ALFRED P. SLOAN FOUNDATION

2025 HIGHLIGHTS

ALFRED P. SLOAN
FOUNDATION

Contents

Cover: YouTuber and maker Xyla Foxlin is bringing her viewers along for the ride as she builds a functional wooden airplane using 100-year-old blueprints.
Read more on page 22.

The Alfred P. Sloan Foundation is a nonpartisan, not-for-profit grantmaking institution dedicated to improving the welfare of all through the advancement of scientific knowledge. The Foundation works in four different areas to help drive the research frontier forward.

RESEARCH & DISCOVERY The Foundation believes that scientific discovery is a chief driver of economic prosperity and that the research enterprise is a vitally important engine of human progress. We help scholars conduct cutting-edge research across a range of disciplines, from astronomy to particle physics to energy economics. Our research grants focus on underexplored topics; innovative methods; and risky, adventurous projects where success holds the promise of truly transformative discovery.

HIGHER EDUCATION Building a thriving 21st century scientific workforce requires a higher education system that opens scientific careers to anyone with the talent and drive to pursue them. We partner with researchers, educators, administrators, and students on initiatives to expand access to scientific education, remove barriers to educational success, and change the culture of scholarship in ways that expand fair opportunity for all.

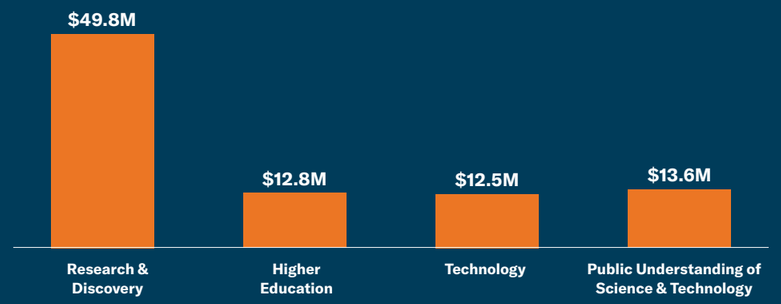
TECHNOLOGY In recent decades, developments like computing and the internet have created new challenges and opportunities for researchers. We work with technologists, programmers, engineers, and scholars to develop innovative new tools, practices, and institutions that give researchers the ability to generate, analyze, and share knowledge at unprecedented speed and scale.

PUBLIC UNDERSTANDING OF SCIENCE & TECHNOLOGY In our increasingly technological world, it is more important than ever that the fruits of scientific discovery be accessible to everyone. We partner with artists across a diverse range of media to tell stories that expand and deepen public engagement with science and technology.

Founded in 1934 by Alfred P. Sloan Jr., the industrialist who made General Motors a household name, the Sloan Foundation was created out of Mr. Sloan's firsthand experience watching scientific and technological innovation drive prosperity and lift American standards of living. Today, we strive to uphold the legacy of that founding insight and to be guided in all our actions by the values of the scientific enterprise: impartiality, empiricism, curiosity, rigor, and the conviction that a careful, systematic understanding of the forces of nature and society, when applied inventively and wisely, can make the world a better place for all.

2025 Grantmaking at a Glance

As of September 30, 2025, the Sloan Foundation had assets totaling approximately $2.3 billion. During 2025, the Foundation awarded $88.8 million in grants to support projects across our four focus areas:



* The Foundation awarded an additional $2.5 million in grants to support nonprofit initiatives and New York City-based projects that advance the Foundation's mission.

A New Chapter

Stacie Bloom

A Moment for Leadership

As I begin my tenure as the eighth president of the Alfred P. Sloan Foundation, the scientific enterprise itself stands at an inflection point. Moments of disruption and uncertainty, while unsettling, carry within them a rare invitation: to examine long-held assumptions, to reimagine routine ways of working, and to reflect upon which values are truly foundational.

The challenges we face — economic transformation, global interdependence, polarized discourse, and more — are more complex, more interconnected, and more urgent than ever before. Among them, AI and machine learning technologies are rapidly becoming general-purpose instruments of discovery, expanding the questions scientists can ask and answer — the latest in a long succession of technological revolutions that have periodically remade the practice of science. But these tools raise hard questions about transparency, equity, labor, energy, and credit. As AI becomes more deeply embedded in research, we must ensure that it strengthens, rather than detracts, from the norms that make science trustworthy and reproducible.

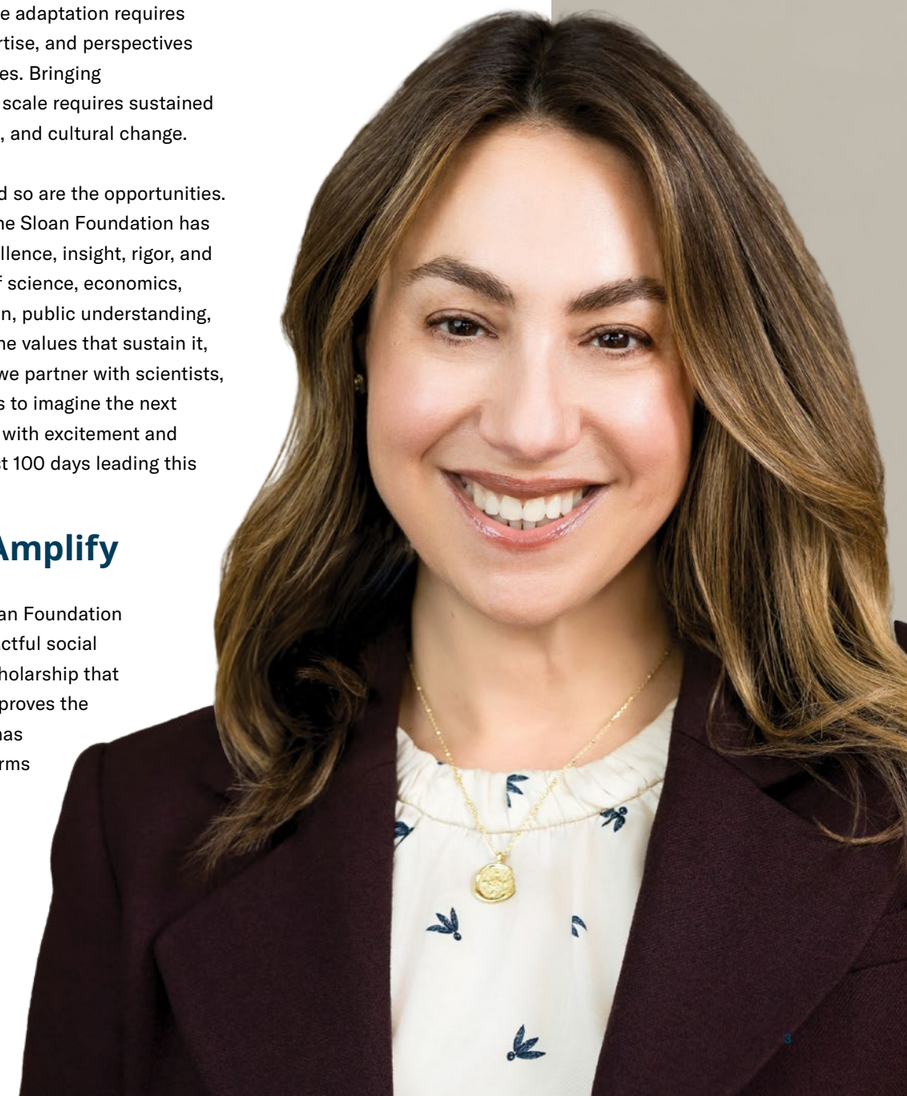
Another defining challenge of our time is scale, particularly in interdisciplinary research. Addressing problems like the social impacts of globalization or the complexities of climate adaptation requires marshalling resources, expertise, and perspectives across disciplinary boundaries. Bringing interdisciplinary research to scale requires sustained investment, experimentation, and cultural change.

“My role as president is to carry this storied history forward — to honor what has made Sloan distinctive while ensuring our work remains relevant, ambitious, and responsive.”

The moment is profound, and so are the opportunities. Since its founding in 1934, the Sloan Foundation has built a unique legacy of excellence, insight, rigor, and impact as a private funder of science, economics, engineering, higher education, public understanding, and more. Our history, and the values that sustain it, are invaluable resources as we partner with scientists, educators, and other funders to imagine the next generation of discovery. It is with excitement and optimism that I begin my first 100 days leading this extraordinary institution.

Preserve and Amplify Sloan’s Legacy

For nearly a century, the Sloan Foundation has supported original, impactful social and physical science and scholarship that advances knowledge and improves the welfare of all. That mission has found expression in many forms — fostering fundamental, curiosity-driven discovery in the physical sciences and economics; enabling development of new tools



and technologies; broadening access to education and careers; and helping the public engage with the fruits of scientific progress. What unites these efforts is a deep belief that science, when thoughtfully supported and widely shared, is among the most powerful forces driving human flourishing.

