# Communicating Climate Science Through The Arts

2021

## Foreword by Mark Rosin

When I first volunteered at the Bristol Science Festival as an undergraduate physics student over 15 years ago, the migration of scientists out of the ivory tower was already well underway. In the intervening years, I've witnessed a series of dramatic changes in the landscape of public engagement with science in both the United States and Europe. Gone are the days of scientists and scientific experts staying behind the scenes. Now more than ever, this academic group is speaking out about the role they want their discoveries to play in the world and taking charge of and adapting the way they engage with the public. With more widespread recognition of social, racial, and gender-based inequity in science, there has been a call for a new social contract between scientists and the communities they serve, live in, and are supported by. It was against this background and in response to strong continued community demand that in July and August of 2021, we convened our fourth annual Communicating Science through the Arts Workshop.

# Convening:

*bringing together a community*

*Here at Guerilla Science, we remain dedicated to bringing communities together to engage in science in ways not only new and engaging but accessible and inviting. Our Communicating Climate Science through the Arts workshop invited a select group of applicants to participate in three design sessions relating to new and emerging climate science practices, giving participants valuable insights into what the future of science and design might look like.*

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## Our Approach

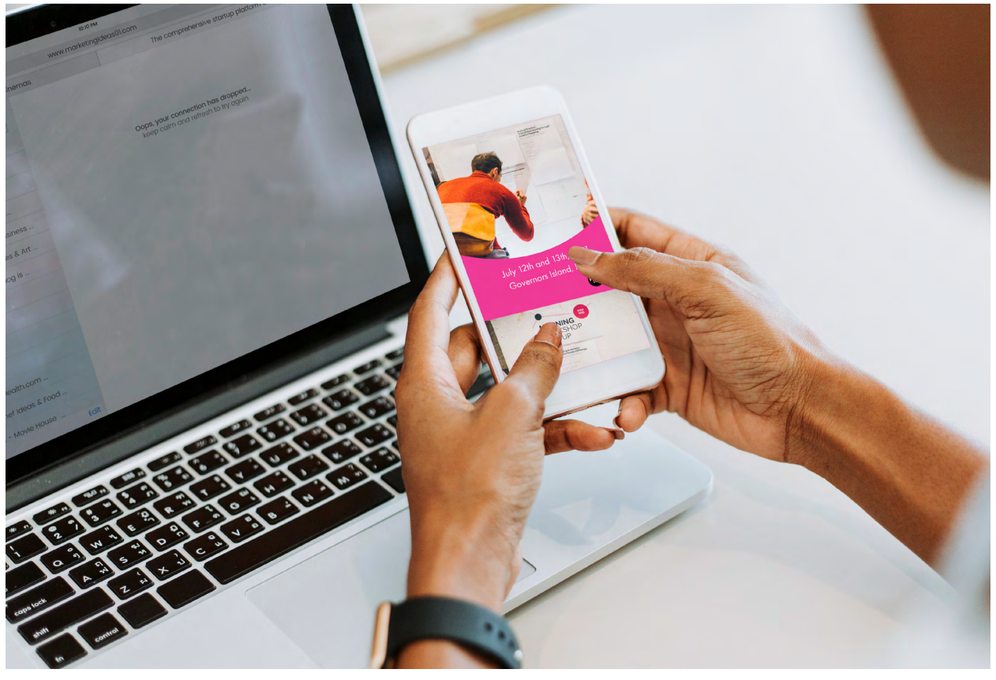
Following a year of sustained global stress caused by the COVID19 pandemic, 2021 saw new levels of climate change induced disaster. Widespread flooding across the world, devastating wildfires across the Pacific Northwest, and Hurricane Ida battering the Northeastern corridor are just some of the few challenges we've faced in this year alone. Humanity's future is now one in which climate disaster is, sadly, an existential threat. Fortunately, it is also largely within our power to stop it. To do so is to take a complex and ever-changing problem and combat it with a novel, multidisciplinary approach involving strong scientific and political leadership. It requires social systems and communities to adapt and change and scientists, citizens, and creators to work together to develop new solutions to even newer problems. As such, we could think of no better focus under which to bring together our nascent community of scientists, architects, designers, and artists for the latest Communicating Climate Science through the Arts workshop.

## Call For Participants

*Guerilla Science provides a platform for scientists who seek a creative outlet and connection to a broader audience; and creative professionals who wants to inspire others with a passion for science.*

In May 2021, we put out a call for participants to local arts organizations, universities, research centers, community groups, and education providers with special attention paid to those that center environmental justice in their work. We supplemented these calls with a strong digital marketing push. Our resultant applicant pool totaled over sixty people, with approximately a quarter from outside the local tri-state area. After a multi-person review process, we selected thirty applicants to join this, our forth workshop, on Communicating Climate Science through the Arts. Half the cohort were scientists, primarily from the biological and ecological sciences. The other half of the cohort held a range of professions, and identified themselves primarily with architecture, design, or socially engaged art.

