, enabling new uses for millions of media files on Wikipedia and across the web. Wikimedia Commons is the world's largest repository of freely licensed educational media, with 50 million and counting files of photos, videos and audio.

In 2016, the Foundation made a grant to Annual Reviews, a non-profit publisher of a prestigious series of multi-author reviews in 47 discipline-specific fields in science and social science, to launch a digital magazine that unlocks scientific research to inform the public discourse in multiple subjects with compelling, timely, and impartial knowledge. The digital magazine launched in 2017 and had 130 pieces of content, 85,000 monthly sessions, and 6,000 newsletter subscribers by the end of 2018.

Trustee Grants

American Institute of Physics

COLLEGE PARK, MARYLAND

$646,697 over 36 months to support global, digital access to the Wenner Collection on the history of physics via detailed cataloging, description, online availability, and initial outreach.

Project Director: Melanie Mueller, Director

This grant supports efforts by the American Institute of Physics (AIP) to catalog and digitize the Wenner Collection, a unique collection of 3,800 rare books and documents that cover the early development of physics and astronomy. The collection was carefully assembled and annotated by David Wenner, a wealthy, philanthropic science aficionado, and contains works—some more than five centuries old—by Ptolemy, Galileo, Huygens, Halley, Newton, Laplace, and many early-19th-century natural philosophers.

AIP will scrupulously organize, classify, and catalog the entire collection in accordance with international and national library standards. Grant funds will support the hiring of a rare book cataloger to make decisions about priorities, storage facilities for the materials that will preserve Wenner's original ordering and grouping, and the hiring of a digital assessment specialist to facilitate efficient, high-quality digitization of the collection. Additional funds will support various outreach activities to facilitate user engagement with the collection.

Annual Reviews

PALO ALTO, CALIFORNIA

$800,000 over 10 months to develop and expand Knowable Magazine, a new digital publication that unlocks scientific research to inform the public discourse with compelling, timely, and impartial knowledge.

Project Director: Richard Gallagher, President & Editor-in-Chief

Funds from this grant provide one year of support to Knowable Magazine, a new digital-native publication launched in October 2017 by Annual Reviews.

Annual Reviews, publisher of a prestigious series of comprehensive, high-quality scientific field reviews, has a large following among scientists. Knowable is an attempt to bring that content to a broader demographic. Its articles use established scientific knowledge and research-based facts to highlight the issues society is grappling with, such as health and disease, aging, and climate change. Grant funds will provide general operating support and enhanced outreach for Knowable as it expands its audience, forms relationships with corporate partners, and moves toward independent sustainability.

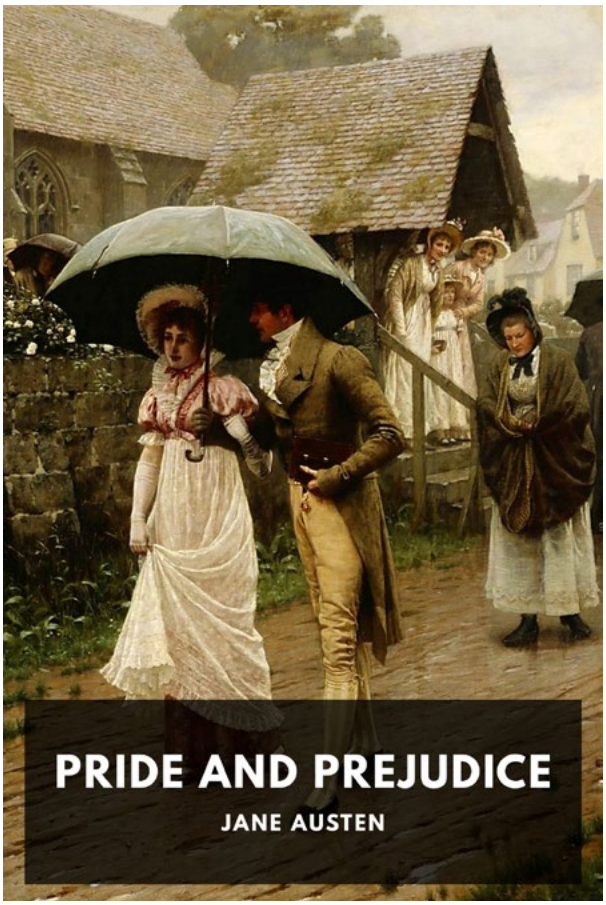
Digital Public Library of America

CAMBRIDGE, MASSACHUSETTS

$1,510,542 over 36 months to continue the growth of DPLA Exchange for enhanced ebook access by thousands of libraries while developing an ongoing revenue stream for DPLA's future.

Project Director: Michele Kimpton, Interim Executive Director

This grant supports efforts by the Digital Public Library of America (DPLA) to expand and enhance its ebook marketplace, the DPLA Exchange, equipping its more than 3,000 member libraries and other contributing institutions across the country with a nonprofit platform for delivering to their patrons a broad range of high-quality digital content. Through a focused three-year sales and outreach effort, DPLA will continue to expand the DPLA Exchange, adding 35 large public libraries, five consortia, and five state libraries to the slate of institutions already actively purchasing ebooks and other digital content. Grant funds will also allow DPLA to expand the number of titles available in the Exchange from 300,000 to one million and to increase the number of participating publishers. The initiative promises to increase access nationwide to ebooks and digital content, expand the menu of options available to American libraries in the ebook marketplace, and provide a reliable, sustainable revenue stream capable of offsetting DPLA operational costs.



The Digital Public Library of American launched Open Bookshelf, a collection of free, openly-licensed books, in 2018. Open Bookshelf now has over 5,000 titles such as *Pride and Prejudice* that can be accessed by libraries and the general public.

Public Understanding of Science, Technology & Economics

Books

PROGRAM DIRECTOR: DORON WEBER

Books are critical entry points for the entire Public Understanding program. They allow us to delve deeply into any subject and uncover or synthesize new knowledge while imparting the profoundest understanding of issues and individuals. Books also frame important questions and concerns for the public in an enlightened and accessible context. The Foundation remains committed to books, both for their intrinsic value as a matrix of uniquely rich experience and deep learning, and for their adaptability to other media for broader dissemination and popularization.

The current book program began in 1996 and has supported over 120 authors. Previously, the Foundation supported the Sloan Series of Scientific Autobiographies in the 1980s and the Sloan Technology Series in the 1990s. Critically acclaimed books such as Margot Lee Shetterly's *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race*, Dava Sobel's *Galileo's Daughter*, Kai Bird and Martin Sherwin's *American Prometheus*, Richard Rhodes's *Hedy's Folly*, Jared Diamond's *Collapse*, and Eric Kandel's *The Age of Insight* are among those that have been supported by the program. Recently published books include *She Has Her Mother's Laugh* by Carl Zimmer, *Evolutions* by Oren Harman, *What is Real?* by Adam Becker, *Energy* by Richard Rhodes, *Einstein's Shadow* by Seth Fletcher, *The Breakthrough* by Charles Graeber, *Delayed Response* by Jason Farman, *Never Home Alone* by Rob Dunn, *Seaweed Chronicles* by Susan Hand Shetterly, *Physics and Dance* by Emily Coates and Sarah Demers, and *Lasers, Death Rays, and the Long, Strange Quest for the Ultimate Weapon* by Jeff Hecht, as well as *The Correspondence of Charles Darwin: Volume 26, 1878*, part of a 30 volume edition of letters.

New efforts include a fellowship for biographies through the Leon Levy Center for Biography at The City University of New York and a television platform for Foundation-supported authors via interviews on PBS's *The Open Mind.*

Trustee Grants

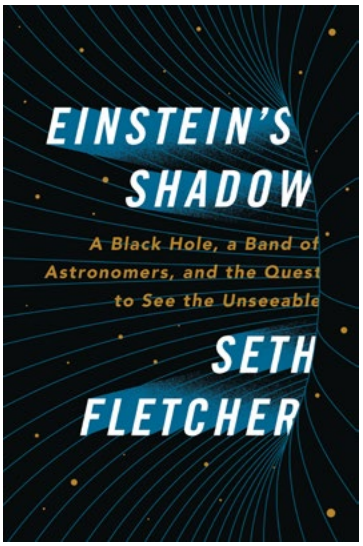
Graduate Center Foundation

NEW YORK, NEW YORK

$330,750 over 44 months to pilot a new, annual scientific biography fellowship at the Leon Levy Center for Biography that will result in three new major biographies of scientists and/or technologists.

Project Director: Kai Bird, Executive Director

The Leon Levy Center for Biography at the City University of New York (CUNY) is the only academic institution in the country devoted to promoting the practice of biography. Founded in 2007, its mission is "to foster excellence in biographical writing and to encourage the academy to understand biography as a scholarly and rigorous discipline." This grant underwrites an annual fellowship at the Center to support an author writing a biography of a scientist, engineer, inventor, or mathematician. Fellows will receive a one-time award of $72,000 and be provided a graduate research assistant, dedicated office space, and access to both the Center's fellow biographers and CUNY's science faculty as advisors. Additional grant funds will support outreach to publicize the fellowship with relevant audiences.



Seth Fletcher's *Einstein's Shadow* tells the incredible story of the Event Horizon Telescope and the historic quest to capture the first direct image of a black hole, accomplished in 2019.

Grants Made Against Prior Authorizations

In June 2017, the Trustee approved the expenditure of up to $500,000 for grants in support of new books on science, technology, engineering, and mathematics. In March 2018, the Trustees approved the expenditure of an additional $500,000 for the same purpose. The following grants were made against these previously authorized funds.

University of Arizona

TUCSON, ARIZONA

$19,000 over 6 months to support the production of Beyond the Earth's Edge: The Poetry of Spaceflight *published by the University of Arizona Press in 2019.*

Project Director: Christopher Cokinos, Associate Professor

Lydia Denworth

BROOKLYN, NEW YORK

$19,000 over 6 months to support the research and writing of Friendship: A Natural History, *to be published by W.W. Norton in 2019.*

Project Director: Lydia Denworth, Author

Benjamin Ehrlich

FORT LEE, NEW JERSEY

$50,000 over 12 months to support the research and writing of The Brain That Discovered Itself, *about the father of neuroscience Santiago Ramon y Cajal, to be published by Farrar, Straus and Giroux in Fall 2020.*

Project Director: Benjamin Ehrlich, Author

Fairfield University

FAIRFIELD, CONNECTICUT

$50,000 over 18 months to support the research and writing of a book about the thalidomide scandal of the 1960s to be published by Random House in 2020.

Project Director: Jennifer Vanderbes, Author & Researcher

Jeffrey Hecht

AUBURNDALE, MASSACHUSETTS

$33,000 over 4 months to support the research and writing of a book on the history of laser weapons, including recent innovations.

Project Director: Jeff Hecht, Author

University of Louisville Research Foundation

LOUISVILLE, KENTUCKY

$30,700 over 24 months to support a book about Charles Willson Peale, creator of a natural history/art museum in Revolutionary-era America, and how the museum influenced the public's perception of science and art.

Project Director: Lee Dugatkin, Professor

Middlebury College

MIDDLEBURY, VERMONT

$45,522 over 21 months to support the research and writing of an updated version of the 1993 Sloan-supported book Nuclear Choices: A Citizen's Guide to Nuclear Technology *to be published by MIT Press.*

Project Director: Richard Wolfson, Benjamin F. Wissler Professor

Michelle Nijhuis

WHITE SALMON, WASHINGTON

$40,000 over 29 months to support the research, fact-checking, and promotion of a book about the species conservation movement to be published by W.W. Norton in 2020.

Project Director: Michelle Nijhuis, Author

Virginia Postrel

LOS ANGELES, CALIFORNIA

$50,000 over 11 months to support the research and writing of The Fabric of Civilization *to be published by Basic Books in 2020.*

Project Director: Virginia Postrel, Author

Brandy Schillace

EUCLID, OHIO

$36,000 over 12 months to support the research and writing of Mr. Humble and Dr. Butcher to be published by Simon and Shuster by 2021.

Project Director: Brandy Schillace, Author

Rebecca Schwarzlose

SAINT LOUIS, MISSOURI

$39,400 over 11 months to support the writing and illustrations for a book about brain maps to be published by Houghton Mifflin Harcourt and Profile Books in Spring 2020.

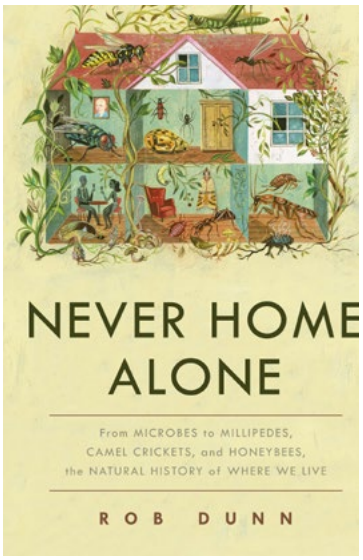
Project Director: Rebecca Schwarzlose, Author

University of Texas, Austin

AUSTIN, TEXAS

$57,500 over 12 months to support Power Trip: The Story of Energy *by Michael Webber, to be published by Basic Books in 2019.*

Project Director: Michael E. Webber, Deputy Director



Rob Dunn's *Never Home Alone* explores the creepy-crawly wildlife living in our homes, from microbes in the shower to spiders in the living room, and is based on research funded by the Sloan Microbiology of the Built Environment program.

Film

PROGRAM DIRECTOR: DORON WEBER

The goal of the Film program is to influence the next generation of filmmakers to tackle science and technology themes and characters, to increase visibility for feature films that depict this subject matter, and to produce and disseminate new films about science and technology and about scientists, engineers, and mathematicians. Film is a universal language and an unrivaled medium for advancing public understanding of the scientific and technological enterprise and of the human beings at its center.

Launched in 1996, Sloan's Film program has awarded grants to over 600 film projects from some of the nation's most innovative filmmakers and has created a film development pipeline consisting of multiple program partners though which Sloan nurtures and develops individual projects. Over the past two decades the Foundation has partnered with six of the top film schools in the country—including the American Film Institute, Carnegie Mellon University, Columbia University, New York University, The University of California, Los Angeles, and the University of Southern California—and established annual awards in screenwriting and film production, along with an annual best-of-the best Student Grand Jury Prize. The Foundation also supports screenplay development programs at the Sundance Film Institute, the Tribeca Film Institute, SFFILM, the Black List, the Athena Film Festival, and Film Independent's Producer's Lab and Fast Track program. Sloan-supported films that premiered in 2018 include: Ben Lewin's *The Catcher Was a Spy,* which premiered at the Sundance Film Festival, Shawn Snyder's *To Dust,* which premiered and won the Best New Narrative Director Award at the Tribeca Film Festival, Ginny Mohler's *Radium Girls,* which premiered at the Tribeca Film Festival, Peter Livolsi's *The House of Tomorrow,* and Mark Levinson's *The Bit Player.*

Additional completed feature films developed by the Sloan pipeline include Matthew Brown's *The Man Who Knew Infinity*, Morten Tyldum's *The Imitation Game,* Michael Almereyda's *Experimenter,* Jake Schreier's *Robot & Frank,* Rob Meyer's *A Birder's Guide to Everything*, Musa Syeed's *Valley of Saints,* and Andrew Bujalski's *Computer Chess*. To gain distribution for Sloan films, the Foundation has expanded Coolidge Corner Theater's *Science on Screen* effort into a nationwide program that has awarded 201 grants to 82 independent cinemas, each of which shows at least one Sloan-supported film a year.

