

Genspace

How the World's **First Community Biology Lab** is Building Meaningful Connections and Redefining Who Can Participate in Science

PRESENTED BY

Siegel Family Endowment

We are a foundation focused on understanding and shaping the impact of technology on society.

About Siegel

Siegel Family Endowment employs an inquiry-driven approach to grant making that is informed by the scientific method and predicated on the belief that philanthropy is uniquely positioned to address some of the most pressing and complex issues facing society today. Our grant making strategy positions us to be society's risk capital. We support high quality work that will help us derive insights to timely questions and has high potential for future scale. Our focus is on organizations doing work at the intersection of learning, workforce, and infrastructure. We aim to help build a world in which all people have the tools, skills, and context necessary to engage meaningfully in a rapidly changing society. Siegel Family Endowment was founded in 2011 by David M. Siegel, co-founder and co-chairman of financial sciences company Two Sigma.

Our Focus on Learning

We strive to understand how we can better equip individuals with the knowledge they need to contribute to and engage with a rapidly changing society. Yet, we also recognize that every factor in a learner's education – from broadband access to safe and affordable housing to the development of social-emotional skills – can widen inequality and impact success. Our work supports and shapes programs and solutions that build lifelong learning opportunities and envision an education system that works for everyone, by addressing long standing social and economic inequities.

Enduring and Frontier Skills

Siegel Family Endowment is committed to supporting organizations that are on the frontlines of building an equitable future by helping to nurture **enduring skills** and **frontier skills**. We seek to foster “**enduring skills**,” or the competencies and mindsets needed to thrive both in the present and in a changing world. These include both technical capabilities, as well as a variety of attitudes and mindsets. Examples of enduring skills include computational thinking, problem solving, collaboration, creativity, resilience, and the ability to learn, to name a few. At the same time, we want to ensure that emergent fields, such as biotechnology and generative AI, are equitable for all. Thus, we also support the development of “**frontier skills**,” that is the abilities, literacies, and pathways necessary to participate in and drive emergent industries - acknowledging that these skills also apply across many areas of life today.

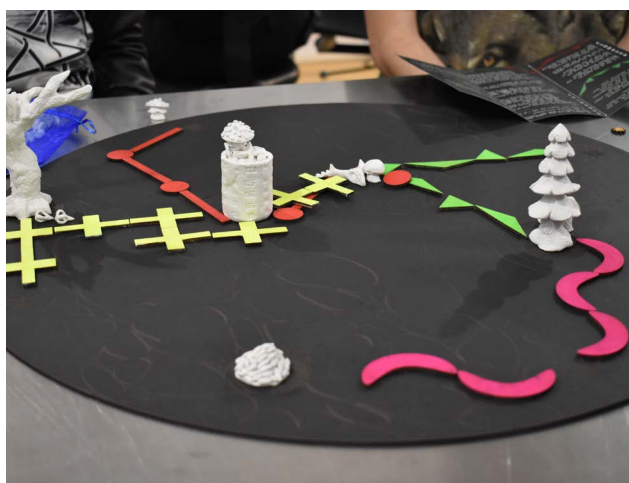
Genspace

About Grantee

Founded in 2009, Genspace is the world's first community biology lab. Situated in the Sunset Park neighborhood of Brooklyn, Genspace aims to foster a safe and inclusive community where all people—including those from non-traditional and historically marginalized backgrounds—can experientially learn, boldly create, and meaningfully grow with the life sciences. Genspace hosts classes, lab training, mentorship opportunities, youth programs, and community-building events. Together, Genspace's programs encourage all people 'to science'—to ask questions, imagine, tinker, build, learn, design, and grow—as individuals and as a community.

KEY TAKEAWAYS

- **Physical infrastructure can build powerful, multi-faceted communities that would not otherwise be possible—if it is designed to do so.** Creating welcoming conditions, intentionally reaching out to and designing for communities that have been historically excluded, and allowing for cross-cutting relationships between traditionally siloed groups can inspire projects and actions that would not otherwise be possible.
- **Living the values of diversity, equity, and inclusion requires precision, intentionality, and deep commitment at every level of an organization.** It is not enough simply to say that programs are "open to all" or to offer DEI messaging within a mission or vision statement. Instead, nonprofits must design programs with DEI at their core, actively seeking input from key stakeholders, designing with and for different audiences, and recruiting staff members and board members who represent diverse communities. Sound organizational management and systems are also important in facilitating this work.
- **The real magic happens when you bring together a range of audiences.** Genspace offers high quality science experiences for all walks of life—seasoned scientists, adult learners who have never set foot in a biology lab, startup founders, young people pursuing internships, and others. The keys are to make sure that all audiences served correspond to the organization's mission, to surface and respond to the unique needs of each audience group, and to create conditions for mutual learning where participants learn from and with each other as experts in their own experiences.