Part of our search for potential participants involved strong social media outreach. During this campaign, we engaged with our potential audience through platforms like Instagram and Facebook by describing our anticipated workshop and inviting those interested in applying. Maintaining consistent branding throughout, our campaign showcased Guerilla Science's greatest potential and welcomed community members to our doors.


## Site: Governors Island

*Governors Island is a 172 acre island in the heart of New York City's harbor; a five minute public ferry ride away from Brooklyn and Lower Manhattan. It hosts a rich array of arts, culture and educational programs as well as expansive open spaces and historic buildings. Our community came together in Building 14 (the "Pratt House") - an exhibit space for various projects on climate ecologies and ways to engineer environmental resilience in urban environments - and at three sites across the island that served as the focus for our cohort's public projects.*

# Workshop

*development and co-design*

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Putting talented and enthusiastic individuals together in the same room is only the first step in forming a Community of Practice. To support our community to create and develop their own public engagement activities we structured a multi-tiered process consisting of a series of team building activities, active learning modules, and co-design sessions in which participants created their own climate-themed public engagement.

## Team Building

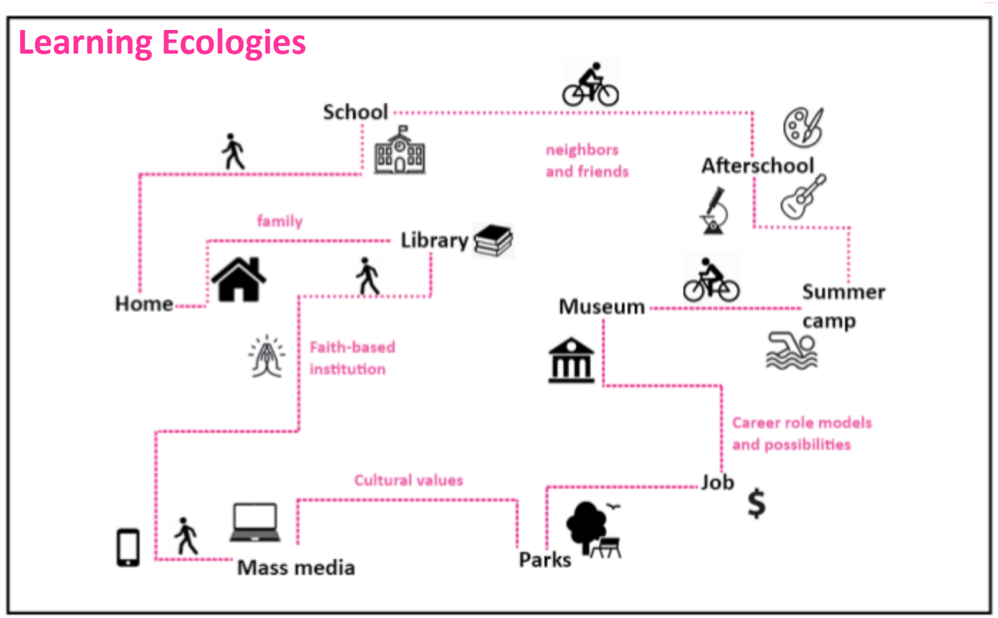
*The active learning modules included creating engaging events, rationales for public engagement with science, audience profiling, and planning for access and inclusion. Participants chose to join one of three different co-design sessions, each led by a practicing scientist or STEM professional working in climate resilience who shared their latest research as inspiration, and helped facilitate the development of the group's activity.*

Effective science communication involves bringing the public into meaningful contact with inter-disciplinary teams of scientists, artists, and educators. Since there is no one-size-fits-all model to engaging the public with socio-scientific topics, it is essential to empower science communicators to develop their own approaches. With this in mind, the approach of our training programs focuses on the development of a science communication Community of Practice (CoP)

Our model for engaging the public in science takes place over three steps:
1. Bring together scientists and artists together to form a CoP alongside community groups, local and national organizations.
2. Support the nascent CoP to learn, collaborate, and create together in response to a theme and public need.
3. Facilitate the CoP to produce and deliver a science communication activity that is of interest and use to a specific public audience.


**Barriers to Engagement** (Maslow)

In 1943 psychologist Abraham Maslow proposed a model known as the Hierarchy of Needs. This consists of tiers of human needs, which need to be met in order to reach self-actualization. A person's most basic need is for physical survival, and this will need to be fulfilled in order for the person to progress to the next level up.
The model can be used to design events in order to fully engage with the audience, for each tier to be considered as a potential barrier if they are not fulfilled.