Trustee Grants

American Film Institute

LOS ANGELES, CALIFORNIA

$345,000 over 36 months to support the development and production of science and technology films, television, and new media projects by top film students.

Project Director: Joe Petricca, Executive Vice Dean

This grant provides three years of continued support to the American Film Institute's (AFI) efforts to encourage young screenwriters and filmmakers to write and produce compelling, engaging narrative films that explore scientific themes or have scientists, engineers, or mathematicians as major characters. AFI's program includes three annual award programs: a $25,000 award given to the best student film project that brings science and technology to life; a $20,000 annual screenwriting award given to the best science-themed script; and a yearly tuition scholarship worth $45,000 given to an incoming graduate student with a background in the hard sciences who wishes to become a filmmaker and to incorporate scientific themes in his or her filmmaking. In addition, AFI holds a seminar series where established actors, writers, directors, and producers talk to students about science and Hollywood, and provides access to working scientists to serve as mentors on student scripts.

American Museum of the Moving Image

ASTORIA, NEW YORK

$440,000 over 36 months to maintain the comprehensive, up-to-date, go-to site for the nationwide Sloan Film program, its partners, and 600+ film projects and to develop related outreach, events, and educational materials for students, teachers, and the general public.

Project Director: Carl Goodman, Executive Director

This grant provides three years of support to the Museum of the Moving Image (MoMI) to maintain and expand its Sloan Science & Film website, the most up-to-date, comprehensive resource for the Foundation's Film program. In addition to cataloging over 600 past, present, and upcoming film projects by Sloan supported filmmakers, the site, along with its various social media channels, serves as an education, information, and engagement platform for the growing science in film community. Supported activities include updating the Sloan film catalog, live streaming six public events promoting science in film, producing four articles per week for publication on the site, and hiring a digital engagement strategist to maximize engagement across the site's various social media channels.

Barnard College

NEW YORK, NEW YORK

$300,000 over 35 months to support the leading women's film festival, the Athena Film Festival at Barnard, with more women-in-STEM programming.

Project Director: Victoria Gordon, Acting Director

Funds from this grant support a number of initiatives, awards, and events at the Athena Film Festival at Barnard College, the leading women's film festival in the United States, which aim to support women filmmakers and increase the visibility of the accomplishments of women working and contributing to STEM fields. Supported activities include an annual Alfred P. Sloan STEM Showcase for films about women in STEM, the screening of a science-themed documentary featuring female scientists or technologists at the festival's Works-in-Progress program, two Sloan screenwriting fellowships for women working on science-related film or television, and a Sloan development award for a female-helmed project at the Festival. Funding will sustain these activities over three years.

University of California, Los Angeles

LOS ANGELES, CALIFORNIA

$361,648 over 36 months to support the development and production of science and technology films, television, and new media projects by top film students.

Project Director: Kathleen McHugh, Chair

This grant provides three years of renewed support to the University of California Los Angeles, for a series of activities, programs, and initiatives designed to encourage UCLA film students to engage with scientific themes in their filmmaking and to produce science-themed films and screenplays. Funded activities include an annual colloquium that brings film students together with leading researchers to discuss the newest developments in science and technology; one annual, $30,000 production grant awarded to the best film project that incorporates scientific or technical themes; two annual $15,000 screenwriting awards given to the best student scripts incorporating scientific themes or featuring a scientist, engineer, or mathematician as a major character; one annual, $15,000 filmmaking grant for the best episodic television project that explores scientific or technical themes; and the development of a screenwriting course open exclusively to students who are working on a science-themed project. The course will help students explore both the challenges and opportunities of incorporating scientific themes into narrative film and television. In addition, this grant provides funds for dedicated scientific advisors to help students with their projects, independent judges to evaluate student submission, and faculty support and other operational costs associated with administration of program.

The 2018 Alfred P. Sloan Feature Film Prize at the Sundance Film Festival was awarded to *Searching*, a thriller told entirely on screens, which also won the Next Audience Award and was bought by Sony in one of the Festival's biggest acquisition deals.

Carnegie Mellon University

PITTSBURGH, PENNSYLVANIA

$321,615 over 36 months to support the development and production of science and technology films, television, and new media projects by top film students.

Project Director: Robert Handel, Associate Professor of Dramatic Writing

This grant continues support for a program at the Carnegie Mellon University School of Drama (CMU) that exposes top dramatic writing students to science and technology and awards prizes to student

screenwriters who write science- or technology-themed scripts. The CMU program includes a fall symposium that brings scientists to the drama school to introduce students to recent developments in a variety of scientific disciplines; a year-long screenwriting workshop that meets weekly and focuses on the challenges and opportunities posed by incorporating science into dramatic or comedic narratives, a mentorship program that pairs film students with working scientists to help them depict science accurately in their work, an annual screenwriting competition that awards $17,500 to the two best science-themed scripts submitted, and a yearly showcase in Los Angeles and New York to bring student filmmakers into contact with leading producers, directors, and distributors in the film and television industry. Grant funds provide core support for these activities for another three years.

University of Southern California

LOS ANGELES, CALIFORNIA

$415,654 over 36 months to support the development and production of science and technology films, television, and new media projects by top film students.

Project Director: Alan Baker, Associate Dean

This grant, to the University of Southern California's (USC's) School of Cinematic Arts, provides three years of renewed support for a series of activities aiming to support student engagement with science as a subject matter in their work and to spur the development and production of science and technology film, television, and new media projects by USC film students. Supported activities include a $25,000 production award, given annually to the best student film project that features science and technology as a theme; two $17,500 screenwriting awards, given annually to the best student film or television scripts featuring science and technology as a theme; a $17,500 animation award, given annually to the best student animation project featuring science and technology as a theme; an annual $12,500 grant given to the most innovative student interactive game design project featuring science or technology as a theme; and a yearly seminar that brings USC film students together with leading scientists to discuss the power and potential of science as a vehicle in narrative filmmaking.

In addition, grant funds will support a host of related support activities, including faculty mentoring, industry events, and dedicated science advisors to ensure accuracy of scientific content in student projects.

Tribeca Film Institute

NEW YORK, NEW YORK

$261,636 over 20 months to support the Sloan Student Grand Jury Prize for the annual selection and development of the best-of-the-best screenplay from Sloan's six film school partners and to pilot a new Sloan Discovery Award selected from six new non-Sloan film school screenplay.

Project Director: Bryce Norbitz, Manager, Artist Programs

Funds from this grant provide two years of support for the continued administration of the Sloan Student Grand Jury Prize, which honors the best science- or technology-themed feature film script produced by a student at one of the Foundation's six participating film school partners: American Film Institute, Carnegie Mellon, Columbia, NYU Tisch, UCLA, and USC. Each participating school submits one script for consideration each year, and nominated screenwriters are then paired with a dedicated mentor to help improve their submissions with an eye toward shepherding the script to production. An independent panel of distinguished filmmakers and scientists then selects the winning script, whose screenwriter or writers receive a $20,000 prize and a cocktail reception in their honor. They also receive support for an industry mentor to guide the project, a committed science advisor, other marketing and distribution efforts, and two professional development workshops to further develop the project.

Additional grant funds will support the pilot creation of a new $10,000 prize for the best science- or technology-themed feature film script submitted by film students drawn from one of six schools outside the Foundation's existing group of film school partners. Schools invited to compete for this new "Sloan Discovery Prize" include Brooklyn College Feirstein School of Cinema, SUNY Purchase School of Film and Media Studies, Florida State University, San Francisco State University, University of North Carolina School of the Arts, and the University of Texas, Austin.

Officer Grants

Barnard College

NEW YORK, NEW YORK

$15,000 over 11 months to support a screening of the Sloan-supported documentary Bombshell: The Hedy Lamarr Story and a panel about portraying women in science on the screen at the Athena Film Festival in February 2018.

Project Director: Kathryn Kolbert, Constance Hess Williams Director

IEEE Foundation

NEW YORK, NEW YORK

$125,000 over 2 months to support enhanced animation and graphics for a feature documentary about Claude Shannon, the father of information theory.

Project Director: Richard Allen, Campaigns Manager

Jacob Burns Film Center

PLEASANTVILLE, NEW YORK

$74,678 over 9 months to produce a feature-length documentary on the Blue Brain Project to build a full-scale, self-aware simulation of the human brain.

Project Director: Noah Hutton, Director

Shawn Snyder's *To Dust*, which won multiple Sloan awards including the 2015 NYU First Feature Award, the 2016 Tribeca Film Institute Grand Jury Prize, and the 2018 Film Independent Distribution Grant, premiered at the 2018 Tribeca Film Festival. It was bought by Good Deed Entertainment and had a 2019 theatrical release.

Radio

PROGRAM DIRECTOR: DORON WEBER

The Foundation supports original, high-quality programming on a range of radio programs tackling science, technology, and economics and seeks to increase both the quantity and the quality of science and technology coverage. Sloan grants started the science and technology desk at National Public Radio and at Public Radio International's *The World*; have supported feature radio series, such as the Peabody-Award winning *The DNA Files;* and sponsored science coverage on commercial radio, such as *The Osgood File*.

Current partnerships include support for the innovative, award-winning podcast *Radiolab,* which the Foundation helped launch; Ira Flatow's perennially popular *Science Friday*; the Public Radio Exchange (PRX), including the female-hosted podcasts *Transistor* and *Orbital Path; Planet Money*, which won a prestigious 2016 Peabody Award for its coverage of the Wells Fargo scandal; WNYC's healthcare reporting unit, which produces the podcast *Only Human* and deep-dive reporting series on the economics of healthcare in the New York region; *Gastropod,* an award-winning podcast that brings a scientific approach to the popular subject of food and agriculture; and *Nerdette,* a podcast about "nerding out" that connects science to popular culture and the humanities. The Foundation also supports *LA Theatre Works* to record full-length science plays with A-list actors as part of a series called *Relativity*, broadcast on public radio. The over thirty recordings include more than twenty plays originally commissioned by the Foundation's theater program.

Gastropod hosts Nicola Twilley and Cynthia Graber record an episode on beer at Earth Eagle Brewings in Portsmouth, New Hampshire.
(PHOTO BY KATHI BAHR)

Trustee Grants

New York Public Radio

NEW YORK, NEW YORK

$650,000 over 36 months to support story-driven health care reporting at WNYC, including coverage of health care policy and economics, medical science and discovery, and personal health.

Project Director: Jim Schachter, Vice President of News

This grant supports the WNYC Health Unit's ongoing coverage of health care policy, health economics, and the complexities and contradictions of the U.S. health care system. Over the three-year grant period, Sloan funds will help WNYC produce 45 to 50 broadcast segments each year on a range of health topics including the Affordable Care Act under the Trump administration, the opioid and obesity epidemics, and the gap in hospital billing between what hospitals charge and the real costs of care. Segments will be aired on several of NPR's most popular radio programs, including Morning Edition, All Things Considered, The Takeaway, and the Brian Lehrer Show. In addition to these weekly segments, WNYC will produce two to three episodes of its Only Human podcast each year. The long-form serial podcast allows WYNC to take a deeper dive into complex health care issues, with a focus on extensive research, immersive storytelling, and rich characters. WNYC will also convene annual workshops, bringing together leading health care practitioners, economists, and policy experts to discuss the health care system and potential reforms. Last, grant funds will support a new radio drama, produced in collaboration with Radiolab, on the life and work of John Bonica, an anesthesiologist and a world champion wrestler also known as the "father of pain management."

Grants Made Against Prior Authorizations

In October 2017, the Trustees approved the expenditure of up to $500,000 to pilot new projects across various media. The following grants were made against this previously authorized fund.

Chicago Public Media

CHICAGO, ILLINOIS

$80,000 over 11 months to support science-and-technology-themed episodes on the Nerdette podcast.

Project Director: Brendan Banaszak, Executive Producer

Food & Environment Reporting Network

NEW YORK, NEW YORK

$63,587 over 12 months to support immersive science storytelling on the Gastropod podcast and a diversity evaluation and implementation plan.

Project Director: Tom Laskawy, Executive Director

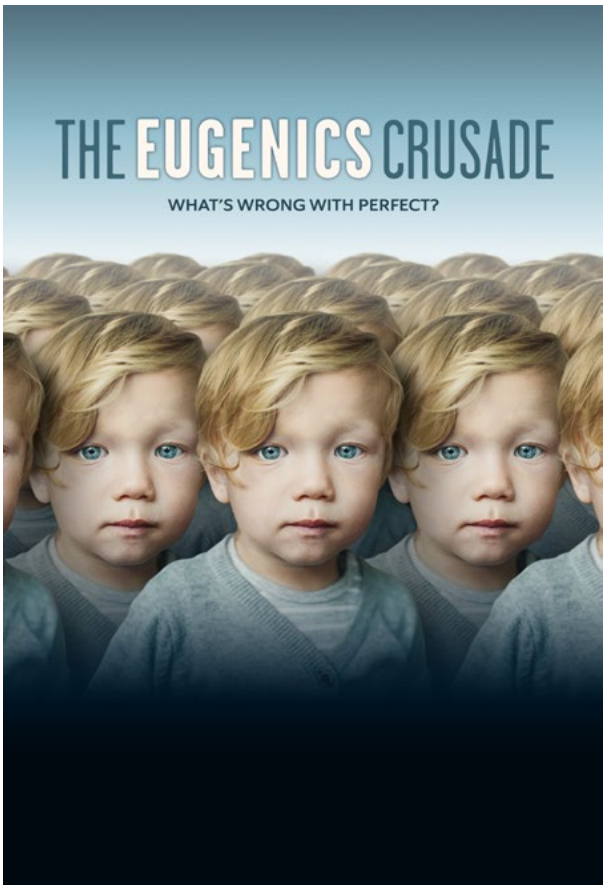
Television

PROGRAM DIRECTOR: DORON WEBER

The Foundation's goal with television is to tell stories, both historical and contemporary, about science and technology, and to portray the lives of the men and women engaged in scientific and technological pursuits. Television continues to be the most powerful medium in terms of audience, with public television regularly delivering several million viewers per show.