An original mycelium-inspired board game created and hosted by the [Interbeing Project](#) at Genspace's Fungi-Game Night.



Inspired by designer Suzanne Lee's [BioCouture](#), students learn to brew kombucha and make novel biomaterials used in fashion, home-goods, and artistic works.

Executive Summary

Biology labs are expensive enterprises, and are typically housed within academic institutions or companies that can bankroll research from grants, investments, or profits. This renders them largely inaccessible for folks like the designer who would like to experiment with incorporating living materials in fashion; the startup founder who has an idea for a promising biotech product but no facility for designing it; the high school student who wants hands-on experience with CRISPR genome editing technology; or the scientist who wants opportunities to collaborate with professionals of other disciplines.

Genspace was designed to fill this void. “It’s a place for anybody ‘to science,’” explains Beth Tuck, Genspace’s outgoing executive director. “You don’t have to be in a PhD program, you don’t have to have XYZ credentials. You just get to come in, bring whoever you are, experiment and explore, and play in a community of other people who also want to explore and imagine different futures with the life sciences.”

Genspace aims to provide the support necessary for a variety of audiences to thrive in a community biology lab environment. This work fits into four buckets:

- [Adult education programs](#) range from one-off classes to comprehensive series. Programs are designed for people who are not traditionally trained in biology, who are “starting to dabble,” as Tuck describes it.
- [Membership](#) offers tiered opportunities for individuals or groups to use Genspace’s lab and equipment. Members include startup businesses, people pursuing their own projects, and groups working on community projects.
- [Youth initiatives](#) include a variety of offerings including their flagship Biorocket internship for students historically excluded from STEM fields, workshops for classrooms, and student and teacher lab memberships.



Genspace’s Biorocket Research Internship Program participants present their final projects for friends and family.



Attendees at the Fungi-Game Night at Genspace learning how to play “Shroomscape.”



FIT Scholar Tahiya Hossain experiments with kombucha SCOBY leather for her design practice.

- [Public engagement and outreach projects](#) connect the lab to the broader neighborhood, city, and virtual communities in which it is situated. Genspace hosts social events for the community and partners with various nonprofits, academic institutions, and other groups to expand its reach and contribute to the community.

Through all of these activities, Genspace aims both to provide opportunities for science exploration to those who have been historically excluded and to develop a diverse and inclusive community. Diversity, equity, and inclusion have emerged as explicit goals of the organization, and it aims to realize those goals in the community it serves, the programming it creates, and the staff and board who supervise that work.

In the process, Genspace is changing incentives for doing science, and challenging the status quo of fortress institutions as the sole gatekeeper of scientific research. “In our space, we get to be free of external motivators [such as profit or publishing]. Instead, we get to lean really heavily into the internal ones,” Tuck says. “It’s the things that people enjoy about science, the curiosities that they have about the world around them in wanting to make something that makes their community better, healthier, or more connected. It’s a really special place.” ■

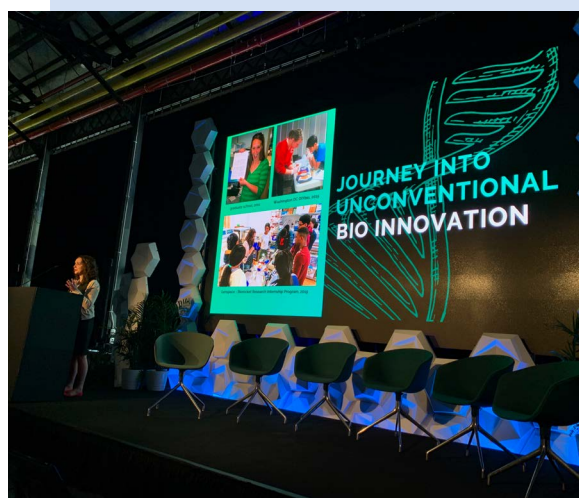
Programs and Examples

Core Elements: What Makes the Program Work?

From its inception, Genspace has been a community hub centered around biology, occupying the physical space of a biology lab. Over time, Genspace has modified its programming, offerings, operations, and strategies to better deliver on that core mission. As a result, the Genspace community has grown in numbers and become more diverse in gender, race, and ethnicity. The progress is particularly striking when compared with [typical STEM workforces](#), where women, Black, and Hispanic workers continue to be underrepresented. For example, the majority of early participants in Genspace were men, while the majority of more recent members are women. Key drivers of this blossoming have been thoughtful and intentional leadership; sound organizational systems and processes; and a willingness to refine strategy to adjust to new circumstances or to more effectively deliver on the mission.



One of Genspace’s Biohacker Boot Camp instructors, Devon Collins (far right) showing participants how to use the gel electrophoresis equipment for their Genetic Ancestry experiment.