Sloan has a long history of funding what others will not or cannot. Our grants find and fund gaps in the research landscape, focusing on complex problems that call for fresh, multidisciplinary perspectives; supporting cross-institutional collaboration; and backing innovative methodologies where success promises transformative discovery.

My role as president is to carry this storied history forward — to honor what has made Sloan distinctive while ensuring our work remains relevant, ambitious, and responsive. Success demands continuous discernment to identify where our resources can have the greatest impact, relational intelligence to forge partnerships that drive systemic change, and strategic imagination to connect our legacy to an expansive vision for the future.

Rooted in Values, Looking at the Future

The Sloan Foundation backs ideas and people early in their development, often long before their potential is fully recognized. Nowhere is this more apparent than in the Sloan Research Fellowship program, where for more than 70 years we have supported thousands of scholars at a point in their careers when early recognition and flexible funding is catalytic. Sloan Research Fellows have gone on to careers of great scientific achievement, and our alumni now include 59 Nobel laureates, 17 Fields Medalists, and 72 recipients of the National Medal of Science. This legacy has made the Sloan Research Fellowships one of the most prestigious and sought-after honors in science.

Our track record of investing early in scientific promise extends beyond people to new ideas. We have made grants at the intersection of originality, rigor, tenacity, and promise — seeding new fields, new approaches, and new knowledge that has expanded our understanding of the world. Sloan support for pioneers exploring new areas — cognitive

“My aspiration is that Sloan will continue to be a place where bold ideas are supported with care, where experimentation and innovation are encouraged, and where great research drives a better future for all.”

science in the 1970s, behavioral economics in the 1980s, digital astronomy and indoor microbial ecology in the 2000s — often came before federal funding was widely available, when the potential for discovery was uncertain.

This tradition reflects a distinctive institutional wisdom: the ability to predict which opportunities, among countless worthy possibilities, represent genuine inflection points. My responsibility as president is to identify where our support can catalyze transformative change, and to have the conviction to act when the moment demands it. The Foundation must not only fund change, but embody it.

The Transformative Opportunity

I joined the Alfred P. Sloan Foundation with a deep sense of gratitude and responsibility. Gratitude for the extraordinary legacy of this institution and the generations of trustees, staff, and grantees who have shaped it. Responsibility because stewarding that legacy requires forward-looking imagination and the courage to meet the current moment.

My aspiration is that Sloan will continue to be a place where bold ideas are supported with care, where experimentation and innovation are encouraged, and where great research drives a better future for all. We will build on our strengths in curiosity-driven research while deepening our engagement with the systems — technological, institutional, and cultural — that shape scientific practice. I will listen closely to our grantees and partners, learn from their experiences, and evolve our approach to address a rapidly changing world.

Every decision we make — from the programs we prioritize to the partnerships we pursue, from the people we support to the public conversations we join — must reinforce who we are and what we stand for. We will remain guided by the conviction that research, at its best, is a public good that benefits both the individual and society. It expands our understanding of the universe and of ourselves. It equips us to confront shared challenges and harness new opportunities. And it offers hope — not by promising easy solutions, but by standing as a testament to what careful inquiry, fruitful collaboration, and forward-looking imagination can achieve.

It is an honor to join the Sloan Foundation at this moment. I am continually amazed by the thoughtfulness, creativity, and diligence of the Sloan staff, our trustees, our grantees, and our colleagues across philanthropy. And I am profoundly grateful for our shared mission and the warmth with which I have been welcomed into this community. I look forward to writing the next chapter of this remarkable institution together — one that honors its past and rises confidently to meet a bright future.

Stacie Bloom
President & Chief Executive Officer
Alfred P. Sloan Foundation

As it sped away from Venus, NASA's Mariner 10 spacecraft captured this seemingly peaceful view of the planet wrapped in a dense, global cloud layer.

Acid Test

In the burning, sulfuric, hostile clouds of Venus, might life have found a way?

Despite being named after the Roman goddess of love and beauty, the planet Venus is inhospitable to life as we know it: surface temperatures average over 800 °F, and surface pressures are over 90 times greater than Earth's. No space probe has survived much longer than two hours before succumbing to the planet's intense heat and pressure.

Yet over a half-century ago, Harold Morowitz and Carl Sagan proposed that while life could not survive on Venus' surface, it might exist in the planet's clouds, where temperatures and pressures are comparable to the life-supporting conditions on Earth.

There's just one problem. Unlike the clouds on Earth that carry life-sustaining water, the atmosphere on Venus is mostly sulfuric acid — a substance that is generally anathema to life.

"You can't blame anyone for thinking that life couldn't survive on Venus," says Sara Seager, a planetary scientist at Massachusetts Institute of Technology. "But what if it could support a different kind of life? What if we could swap out some parts and create something stable?"

Seager's questions are based on evidence from her lab. While concentrated sulfuric acid quickly destroys the sugar-phosphate backbone of DNA, her team found that the bases of DNA and RNA (adenine, guanine, thymine, cytosine, and uracil) were stable in sulfuric acid. Follow-up work revealed that 19 of the 20 amino acids essential to life on Earth were either stable or minimally altered after four weeks of sitting in concentrated sulfuric acid.

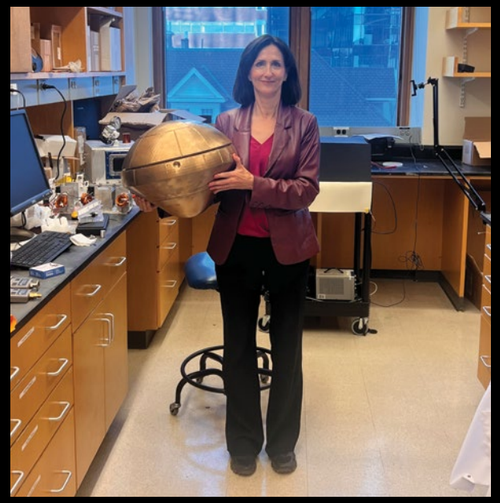
Through its Matter-to-Life research program, the Alfred P. Sloan Foundation is supporting Seager's ongoing quest to find a DNA-like molecule stable in concentrated sulfuric acid. If successful, Seager and

her team could demonstrate that not only is life in some form possible on Venus, but that it could also be plausible on countless other similar planets outside our solar system.

"An organism on Venus would have to function so differently than one on Earth that it would have a completely different makeup, right down to its biomolecules," Seager told *Toronto Life* magazine in 2025. "That, in turn, would prove that life had a second genesis — it originated independently in two places. And if it started in two places, it could start in many. That's really what we're after."

Molecules for Another World

Through the Sloan Foundation's grant, Seager's team has identified a more stable alternative to DNA and RNA, known as a peptide nucleic acid (PNA). Unlike the sugar-phosphate backbone of DNA and RNA, which is quickly destroyed when exposed to sulfuric acid, PNA features a glycine-based backbone. Glycine is one of the amino acids that Seager's team found could survive in concentrated acid.



Seager holds a full-size model of the Rocket Lab Mission to Venus Probe.

Working with Seager, Dr. Iaroslav Iakubivskyi samples for bacteria at a sulfur-rich volcanic vent in Volcano National park on the Big Island in Hawai'i.

The researchers have also developed a list of alternative nucleic acid bases, and they are studying how these bases behave in concentrated sulfuric acid.

"Our work is helping us understand the range of molecules that can exist on Venus and how complex they can be," Seager says. "Now, when there are future missions to Venus, we can come prepared with a list of things to look for."

And after decades of overlooking Earth's closest planetary neighbor, the world is taking a renewed interest in Venus. Between NASA and the European Space Agency, there are now three planned missions to Venus set to launch in the early 2030s with the aim of learning more about the planet's atmosphere and geology. Seager herself is leading a separate effort called the Morning Star Missions to Venus to search for signs of life within the planet's clouds.

Unexpected Discoveries

Beyond exploring what life might look like on Venus, Seager's team made an unexpected discovery that could change our knowledge of what makes life possible on other planets.

When one of the researchers in her group built a custom apparatus to study the stability of molecules in concentrated sulfuric acid, they noticed that after dissolving the molecules and evaporating away the excess sulfuric acid, there was always a tiny bit of leftover liquid that refused to evaporate.

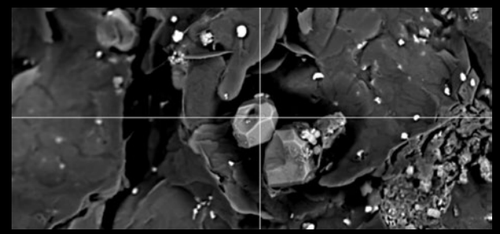
"Now, when there are future missions to Venus, we can come prepared with a list of things to look for."