Since 1996, Sloan's Television program has been helping to integrate science and technology—and profiles of scientists, engineers, and mathematicians—into the nation's regular programming. Foundation-supported shows such as PBS's *The American Experience*, the longest running history series on television, receive support for highlighting the role of science and technology in society, and for broadening our view of the nation's history and of the central role of science, technology, and engineering in the country's narrative. The Foundation also supports *American Masters,* National Geographic Television, programs on *NOVA*, and economics coverage on *The NewsHour*. Recently aired television programs supported by the Foundation include *American Experience*'s "The Secret of Tuxedo Park" and Writer's Guild Award-winning "The Eugenics Crusade;" *NOVA*'s "Black Hole Apocalypse," the first-ever *NOVA* documentary to be hosted by a female scientist, Janna Levin; and Kikim Media's *Silicon Valley: The Untold Story,* which aired on the Science Channel.

The Foundation has a longtime interest in the under-appreciated role of women and minorities in science and technology, and is supporting work about such figures as Lise Meitner, Marie Curie, Rosalind Franklin, Jane Goodall, and Hedy Lamarr. The Foundation also supports television programs based on topics it has backed in other media.



American Experience's award-winning *The Eugenics Crusade*, about the dark history of eugenics and its role in American society, premiered on PBS in October 2018. (© WGBH EDUCATIONAL FOUNDATION)

Trustee Grants

Catticus Corporation

BERKELEY, CALIFORNIA

$600,000 over 12 months to produce Look Who's Driving, a one-hour documentary about autonomous vehicle technology, to air on PBS's NOVA.

Project Director: Michael Schwarz, President

This grant to the Catticus Corporation provides support for the production and broadcast of a one-hour documentary special on driverless cars, "Look Who's Driving," that will explore both the promise and pitfalls as we move toward adoption of autonomous vehicles (AVs). In addition to explaining the major technological advances that have enabled progress in AVs—mapping, sensing, and artificial intelligence—the series will explore the engineering, legal, regulatory, security, privacy, and ethical challenges behind this much-ballyhooed potential revolution in transportation. The documentary will include interviews and commentary from leading technologists and engineers working on AVs, as well as scholars, historians, research scientists, and ordinary citizens. The show is slated to be broadcast on the PBS series, NOVA.

Greater Washington Educational Telecommunications Association

ARLINGTON, VIRGINIA

$1,035,000 over 12 months to continue weekly broadcast of Paul Solman's economic and business coverage Making Sen$e on PBS NewsHour and to support online, social and mobile platforms with related content and to support an evaluation.

Project Director: Lee Koromvokis, Producer, Business & Economics

This grant provides one year of support to the PBS NewsHour to continue its regular broadcast of Making Sen$e with Paul Solman, a weekly segment that explains business and economic issues clearly and engagingly to a general audience both on air and online. Grant funds support the production of 50 7-to-10-minute Making Sen$e broadcast segments on major issues facing the American and global economy, such as tax policy, health insurance, immigration, and the gig economy. Additional grant funds support increased outreach and development of the Making Sen$e website and social media presence, and the production of hundreds of original pieces of web native content, including long-form think pieces written by economists or based on Paul Solman's interviews with economists.

Greater Washington Educational Telecommunications Association

ARLINGTON, VIRGINIA

$1,000,000 over 20 months to support production and outreach for The Gene: An Intimate History, a three-hour documentary, based on Siddhartha Mukherjee's book, to air nationally on PBS primetime.

Project Director: Dalton Delan, Chief Programming Officer

This grant is to the Greater Washington Educational Telecommunications Association (WETA) to produce and air a three-part television documentary series, The Gene: An Intimate History. Produced by legendary documentary filmmaker Ken Burns and based on the critically acclaimed bestseller by physician and oncologist Siddhartha Mukherjee, The Gene: An Intimate History will use human case studies of the

genetic treatment of illness to tell the story of genetic research while exploring its scientific, medical, social, and ethical implications. In addition to a three-hour documentary and associated website, the broadcast will be accompanied by a major public engagement effort around genetics, as well as a wealth of educational curricula.

Verse Video Education, Inc.

BROOKLINE, MASSACHUSETTS

$300,000 over 27 months to support the production of two science-themed episodes of Poetry in America, a public television series to enhance appreciation of poetry.

Project Director: Elisa New, Creator & Director

Poetry in America is a half-hour public television series that seeks to deepen and enhance appreciation of poetry in the United States via an "immersive, inclusive experience in hearing, reading, and interpreting American poems."

The series is hosted by Elisa New, Powell M. Cabot Professor of American Literature at Harvard University, who reads each poem out loud, discusses its forms of meaning, and links it to the life of the author, the history of the poem's reception, and the period in which it was composed. Professor New then seeks to connect the poem to a wider sphere of activity and demonstrate how poetry can help people better understand their place in the world.

Funds from this grant support the production and broadcast of two episodes of Poetry in America that will feature poems with scientific themes and that were written by poets with a science background. The first is Marianne Moore's "The Fish," which introduces viewers to topics in marine science. Interviewees include scientists from Conservation International, poet and Harvard professor Jorie Graham, and filmmaker James Cameron. The second is A.R. Hammons's "Cascadilla Falls," which touches on geology and physics, specifically the earth and the cosmos. Interviewees include Harvard physicist Lisa Randall, multimedia artist and composer Paul Miller (also known as DJ Spooky), writer John McPhee, poet and environmental humanist Joshua Bennett, and Harvard geologist and environmentalist Daniel Schrag.

WNET

NEW YORK, NEW YORK

$750,000 over 45 months to support a three-part television series broadcast and accompanying outreach on the engineering and technology of LaGuardia Airport, with a focus on the current new terminal project.

Project Director: Stephen Segaller, Vice President

This grant to WNET, New York's PBS station, in partnership with Windfall Films, supports the production and broadcast of a three-hour series about one of America's biggest infrastructure projects: the rebuilding of LaGuardia airport, which is currently underway and slated for completion in 2021. Episode One: A Grand Terminal will focus on the state-of-the-art, 1.3-million-square-foot terminal itself, including its history and an overview of terminal design. Episode Two: Runways and Highways will cover building the runway space that surrounds the terminal, including flood-proofing the new taxiways—LaGuardia is surrounded on three sides by water—and preparing for environmental threats such as climate change and hurricanes. Episode Three: Bridges, Belts, and Baggage will explore the construction of two skybridges to get passengers from the new terminal to the 35 boarding gates as well as upgraded systems for moving baggage and passengers.

The series will discuss a host of topics in science and engineering, including new construction techniques and machinery, the logistics of urban planning, impacts on local communities and the environment, tailoring runways to limit noise pollution, advanced radar technology to detect runway debris, and the use of swarm modeling mathematics to efficiently guide passengers and avoid congestion.

In addition to primetime broadcast, grant funds support the production and dissemination of complementary educational resources through PBS Learning Media, and outreach through social and other media.

Theater

PROGRAM DIRECTOR: DORON WEBER

The goal of this program is to engage leading playwrights, actors, directors, and producers to create and develop new works for the theater about science and technology and about scientists, engineers, and mathematicians, and to support the production of plays with dramatically engaging high-quality science content. Over the past twenty years, the Foundation has developed a nationwide theater program with participants in many regions anchored by two acclaimed New York City partners—Ensemble Studio Theatre and Manhattan Theatre Club. This seminal program has backed such early Tony and Pulitzer Prize-winning works as *Proof* and *Copenhagen,* made dozens of subgrants to regional theaters nationwide, and is today recognized as the leading supporter of science plays in the country.

In addition to its two main partners, the Foundation is working on pilot grants to the National Theatre in London and in the past has worked with New York-based Playwrights Horizons to develop and stage new works. Sloan's theater program has provided support to plays such as Nick Payne's critically acclaimed *Incognito* and the Broadway hit *Constellations*, starring Jake Gyllenhaal and Ruth Wilson, Frank Basloe's *Please Continue*, Nell Benjamin's *The Explorer's Club,* and Anna Ziegler's *Boy* and *Photograph 51*, which had an award-winning 2015 production starring Nicole Kidman in London's West End. In 2018, *Bump,* about a car mechanic's invention of a new birthing device was the Ensemble Studio Theatre/Sloan mainstage production. To date, the theater program has received over 2,000 submissions for new plays, has commissioned more than 300 works, and has staged more than 60 plays in New York City alone, with dozens travelling to more than 30 theaters across the country and internationally.

Chiara Atik's *Bump*, an Ensemble Studio Theatre/Sloan-commissioned play spanning three centuries that focuses on the true-life story of a car mechanic who invented a new birthing device, premiered in May 2018. (PHOTO BY GERRY GOODSTEIN)

Trustee Grants

Manhattan Theatre Club

NEW YORK, NEW YORK

$650,000 over 36 months to support the MTC/Sloan Initiative commissioning, developing, and producing new science and technology plays.

Project Director: Scott Kaplan, Sloan Project Manager

This grant continues a partnership with New York City's Manhattan Theatre Club (MTC) to commission, develop, and produce science and technology plays. Over the next three years, MTC will commission between 18 and 24 new plays from both rising and established playwrights that explore scientific themes or feature scientists, engineers, inventors, or mathematicians as major characters. Commissions are selected twice yearly in consultation with an independent scientific advisory panel that serves as a year-round resource to help playwrights ensure scientific accuracy. In addition to the commissions, grant funds will support three-to-four readings or workshops for Foundation-commissioned plays per year, and one annual presentation of a Foundation-developed play before a public audience of over 100 people.

Grants Made Against Prior Authorizations

In March 2018, the Trustees authorized the expenditure of up to $500,000 to incentivize the production of more science and technology plays at Manhattan Theatre Club by offering production support for qualifying plays. The following grants were made against this previously authorized fund.

Manhattan Theatre Club

NEW YORK, NEW YORK

$250,000 over 3 months to provide production support for Manhattan Club Theatre's staging of Bess Wohl's science-themed play Continuity.

Project Director: Scott Kaplan, Sloan Project Manager

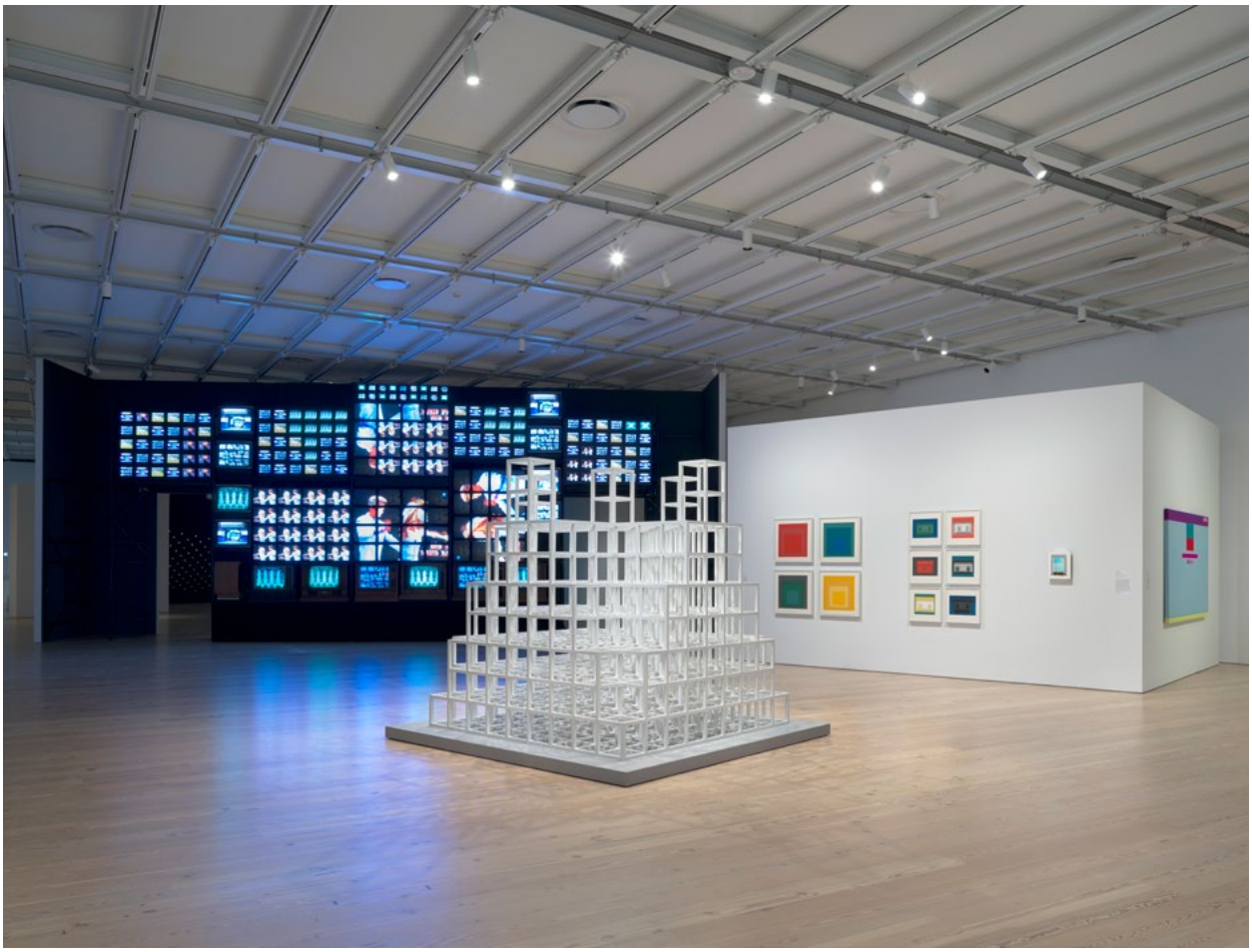
New Media

PROGRAM DIRECTOR: DORON WEBER

The Foundation sponsors innovative efforts using a range of media and other platforms to reach a broad, cross-cultural audience or to target specific segments of the public to enhance public understanding of science. These efforts may take the form of conferences, multimedia events, performances, eBooks, interactive games, science and arts festivals, and more.