Beth Tuck (former Executive Director) took the stage at the 2022 Biofabricate Summit to present on Genspace as a space for innovation and interdisciplinary work.



Genspace members and Biorocket alumni looking at a touch table of biomaterials during Genspace’s biannual Open Lab.

1

Using Physical Infrastructure to Cultivate Community

“Doing biology” requires physical engagement. Whether it’s genome editing, growing edible mushrooms in petri dishes, experimenting with fluorescent proteins, or building an herb garden using clones of seeds - some amount of interaction with living organisms, biological materials, and specialized equipment is required. Yet there are very few spaces where members of the public without an academic or industry affiliation can access the physical materials necessary to do biology. Genspace is the rare organization that provides Biosafety Level 1-compliant lab space to independent researchers, designers, scientists, artists, entrepreneurs, hobbyists, teachers, students, and others.

The space is situated within the Sunset Park neighborhood of Brooklyn, and Genspace aims to use that location to bring together residents who might not otherwise feel a natural connection to a biology space. For example, the space also hosts community gatherings such as movie nights, a cyborg feminist reading group, and other fun events. Tuck explains, “We might have a festival and fly kites to collect microbes from the sky—things that are a little bit more playful or imaginative, and have a little bit lower barrier to entry.” Tuck cites examples of students who live in the neighborhood who have served as interns as one way that this commitment

to the neighborhood pays off.

The initial phases of the COVID-19 pandemic posed a major challenge to Genspace’s model for community engagement, which had been almost entirely in-person. Tuck remembers that this period was “rough,” but also presented an opportunity “to be a lot more creative and imaginative about how we understood programs and how we understood community.” Programs switched to virtual, allowing for more collaboration with farflung partners, including a children’s museum in Mexico. Genspace’s high school research internship shifted to focus on social and behavioral research that students could conduct at home. A bioinformatics scientist who is a Genspace board member mentored the students as they produced their own podcasts on science and society issues.

Still, Tuck acknowledges that physical proximity and shared physical infrastructure are important for much of the work that Genspace does. Indeed, Genspace now faces a new challenge. “We don’t have enough room to accommodate all the people that want to be using the lab,” says Tuck. “Virtual programming is not as attractive to people post-pandemic, so we need to figure out how to accommodate people in a physical space, while maintaining some communication and connectivity digitally. It’s a good problem, but still a challenge.”



Designer Danielle Trofe teaches participants about biomimicry and how to incorporate nature’s lessons to solve the world’s biggest challenges.

2

Establishing Clear Systems for Pursuing Diversity, Equity, and Inclusion

Asked to reflect on her proudest accomplishment at Genspace, Tuck has a surprising answer. It isn't the state-of-the-art lab facility that Genspace occupies, the number of community members it serves, or the types of projects that participants pursue. Instead, it's the feeling that people have when they're at Genspace. "We've worked hard to make it feel like a place where you belong," Tuck says. "We want people to have a place where people are going to welcome you and be excited to see you, be excited to talk to you, be excited to learn with you. There is a real sense of belonging."

Tuck believes that that sense of belonging came from an explicit refocus on diversity, equity, and inclusion (DEI) in Genspace's work beginning in 2019. Genspace had always committed itself to democratizing science and making it more accessible, but under Tuck's leadership, the organization reworked its vision, mission, and values, making DEI a "centerpiece" of Genspace's work. That was further reflected in the metrics that it used to judge success. For the first time, the organization began to look explicitly at its demographic breakdown and to develop approaches for diversifying its membership.

That new grounding set the stage for changes within both Genspace's membership community, and in its staff and board. Tuck says, "We are seeing women - especially women of color - stepping up in leadership roles. We have three community project teams, and all three of them have at least



Biorocket Research Internship Program participants demonstrate how to extract DNA from strawberries for their families, friends, and teachers.

one woman of color in the leadership role." The composition of Genspace's staff has also shifted to become more diverse. Tuck reflects, "At every point, we ask, 'Who's here? Who's heard about this conversation? Who's not? How can we be more intentional about making sure that folks are involved in the conversation?'"

Tuck credits better understanding and use of system-minded thinking with driving intentionality around DEI. "When I started, we didn't have templates. We didn't have systems architecture. We didn't have databases." Tuck says that as Genspace adopted more formal processes, the team was able to focus on its mission and on pursuing its DEI goals. In addition, formal systems allowed for better understanding and evaluation of DEI initiatives within the organization, paving the way for more data-driven improvements.

3

Surfacing and Responding to the Unique Needs of Multiple Audiences

Genspace has a wider range of audiences than most nonprofit organizations. It serves scientists, adult learners, startups, students, and teachers, to name just a few. Yet even though all of these audiences may individually have different goals - whether it's launching a new startup or considering a career change - all are represented in Genspace's singular mission: creating a place where people of all backgrounds and identities can learn, create, and grow with the life sciences.