—Sara Seager

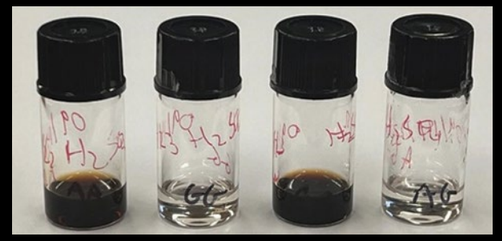
As it turns out, the researcher had inadvertently synthesized an ionic liquid, which is a substance that remains a liquid in warm, low-pressure conditions — even in a near-vacuum.

Seager says these ionic liquids are exciting not just because they resist evaporation in low-pressure environments (such as those on planets with thin atmospheres), but also because her team demonstrated that they can form from sulfuric acid and nitrogen-containing organic molecules, which are relatively common on other planets. Moreover, some ionic liquids have been shown to be bio-friendly and have even been researched for use in healthcare as components in drug delivery.

"Imagine you have a planet with no atmosphere, or a very thin atmosphere, where water can never be sustained because it'll evaporate. You could instead imagine little patches of this ionic liquid that wouldn't evaporate," Seager says. "So all of a sudden, this discovery has opened up close-to-airless planets as possible candidates for sustaining life, whereas they had previously been dismissed as inhospitable."



A drop of glycine sulfate ionic liquid under an electron microscope.



Four dipeptides in concentrated sulfuric acid. The dark color indicates instability while clear solutions are stable. The dipeptide AG (composed of two amino acids abbreviated A and G) is stable in concentrated sulfuric acid. What is surprising is that a dipeptide composed of the same amino acids in reverse order, GA, is unstable.

Seager says her team's discovery of ionic liquids has opened up entirely new research directions for her lab, allowing her and her team to gain new skills, knowledge, and expertise to answer exciting questions in planetary science.

"What started as a narrowly defined proposal has taken on a life of its own," Seager says. "The Sloan Foundation's support has allowed me to follow my gut — in some ways, it feels like being an early-career researcher again, when you are approaching these large problems with a fresh set of eyes."

Through its Matter-to-Life program, the Sloan Foundation supports research to advance an understanding of life that explains both its physical distinctiveness and any processes that guide the complexification of matter towards life.

Contagious Laughter

A side-splitting, Tony-winning play tackles vaccination and community membership in a highly polarized world.

Written by Jonathan Spector and first performed a few years before the COVID-19 pandemic, the satirical *Eureka Day* recounts the chaos that erupts at a private elementary school after a mumps outbreak pits parents against each other over how to respond. The play also asks prescient and fundamental questions about what it means to be part of a community, the importance and limits of consensus, and the corrosive effects on relationships when friends and neighbors can't agree on a common reality.

The Alfred P. Sloan Foundation, through its Public Understanding of Science program, supported the Manhattan Theatre Club's 2024 production of *Eureka Day* at the Samuel J. Friedman Theatre on Broadway. The play was a commercial and critical success, earning the 2025 Tony Award for Best Revival of a Play. Since then, *Eureka Day* has been staged in cities across the US and Europe.

We sat down with Spector after the play's Broadway run to discuss how *Eureka Day* has taken on new meaning after the pandemic transformed vaccination into one of today's most polarizing public health issues.

***Eureka Day* was first performed in 2018, two years before the COVID-19 pandemic. What was the original inspiration for the play?**

I was living in Berkeley, California at the time, and the play was inspired by my experience of being in conversation with an acquaintance who was smart and well-educated, with a seemingly similar world view to me, and then realizing that they didn't vaccinate their kids. I was so curious about how we could believe pretty much all of the same things except for this one thing, where it seemed like we were living in different realities.

At the time, some areas with the highest rates of unvaccinated kids were also some of the wealthiest, most privileged, and ostensibly most liberal areas of

Parents Eli and Carina (played by Thomas Middleditch and Amber Gray) look on as Don (played by Bill Irwin) struggles to control a community livestream about a mumps outbreak at a private school in Berkeley, California.

In *Eureka Day*, a progressive private school in California struggles to achieve consensus after a mumps outbreak divides the community over vaccines.

the country. It was an issue that didn't really correlate with politics. If the only fact you knew about somebody was that they didn't vaccinate their kids, it didn't tell you whether they were a Republican or Democrat. Obviously, vaccination decisions have since become much more predictive of someone's politics.

How did reviving the play after the COVID-19 pandemic affect its meaning?

I think there was a way in which the play worked even better before COVID, because people might not have had such intense personal feelings. It made it easier for audiences to see the metaphor of the play, which is just as much about how to create a democratic society when you can't agree on what's true as it is about vaccines. Immediately after COVID, it became very hard to see the play as being about anything but COVID — even though the play is actually about a mumps outbreak.

But it's certainly very strange to have this thing that felt like my own private obsession become something that the whole world was talking about and obsessing over. There were lines in the original play explaining concepts like herd immunity that I removed for the post-pandemic stagings because they have become so mainstream.

The play features characters that represent a wide spectrum of views, including characters who dissent from the scientific consensus about the efficacy of vaccines. As a writer, how did you thread that needle?

You want to write rich, dynamic characters. Whatever your personal beliefs are as a writer, if you're putting people on stage who feel like cardboard cutouts, the play is not going to be interesting. The audience will have checked out before you get to say what you want. That said, it was tricky to find a balance, because I didn't want people to walk out of the play thinking that it was okay to not vaccinate their children, which could have direct negative consequences.

The play earned the 2025 Tony Award for Best Revival of a Play.

When I talked to public health officials while I was writing the play, all of them said that it's extremely difficult to change people's minds about vaccines. But I think that the more space you make for the audience to have their own thoughts, the more space you give them to shift their beliefs.

One of the most talked about scenes from the play depicts a community meeting that goes off the rails. What did you set out to accomplish with this scene, and why do you think it resonated so strongly with audiences and critics?

I was not expecting such an intense response from the livestream scene. There tends to be so much laughter from the audience that it drowns out what the actors are saying. Before COVID, I think that the audience didn't necessarily know where the scene was headed, because live chats were a lot less common. Now, though, as soon as somebody in the livestream makes a slightly tangential comment, the entire audience knows that it's going to end in disaster.

"Whatever your personal beliefs are as a writer, if you're putting people on stage who feel like cardboard cutouts, the play is not going to be interesting."

—Jonathan Spector

Jessica Hecht (right) earned a Tony nomination for Best Performance by an Actress in a Featured Role for her portrayal of Suzanne in *Eureka Day*.

There's also the juxtaposition of these people on stage who are attempting to have an earnest, thoughtful conversation — even if they disagree with each other — and then the people at home who are letting their worst selves dominate in the comment section. I think there's something cathartic for audiences when they watch that scene unfold.

What does winning the Tony for Best Revival mean, and what's next for you?

It's incredible and surreal, and certainly not something I ever expected. I don't know what it means for me yet, but we'll see as I start work on some new projects.

I'm currently working on a TV show that is also, in a way, connected to medicine and public health. And I have a new play coming to New York next June, called *Birthright*, which is about the fracture of the American Jewish community after October 7th — another topic that I think hits close to home for many people.

The Sloan Foundation supports science-related podcasts, theater, TV, film, video, and books aimed at a diverse, non-scientific audience, through its Public Understanding of Science and Technology program.

Shaking Up STEM

Some of the largest public research universities are coming together to make introductory STEM courses more effective for every student.

Chemistry 101. Intro to Physics. Precalculus. These course names conjure up images of large, impersonal, lecture halls, in which a single professor draws on a dusty chalkboard in front of hundreds of students.

Though these courses are intended to introduce students to foundational concepts in a scientific discipline, many have instead developed notoriety as "weed out" courses, designed (intentionally or not) to discourage students from continuing in STEM.

But a multi-disciplinary, multi-institutional collaboration across some of the largest public research universities in the United States has been reimagining these introductory STEM courses. Supported by the Alfred P. Sloan Foundation through its Higher Education program, the Sloan Equity & Inclusion in STEM Introductory Courses (SEISMIC) Collaboration is working to transform these "weed-out" courses into authentic learning environments where students from all backgrounds can gain the knowledge and skills they need to advance in STEM.

"These courses have developed a reputation as barriers to student progress, courses whose purpose is to decide who gets to continue in STEM and who should not," says SEISMIC lead Timothy McKay, an astrophysicist by training and Associate Dean for Undergraduate

The Michigan State University STEM Equity Learning Community at the SELC May Institute in 2023, hosted at the University of California, Davis.

Members of SEISMIC Central at the SEISMIC Action for STEM Department Transformation Conference in 2024, hosted at the University of Michigan, Ann Arbor.

Education at the University of Michigan. "When in reality, these courses should be about teaching the fundamentals to students and providing them with the deep roots they need to continue in their field."