The Foundation is a founding sponsor of the annual World Science Festival; has funded the Science Festival Alliance; has backed a short VR film allowing viewers to experience the workings of the LIGO gravitational wave detector; has supported a catalogue and traveling exhibition featuring the seminal drawings of Santiago Ramón y Cajal, the father of modern neuroscience; has funded an interactive virtual chemistry set developed by the Chemical Heritage Foundation; has provided support to *The Secret Lives of Scientists,* a spin-off of the Sloan-supported NOVA ScienceNOW commissioned and funded exclusively by Sloan as a web-based experiment; and has provided support to other projects such as an interactive eBook developed by the New York Hall of Science on the science of DNA and its role in overturning wrongful convictions. In 2018, the Foundation funded an art and technology exhibit at the Whitney Museum of American Art; two events on science denialism with the New York Academy of Sciences; a free, open source, interactive digital edition of *Frankenstein,* and the Science Discovery Hall at the Sloan Museum of Discovery in Flint, Michigan.

In 2018, the Foundation made a grant to Consumer Reports to research consumer attitudes on digital privacy, convene experts and test technology platforms on their privacy practices, and educate consumers about digital privacy and security. Consumer Reports plans to deliver a planning report to the Foundation and hold an expert convening in 2019.



Installation view of Programmed: Rules, Codes, and Choreographies in Art, 1965-2018 (Whitney Museum of American Art, New York, September 28, 2018-April 14, 2019). From left to right: Nam June Paik, Fin de Siècle II, 1989 (partially restored, 2018); Sol LeWitt, Five Towers, 1986; Josef Albers, Homage to the Square V, 1967; Josef Albers, Homage to the Square IX, 1967; Josef Albers, Homage to the Square XII, 1967; Josef Albers, Homage to the Square X, 1967; Josef Albers, Variant V, 1966; Josef Albers, Variant VI, 1966; Josef Albers, Variant X, 1966; Josef Albers, Variant IV, 1966; Josef Albers, Variant II, 1966; Josef Albers, Variant VII, 1966; John F. Simon Jr., Color Panel v1.0, 1999; Rafaël Rozendaal, Abstract Browsing 17 03 05 (Google), 2017. (PHOTOGRAPH BY RON AMSTUTZ)

Trustee Grants

Consumer Reports

YONKERS, NEW YORK

$342,079 over 9 months to research consumer attitudes on digital privacy, convene experts and test technology platforms on their privacy practices, and educate consumers about digital privacy and security.

Project Director: Justin Brookman, Director

Funds from this grant support efforts by Consumer Reports (CR) to provide consumers with the knowledge and tools they need to make more informed choices about their digital privacy. Supported activities include refining the Digital Standard, an evaluative framework used to objectively rank consumer products based on how well they perform on security architecture, data collection, and user control over his or her own data. CR will bring together academics, thought leaders, technical experts, and industry players to review and suggest improvements to the platform. It will draw on its Consumer Insights Panel, a web-based tool that interacts with 4,500 consumers to inform more effective messaging and education strategies. CR will then use the revised Digital Framework to evaluate major technology platforms such as Google, Facebook, Twitter, and Wikipedia. Finally, CR will publish its findings in a report to help inform future consumer choices and industry product development. The overall effort is designed to establish privacy as a core consumer value and to drive competition regarding who can do the best job protecting consumer privacy and individual ownership of data.

Flint Cultural Center Corporation

FLINT, MICHIGAN

$500,000 over 24 months to support the Science Discovery Hall at the Sloan Museum of Discovery in Flint, Michigan, and to advance public understanding of science to an underserved population.

Project Director: Todd Slisher, Executive Director

The Sloan Museum in Flint Michigan was created through a personal gift from Alfred P. Sloan Jr. and still bears his name. The museum is currently engaged in a $24 million modernization campaign to transform itself into the premier regional resource for early childhood and K-12 STEM and history education. Plans include the construction of a 10,000-square-foot Science Discovery Hall featuring a Makers Lab, interactive physical science and earth science exhibits, a spaceship earth climbing structure, and a specially designed entryway focusing on "what is science." The museum estimates that more than 200,000 people will visit annually, including 90,000 K-12 students, many of whom will come from underserved communities. Funds from this grant support the Sloan Museum's modernization campaign.

Massachusetts Institute of Technology

CAMBRIDGE, MASSACHUSETTS

$557,359 over 37 months to support the growth of twelve new science festival initiatives in communities across the country with small resource bases with a special new emphasis on diversity.

Project Director: John Durant, Director

This grant provides funds to the Science Festival Alliance (SFA)—a network and incubator of science festivals across the country—to promote the development and expansion of 12 science festivals across the United States in communities with small resource bases and with a focus on promoting diversity. SFA will select and recruit four leading festivals; they will spend the first year experimenting with different approaches to improving diversity. Each lead festival would create a customized plan for engaging diverse audiences with measurable indicators for progress that would be evaluated after 12 months. This new knowledge would then be applied in selecting the 12 new partners—each lead festival is responsible for recruiting and mentoring three new festival partners in communities with small resource bases. The 12 selected festivals would be given modest $2,000 professional development grants and then be eligible for $10,000 challenge grants as they develop their own plans. Grant funds support these activities and associated administrative and operational costs.

Mathematical Sciences Research Institute

BERKELEY, CALIFORNIA

$500,000 over 39 months to support the 2019 and 2021 National Math Festivals, events that increase the appreciation for mathematics and mathematical research through the arts, engaging lectures, and interactive activities.

Project Director: David Eisenbud, Director

This grant provides operational and administrative support for the National Math Festival, a biannual celebration of mathematics and mathematics research held in Washington, D.C. The festival, which drew crowds in excess of 20,000 people in both 2015 and 2017, features publicly accessible lectures on mathematics, interactive exhibits about mathematical concepts, and demonstrations for adults and children of the beauty of mathematical patterns and their prevalence in virtually every facet of life. Grant funds will support production of the National Math Festival in 2019 and 2021, the fielding and analysis of attendee surveys to improve the festival's offerings, production of a documentary about the festival, and expanded outreach through the web and social media.

Southern California Institute of Architecture

LOS ANGELES, CALIFORNIA

$200,000 over 14 months to support architecture students in the creation and dissemination of multi-media fictional narratives based on the latest research on AI and automation.

Project Director: Liam Young, Coordinator

Southern California Institute of Architecture (SCI-Arc) is host to a unique program, "Fiction and Entertainment," devoted to the notion that architectural training and a strong design background provide an excellent foundation for success in nonarchitectural fields such as media and entertainment. Funds from this grant support an expansion of the Fiction and Entertainment program that will help 16 master's students incorporate the latest research in AI and automation technologies into multimedia fictional narratives including short films, animations, documentaries, video games, VR environments, music videos, and web series. Grant funds will allow students to en-

gage in a year-long exploration of AI and automation technologies guided by eight experts in these fields—from Google, Uber, Sidewalk Lab, and elsewhere. Additional workshops and labs will pair students with leading artists to discuss world building, storytelling, character development, and production. As they refine their projects, each student will be matched with an appropriate technologist collaborator whose research they will crystallize into fictional projects.

The grant will be capped by a daylong storytelling symposium, Fear & Wonder, which draws 500 people to hear leading directors, conceptual artists, video game designers, and storytellers "share their approach to imagining alternative worlds as a means to understanding our own." The resulting work products, which may take a variety of multimedia forms, will then be screened at a Future of Automation symposium, which will be interspersed with themed panel discussions to further contextualize the issues. Experts and well-known figures in technology and the arts will be invited to participate. Last, Sci-Arc will produce a 12-minute documentary about all the projects and distribute it via social media.

Grants Made Against Prior Authorizations

In October 2017, the Trustees approved the expenditure of up to $500,000 to pilot new projects across various media. The following grants were made against this previously authorized fund.

Fractured Atlas

NEW YORK, NEW YORK

$30,000 over 9 months to support Kaimera Productions in an immersive installation performance that blends theater, music, dance, and multimedia, and invites audiences to question the ethics of data privacy.

Project Director: Lauren Lattimore, Program Associate

Retro Report

NEW YORK, NEW YORK

$65,000 over 6 months to support research and production of a short digital documentary and accompanying videos on the science and technology behind driverless cars.

Project Director: Kyra Darnton, Executive Producer

Whitney Museum of American Art

NEW YORK, NEW YORK

$100,000 over 9 months to support a major exhibition on the intersection of art and technology from the 1960s until today.

Project Director: Christiane Paul, Adjunct Curator of New Media Arts

Officer Grants

Massachusetts Institute of Technology

CAMBRIDGE, MASSACHUSETTS

$20,000 over 5 months Support for the preliminary stages of a MIT Press book and film project on women in STEM fields and the seminal 1999 report "A Study on the Status of Women Faculty in Science at MIT.".

Project Director: Amy Brand, Director

National Academy of Sciences

WASHINGTON, DISTRICT OF COLUMBIA

$75,976 over 12 months to support the development of a Nobel Prize-level science communication prize and activities at the Arthur M. Sackler Colloquium on Misinformation, to be held April 3 and 4, 2019.

Project Director: Mary Ellen O'Connell, Executive Director

New York Academy of Sciences

NEW YORK, NEW YORK

$40,000 over 12 months to support a multidisciplinary symposium and panel on science denialism.

Project Director: Melanie Brickman Borchard, Director

New York City Program

The New York City Program

PROGRAM DIRECTOR: PAULA J. OLSIEWSKI

Since its founding in 1934, the Alfred P. Sloan Foundation has been proud to call New York City home. In the New York City Program, the Foundation responds to unique opportunities to benefit the New York City metro area with an eye toward advancing the Foundation's other interests in research and education in science, technology, engineering, mathematics, and economics.

Major projects supported through this program include:

- **Sloan Public Service Awards:** Annual awards that honor the lifetime contributions of six NYC civil servants.
- **Sloan Awards for Excellence in Teaching Science and Mathematics:** Annual awards that recognize extraordinary science and math teachers in NYC public schools.
- **BioBus:** A retooled school bus, transformed into a mobile biology lab, that brings immersive, fun science education to underserved students all over the city.
- **The DNA Learning Lab:** A new branch of Cold Spring Harbor Laboratory's DNA Learning Center, to be located in New York City, which will bring innovative, high-quality, genomics education to NYC students.
- **New York Genome Center:** A new, state-of-the-art genomic research and sequencing facility in Manhattan that provides services to a consortium of a dozen prominent NYC research organizations.

In recent years, grantmaking in this program has focused on revitalizing the NYC science, technology, and engineering sector.

Though the New York City Program is the only Sloan grant program specifically designed to benefit New York, it is not the only way the Foundation contributes to the state. Approximately one out of every four Foundation grant dollars goes to an institution based in New York.

Trustee Grants

Art of Problem Solving Initiative

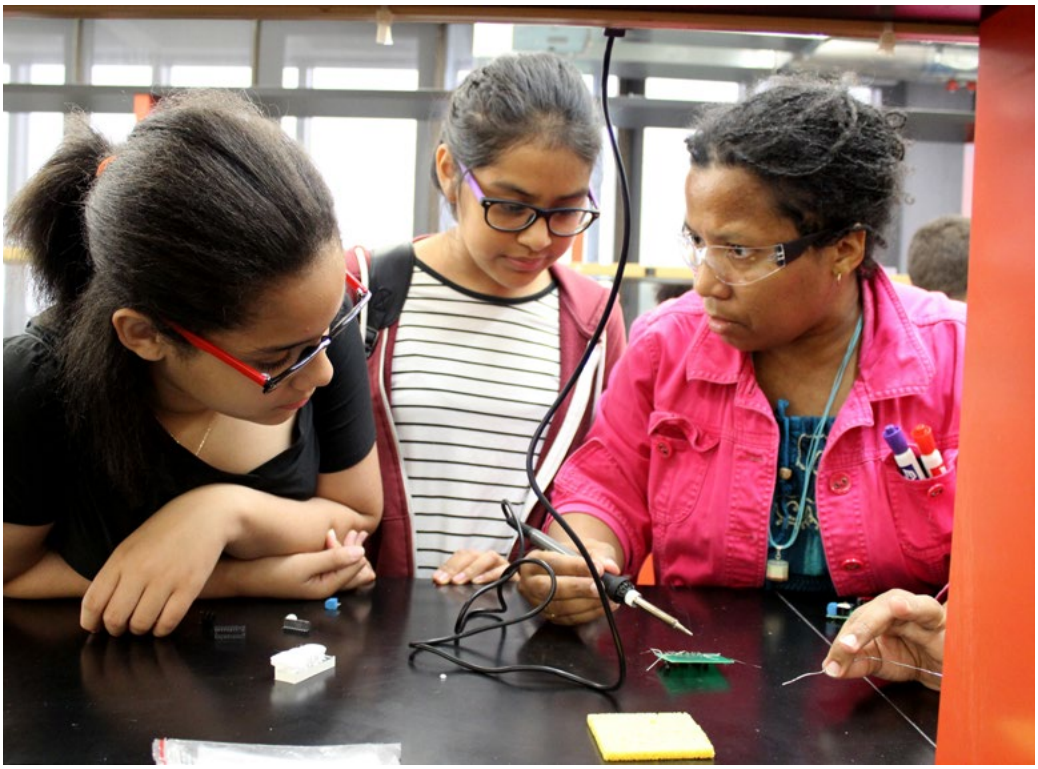
NEW YORK, NEW YORK

$330,000 over 36 months to provide renewed partial support for the BEAM 6 program.

Project Director: Daniel Zaharopol, Executive Director

This grant supports Bridge to Enter Advanced Mathematics 6 (BEAM6) (https://www.beammath.org/), a five-week summer mathematics program operated by the Art of Problem Solving Initiative. The Initiative offers high-quality mathematics instruction to 200 talented New York City sixth-grade students from low-income families. BEAM 6 features rigorous academics as well as a focus on social/emotional development. Student participants enter into an intellectual community, make close friends with other students who are interested in academics, and experience a social environment where academic achievement is prized. After the summer, continued study is encouraged through books, online courses, monthly challenge sets, and information about other next steps, including high school. At the beginning of eighth grade, all students who have completed BEAM 6 receive by mail a detailed guide to New York's high schools and how to apply. This guide helps the students and their parents identify top high schools and prevents students enrolling in high schools that offer no calculus course.

Funds will support operation of the program for three years, and fund various evaluative initiatives that will allow the program to iteratively improve its admissions procedures and curriculum.



Emily (left) and Jas learn to program Arduinos (programmable circuit boards) and build their own vehicles in the BEAM Discovery circuit design class led by faculty member Susan. BEAM (Bridge to Enter Advanced Mathematics) is a Sloan-supported educational enrichment program that introduces underserved students in NYC to the world (and wonders) of advanced mathematics. **(PHOTO COURTESY OF BEAM)**

City University of NY

NEW YORK, NEW YORK

$1,308,345 over 36 months to provide renewed support to encourage and support promising early career scientists at both student and faculty levels through two award programs: A Summer Undergraduate Research program and a Junior Faculty Research Award program.