In other words, the interplay between diverse audiences is reflected in Genspace's mission. To do so, Genspace has shifted incentives for participation in biology, eschewing traditional barometers for success in industry (e.g., profit) or academia (e.g., publication), toward a more holistic, community-minded incentive: the opportunity to build connections with others.

Genspace has leveraged its infrastructure to build a

community that facilitates relationships between those audiences. It has become a hub for creating connections between groups that would otherwise not be in contact: academic scientists and members of the public; individuals who come together to participate on a community project; high school students and adults; and neighborhood residents and industry professionals, to name a few.

In some cases, such relationships have occurred organically, mediated through informal exchanges in the physical lab space itself. In other cases, Genspace has intentionally cultivated them. For example, Genspace offers a [community project](#) membership in which individuals from different fields contribute their expertise and collaborate on initiatives such as fermenting synthetic spider silk, upsourcing electronics, and participating in an open source plant biotechnology consortium.

Impact and Next Steps

Impact

Tuck says a central goal of Genspace's programs is to emerge with a **richer understanding of science**. "Often people come into our classes having heard a lot of things about biotechnology or biodesign," Tuck says. "We break down their misconceptions and they learn how science works. They might have heard that CRISPR is easy, or that science is more doable than it was a decade ago, or that DNA is a programming language." Tuck continues, "When they start working with us, we unpack the methodologies of science, the black boxes, and where the metaphors break down. They see that it's noisy, and they begin to understand why independent verification is important, and why replicability matters. We hope they walk away with a much richer and more nuanced understanding."

Tuck hasn't settled on an easy way of measuring progress toward this goal, but they track measures such as the following:

- The total number of people served, which numbered nearly 3000 in 2022
- The total hours of teaching, which numbered 775 in 2022
- The total hours of learning, which numbered over 7000 in 2022
- The total number of members, which numbered over 50 in 2022, representing a sharp increase from previous years
- Qualitative measures, such as participants who have told Genspace staff that they had a better understanding of how biology works or who were able to do more sophisticated projects in the lab as a result of their participation in an initial program

Tuck also identifies a second goal of Genspace's programs. "We want our learners to develop the **confidence to actually take the next step**," she says. "For example, many people want to change careers or are considering going back to school. We want them to be able to emerge from our programs feeling that that next step isn't so scary. Or to feel that they can read and make sense of a scientific paper, or take whatever that next step is."

Measuring that confidence to take the next step is challenging, but some of the measures that Genspace is considering includes the following:

- How many people decided to pursue a career change or enter a graduate program based on their Genspace experience
- The percentage of memberships that are held by people whose initial introduction to Genspace came through a class, which Genspace leaders estimate to be around 60 percent
- The number of student interns who enrolled in graduate programs in STEM

But perhaps the most powerful way to assess impact is to consider

the stories of **people who have said that Genspace changed their lives**. Tuck says, "I hear over and over and over again, 'Genspace has changed my life.' But things often look different from person-to-person." Tuck explains that Genspace's impact might best be communicated through stories of individuals who are part of the Genspace community.

Here is one example of a story that reveals Genspace's impact, both in scientific learning and in confidence to take the next step:

One community member has been living in New York for 20 years, working in fashion design. She became excited about biodesign and went back to school to study it further. However, she found that her new classmates are heavily focused on technology, AI, and other emerging fields; she was the one biodesign-oriented person in her cohort. She was searching for people she could do this work with and took some classes with Genspace. Genspace paired her with a "science buddy" (a professional relationship) and together they have been growing SCOBY samples - kombucha materials that are engineerable living systems - to leverage as teaching materials for other artists, designers, and community participants in art-making practice. She wouldn't have had the requisite subject matter knowledge, or somebody to tinker alongside her.

Next Steps

Genspace invites a range of stakeholders to get involved in its work:

- 1 Individuals, startups, and groups in the New York City area can become members of Genspace's lab. Genspace has adopted a tiered membership model, with more affordable [membership](#) options for students, teachers, and community members.
- 2 People in the Sunset Park neighborhood and across the New York City region can [take classes and attend public programs](#) offered by Genspace. Local community organizations can reach out to Genspace to find ways of partnering.
- 3 Students at New York City public high schools can apply to participate in Genspace's [Biorocket Research Internship Program](#).
- 4 [In-kind and monetary donations](#) can help support and sustain Genspace's efforts to reach individuals who may lack the financial resources to join Genspace on their own.
- 5 [Biologists, biodesigners, and others](#) who work at academic institutions and in industry across New York City can lead workshops, serve as mentors and advisors, and participate in projects that serve their communities.
- 6 Follow the latest happenings at Genspace [on social media](#).

To learn more and contact Siegel Family Endowment, visit www.siegelendowment.org