Since launching in 2019, SEISMIC has brought together faculty, researchers, students, and administrators from 10 large, public research institutions to collect and compare data on student outcomes in introductory STEM courses, allowing them to uncover shared challenges and identify potential levers for systemic change.

For example, SEISMIC researchers have developed Course Equity Reports for STEM courses across disciplines and institutions. These reports provide instructors with information about how student outcomes in their courses are related to factors like the students' majors or whether they are first-generation, low-income, or from other groups historically underrepresented in STEM higher education. Instructors and institutions can use the data from these reports to identify barriers to student success and restructure their courses, materials, or teaching methods so that all students can succeed.

"SEISMIC allows us to discuss topics that are usually left unspoken between universities," says Marco Molinaro, Executive Director for Educational Effectiveness and

"Given the sheer number of students in these introductory courses and the magnitude of this project, you're talking about hundreds of thousands of students impacted."

—Linda Adler-Kassner

Analytics at the University of Maryland, a SEISMIC member. "Through SEISMIC, we can show that institutions are not alone in their challenges, and that there is value in communicating with peers."

With continued support from the Sloan Foundation, SEISMIC will target new approaches for changing grading and assessment practices in STEM courses, which they previously identified as a primary driver of inequitable course outcomes among students.

In many intro courses, for instance, final grades are determined by how students perform on a few high-stakes exams during the semester. These exams have been linked to testing anxiety, are ill-suited to students with learning disabilities, and lead to inequitable outcomes across a variety of student groups. Women, for example, perform worse on average in lecture courses with timed exams than men do, even though they perform just as well as men in interactive, lab-based courses.

"These performance differences don't emerge in homework, lab reports, or participation — it's nearly all in high-stakes exams," says McKay. "These exams are not only inauthentic — no scientist gets their work done by taking a timed exam — but also deeply inequitable. Yet they've become so deeply embedded in our system that we've just gotten used to doing this flawed form of assessment."

Collaborators at SEISMIC are experimenting with alternatives. For instance, when the University of Michigan switched the grading structure of a precalculus course from four timed exams to a mastery-based approach, in which students have multiple tries to demonstrate their knowledge, the percentage of students either withdrawing from the course or receiving Ds and Fs fell from 20% to 12%. The average course GPA also rose from 2.75 to 3.17.

Furthermore, SEISMIC's collaborative network approach ensures findings at one university are shared and replicated at others. In this way, SEISMIC's work can be scaled across higher education, whereas most STEM course reform is often limited to isolated departments within single universities.

"The ripple effects of this collaboration are huge," says SEISMIC collaborator Linda Adler-Kassner, Associate Vice Chancellor for Teaching and Learning at the University of California, Santa Barbara. "Given the sheer number of students in these introductory courses and the magnitude of this project, you're talking about hundreds of thousands of students impacted over the time period of this grant."

And SEISMIC isn't done growing. The collaboration plans to invite additional colleges and universities into its network, expanding the project's reach to more students and instructors across the country.

"The end goal is to make these courses effective for every student," says McKay. "We're really aiming to make these large, introductory courses generationally different from how they've been in the past."

The Sloan Foundation's Higher Education program works to ensure that all students, no matter their background, have the access and opportunity to thrive in STEM disciplines.

The Matchmaker

Cara Eckholm is proving that better government can start with a simple introduction.

As an Urban Tech Fellow at Cornell Tech in 2022, Cara Eckholm was tasked with finding ways for New York City to bolster its innovation economy in the wake of the COVID-19 pandemic.

Through countless interviews with city officials, academic researchers, venture capitalists, and startups, a common thread emerged: organizations in New York were not working together as well as they could be, because in many cases, they didn't know how to find each other.

"There was no systematic way to pair city agencies with academic researchers," says Eckholm. "New York has a wealth of research talent that its government agencies were essentially missing out on."

Thus, the first Pilot Pitchfest was born.

Supported by the Alfred P. Sloan Foundation through its New York City program, the event convened more than 250 agency staff and local academic researchers, bringing together public servants who were planning pilot projects within their agency

and technical experts who could provide actionable analysis to push the project forward.

Through a series of low-stakes, two-minute presentations, researchers and agency staff pitched over 30 planned or ongoing projects, from boosting community engagement with the city's rain gardens to leveraging AI tools to assess the pavement conditions in protected bike lanes.

"There's a bias that entrepreneurship can only exist in the private sector, but we've been able to demonstrate that there are also entrepreneurs within government agencies," says Eckholm.

Beyond expanding the traditional view of entrepreneurship, Eckholm says one of the biggest benefits of the Pitchfest is its ability to connect people with complementary interests and skillsets who might otherwise never meet.

For instance, staff at the New York City Housing Authority, which provides affordable housing for New Yorkers, wanted to understand how leaf mulching impacted soil health at its sites. As it turns out, there was an expert on urban soils from Brooklyn College — Dr. Zhongqi Cheng — in the audience at Pitchfest who was able to help.

"In 2022, NYCHA launched a pilot to mulch leaves in-place, aiming to save staff time, improve efficiency related to leaf collection, and increase the organic content of NYCHA's soil," says Shaan Mavani, Chief Asset & Capital Management Officer at NYCHA. "The partnership of Dr. Zhongqi Cheng and his students at Brooklyn College has been a wonderful complement to our efforts, and we thank them for their work and expertise in this important area."

After receiving a small grant from Pitchfest to pursue their work, the NYCHA and Brooklyn College team undertook testing to confirm that leaf mulching has a positive impact on soil health and water retention. They have subsequently earned a follow-on grant of nearly $400,000 from the US Department of Agriculture to expand the leaf mulching and soil health monitoring program to other sites.

"Many people want to see the government work more effectively. We've shown them an optimistic version of what government innovation can look like."

—Cara Eckholm

At the 2025 Pilot Pitchfest, more than 1,000 attendees listened to 50 pitches from staff at more than 20 New York City agencies.

Eamon Smithsimon, an undergraduate at Vassar College, performs a soil infiltration test at NYCHA's Glenwood Houses campus in Brooklyn, New York.

Following the success of the first Pilot Pitchfest, Eckholm planned a bigger event. Again, she was shocked by the demand: more than 400 in-person and 600 online attendees listened to 50 pitches from agencies across the city.

Again, the event catalyzed meetings between public servants and local researchers. Topics ranged from the Department of Environmental Protection's call to study what causes algal blooms in the Croton Watershed to the Department of Transportation's efforts to evaluate the impacts on student well-being of closing streets in front of schools to provide safe outdoor spaces. After receiving a small kick-off grant, both projects are now underway.

The second Pilot Pitchfest also added a volunteer track to match highly skilled New Yorkers with agencies to work on short-term projects. These projects included developing infographics that communicate the impacts of climate change and digitizing an outdated, paper-based disposal voucher system for the Department of Sanitation. Over 100 New Yorkers applied as volunteers.

"There were actually more volunteers who wanted to help than there were projects that the agencies had surfaced," says Eckholm. "It shows us that there are a lot of New Yorkers who want to lend their expertise to the city and see it become a better place for everyone."

Pointing to the oversubscribed demand for the first two events, Eckholm is looking to continue growing the impact of Pilot Pitchfest. Beyond expanding and formalizing the volunteer program with the Mayor's Office, Eckholm says the team is exploring ways to replicate the success of the Pilot Pitchfest in other cities across the US. They are also looking into opportunities to support longer-term evidence and evaluation projects with the potential to dramatically change agency policies and procedures.

"There are many people who want to see the government work more effectively, and I think we've shown them an optimistic version of what government innovation can look like," says Eckholm. "And given the right platform to voice their ideas, we've demonstrated that these entrepreneurs within agencies can be poised to make a big difference in New Yorkers' lives."

The Sloan Foundation's New York City program supports projects in New York City that advance the Foundation's mission to support research and education in science, technology, engineering, mathematics, and economics.

~~Do~~ Flew It Yourself

Armed with century-old blueprints, cedar, glue, and a fearless willingness to learn by doing, a YouTuber is building an airplane from scratch. And taking her viewers along for the ride.

Xyla Foxlin is no stranger to flying. Here, she stands with her 1946 Cessna 140, which she has flown coast-to-coast across the United States.

Xyla Foxlin is a maker. From wooden canoes and rockets to bulletproof ballgowns and custom bass guitars, Foxlin's YouTube channel is a hub for projects that put her passion for craftsmanship and her background in mechanical engineering to the test.

And with support from the Alfred P. Sloan Foundation through its Public Understanding of Science and Technology program, Foxlin is embarking on her biggest, most complex project to date: building a functional, vintage wooden aircraft from scratch.

Referencing blueprints first published in 1929, Foxlin is documenting her efforts to build and fly a Pietenpol Air Camper, a simple aircraft originally designed for homebuilders and hobbyists. And she is bringing her over 500,000 channel subscribers along for the ride.