Project Director: Avrom J. Caplan, Associate Dean

This grant continues Foundation funding of two ongoing programs at the City University of New York aimed at supporting early-career scientists: the CUNY Summer Undergraduate Research program (CSURP) and the Junior Faculty Research Award in Science and Engineering program (JFRASE).

CSURP provides 20 talented undergraduates with direct, high-quality research experiences by placing them in labs at CUNY's Advanced Science Research Center. Under the direction of faculty mentors, students perform hands-on research, attend workshops and seminars on scientific and professional development topics, and design and execute their own research projects, which are then presented at a poster session. To enable participation by students across all socio-economic groups, CSURP provides student stipends, housing, and reimbursements for local travel.

The Junior Faculty Research Award in Science and Engineering program provides a $50,000 fellowship to outstanding junior faculty in STEM fields, providing recognition and flexible funding at a crucial junction in a researcher's career. In addition, CUNY provides winning fellows with a three-credit course release to enable fellows to dedicate more time to their research. Grant funds will support three yearly cohorts of four fellows per cohort.

Cooper Union for the Advancement of Science and Art

NEW YORK, NEW YORK

$400,000 over 36 months to provide renewed support for STEM Saturdays.

Project Director: George Delagrammatikas, Professor

The STEM Saturdays program, launched in 2017 under the direction of George Delagrammatikas, professor of mechanical engineering at the Cooper Union, aims to engage talented, at-risk New York City high school students in engineering activities. The curriculum focuses on teaching in-depth understanding of microcontroller applications and computer programming skills and includes lunch time presentations on the college admissions process, career development, intellectual property, and patent law. Students work with electronic circuits, switches, resistors, digital inputs, LCDs, DC motors, photocells, RFID modules, and IR receivers. They also learn to program computers to create a "smart home," with connected lighting, HVAC, and motion alarm systems; and work in teams to develop a design project using engineering principles to solve current, real-world problems.

This grant provides three years of operational support for the continuation of STEM Saturdays. In addition to continued operation of the program, grant funds will support a series of program improvements, including increased training of the mentors, and more timely access to instructional materials. In addition, Cooper Union will formally link STEM Saturdays with their long-running Summer STEM program to create a progression of STEM college readiness support for underserved students; formally incorporate both programs into their undergraduate admissions strategy to increase diversity within their STEM enrollment; develop the financial and institutional support for long-term sustainability of the program; and engage other New York City STEM outreach programs to expand opportunities for students across New York City.

Fund for the City of New York

NEW YORK, NEW YORK

$810,000 over 33 months to provide partial support for the Sloan Public Service Awards program.

Project Director: Mary McCormick, President

Each year since 1973, the Sloan Public Service Awards have recognized six outstanding civil servants out of the hundreds of thousands who work for New York City government. The Fund for the City of New York manages the nomination and selection process and refers to the awards as "the Nobel Prizes of Government..., the highest award that can be bestowed upon a New York City public servant." Nominated by their colleagues and selected by a blue-ribbon panel of distinguished New Yorkers, each of the six winners receives a $10,000 cash prize and is honored at individual celebrations at their workplaces and at a citywide celebration at the Cooper Union. This grant continues the Foundation's long support of the Sloan Public Service Awards with funding for an additional three years.

Fund for the City of New York

NEW YORK, NEW YORK

$525,000 over 24 months to improve local decision-making by continuing to build technical capacity in NYC borough president offices and community boards.

Project Director: Noel Hidalgo, Executive Director, BetaNYC

BetaNYC aims to improve civic technology and open data usage in New York City. The organization partners with New York's borough president offices and the 59 community boards under them, focusing on how better use of technology and access to data can improve on-the-ground decision-making at a hyper-local scale. Among many other activities, BetaNYC runs a Civic Innovation Fellows program, which puts CUNY undergraduates to work identifying and addressing technology needs at borough president offices and community boards; offers open data training to municipal government workers; developed an open data dashboard to allow community board members to quickly and intuitively access relevant data, like the number and type of complaints received; and has launched several new software tools to inform community-level issues like liquor licensing or tenant disputes. Funds from this grant provide two years of operational support for BetaNYC.

hackNY

NEW YORK, NEW YORK

$397,900 over 24 months to support the local NYC tech startup community through community events, hackathons, and summer fellowships; and to help HackNY develop and execute on new sustainability models to support these activities in the future.

Project Director: Chris Wiggins, Co-Founder

Devoted to cultivating the community of software engineers living in and around New York City, hackNY runs community-building hackathons as well as a marquee summer fellowship that combines internships with networking and cohort training in practical career skills. As a complement to summer intern programs run by Google and Facebook, the hackNY internship program specifically works with start-up companies that do not have the resources to run their own efforts. Funds from this grant provide operational support for hackNY for two years.

Officer Grants

Mayor's Fund to Advance New York City

NEW YORK, NEW YORK

$56,384 over 6 months to increase the utility of NYC open data by enabling library and information professionals to improve the quality of data dictionaries.

Project Director: Adrienne Schmoeker, Director of Civic Engagement & Strategy

Stevens Institute of Technology

HOBOKEN, NEW JERSEY

$19,762 over 12 months to pilot two middle school Math Circles in NYC that inform the development of a system of Math Circles in the NYC area.

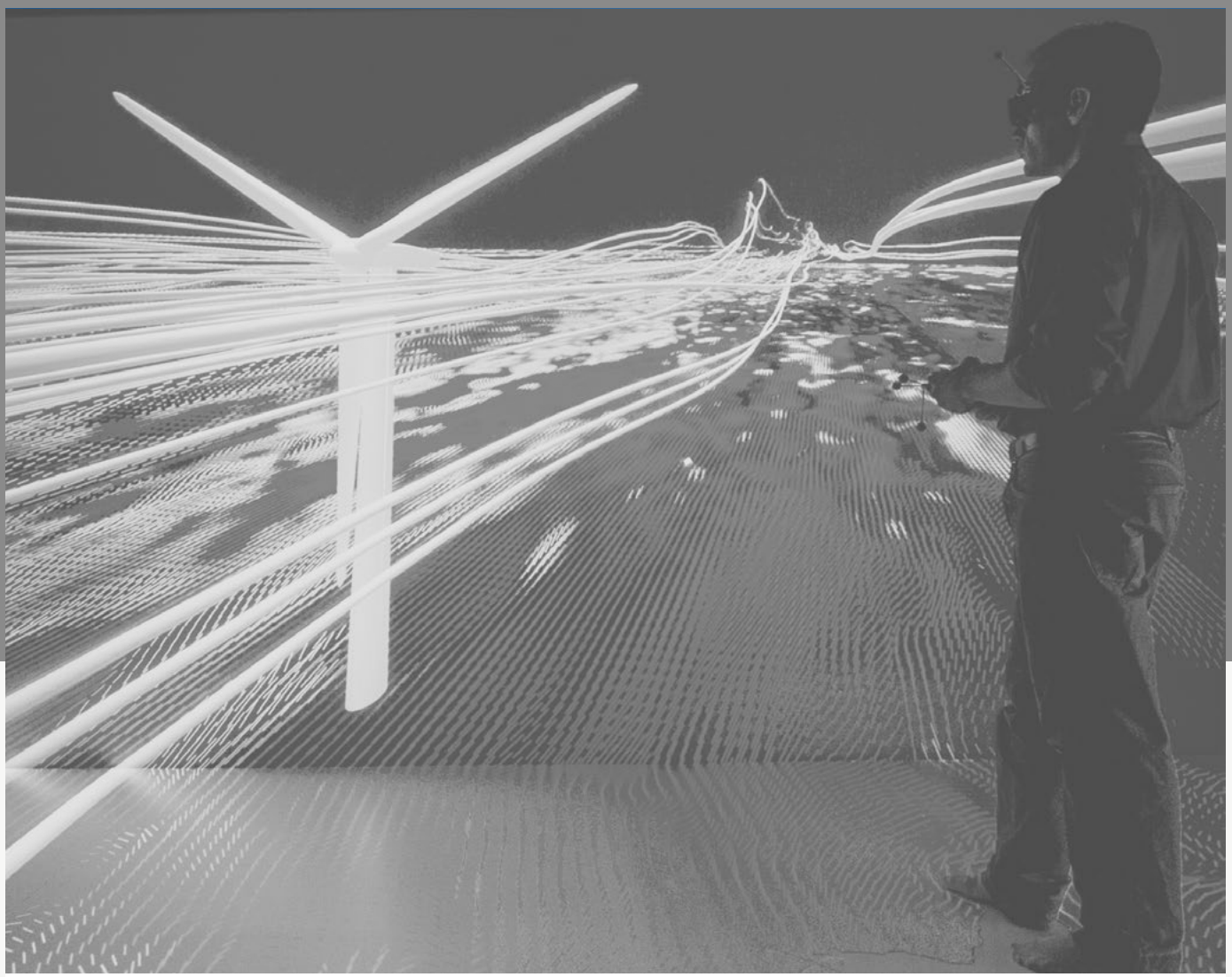
Project Director: Jan Cannizzo, Teaching Assistant Professor

United Hospital Fund of New York

NEW YORK, NEW YORK

$60,000 over 12 months to provide partial support for a workshop on the impact of the opioid crisis on children and caregivers.

Project Director: Carol Levine, Director



Special Initiatives

Special Initiatives

The Foundation occasionally makes small, out-of-program grants in support of the philanthropic community, science philanthropy, or to take advantage of unique philanthropic opportunities. In recent years, grants have focused on the support for a host of institutions that provide services to philanthropy and philanthropists and for the Science Philanthropy Alliance, an organization devoted to increasing private charitable contributions to basic scientific research.

Grants Made Against Prior Authorizations

In December 2016, the Trustees authorized the expenditure of up to $170,000 for grants that support the nonprofit and charitable community. In December 2017, the Trustees approved the expenditure of an additional $148,000 for the same purpose. The following grants were made against these previously authorized funds.

Council on Foundations

ARLINGTON, VIRGINIA

$25,000 over 12 months to support work on behalf of the nonprofit and charitable community.

Project Director: Phillip Blackmon, Membership Associate

Foundation Center

NEW YORK, NEW YORK

$75,000 over 12 months to support work on behalf of the nonprofit and charitable community.

Project Director: Bradford K. Smith, President

GuideStar USA

WILLIAMSBURG, VIRGINIA

$10,000 over 15 months to support work on behalf of the nonprofit and charitable community.

Project Director: Erin DeSandro, Manager

Technology Affinity Group

CHICAGO, ILLINOIS

$5,000 over 12 months to support 2018 Membership Dues for this affinity group of the Council on Foundations.

Project Director: Chantal Forster, Executive Director

In October 2016, the Trustees authorized the expenditure of up to $500,000 to encourage charitable giving in support of basic scientific research through support of the Science Philanthropy Alliance. The following grants were made against this previously authorized fund.

New Venture Fund

WASHINGTON, DISTRICT OF COLUMBIA

$175,000 over 12 months to encourage charitable giving in support of basic scientific research through Sloan membership in the Science Philanthropy Alliance.

Project Director: Lee Bodner, Board Chair

Officer Grants

Arizona State University

TEMPE, ARIZONA

$122,846 over 18 months to integrate engineering principles and thought into the Masters of Public Policy/Masters of Public Administration programs to enhance the effectiveness of public and nonprofit managers.

Project Director: Donald Siegel, Director, School of Public Affairs, and Professor of Public Policy and Management

Open Space Institute

NEW YORK, NEW YORK

$50,000 over 12 months to develop, design, fabricate, and install exhibits, interpretive features, and orientation in the new Minnewaska Visitor Center.

Project Director: LoriJeane Moody, Vice President

2018 Financial Review

The financial statements and schedules of the Foundation for 2018 and 2017 have been audited by Grant Thornton LLP. They include the consolidated statements of financial position, consolidated statements of activities, consolidated statement of functional expenses, consolidated statement of cash flows, notes to consolidated financial statements and supplementary information including the schedule of grants and appropriations.

Investment income for 2018 was $8,704,661, an increase of $1,474,645 from $7,230,016 in 2017. After the deduction of realized and unrealized gains/losses, investment expenses and provision for taxes, net investment return was ($64,256,727) in 2018 as compared to $212,073,558 for the prior year. Total investment expenses and provision for taxes equaled $8,816,634 in 2018 versus $9,194,401 in 2017.

The fair value of the Foundation's total assets was $1,754,284,643 at December 31, 2018 including investments valued at $1,728,497,906 as compared with total assets of $1,909,215,902 at December 31, 2017 including investments valued at $1,861,218,765.

Grants (net of grant refunds) and program expenses and management expenses during 2018 totaled $96,270,227 as compared to $109,667,990 for the prior year. Of this total, grants and program expenses amounted to $90,485,368 and management expenses were $5,784,859. For the prior year, grants and program expenses amounted to $103,860,762 and management expenses were $5,807,228. Grant payments in 2018 were $79,236,198 compared to $84,035,928 for the prior year.

Grants authorized and payments made during the year ended December 31, 2018 are summarized in the following table:

Grants unpaid at December 31, 2017	$	68,385,938
Authorized during 2018		82,697,469
Payments during 2018		(79,236,198)
Grants unpaid at December 31, 2018	$	71,847,209

Consolidated Financial Statements and
Supplementary Information Together with
Report of Independent Certified Public Accountants

ALFRED P. SLOAN FOUNDATION

December 31, 2018 and 2017

Audited Financial Statements and Schedules

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Grant Thornton

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REPORT OF INDEPENDENT CERTIFIED PUBLIC ACCOUNTANTS

To the Board of Trustees of
Alfred P. Sloan Foundation:

We have audited the accompanying consolidated financial statements of the Alfred P. Sloan Foundation (the "Foundation"), which comprise the consolidated statements of financial position as of December 31, 2018 and 2017, and the related consolidated statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the consolidated financial statements.

MANAGEMENT'S RESPONSIBILITY FOR THE FINANCIAL STATEMENTS

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

AUDITOR'S RESPONSIBILITY

Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Foundation's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Foundation's internal control. Accordingly, we express no such opinion. An audit also includes evaluat-

Grant Thornton

ing the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

OPINION

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the consolidated financial position of the Alfred P. Sloan Foundation as of December 31, 2018 and 2017, and the changes in its net assets and its cash flows for the years then ended, in accordance with accounting principles generally accepted in the United States of America.

OTHER MATTERS

SUPPLEMENTARY INFORMATION

Our audits were conducted for the purpose of forming an opinion on the 2018 consolidated financial statements as a whole. The schedule of grants and appropriations for the year ended December 31, 2018 on pages 124 through 132 are presented for purposes of additional analysis and is not a required part of the consolidated financial statements. Such supplementary information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the consolidated financial statements. The information has been subjected to the auditing procedures applied in the audits of the consolidated financial statements and certain additional procedures. These additional procedures included comparing and reconciling the information directly to the underlying accounting and other records used to prepare the consolidated financial statements or to the consolidated financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the supplementary information is fairly stated, in all material respects, in relation to the consolidated financial statements as a whole.