"[The Pietenpol] is one of the earliest successful experimental aircraft designs and was the first airplane to successfully run on an automotive engine," Foxlin says. "It's from an era when aviation was much more accessible to the common person — and so much more whimsical."

Through her video series, viewers can watch Foxlin transform planks of spruce, plywood, and red cedar into functional parts of an airplane. In one video, for example, Foxlin assembles the plane's fuselage, referencing the original blueprints to cut and size spruce boards and bond them together.

Foxlin views each video through the lens of a storytelling arc, taking viewers through a journey from starting material to final product and documenting the decisions she makes along the way.

"If people know the materials that you started with and the final product you're trying to achieve, they're emotionally invested enough that they want to learn what it takes to get there," Foxlin says.

For instance, Foxlin guides viewers in a video through the best adhesive for bonding together the pieces of the fuselage, what makes a piece of wood aviation-worthy, and the step-by-step process for reinforcing the plane's components for flight. She also highlights any mistakes she makes and any part of a build that doesn't go to plan.

"Messing up is a critical part of the engineering and maker process," Foxlin says. "A lot of times, you learn the most when you're recovering from a mistake. That learning can then become a plot point in the video, which I think is one of the most effective ways to teach people."

> "One of the best skills you can have as an engineer or a maker is to be willing to start a project without knowing how you're going to finish it, but having trust in yourself that you can figure it out along the way."
>
> —Xyla Foxlin

Foxlin began posting to YouTube in college when she produced tutorial videos for the machines at her university's Makerspace. She says she appreciates the creativity and freedom that the platform gives her to explore her interests, as well as the diverse audience she is able to reach. Each of Foxlin's videos is seen by hundreds of thousands or even millions of viewers from around the world.

Yet despite YouTube's popularity, funding opportunities for individual content creators — especially science and engineering-focused creators — have lagged behind traditional media platforms like film and television.

"This grant from the Sloan Foundation has allowed me to work on a project that's been on my bucket list forever," Foxlin says. "And having the Foundation say that my project is a good idea and that people will care about my work has been validating enough to actually go out and start it."

Foxlin's goal is to complete the Pietenpol Air Camper and fly it in the real world. And while it is by far the longest, largest, and most ambitious project she has undertaken on her channel, she says it has also been one of the most rewarding, teaching her new skills and taking her outside of her comfort zone.

"One of the best skills you can have as an engineer or a maker is to be willing to start a project without knowing how you're going to finish it, but having trust in yourself that you can figure it out along the way," Foxlin says. "If you need everything mapped out before you start something, you'll never start."

The Sloan Foundation supports science-related podcasts, theater, TV, film, video, and books aimed at a diverse, non-scientific audience, through its Public Understanding of Science and Technology program.

Foxlin building her plane at her workshop in Los Angeles, California.

Measuring What Matters

An innovative dashboard highlights the often-unseen value of care work to the US economy.

When the pandemic hit in March 2020, economist Misty Heggeness found herself in a situation familiar to parents and caregivers worldwide: juggling remote work while managing exponentially intensified care duties at home. Her research productivity plummeted as she helped her children navigate virtual learning, prepared additional meals, and worked in isolation from her colleagues. Heggeness had spent her entire career working with economic data, but as pandemic lockdowns wore on, those official metrics seemed increasingly disconnected from her daily reality.

“My economic activity includes not just writing my research papers, but also making food, reading bedtime stories, and getting my kids in the bath,” Heggeness says. “Official statistics only capture a fraction of the work I was doing every day.”

That frustration, intensified by the pandemic, sparked a question: what would economic statistics look like if they centered caregivers instead of wage-earners who traditionally have someone else handling their household needs? The result is The Care Board, an innovative data dashboard launched in April 2025, that makes visible the extent and value of care work in the US economy — a huge economic contribution that has remained unmeasured for decades. Using novel data visualization, The Care Board shows that 233 million US adults collectively spend 1.4 billion hours providing care each day. It then breaks down those 1.4 billion hours by *who* is providing the care and by *what kind* of care they are providing. Mothers provide 32% of total care time, including formal care occupations (like teaching) and informal care activities (like cooking). On average, a mother with kids in the home spends 12 hours per day on care activities, while fathers spend only 8.4 hours a day providing care. The Care Board also highlights the fact that, of the total 1.4 billion daily "care hours" in the US, 1.3 billion are made up of *informal* care activities, not paid care occupations.

"Care work remains unmeasured not because it is too technically challenging to measure, but because it has not been prioritized."

—Misty Heggeness

By including these unpaid care activities, The Care Board addresses a fundamental blind spot in economic measurement that dates to the 1940s, when economists systematically excluded household production and care work from measures like Gross Domestic Product (GDP) — a measure that attempts to quantify all the goods and services produced by an economy. This omission was not simply because unpaid work is "too hard" to measure.

"There is an assumption that value is conferred through a wage, and therefore unpaid work is unmeasurable," says Heggeness. "That's a lazy way to think about it. There are multiple viable methods for assigning a dollar value to unpaid work. For instance, you can assign the minimum wage to all care work. Or you can find a paid equivalent, assigning the time I spent cooking dinner the same amount it would cost to eat in a restaurant or order takeout. Or you can look at the caregiver's educational and professional background to estimate their earning potential if, instead of caregiving, they spent that time in paid work."

"Care work remains unmeasured not because it is too technically challenging to measure, but because it has not been prioritized," says Heggeness.

The consequences of this invisibility are profound. Labor force statistics provide only partial pictures of economic reality, leading to inaccurate public perceptions and uninformed public policy.

For example, Heggeness had assumed the majority of care hours would be related to healthcare (doctor's visits, nursing, or caring for sick relatives). However, The Care Board reveals that healthcare makes up just 10% of the US' 1.4 billion daily care hours. 55% of care hours are spent doing daily tasks like laundry and food preparation, while 34% of care hours are spent on developmental care like teaching, homework supervision, and educational and enrichment activities for children or individuals with disabilities.

Heggeness' team also developed innovative metrics, including a measure for the alignment between the availability of caregivers and the need for caregivers in a given geographic area. These metrics help identify inequities in the distribution of care resources. For example, they tell us how many paid care workers in elder care are available today to care for all the elderly individuals who may require care within a geographic location. This helps policymakers better plan their resources around potential gaps in meeting care needs.

Within its first month, The Care Board attracted over 2,000 unique users and was informing conversations amongst journalists and researchers. But Heggeness' vision extends beyond academic impact: "I would love the federal government to take this dashboard and make it their own."

This isn't a far-fetched dream. The data available on The Care Board is a compilation of publicly-available government data. "The federal government already collects this information," says Heggeness. "All we have done is analyzed it and presented it in new ways, to illuminate the unique and under-valued role of care work."

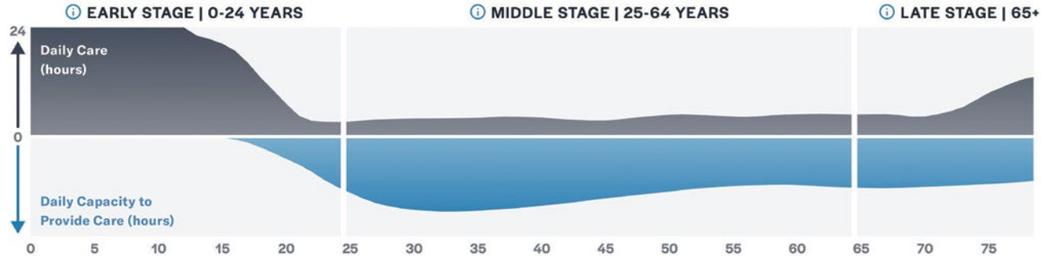
For Heggeness, there has never been a better time to focus on this work. "Labor force participation rates for mothers are the highest they have ever been in recorded history," she says. "Despite also shouldering most caregiving hours, mothers are more active participants in formal labor markets. If we don't recognize this, an entire generation of caregivers will remain stressed out and underserved by social and economic policies that ignore the amount of unpaid care work they do."

By making the invisible economy visible, The Care Board isn't just changing how we measure economic activity, it's changing how we value the essential work that sustains our families, communities, and ultimately, our entire economy.

How much of your day is spent giving or receiving care?

Care through the stages of life

Estimated daily care and capacity to provide care - based on age



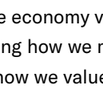
The Care Board website allows users to visualize the scale and distribution of the care economy.

Time Investment

Time Investment represents the time spent providing care by care providers.

Unpaid Care Hours Worked, 2024

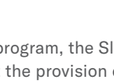
1.4 B
total hours per day



26%
of all unpaid hours per day

Paid Care Hours Worked, 2024

239 M
total hours per day



29%
of all paid hours per day

The Care Board data demonstrate that unpaid care work far surpasses paid care work in the United States.

Through its Economics program, the Sloan Foundation makes grants to support the provision of public goods that strengthen and accelerate US economic progress. Misty Heggeness is an economist at the University of Kansas and author of *Swiftynomics: How Women Mastermind and Redefine Our Economy*.

Share Tactics

How the Sloan Digital Sky Survey's two-decade commitment to open data is revolutionizing astronomy

The SDSS telescope at Apache Point Observatory takes calibration observations. For these observations, the telescope's cover is closed and the inside is illuminated by a special lamp.

For most of modern astronomy's history, scientific discovery was a race.

Scientists fiercely competed for time with the latest and best telescopes, because their careers depended on being the first to analyze and publish their observations about stars and galaxies.

But in the 1990s, a group of astronomers who were planning a new telescopic survey — what would eventually be called the Sloan Digital Sky Survey (SDSS) — decided to take a different, more collaborative approach.

Instead of guarding telescope time and data access, the scientists behind SDSS decided to share that data freely with the world — one of the first major scientific efforts to do so. After a one-year embargo when data would only be available to survey members, all SDSS data would be made freely available to anyone in the world to use and analyze.

This open science approach to data sharing was virtually unprecedented at the time in astronomy, and the results have been explosive. Over the course of more than 25 years and 19 data releases, SDSS has mapped over a third of the night sky. Moreover, SDSS data have generated nearly 16,000 peer-reviewed papers that have garnered more than 900,000

SDSS team members, including Alex Szalay (front left) and Ani Thakar (front center), stand next to nearly 2,000 failed hard drives containing SDSS catalog data, which they nicknamed the "Dark Tower."

Attendees interact with the *Shine: Code for Everything III* exhibit by Tim Fitzpatrick, an artist-in-residence for SDSS. Housed at the Museum of the University of St. Andrews in Scotland, the exhibit explores the hidden messages encoded in emission line spectra.

citations, making it one of the most heavily cited, most influential, and most cost-effective astronomical observation programs of all time.

"It is fair to say that the project and its archive have changed astronomy forever, showing that a whole community of scientists are willing to change their approach to data and analytics, if the data are of high quality and presented in an intuitive fashion," wrote Alex Szalay, one of the original architects of SDSS's data sharing practices and an early advocate of open-source science, in a 2017 paper.

Yet even beyond its impacts on, say, how black holes form or how galaxies move, SDSS has always served as a model for open and accessible science, inspiring decades of work to bring large datasets out of the void and into the hands of researchers, students, and enthusiasts alike.

Opening Up Astronomy

Early on, the scientists of SDSS realized that designing and building their first telescope, camera, and spectrograph system — which leveraged charged-couple device cameras and optical fiber technology that were later awarded the 2009 Nobel Prize in Physics — was only half the challenge.

SDSS Artist-in-Residence Tim Fitzpatrick painted the emission spectrum for the element neon onto the roof of the Old County Jail in Las Cruces, New Mexico, during a visit to the SDSS facilities.

Soon after the telescope achieved first light in 1998 from the Apache Point Observatory in New Mexico, it was generating hundreds of gigabytes of data about objects in the universe every night, far more than any research team could ever hope to analyze alone.

The SDSS scientists quickly realized that an equally important task was finding ways to process that data and make it broadly available, for which the SDSS team had to use state-of-the-art technology and invent groundbreaking tools.

To process and distribute the data to SDSS researchers and students, the team created a centralized data processing hub known as the Science Archive Server (SAS), which since 2014 has been hosted at the University of Utah Center for High Performance Computing (CHPC). The SAS, which has grown over time to include a petabyte-scale file system and a 1000-core computational cluster at the CHPC, ensures that every photon hitting the SDSS telescopes is transformed from a raw observation into a research-ready product for scientists in the collaboration.

And with the help of the late Jim Gray, database guru and Turing Award-winning genius, the SDSS catalog archive team at Johns Hopkins University made the pivotal decision to serve SDSS data to users with a commercial relational database management system (RDBMS) — Microsoft's SQL Server. Thus, alongside the first public SDSS data release in 2001, SDSS launched SkyServer, a web-based portal that allowed anyone who was interested to browse and analyze survey data. SkyServer allowed users, from astronomers and astrophysicists to members of the public, to run queries and fetch SDSS data in real time.

Over time, the system evolved with the needs of its users. For example, the SDSS team developed CasJobs in 2004 to allow users to run queries on huge amounts of SDSS data, more than SkyServer could process. Moreover, instead of requiring users to download the results of those queries onto their own devices — limiting access only to those who had gigabytes of storage available — CasJobs stored the results in a personal, server-side database.

"Suddenly, people were able to run a query, return the results to a personal database, and do as much further

During a visit to SDSS facilities, SDSS Artist-in-Residence Tim Fitzpatrick created an art installation in the Organ Mountains in New Mexico. The installation depicts the H-alpha line, which is the deep-red spectral line produced by hydrogen atoms when an electron falls from its third to its second-lowest energy level.

analysis on that data as they wanted, without having to download all of that data onto their own computers," says Ani Thakar, the current Catalog Archive Scientist for SDSS. "SDSS pioneered this model of server-side analysis, at least in astronomy. And it really took off."

Not only did SDSS form the blueprint for subsequent large-scale astronomical surveys like the Dark Energy Spectroscopic Instrument (DESI), but its trailblazing approach to large-scale data access has also transformed other fields. Scientific tools originally developed by SDSS for astronomy, like SkyServer and CasJobs, are routinely used by other disciplines from genomics to the social sciences under a unified tool known as SciServer.

In recognition of their work, the SDSS team received the 2021 Systems Award from the Association for Computing Machinery's Special Interest Group on Management of Data for "an early and influential demonstration of the power of data science to transform a scientific discipline."

"The world sees the value in what the Sloan Foundation has invested in and what the collaboration has accomplished for science," says Joel Brownstein, the current Head of Data Management and Archiving and the Science Archive Scientist for SDSS. "The SDSS work is truly transformative, and I am very proud of the data systems that we have built."

"We don't want SDSS data to be just for black belt astronomers. It should be accessible for anyone who wants to use it."

—Anne-Marie Weijmans

Moving Beyond Science

In addition to the impact of SDSS on science, the SDSS team finds success in the ways that non-scientists have interacted with the data.

"From the very beginning, the services that we provided were designed to be digestible and appealing to the general public," says Thakar.

Anne-Marie Weijmans, the Data Products Manager for SDSS who manages the project's yearly public data releases, spends much of her time ensuring that extensive documentation is in place on how to use and interact with SDSS data to lower the barriers for public engagement.

For example, Weijmans has collaborated for many years with Tim Fitzpatrick, a Scottish installation artist, to translate SDSS data into compelling works of art. The collaboration has yielded benefits in both directions, she says, with her introducing Fitzpatrick to SDSS spectra and Fitzpatrick telling her more about the process of making and interpreting art.

The SDSS team also worked closely with curator Stephen Little at the LA County Museum of Art (LACMA) on a massive project undertaken as part of the Getty Museum's *Art and Science Collide* show that ran through early 2025. The show featured an immersive, floor-to-ceiling projection of a galaxy survey from SDSS.

"We don't want SDSS data to be just for black belt astronomers," Weijmans says. "It should be accessible for anyone who wants to use it."

And after more than 25 years and 19 data releases, Weijmans says that data at SDSS is stronger than ever. The latest release, published in summer 2025, features the first sneak peek of data collected by the Local Volume Mapper, an instrument that began operating in late 2023 to help study the formation and evolution of the Milky Way and other nearby galaxies. Subsequent data releases will dive more fully into the spectra captured by the Local Volume Mapper, furnishing a new generation of scientists and public citizens with data that paint a richer picture of the universe.

"Making the data available to everyone helps us to broaden our impact," Weijmans says. "If you set the data free, you allow for opportunities for others to uncover new insights that we weren't originally looking for."

The Sloan Foundation has supported the Sloan Digital Sky Survey for more than 25 years and has provided about a quarter of the project's total funding. The story of the SDSS project is chronicled in Ann Finkbeiner's 2010 book, *A Grand and Bold Thing*.

Invisible Architects

Campuses across the U.S. are institutionalizing support for open-source software — and for the researchers who work tirelessly to develop and maintain it.

Nearly every research breakthrough at a university depends on countless lines of code. However, academic institutions often do not provide the necessary support, resources, incentives, or recognition for the scientists and engineers who develop and maintain that code.

By open-sourcing their software — making code publicly available for others to use, copy, and modify — researchers can distribute the workload of maintaining research-grade code, enable others to build upon their efforts, and unlock collaborations that extend beyond the work of a single lab.