Grant Thornton LLP

New York, New York
July 16, 2019

Alfred P. Sloan Foundation

CONSOLIDATED STATEMENTS OF FINANCIAL POSITION

As of December 31, 2018 and 2017

	2018	2017
ASSETS		
Cash	$ 1,554,235	$ 1,563,174
Redemption receivable	24,232,502	46,433,963
Investments (Note 3)		
Direct investments—equities	46,427,936	95,433,925
Direct investments—fixed income	19,706,744	24,080,791
Direct investments—mutual and exchange traded funds	176,840,197	172,086,786
Alternative investments	1,485,523,029	1,569,617,263
Total investments	1,728,497,906	1,861,218,765
Total assets	$ 1,754,284,643	$ 1,909,215,902
LIABILITIES AND NET ASSETS		
LIABILITIES		
Grants payable (Note 8)	$ 71,847,209	$ 68,385,938
Federal excise tax payable (Note 5)	13,449,834	11,689,871
Accrued compensation	1,391,126	1,573,500
Accrued postretirement health benefit obligation (Note 7)	4,797,647	8,238,465
Other liabilities	—	245,726
Total liabilities	91,485,816	90,133,500
Commitments (Notes 3, 4, and 9)		
NET ASSETS—without donor restrictions	1,662,798,827	1,819,082,402
Total liabilities and net assets	$ 1,754,284,643	$ 1,909,215,902

The accompanying notes are an integral part of these consolidated financial statements.

Alfred P. Sloan Foundation

CONSOLIDATED STATEMENTS OF ACTIVITIES

For the years ended December 31, 2018 and 2017

	2018	2017
INVESTMENT RETURN		
Interest and dividends	$ 8,704,661	$ 7,230,016
Net realized gain on disposal of investments	125,514,983	94,320,461
Unrealized (loss) gain on investments, net of deferred federal excise tax expense of $7,023,219 in 2018 and $5,391,894 in 2017	(189,659,737)	119,717,482
Investment expenses	(8,816,634)	(7,344,401)
Provision for taxes (Note 5)	—	(1,850,000)
Net investment return	(64,256,727)	212,073,558
Other income	4,010	5,850
Net total income	(64,252,717)	212,079,408
EXPENSES		
Grants and program expenses	90,485,368	103,860,762
Management expenses	5,784,859	5,807,228
Total expenses	96,270,227	109,667,990
(Decrease) increase in net assets before postretirement benefit adjustments	(160,522,944)	102,411,418
Amounts not yet recognized as a component of net periodic benefit cost	4,239,369	1,888,807
(Decrease) increase in net assets	(156,283,575)	104,300,225
Net assets at beginning of year	1,819,082,402	1,714,782,177
Net assets at end of year	$ 1,662,798,827	$ 1,819,082,402

The accompanying notes are an integral part of these consolidated financial statements.

Alfred P. Sloan Foundation

CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES

For the year ended December 31, 2018 (with comparative totals for the year ended December 31, 2017)

	2018			2017
	Grants and Program	Management and General	Total	Total
Salaries	$ 4,306,139	$ 1,654,661	$ 5,960,800	$ 5,170,824
Employee benefits	706,967	2,213,682	2,920,649	2,857,382
	5,013,106	3,868,343	8,881,449	8,028,206
Grants, net of refunds of $435,821 in 2018 and $467,561 in 2017	82,697,469	—	82,697,469	97,077,333
Occupancy	856,794	734,396	1,591,190	1,518,357
Office expenses	576,056	489,521	1,065,577	888,849
Professional fees	657,761	124,784	782,545	860,592
Travel	382,068	117,266	499,334	547,258
Board of Trustees	—	331,883	331,883	360,674
Communications	110,793	118,666	229,459	206,019
Conferences and events	191,321	—	191,321	180,702
Total expenses	$ 90,485,368	$ 5,784,859	$ 96,270,227	$ 109,667,990

The accompanying notes are an integral part of these consolidated financial statements.

Alfred P. Sloan Foundation

CONSOLIDATED STATEMENTS OF CASH FLOWS

For the years ended December 31, 2018 and 2017

	2018	2017
CASH FLOWS FROM OPERATING ACTIVITIES		
(Decrease) increase in net assets	$ (156,283,575)	$ 104,300,225
Adjustments to reconcile increase in net assets to net cash used in operating activities		
Net realized gain on disposal of investments	(125,514,983)	(94,320,461)
Unrealized loss (gain) on investments	188,028,412	(116,658,764)
Decrease (increase) in redemption receivable	22,201,461	(46,433,963)
Increase (decrease) in federal excise tax payable	1,759,963	(2,750,532)
Increase in grants payable	3,461,271	13,898,744
Decrease in accrued postretirement health benefit obligation	(3,440,818)	(974,039)
(Decrease) increase in accrued compensation	(182,374)	532,500
(Decrease) increase in other liabilities	(245,726)	151,293
Net cash used in operating activities	(70,216,369)	(142,254,997)
CASH FLOWS FROM INVESTING ACTIVITIES		
Proceeds from sales of investments	78,912,607	149,784,663
Purchases of investments	(8,705,177)	(7,230,017)
Net cash provided by investing activities	70,207,430	142,554,646
Net (decrease) increase in cash	(8,939)	299,649
Cash at beginning of year	1,563,174	1,263,525
Cash at end of year	$ 1,554,235	$ 1,563,174

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

1. ORGANIZATION

The Alfred P. Sloan Foundation (the "Foundation") is a not-for-profit grantmaking institution that supports high quality, impartial scientific research; fosters a robust, diverse scientific workforce; strengthens public understanding and engagement with science; and promotes the health of the institutions of scientific endeavor. The Foundation funds research and education in science, technology, engineering, mathematics and economics. The Foundation believes that these fields, and the scholars and practitioners who work in them are chief drivers of the nation's health and prosperity. The Foundation also believes that a reasoned, systematic understanding of the forces of nature and society, when applied inventively and wisely, can lead to a better world for all. In selecting projects for funding, the Foundation seeks proposals for original initiatives led by outstanding individuals or teams. The Foundation is interested in projects that have a high expected return to society, exhibit a high degree of methodological rigor, and for which funding from the private sector, the government, or other foundations is not yet widely available. The Foundation's investment portfolio provides the financial resources to support its activities. The investment strategy for the investment portfolio is to invest prudently in a diversified portfolio of assets with the goal of maintaining or growing the real value of the portfolio over long-term periods.

In June 2009, Sloan Projects LLC was established under the Delaware Limited Liability Company Act. The Foundation and Sloan Projects LLC share the common charitable and educational purpose of supporting, among other projects, film, theatrical, and television projects that promote education about science, technology, economics, and the scholars who do research in these areas. Sloan Projects LLC is a single member limited liability company ("LLC") with the sole member being the Foundation. Sloan Projects LLC is consolidated with the Foundation for financial statement and tax purposes.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Accounting

The accompanying consolidated financial statements have been prepared on the accrual basis of accounting and include the assets, liabilities, net assets, and financial activities of Alfred P. Sloan Foundation and Sloan Projects LLC (collectively, the "Foundation"). All significant inter-organization balances and transactions have been eliminated in consolidation.

In August 2016, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2016-14, Not-for-Profit Entities (Topic 958): *Presentation of Financial Statements of Not-for-Profit Entities* ("ASU 2016-14"). The ASU amends the current reporting model for not-for-profit organizations and requires certain additional disclosures. The significant changes include:

- Requiring that all not-for-profits present an analysis of expenses by function and nature in a separate statement or in the notes to the financial statements;
- Requiring disclosure of quantitative and qualitative information on liquidity;
- Presenting investment return net of external and direct internal investment expenses;
- Requiring the presentation of two net asset classes classified as "net assets without donor restrictions" and "net assets with donor restrictions";

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

- Modifying the presentation of underwater endowment funds and related disclosures;
- Requiring the use of the placed in service approach to recognize the satisfaction of restrictions on gifts used to acquire or construct long-lived assets, absent explicit donor stipulations otherwise; and
- Modifying other financial statement reporting requirements and disclosures intended to increase the usefulness to the reader.

As required by the standard, the Foundation adopted ASU No. 2016-14 as of and for the year ended December 31, 2018.

Income Taxes

The Foundation is exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code (the "Code") and is a private foundation as defined in Section 509(a) of the Code. Sloan Projects LLC is a single member LLC and is a disregarded entity for tax purposes. The Foundation recognizes the effect of income tax positions only if those positions are more likely than not of being sustained.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset in an orderly transaction between market participants at the measurement date. Fair value is a market-based measurement, not an entity-specific measurement, and sets out a fair value hierarchy with the highest priority being quoted prices in active markets. The Foundation discloses fair value measurements by level within that hierarchy. The fair value hierarchy maximizes the use of observable inputs and minimizes the use of unobservable inputs by requiring that the most observable inputs be used when available. Observable inputs are those that market participants would use in pricing the asset or liability based on market data obtained from sources independent of the Foundation as of the reporting date. Unobservable inputs reflect the Foundation's assumptions about the inputs market participants would use in pricing the asset or liability developed based on the best information available in the circumstances. The fair value is categorized into three levels based on the inputs as follows:

Level 1—based on unadjusted quoted prices in active markets for identical assets or liabilities that the Foundation has the ability to access at the measurement date. An active market for the asset or liability is a market in which transactions for the asset or liability occur with sufficient frequency and volume to provide pricing information on an ongoing basis. A quoted price in an active market provides the most reliable evidence of fair value and shall be used to measure fair value whenever available. Since valuations are based on quoted prices that are readily available and regularly available in an active market, valuation of these securities does not entail a significant degree of judgment.

Level 2—Valuations based on quoted prices in markets that are not active or for which all significant inputs are observable, either directly or indirectly.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

Level 3—Valuations based on inputs that are unobservable and significant to the overall fair value measurement. Unobservable inputs shall be used to measure fair value to the extent that observable inputs are not available, thereby allowing for situations in which there is little, if any, market activity for the asset or liability at the measurement date.

The categorization of a financial instrument within the fair value hierarchy is based upon the pricing transparency of the instrument and does not necessarily correspond to the Foundation's perceived risk of that instrument. As permitted by ASU 2015-07, the Foundation has excluded investments that are measured at fair value using the net asset value ("NAV") per share practical expedient from the fair value hierarchy.

The Foundation follows the accounting standards of the FASB Accounting Standards Codification ("ASC") Subtopic, 820-10-35-59, *Fair Value Measurement and Disclosures—Fair Value Measurements of Investments in Certain Entities That Calculate Net Asset Value per Share (or its Equivalent)*. This allows for the estimation of the fair value of investments in investment companies, for which the investment does not have a readily determinable fair value, using net asset value per share or its equivalent, as provided by the investment managers. The Foundation reviews and evaluates the values provided by the investment managers and agrees with the valuation methods and assumptions used in determining the net asset values of these investments as of the measurement date. These estimated fair values may differ significantly from the values that would have been used had a ready market for these securities existed.

Investments

Investments in equity securities with readily determinable fair values are reported at fair value based on quoted market prices. Investments in debt securities are measured using quoted market prices where available. If quoted market prices for debt securities are not available, the fair value is determined using an income approach valuation technique that considers, among other things, rates currently observed in publicly traded markets for debt with similar terms to companies with comparable credit risk, the issuer's credit spread, and illiquidity by sector and maturity.

Gains and losses on disposal of investments are determined on the first-in, first-out basis on a trade date basis.

Concentrations of Credit Risk

Financial instruments which potentially subject the Foundation to concentrations of credit risk consist of cash and cash equivalents, equity and fixed-income securities and alternative investments. The Foundation maintains its cash in various bank deposit accounts which, at times, may exceed federally insured limits. The Foundation's cash accounts were placed with high credit quality financial institutions. The Foundation has not experienced, nor does it anticipate, any losses with respect to such accounts. The Foundation has a significant investment in equities, fixed income securities, mutual and exchange-traded funds and alternative investments, both marketable and non-marketable, and is therefore subject to concentrations of credit risk.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

Grants

Grants are recorded as an expense of the Foundation when authorized by the Board of Trustees and the grantee has been selected and notified. In certain instances (e.g., Sloan research fellowships), grants are recorded as an expense and liability when the Board of Trustees appropriates amounts for selected projects. Refunded grants are recorded as a reduction to grant expense. Conditional grants are not recorded until the conditions are substantially met.

Expenses

Expenses are recognized by the Foundation as incurred. The costs of grant making and management and general activities have been summarized on a functional basis on the statement of activities. The consolidated statement of functional expenses presents expenses by function and natural classification. Expenses directly attributable to a specific functional area are reported within that functional area. Indirect expenses that benefit multiple functional areas have been allocated based upon either time spent on each function or full-time equivalent units within each department.

Use of Estimates

The preparation of consolidated financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

Reclassifications

Certain reclassifications of prior year amounts have been made to conform to the current year presentation. Such reclassifications did not change total assets, liabilities, revenues, expenses or changes in net assets as reflected in the fiscal 2017 consolidated financial statements.