Since 2020, the Alfred P. Sloan Foundation through its Technology program has provided support for research universities across the United States to build institutional capacity for developing and maintaining high-quality open-source software. To date, the Foundation has given over $16 million to 12 universities to launch and grow Open Source Program Offices (OSPOs) on their campuses.

Each OSPO is designed to leverage the unique structure, culture, and strategic priorities of its host institution. They serve as centralized resource hubs for researchers to gain knowledge, skills, and information about best practices in open-source software. Many also function as community-building centers for the scientists and engineers who spend countless hours as architects of open-source tools, as advocates who document the often-invisible work that goes into software development, and as facilitators for interested students seeking to gain hands-on experience in open-source software.

Resources for Every Researcher

The Stanford OSPO is both a resource hub and community center.

“At any given time at Stanford, there’s something on the order of 7,000 sponsored research projects taking place, and they’re all producing code,” says Zach Chandler, Stanford’s Director for Open Scholarship Strategy. “Yet in many cases, these research projects may not be following the best practices for open science. That’s where we come in.”

The Stanford OSPO, situated within the Center for Open and Reproducible Science, operates both top-down and bottom-up approaches to boost adoption of open-source best practices across the university.

For example, the OSPO advocates for open-source software as first-class research products on par with peer-reviewed papers so that they can be evaluated as legitimate scholarly contributions, rather than as simply a means to answering a specific research question. This involves creating systems that make sure open-source projects are citable and that tenure and promotion processes recognize the work of developers.

At the same time, support from the Sloan Foundation allowed Stanford to hire a full-time technical community manager to convene researchers across

Chandler (center) and OSPO community manager Francesca Vera (right) stand with James Douglass, a research software engineer at Stanford who was awarded the Open Source@ Stanford Community Prize for his commitment to helping fellow researchers and developers maintain effective open-source research software.

campus around open-source science. Among other responsibilities, the community manager organizes roundtable meetings where researchers of all skill levels can share challenges and receive feedback on their work, whether that be refining a machine learning algorithm to discern the boundaries of boulders on Mars or improving the efficiency of software for querying a protein database.

“Almost everything good that has happened at the Stanford OSPO was because we started the roundtable,” Chandler says. “Without the Sloan Foundation’s support, we might have launched an OSPO at Stanford, but it would’ve had far fewer resources than it would need to truly succeed.”

Toward Systemic Change

At the University of Texas, Austin, the Sloan Foundation’s support has helped fill a crucial niche.

The UT Austin OSPO provides resources and trainings for researchers at every skill level, from those just learning how to find and use relevant open-source tools to those who want to scale their software to a broader research ecosystem.

“Without the Sloan Foundation’s support, we might have launched an OSPO at Stanford, but it would’ve had far fewer resources than it would need to truly succeed.”

—Zach Chandler

The UT Austin Open Source Program Office helped organize the 2025 Geosciences Hackathon, convening students, researchers, and faculty members to hone their skills in computer programming and the geosciences over the course of three days.

“The real value is that we’re offering resources to researchers at all levels of experience and across all different fields,” says Dr. Jennifer Schopf, Director of Networking Partnerships at the Texas Advanced Computing Center (TACC). “From sociology and economics to biology, astronomy, physics, and engineering, we have offerings that cover that full space. We have taken a very pragmatic, service-oriented approach to our work.”

Schopf says that a case study lecture series her office kickstarted has been particularly helpful to researchers on campus, beyond the numerous resources that the OSPO has either developed or collected from across the university.

“We’re having people talk about their work as an open-source case study,” Schopf says. “How did the initial idea grow into a full-fledged project? Where did the initial funding come from? When did the team grow and contract? We want to showcase the different lifecycles of open-source projects.”

Since the first grant in 2023, Schopf says that the UT Austin OSPO's efforts have been met with resounding approval from the university’s research and administrative communities. And with follow-on support from the Sloan Foundation, the OSPO is now in the planning stages to expand its work across the entire University of Texas system. Beginning first with UT Dallas, UT El Paso, and UT San Antonio, Schopf says she envisions a future where the OSPO system has expanded not only across the UT system but also to other schools both inside and outside of Texas.

“There is a direct line from the Sloan Foundation’s support to the development of this UT-wide OSPO system,” Schopf says. “The grant has opened doors for us on our campus and has unlocked new ways for us to work with our campus partners, really helping us to raise all boats.”

The Sloan Foundation supports the development of open-source tools, platforms, and practices through its Technology program.

“There is a direct line from the Sloan Foundation’s support to the development of a UT-wide OSPO system.”

—Jennifer Schopf

At the UT Austin Quant Night, hosted at the Texas Science & Natural History Museum, quantitative graduate student researchers from across campus networked with alumni and recruiters about data-focused careers.

The Hidden Cost of Choice

Consumer choice in electricity markets promised higher competition and lower bills. Does it deliver?

Last year, teams of students from The Ohio State University spread out across cities, suburbs, and small towns in Ohio and Pennsylvania with an unusual assignment: ask people about their electricity bills.

They met with residents at kitchen tables to review recent bills and ask how households had chosen their electricity supplier (if they had chosen at all). Many conversations followed a similar pattern. People were unsure how they had ended up on their current contract. Some did not realize they had alternatives. Others had switched providers hoping to save money, only to see their bills rise months later.

For the students, the experience was eye-opening. Electricity markets, often discussed in abstract economic terms, suddenly became concrete and personal. For economist Noah Dormady, who leads the research effort at Ohio State, those conversations were essential to testing one of the central premises of modern market theory: that increased competition benefits consumers.

Over the past two decades, 14 US states, including Ohio and Pennsylvania, have restructured their electricity markets to allow for “retail choice.” Under this system, consumers can select their electricity supplier from a range of competing companies rather than purchasing power through their local utility’s default service. In theory, competition among suppliers should drive down prices.

Dormady and his interdisciplinary research team set out to examine whether that promise is being realized in practice.

With support from the Alfred P. Sloan Foundation, the team constructed a database of more than two million retail electricity rate offers filed in Ohio over a nine-year period. The scale of the dataset allowed them to evaluate how competitive offers compared to utilities' default service rates across time and service territories. At the same time, the researchers conducted in-depth interviews with households in Ohio and Pennsylvania, collecting bills and documenting consumers' experiences navigating retail markets.

The results suggest that retail choice has produced mixed outcomes for consumers and that consistent savings are far from guaranteed.

Over the last decade, "72 percent of competitive retail electricity contracts have not been cost saving for consumers," says Dormady. "They've actually been more expensive than the utilities' contemporaneous default offer."

Dormady also found a pricing asymmetry. When competitive offers were more expensive, they were often substantially higher — frequently 25 to 30 percent above the default rate. In contrast, Dormady found that when competitive contracts did produce savings, those savings tended to be smaller, typically in the range of 5 to 10 percent below the default rate.

Even for well-informed consumers, the market can be difficult to navigate. Depending on the service territory, the team found that a fully informed consumer who monitored offers continuously would find a better-than-default option less than half the time. "It's like you're hunting around in a dark space, trying to find something that doesn't stand out," says Dormady. "And, 43% of the time, it doesn't even exist."

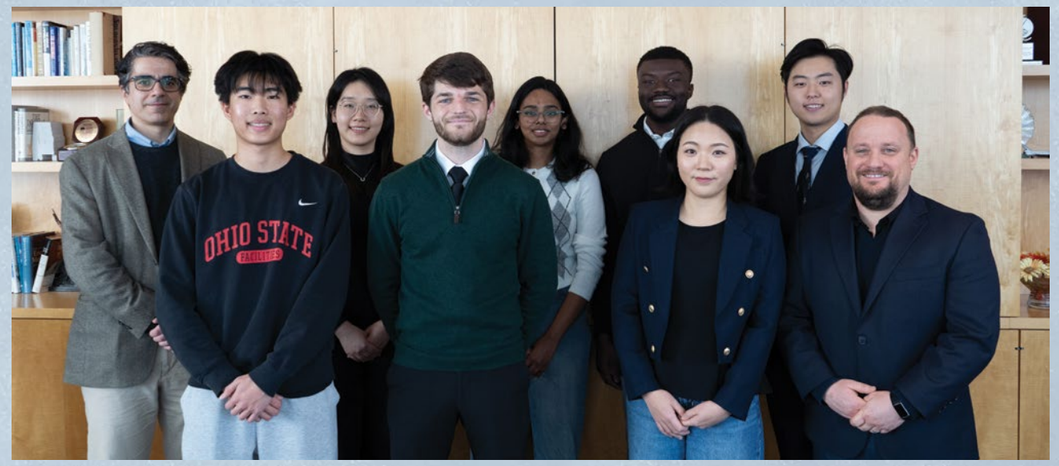
The fieldwork helped explain why.

In interviews, many households described confusion about contract terms, introductory rates, and expiration dates. Some had signed up without fully understanding how rates would change over time. Some believed they were securing long-term savings, only to see their rates skyrocket months later. These stories provided a crucial perspective, says professor and research team member Alberto Lamadrid of Lehigh University. "We can look beyond the numbers and into the lived experiences of real people."

In Pennsylvania, the team uncovered another concerning pattern through direct conversations with residents. Many households eligible for subsidized low-income electricity rates were not enrolled in those programs. Some had been automatically placed into competitive supply contracts and did not realize they needed to actively unenroll to access bill assistance. Several told researchers they were unaware that subsidized options were available to them at all. "Many people are unaware of any of the issues with these energy markets," Dormady says, "They just pay their bill."

"Over the past decade, 72 percent of competitive retail electricity contracts have not been cost saving for consumers. They've actually been more expensive than the utilities' contemporaneous default offer."

—Noah Dormady



Professors Abdollah Shafieezadeh (left) and Noah Dormady (right) with their student researchers at The Ohio State University.

The findings especially raise concerns for low-income and elderly consumers, who may have fewer resources to devote to monitoring and understanding competing pricing offers. "There are definite low-income population effects in these communities," explains Dormady.

At the same time, Dormady emphasizes the goal of the research is not to dismiss competition outright, but to better understand how market design influences outcomes. Competitive retail markets do not operate in isolation. The default service rate, set through periodic auctions, serves as a benchmark for the entire market. Retail suppliers structure their offers in relation to that benchmark, and consumer decisions hinge on comparisons to it. But if consumers don't understand these mechanisms and how they drive prices, they can't make informed choices. The promised benefits of competition may not fully materialize.

Dormady's research has already influenced policy discussions. In Ohio, for instance, lawmakers recently passed bipartisan energy reform legislation that incorporates several recommendations aligned with the team's work, including measures to strengthen oversight and improve transparency in retail electricity markets.

Among the reforms proposed by Dormady and his colleagues are the creation of an independent market monitor to oversee retail competition, the development of supplier "scorecards" to help consumers compare offers more easily, and improvements to auction processes that establish default service rates. The aim is not to eliminate consumer choice, but to ensure that this choice architecture operates in a more transparent and effective environment.

By combining rigorous empirical analysis with direct engagement in communities across Ohio and Pennsylvania, the project provides a more grounded assessment of how retail electricity markets function in practice. Abdollah Shafieezadeh, an engineering professor at Ohio State and a member of the research team, says, "These insights could help inform the design of consumer-facing tools that translate our findings into practical advice, helping people make more informed decisions."

The Sloan Foundation's Energy and Environment program supports research to inform the societal transition toward a low-carbon energy system in the United States.

Meet the Fellows

Since 1955, Sloan Research Fellowships have recognized the most creative and pioneering early-career scientists across seven fields in science and math. Here, we introduce four of the 126 extraordinary researchers from the 2025 cohort of Sloan Research Fellows.

Marzyeh Ghassemi

Computer Science
Massachusetts Institute of Technology

Fair AI models for every patient

Marzyeh Ghassemi is developing AI models robust and secure enough for use in healthcare settings.

Ghassemi's research has revealed that even though AI models for healthcare might achieve high levels of accuracy on average, they often perform poorly when comparing across many different patient subgroups. For instance, Ghassemi and her collaborators found that while an AI model for triaging patients trained on 700,000 X-ray images appeared to perform well overall, it consistently under-diagnosed female and Black patients. In another line of work, Ghassemi has demonstrated that AI models can infer patient demographic information like race, gender, and age from medical images or clinician notes, and then use those inferences to make biased healthcare recommendations that can harm minoritized populations.

In response, her team developed constraints to AI healthcare models to ensure they evaluate each patient fairly, leading to better healthcare diagnoses for a diverse range of patients. By working to make fair AI models for patients in the tails of health distributions, Ghassemi is pioneering the future of equitable healthcare.

Rachel Greenfeld

Math
Northwestern University

A shape that reshapes our understanding of order

Rachel Greenfeld is solving major open problems that have challenged mathematicians for decades. One of those problems is the periodic tiling conjecture, a fundamental question that explores how shapes can fill space without gaps or overlaps, using only translations — meaning tiles are shifted but not rotated or reflected.

For decades, mathematicians believed that if a shape could fill space with a repeating pattern in one and two dimensions (like a chessboard), it would do the same all dimensions. However, Rachel Greenfeld, along with partner Terence Tao, has constructed a tile that never forms a repeating pattern in three-dimensional or higher-dimensional spaces. Their tile can only fill space in a chaotic, unpredictable way, disproving the long-held periodic tiling conjecture.

The discovery reshapes how we understand patterns, structure, and order, which are fundamental concepts in data science, quantum mechanics, and theoretical physics. Greenfeld's breakthrough not only deepens theoretical understanding but also paves the way for new technologies and scientific advancements, demonstrating that math can drive innovation.

Alvine Kamaha

Physics
University of California, Los Angeles

Shedding light on dark matter

Detecting dark matter — thought to make up about 85% of matter in the universe — would unlock key insights into the fabric of the universe. Alvine Kamaha is advancing detectors that identify subtle dark matter signals, helping to answer one of science's greatest mysteries.

A leading candidate for dark matter's composition is the class of Weakly Interacting Massive Particles (WIMPs). WIMPs interact only via gravity and the weak nuclear force, which makes detecting them extremely challenging. Kamaha's innovative calibration program can screen out background noise like radioactivity or cosmic rays, distinguishing them from the faint, rare signals expected from WIMPs. Her work has resulted in world-leading sensitivity, ensuring that dark matter interactions are reliably extracted from noisy data.

In addition to improving the detection of WIMPs, Kamaha is developing novel detectors that broaden the search for dark matter to include other candidates. In overcoming a longstanding barrier in experimental particle physics, Kamaha's research promises to deepen our understanding of the universe, of matter, and of the fundamental laws of physics.

Jean-Paul Noel

Neuroscience
University of Minnesota

Decoding how our brain interacts with sensory signals

Jean-Paul Noel studies how the brain constructs and updates internal models of the world, a process that underpins our perception, decision-making, and social understanding. His research focuses on how the brain draws causal inferences from sensory signals, such as when it determines that a sound is coming from a puppeteer instead of a puppet. This process influences navigation, speech comprehension, and the ability to interpret social cues, yet its underlying neural mechanisms remain largely unknown.

Noel applies his mechanistic insights about the brain to better understand conditions such as autism spectrum disorder (ASD). He discovered that individuals with ASD do not struggle with sensory integration, as previously thought, but rather with updating expectations based on new sensory evidence. Once an initial interpretation is formed, individuals with ASD are less likely to update their internal models, even when presented with contradictory information. This rigidity may explain sensory sensitivities and social challenges experienced by people with ASD.

Acknowledgements

Art Direction
Victoria Corish

Art Direction Management
Jonathan Corish

Writers
Colton Poore and Faye Saulsbury

Editor
Nate Williams

Photo credits

Cover: Photo by Bryan Weathers.
Pages 3–4: Photos by Amanda Gentile (amandagentilephotography.com).
Page 6: Photo courtesy of NASA.
Page 8 (Left): Photo by I. Iakubivskyi.
Page 8 (Right): Photo by Sara Seager.
Page 9: Photos courtesy of Sara Seager.
Pages 11–13: Cast photos by Jeremy Daniel.
Page 12: Tony Award photo courtesy of Manhattan Theatre Club.
Page 13: Headshot of Jonathan Spector by Cheshire Isaacs.
Pages 14–15: Illustration generated using ChatGPT.
Page 16: Photos courtesy of SEISMIC.
Page 18: Headshot courtesy of Cara Eckholm.
Page 20: Event photo by Cara Eckholm.
Page 21: Photo courtesy of Zhongqi (Joshua) Cheng.
Pages 22–23: Photo by Bryan Weathers.
Page 25: Photo by Audrey Love.
Pages 26–27: Photo from Shutterstock.
Pages 28–29: Infographics courtesy of The Care Board.
Page 28: Headshot courtesy of Misty Heggeness.
Page 30–31: Photo courtesy of SDSS / David Law.
Page 32: Data tower photo courtesy of Ani Thakar.
Pages 32–34: Art installation photos courtesy of Tim Fitzpatrick.
Page 36: Illustration generated using Midjourney and ChatGPT.
Page 37: Photo courtesy of Zach Chandler.
Pages 38-39: Photos courtesy of UT Austin OSPO.
Page 40: Illustration generated using Midjourney and ChatGPT.
Pages 42-43: Photos courtesy of Noah Dormady / The Ohio State University.
Page 44: Headshots courtesy of Marzyeh Ghassemi and Rachel Greenfeld.
Page 45: Headshots courtesy of Alvine Kamaha and Jean-Paul Noel.


ALFRED P. SLOAN
19
34
FOUNDATION