Subsequent Events

The Foundation evaluated its December 31, 2018 consolidated financial statements for subsequent events through July 16, 2019, the date the consolidated financial statements were available to be issued.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

3. INVESTMENTS

The following tables present the fair value hierarchy of investments, the only financial instruments of the Foundation that are measured at fair value on a recurring basis, at December 31, 2018 and 2017:

	Fair Value Measurements at December 31, 2018				
	Total	Level 1	Level 2	Level 3	NAV*
Direct investments:					
Equities:					
Domestic	$ 46,427,936	$ 46,427,936	$ —	$ —	$ —
Fixed income:					
U.S. government	19,706,744	19,706,744	—	—	—
Mutual and exchange-traded funds:					
Equities	50,541,533	50,541,533	—	—	—
Fixed income	126,298,664	126,298,664	—	—	—
	176,840,197	176,840,197	—	—	—
Alternative investments:					
Equities:					
Domestic	299,064,318	—	—	—	299,064,318
International	423,524,840	—	—	—	423,524,840
Absolute return	358,170,854	20,617,127	—	—	337,553,727
Hybrid	159,642,668	—	—	—	159,642,668
Real estate	22,605,270	—	—	5,180	22,600,090
Private equity	222,515,079	—	—	—	222,515,079
	1,485,523,029	20,617,127	—	5,180	1,464,900,722
	$ 1,728,497,906	$ 263,592,004	$ —	$ 5,180	$ 1,464,900,722

* In accordance with ASC Subtopic 820-10, investments measured at fair valuing using NAV per share as a practical expedient have not been categorized in the fair value hierarchy as permitted by ASU 2015-07.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

	Fair Value Measurements at December 31, 2017				
	Total	Level 1	Level 2	Level 3	NAV*
Direct investments:					
Equities:					
Domestic	$ 95,433,925	$ 95,433,925	$ —	$ —	$ —
Fixed income:					
U.S. government	24,080,791	24,080,791	—	—	—
Mutual and exchange-traded funds:					
Equities	23,128,503	23,128,503	—	—	—
Fixed income	148,958,283	148,958,283	—	—	—
	172,086,786	172,086,786	—	—	—
Alternative investments:					
Equities:					
Domestic	335,936,569	—	—	—	335,936,569
International	455,307,684	—	—	—	455,307,684
Absolute return	346,247,209	3,549,627	—	—	342,697,582
Hybrid	211,634,443	—	—	—	211,634,443
Real estate	18,000,369	—	—	1,601,312	16,399,057
Private equity	202,490,989	—	—	—	202,490,989
	1,569,617,263	3,549,627	—	1,601,312	1,564,466,324
	$ 1,861,218,765	$ 295,151,129	$ —	$ 1,601,312	$ 1,564,466,324

* In accordance with ASC Subtopic 820-10, investments measured at fair valuing using NAV per share as a practical expedient have not been categorized in the fair value hierarchy as permitted by ASU 2015-07.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

The following table presents a reconciliation for all Level 3 assets measured at fair value at December 31, 2018:

	Beginning Balance	Purchases	Settlements/ Redemptions	Total Net Realized and Unrealized Gains	Transfers In/(Out)	Ending Balance
Alternative Investments:						
Real estate	$ 1,601,312	$ —	$ (950,370)	$ (645,762)	$ —	$ 5,180

The following table presents the reconciliation for all Level 3 assets measured at fair value at December 31, 2017:

	Beginning Balance	Purchases	Settlements/ Redemptions	Total Net Realized and Unrealized Gains	Transfers In/(Out)	Ending Balance
Alternative Investments:						
Real estate	$ 1,774,257	$ —	$ (243,685)	$ 70,740	$ —	$ 1,601,312

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

The following tables list the redemption terms and unfunded commitments for the alternative investments as of December 31, 2018 and 2017:

	2018					
	# of Funds	Fair Value	Unfunded Commitments ($ in millions)	Redemption Frequency	Redemption Notice Period	Lock-up Period
Alternative investments:						
Equities:						
Domestic	13	$ $299,064,318	$ —	monthly, quarterly, other	30-90 days	None
International	11	423,524,840	—	monthly, quarterly, other	10-60 days	None
Absolute return	15	337,553,727	—	daily, monthly, quarterly, annually, other	30-90 days	rolling 2-year
Hybrid	14	159,642,668	93	monthly, quarterly, other	45-180 days	none, rolling 2-year
Real estate	4	22,600,090	38	None	N/A	N/A
Private equity	25	222,515,079	243	None	N/A	N/A
Total		$ 1,464,900,722	$ 374			

	2017					
	# of Funds	Fair Value	Unfunded Commitments ($ in millions)	Redemption Frequency	Redemption Notice Period	Lock-up Period
Alternative investments:						
Equities:						
Domestic	13	$ 335,936,569	$ —	monthly, quarterly, other	30-60 days	None
International	9	455,307,684	—	monthly, quarterly, other	10-60 days	None
Absolute return	13	342,697,582	—	daily, monthly, quarterly, annually, other	30-60 days	rolling 2-year
Hybrid	15	211,634,443	82	monthly, quarterly, other	45-180 days	none, rolling 2-year
Real estate	5	16,399,057	8	None	N/A	N/A
Private equity	40	202,490,989	151	None	N/A	N/A
Total		$ 1,564,466,324	$ 241			

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

Equities: Alternative investments in this category invest predominantly in equity securities including U.S., international developed and emerging markets, benchmarked against MSCI All Country World Index. Equity funds range from no lock-up provisions to no more than 3 years.

Fixed Income: Alternative investments in this category invest in domestic and international fixed income securities, benchmarked against Barclays Intermediate US Aggregate.

Absolute Return: Absolute return funds include investments such as low net exposure equity hedge funds, relative value, merger arbitrage, and diversifying funds. Such strategies are expected to generate steady risk-adjusted returns, but with low correlation to the equity markets.

Hybrid: Hybrid investments sits within Global Equities and will provide equity-like returns over a full market cycle. Strategies include public and private debt, direct lending and other opportunistic credit investing. The hybrid portfolio contains 4 and 8 funds in a drawdown structure for 2018 and 2017, respectively.

Real Estate: Includes funds that invest primarily in commercial real estate, all of which are illiquid investments.

Private Equity: Includes buyout, venture capital, real estate and natural resources funds, all of which are illiquid investments.

Private foundations are required by the Internal Revenue Service ("IRS") to distribute 5% of average assets during the year. In order to plan and budget in an orderly manner, the Foundation implements the 5% rule by using a 12-quarter rolling average of the fair value of its investment portfolio to determine the distribution level for the year. The last quarter on the 12-quarter rolling average is September 30th.

4. FINANCIAL INSTRUMENTS WITH OFF-BALANCE-SHEET CREDIT OR MARKET RISK

The Foundation's investment strategy has the ability to incorporate certain financial instruments that involve, to varying degrees, elements of market risk and credit risk in excess of the amounts recorded on the consolidated financial statements.

During 2018, the Foundation bought S&P 500 Index put options valued at approximately $17 million at December 31, 2018. During 2017, the Foundation sold S&P 500 Index put options valued at approximately $17.2 million at December 31, 2017. The Foundation does not anticipate that losses, if any, resulting from its market or credit risks would materially affect its consolidated financial statements.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

5. TAXES

The Foundation is liable for a federal excise tax of 2% of its net investment income, which includes realized capital gains. However, this tax is reduced to 1% if certain conditions are met. The Foundation did not meet the requirements for the 1% tax for the year ended December 31, 2018, therefore, taxes are estimated at 2% of net investment income for 2018. The Foundation did meet the requirements for the 1% tax for the year ended December 31, 2017, therefore, taxes were estimated at 1% of net investment income for 2017. Additionally, certain of the Foundation's investments give rise to unrelated business income tax liabilities. Such tax liabilities for 2018 and 2017 are not material to the accompanying consolidated financial statements; however, the provision for taxes, as of December 31, 2018 and 2017, includes an estimate of tax liabilities for unrelated business income.

Deferred taxes principally arise from differences between the cost value and fair value of investments. Deferred taxes represent 2% and 1% of unrealized gains at December 31, 2018 and 2017, respectively.

As a result of the 2017 Tax Cuts and Jobs Act, the Foundation is subject to a new excise tax under Section 4960 for 2018. The amount is not material to the accompanying consolidated financial statements.

6. RETIREMENT PLAN

The Foundation has a defined contribution retirement plan covering substantially all employees under arrangements with Teachers Insurance and Annuity Association of America and College Retirement Equities Fund and Fidelity Investments. Beginning in July 2018, contributions are made to Fidelity only with, previous legacy funds remaining with TIAA. Retirement plan expense was $906,804 and $879,709 in 2018 and 2017, respectively.

7. POSTRETIREMENT BENEFITS OTHER THAN PENSIONS

The Foundation provides healthcare benefits for qualified retirees. The Foundation records annual amounts relating to the plan based on calculations that incorporate various actuarial and other assumptions, including discount rates, mortality, turnover rates, and healthcare cost trend rates.

The Foundation reviews its assumptions on an annual basis and makes modifications to the assumptions based on current rates and trends as appropriate. The effect of modifications to those assumptions is recorded as a charge to net assets and amortized to net periodic cost over future periods using the corridor method. The net periodic costs are recognized as employees render the services necessary to earn the postretirement benefits.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

The following table sets forth the financial information for the plan for 2018 and 2017:

	2018	2017
Change in accrued postretirement benefit obligation:		
Benefit obligation at beginning of year	$ 8,238,465	$ 9,212,504
Service cost	433,307	384,124
Interest cost	287,896	369,941
Actuarial gain	(1,465,314)	(1,412,746)
Benefits paid	(299,078)	(315,358)
Plan amendments	(2,397,629)	—
Benefit obligation at end of year	$ 4,797,647	$ 8,238,465
Fair value of plan assets	$ —	$ —
Funded status of plan	$ (4,797,647)	$ (8,238,465)
Components of net periodic postretirement benefit cost:		
Service cost	$ 433,307	$ 384,124
Interest cost	287,896	369,941
Amortization of transition obligation	476,061	476,061
Amortization of gain	(99,635)	(9,451)
Net periodic postretirement benefit cost	$ 1,097,629	$ 1,220,675
Benefit obligation weighted average assumptions at December 31, 2018 and 2017:		
Discount rate	4.22%	3.57%
Periodic benefit cost weighted average assumptions for the years ended December 31, 2018 and 2017:		
Discount rate	4.22%	3.57%

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

In October 2018, the Foundation amended its postretirement benefits plan changing the eligibility requirements and implemented cost sharing. The amendment became effective January 1, 2019, and resulted in a decrease in the benefit obligation totaling $2,397,629.

The medical trend and inflation rate is 7.10% grading down to 4.40% in 2029 pre-65 and 5.50% grading down to 4.10% in 2026 post-65.

Assumed healthcare cost trend rates have a significant effect on the amounts reported for the postretirement health benefit plan. The effects of a 1% increase (decrease) in trend rates on total service and interest cost and the postretirement health benefit obligation are as follows:

	2018		2017	
	1% Increase	1% Decrease	1% Increase	1% Decrease
Effect on total service and interest cost	$ 248,062	$ (171,472)	$ 248,062	$ (171,472)
Effect on postretirement benefit obligation	664,356	(532,501)	1,582,952	(1,203,031)

Projected premium payments for each of the next five fiscal years and thereafter are as follows:

Year ending December 31:	
2019	$ 270,108
2020	279,591
2021	266,245
2022	274,308
2023	280,004
Thereafter through 2028	1,328,172
	$ 2,698,428

The accumulated amount not yet recognized as a component of net periodic benefit cost was $(5,683,120) and $(1,443,751) at December 31, 2018 and 2017, respectively. The components are as follows:

	2018	2017
Transition obligation	$ 558,979	$ 1,035,040
Prior service credit	(2,397,629)	—
Net actuarial gain	(3,844,470)	(2,478,791)
	$ (5,683,120)	$ (1,443,751)

The transition obligation, actuarial gain and prior service credit that will be amortized into net periodic benefit cost in 2019 will be $476,061, $221,800 and $104,472, respectively.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

8. GRANTS PAYABLE

The Foundation estimates that the grants payable balance as of December 31, 2018 will be paid as follows:

Year:		
2019	$	48,801,955
2020		14,110,581
2021		4,625,673
2022		2,559,000
2023		1,750,000
	$	71,847,209

The Foundation awards multi-year grants for certain programs with continued annual funding contingent upon the respective grantee satisfying certain performance criteria as outlined in the executed grant agreement; accordingly, the Foundation has not recorded a liability for these conditional awards which are subject to annual review. There were no conditional grant commitments at December 31, 2018 and 2017, respectively.

9. LEASE

Rent expense for 2018 and 2017, including escalations, was $1,877,704 and $1,848,933, respectively. On November 21, 2013, the Foundation modified the original lease. As a result of the lease modification, rent commencement on the substitute premises began on February 27, 2015 for a period of fifteen years ending on February 28, 2030. The fixed rent payable under the lease is an amount equal to (a) $1,740,492 per annum for the period commencing on February 27, 2015 and ending on February 26, 2020, (b) $1,874,376 per annum for the period commencing on February 27, 2020 and ending on February 26, 2025, and (c) $2,008,260 per annum for the period commencing on February 27, 2025 and ending on February 28, 2030.

10. LINE OF CREDIT

The Foundation established a $40,000,000 line of credit with Bank of New York Mellon to provide bridge funding of grants and to finance short-term working capital needs of the Foundation. The Foundation had not yet used the line of credit and closed the line in August of 2018. The interest rate was calculated using the Mellon Monthly LIBOR plus 75 basis points, with a fallback rate of Wall Street Journal Prime minus 125 basis points and floor rate of 2%.

Alfred P. Sloan Foundation

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2018 and 2017

11. LIQUIDITY

The Foundation's investment portfolio provides the financial resources to support its operating needs. Operating needs include management and program expenses and grant commitments expected to be paid in the subsequent year. The Foundation regularly monitors the liquidity required to meet its operating needs as they become due. The portfolio is managed with a prudent level of risk given the Foundation's long-term investment horizon, which is designed to exist in perpetuity. The portfolio can tolerate considerable volatility in short- and intermediate-term performance, provided the long-term performance meets the return objective. The Foundation's return objective and risk tolerance necessitates a meaningful allocation to asset classes with high expected returns and risk across all asset classes. Approximately 82% of the portfolio is held in assets that can be liquidated within one year or less to meet operating needs and a cash position is maintained to support immediate operating needs. In addition, the Foundation must annually pay out a minimum of 5% of the average fair value of its investment assets from the preceding year for charitable and administrative purposes in accordance with IRS requirements imposed on private foundations

The table below presents financial assets available for operating needs within one year at December 31, 2018:

Financial assets at year-end:	
Cash	$ 1,554,235
Redemption receivable	24,232,502
Investments	1,728,497,906
Total	1,754,284,643
Less amounts not available to be used within one year	
Alternative investments	(320,572,367)
Financial assets available to meet operating needs within one year	$ 1,433,712,276

SUPPLEMENTARY INFORMATION

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
American Assembly	$ 374,399	$ —	$ 374,399	$ —
American Association for the Advancement of Science	250,251	762,693	145,375	867,569
American Film Institute	—	345,000	115,000	230,000
American Friends of Toulouse School of Economics	—	300,000	100,000	200,000
American Institute of Physics	—	646,697	200,000	446,697
American Museum of the Moving Image	128,484	440,000	128,484	440,000
American Statistical Association	—	898,783	—	898,783
Annual Reviews	250,000	800,000	670,000	380,000
Appalachian State University	63,254	—	63,254	—
Arizona State University	159,615	179,788	302,461	36,942
Arizona, University of	—	435,997	300,205	135,792
Art of Problem Solving Foundation	—	330,000	—	330,000
Aspiration	—	448,800	448,800	—
Association of American Universities	20,000	301,550	170,000	151,550
Association of Research Libraries	164,663	—	164,663	—
Astrophysical Research Consortium	11,681,000	530,000	2,806,000	9,405,000
Aspen Institute	150,000	—	150,000	—
ASU Foundation for a New American University	93,648	—	63,648	30,000
Barnard College	—	315,000	15,000	300,000
Boston College	—	699,674	320,971	378,703
Boston University	149,360	245,000	345,000	49,360
Brandeis University	190,703	—	190,703	—
Brookings Institution	100,000	1,690,856	1,060,606	730,250
Brown University	—	98,500	98,500	—
California Institute of Technology	—	503,614	401,057	102,557
California Polytechnic State University, San Luis Obispo	—	1,684,036	547,947	1,136,089
California, University of, Berkeley	849,908	2,784,060	2,305,252	1,328,716
California, University of, Davis	590,003	851,430	1,341,433	100,000
California, University of, Irvine	493,006	65,000	558,006	—
California, University of, Los Angeles	1,300,199	1,365,188	2,292,445	372,942
California, University of, Regents	370,573	20,000	390,573	—
California, University of, Riverside	333,888	65,000	266,145	132,743
California, University of, San Diego	824,760	286,867	786,867	324,760
California, University of, Santa Cruz	—	65,000	65,000	—

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Cambridge, University of	$ —	$ 364,103	$ 364,103	$ —
Canberra, The University of	—	135,373	—	135,373
Carnegie Institution of Washington	250,000	2,117,670	1,367,670	1,000,000
Carnegie Mellon University	—	1,111,057	796,557	314,500
Catticus Corporation	—	600,000	600,000	—
Cell Motion Laboratories, Inc.	250,000	—	250,000	—
Center for Economic and Policy Research	—	115,750	115,750	—
Center for Open Science	—	499,431	247,243	252,188
Center for Strategic and International Studies	—	124,475	124,475	—
Chicago Public Media, Inc.	—	80,000	50,000	30,000
Chicago, University of	1,263,597	1,899,216	1,550,845	1,611,968
City College of New York - CUNY	—	250,000	125,000	125,000
Code for Science and Society	—	832,820	832,820	—
Cold Spring Harbor Laboratory	—	134,100	134,100	—
Colorado School of Mines	170,000.00	277,334.00	286,236.00	161,098.00
Colorado State University	—	253,684	253,684	—
Colorado, University of, at Boulder	850,000	125,000	975,000	—
Colorado, University of, at Denver	88,239	—	88,239	—
Columbia University	719,466	1,429,832	1,405,791	743,507
Community Initiatives	237,188	279,650	279,650	237,188
Consumer Reports	—	342,079	171,040	171,039
Coolidge Corner Theatre Foundation	471,000	—	280,000	191,000
Cooper Union for the Advancement of Science and Art	—	400,000	275,000	125,000
Cornell University	22,531	383,902	356,433	50,000
Council for Economic Education	90,000	—	90,000	—
Council on Foreign Relations	—	50,000	50,000	—
Council on Foundations, Inc.	—	25,000	25,000	—
Council on Library and Information Resources	600,000	—	300,000	300,000
CUNY Graduate Center Foundation, Inc.	—	330,750	110,250	220,500
Dartmouth College	—	337,206	293,895	43,311
Decision Science Research Institute, Inc.	—	622,549	309,410	313,139
Denworth, Lydia	—	19,000	19,000	—
Digital Public Library of America, Inc.	847,674	1,510,542	847,674	1,510,542
Duke University	77,000	450,631	320,758	206,873

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
East Carolina University	$ —	$ 65,000	$ 65,000	$ —
Ehrlich, Benjamin	—	50,000	45,000	5,000
Ensemble Studio Theatre, Inc.	600,000	—	600,000	—
Environmental Defense Fund Incorporated	475,000	—	325,000	150,000
Environmental Law Institute	—	550,000	300,000	250,000
Fairfield University	—	50,000	25,000	25,000
Farmer, Jared	25,000	—	25,000	—
Film Independent, Inc.	400,000	—	200,000	200,000
Fletcher, Seth	10,000	—	10,000	—
Flint Cultural Center Corporation	—	500,000	300,000	200,000
Florida, University of	—	124,998	—	124,998
Food & Environment Reporting Network	—	63,587	33,587	30,000
FORCE11	—	20,000	20,000	—
Fordham University	—	7,500	—	7,500
Foundation Center	—	75,000	75,000	—
Fractured Atlas	—	30,000	30,000	—
FPF Education and Innovation Foundation	—	508,343	178,463	329,880
Fund for the City of New York	—	1,335,000	620,000	715,000
Georgia Institute of Technology	—	195,000	195,000	—
Georgia, University of	—	65,000	65,000	—
George Mason University	100,227	—	100,227	—
George Washington University	—	50,000	—	50,000
Georgetown University	149,940	1,691,657	865,670	975,927
Greater Washington Educational Telecommunications Association Inc.	—	2,035,000	1,535,000	500,000
Georgia State University Research Foundation	—	232,931	232,931	—
GuideStar USA, Inc.	—	10,000	10,000	—
HackNY	—	397,900	198,950	198,950
Harvard University	1,280,257	2,818,781	1,987,912	2,111,126
Haverford College	202,246	—	100,000	102,246
Hawaii, University of	60,000	—	60,000	—
Hecht, Jeff	—	33,000	33,000	—
Hopewell Fund	129,429	20,000	149,429	—
Hunter College, CUNY	—	125,000	125,000	—

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Hypothesis Project	$ —	$ 12,000	$ 12,000	$ —
Idaho, University of, Foundation	—	20,000	20,000	—
Ideas42	—	189,873	189,873	—
IEEE Foundation, Inc.	—	125,000	125,000	—
Illinois, University of, Urbana-Champaign	—	195,000	195,000	—
Indiana, University of	—	743,509	269,843	473,666
Innovations for Poverty Action	260,365	—	120,000	140,365
Institute of International Education Inc.	500,000	—	250,000	250,000
International Documentary Association	25,000	—	25,000	—
Internet Archive, The	—	20,000	20,000	—
Ithaka Harbors Inc	—	20,000	20,000	—
Jacob Burns Film Center, Inc.	—	74,678	44,678	30,000
Johns Hopkins University	—	1,330,643	1,005,643	325,000
Johnson Jr., John M.	38,517	—	38,517	—
Julia Computing	406,206	—	406,206	—
L.A. Theatre Works	250,000	—	250,000	—
Louisville Research Foundation, University of	—	30,700	15,350	15,350
Lyrasis	—	20,000	20,000	—
Manhattan Theatre Club	—	900,000	216,667	683,333
Manufacturing Institute, The	—	125,000	125,000	—
Marine Biological Laboratory	700,000	—	700,000	—
Maryland, University of, Baltimore County	1,109,244	—	—	1,109,244
Maryland, University of, College Park	23,250	566,612	406,682	183,180
Massachusetts Institute of Technology	2,334,822	2,565,182	3,098,536	1,801,468
Mathematical Sciences Research Institute	298,000	500,000	250,000	548,000
Max Planck Institute for Chemistry	—	409,975	—	409,975
Mayor's Fund to Advance New York City	—	56,384	56,384	—
McGill University	—	130,000	130,000	—
Memorial Sloan-Kettering Cancer Center	—	65,000	65,000	—
Michigan State University	—	65,000	65,000	—
Michigan Technological University	—	49,963	49,963	—
Michigan, University of	463,174	1,855,465	1,419,673	898,966
Middlebury College	—	45,522	22,761	22,761
Miller-McCune Center for Research Media and Public Policy	—	50,000	50,000	—

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Minnesota, University of	$ —	$ 591,438	$ 247,737	$ 343,701
Montana State University, Bozeman	48,417	—	28,417	20,000
Mozilla Foundation	250,000	—	250,000	—
Murdomo Institute, Inc.	—	50,000	50,000	—
National Academy of Sciences	550,000	767,166	674,105	643,061
National Action Council for Minorities in Engineering, Inc.	4,884,328	2,870,643	2,850,000	4,904,971
National Bureau of Economic Research, Inc.	2,291,801	2,799,562	2,694,841	2,396,522
National Information Standards Organization	—	197,372	197,372	—
National Federation of Abstracting & Information Services	—	16,000	16,000	—
National Press Foundation	—	5,540	5,540	—
National Public Radio, Inc.	200,000	—	200,000	—
National Science Communication Institute	—	20,000	20,000	—
Nebraska, University of, Omaha	—	449,423	223,585	225,838
Nesta	—	20,000	20,000	—
New Jersey Institute of Technology	109,038	—	—	109,038
New Venture Fund	—	175,000	—	175,000
New York Academy of Sciences	—	441,144	191,144	250,000
New York Public Radio	150,000	650,000	400,000	400,000
New York University	1,521,747	466,897	1,134,026	854,618
Nijhuis, Michelle	—	40,000	20,000	20,000
North Carolina State University	209,655	113,002	322,657	—
North Carolina, University of, at Chapel Hill	500,000	604,753	560,113	544,640
Northeastern University	—	437,641	315,000	122,641
NumFOCUS	365,793	40,000	246,608	159,185
O'Connor, Maura R.	32,100	—	32,100	—
Ohio State University	—	130,000	130,000	—
Olson, Stephen E.	50,000	—	50,000	—
Open Knowledge Foundation	—	749,624	249,875	499,749
Open Mind Legacy Project	100,000	—	100,000	—
Open Space Institute	—	50,000	50,000	—
Oregon, University of	150,000	—	150,000	—
Paris School of Economics	600,000	—	300,000	300,000
Pecan Street, Inc.	100,000	1,102,625	558,493	644,132
Pennsylvania State University	—	679,416	629,416	50,000

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Pennsylvania, University of	$ 232,457	$ 262,930	$ 262,930	$ 232,457
Pittsburgh, University of	—	582,852	78,094	504,758
Postrel, Virginia	—	50,000	30,000	20,000
Princeton University	223,655	220,802	444,457	—
Private Capital Research Institute	250,000	—	—	250,000
PRX Incorporated	235,000	—	—	235,000
Public Lab	—	50,000	50,000	—
Puerto Rico, University of, Mayagüez	—	498,065	300,000	198,065
Purdue University	233,754	65,000	185,000	113,754
RAND Corporation	—	125,000	125,000	—
Ramirez, Ainissa	17,500	—	—	17,500
Rhizome	—	19,800	19,800	—
Rice University	—	65,000	65,000	—
Rensselaer Polytechnic Institute	400,207	468,737	635,521	233,423
Research Foundation of the City University of NY	—	1,308,345	—	1,308,345
Research Foundation of CUNY o/b/o Advanced Science Research Center	—	30,746	30,746	—
Research Foundation of CUNY o/b/o John Jay College	—	124,991	124,991	—
Resources for the Future, Inc.	450,000	700,034	650,034	500,000
Retro Report	—	65,000	32,500	32,500
Rhode Island, University of	—	899,795	600,000	299,795
Rockefeller University	450,000	65,000	515,000	—
Rochester Institute of Technology	100,000	—	—	100,000
Rutgers, The State University of New Jersey	55,832	130,000	185,832	—
San Francisco Film Society	230,000	—	230,000	—
San Francisco State University	—	124,833	124,833	—
Schillace, Brandy	—	36,000	—	36,000
Schwarzlose, Rebecca	—	39,400	19,700	19,700
Science Friday Initiative, Inc.	228,000	—	228,000	—
Shetterly, Susan Hand	22,500	—	22,500	—
Stevens Institute of Technology	—	19,762	19,762	—
Social Science Research Council	440,976	500,000	940,976	—
South Florida, University	—	65,000	65,000	—
Southern California Institute of Architecture	—	200,000	110,000	90,000

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Southern California, University of	$ 100,000	$ 415,654	$ 238,551	$ 277,103
Southern Regional Education Board	99,645	—	99,645	—
Stanford University	1,971,987	1,107,671	1,846,895	1,232,763
Sundance Institute	200,000	—	200,000	—
SUNY Polytechnic Institute	—	197,851	197,851	—
Sydney, University of	—	80,000	80,000	—
Syracuse University	—	729,933	257,226	472,707
Technology Affinity Group	—	5,000	5,000	—
Texas, University of, Austin	204,639	598,539	803,178	—
Texas, University of, El Paso	—	65,000	65,000	—
Texas, University of, MD Anderson Cancer Center	—	65,000	65,000	—
The Brookings Institution	300,000	—	100,000	200,000
The Conversation	100,000	—	100,000	—
Thomas Jefferson University	—	65,000	65,000	—
Toronto, University of	1,002,230	260,000	855,516	406,714
Tribeca Film Institute	500,000	261,636	400,818	360,818
United Hospital Fund of New York	—	60,000	60,000	—
United States Association for Energy Economics	—	10,000	10,000	—
University College London	20,000	—	20,000	—
Urban Institute	1,226,012	376,162	1,426,012	176,162
Vanderbilt University	—	65,000	65,000	—
Vermont, University of	—	683,273	202,451	480,822
Verse Video Education, Inc.	—	300,000	—	300,000
Virginia Polytechnic Institute and State University	—	532,170	502,170	30,000
Washington State University	—	249,785	200,000	49,785
Washington, University of	—	945,808	594,016	351,792
Washington University in St. Louis	—	363,758	363,758	—
Western Michigan University	—	19,200	19,200	—
WGBH Educational Foundation	1,450,000	—	600,000	850,000
Whitney Museum of American Art	—	100,000	50,000	50,000
Wikimedia Foundation	1,250,000	200,000	1,316,667	133,333
William and Mary, College of	—	50,000	50,000	—
WNET.ORG	350,000	750,000	250,000	850,000
Yale University	1,098,477	652,651	980,288	770,840

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

Alfred P. Sloan Foundation

SCHEDULE OF GRANTS AND APPROPRIATIONS

For the year ended December 31, 2018

Grantee	Unpaid December 31, 2017	2018 Authorized	2018 Payments	Unpaid December 31, 2018
Yale University Press	$ 30,250	$ —	$ 30,250	$ —
York, University of	—	529,488	529,488	—
Zurich, University of	—	19,610.00	19,610.00	—
TOTAL	59,901,086	83,421,417	80,357,657	62,964,846
Sloan Research Fellowships to be Granted in Ensuing Year	8,200,000	620,000	—	8,820,000
Other Appropriations Authorized but not committed	284,852	—	222,489	62,363
	68,385,938	84,041,417	80,580,146	71,847,209
Reduction for Grant Transfers	—	(908,127)	(908,127)	—
Refunded Grants	—	(435,821)	(435,821)	—
	$ 68,385,938	$ 82,697,469	$ 79,236,198	$ 71,847,209

This schedule should be read in conjunction with the accompanying consolidated financial statements and notes thereto.

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(AS OF DECEMBER 31, 2018)

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