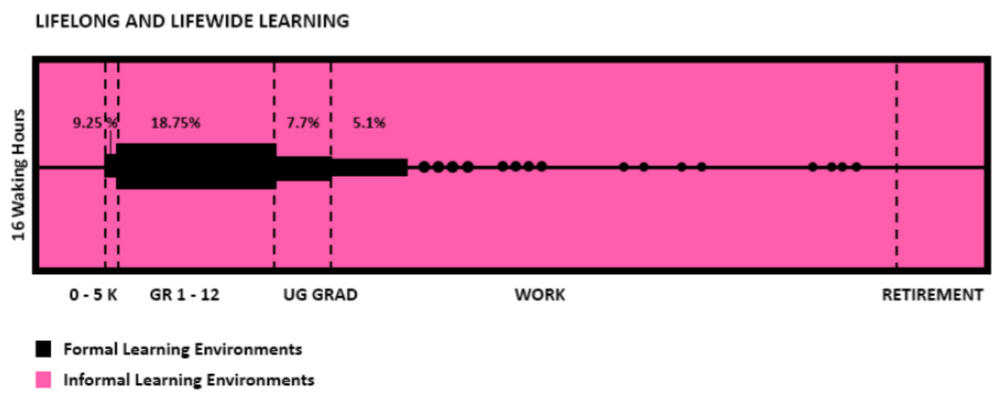



**STEM Learning Ecosystems**

- Places
- People
- Pursuits

Historical and cultural, value-laden shaped by social structures (sexism, racism, xenophobia, otherism)

**Ecological Perspectives**



## Day 02

*Many people who believe that science is “not for them”, have only ever encountered it via formal, largely passive, classroom experiences.*

*The conference is designed for individuals interested in creating experiences that mix science with installation art, theatre, and play, to introduce new audiences to the excitement of scientific discovery and social relevance of climate science.*

## Pollinator’s Pavilion - Reimagining Pollination

The Pollinators Pavilion is a constructed or artificial habitat for native bees. Its rounded spiky form is shaped like a bee’s bristling compound eye and a grain of pollen. These “spines” serve as canopies to protect bee nesting tubes from rain while housing a solar-powered monitoring system (camera and microprocessor). The monitoring system inside the Pollinators Pavilion’s panels harvests images of the solitary bees, which relay to a database and AI model to automate insect identification, and help fill data gaps on these pollinators. Much remains unknown about the 4,000 species of solitary bees in America..

Playing on the form of the bee’s compound eye, our Pollinators Pavilions produces new habitat for solitary bee species at the Old Mud Creek Farm, a 2,500 acre model of regenerative organic agriculture in New York’s Hudson Valley. The pavilion’s innovative paneling system houses hundreds of nesting tubes for solitary bees and a solar-powered electronic monitoring platform. The diverse micro-conditions that we develop with our pavilion’s novel paneling system provide artificial nesting structures for solitary bees and models environmental stewardship in our Anthropocene age.

## Biogels - Reimagining Backyard Waste

Field is a bio-arts laboratory and research space that creates new discourse around our relationships with nature, time and the body. Field prompts audiences to reflect on their own relationships to manicured public lawns and engage within their cities to rethink the homogeneity, order, and control present within the built environment. Ultimately, Field asks us to reflect on our own biases, assumptions, and desires while navigating shared space.
Field is a critique of the urban typology of the manicured civic park, replicated within cities the world over, and the billion-dollar industry it advances. It is estimated that lawns comprise more than 3 times the acreage of agricultural corn production in the US, making them the single largest irrigated crop—covering about 128,000 sq.km. of public and private land (Milesi 2005). In recent years, movements such as “no-mow” lawns are being popularized in order to rethink our relationships with these grasses. Field seeks to shift our ecological and aesthetic understandings of these grasses, and to rethink the current policies embedded within contemporary urban development programs that perpetuate their use. The project is a means to engage city workers, planners, and architects to generate discourse around power, space, and expanded ecology. The resulting landscape interventions engage urban dwellers from all walks of life. They are affective and embodied experiences of the urban ‘wild’ for adults and children alike.


## Blueblocks - Reimagining Land/Water Divide

A living prototype, exploring how plants and biophilic structures can improve the waterways of the Hudson River Estuary,  BlueBlocks is a collaboration between thread collective and the RETI Center. BlueBlock Gardens create small salt marsh archipelagos that provide a range of ecological benefits for humans and other species: they increase habitat for a broad range of marine life, introduce plant ecologies at engineered urban edges, improve water quality, and serve as platforms for hands-on high school science. The constructed landscapes are designed specifically for urban coastal conditions and communities, linking positive ecological impacts and sustainable production practices, jobs, and education. We are in the process of building and installing a series of prototypes, following our first successful floating pilot in March of this year. In addition to accessible docks and planting areas, we are currently exploring how every level of the floating garden can be calibrated to actively support life, with specific focus on the underwater-scapes. The design of the BlueBlocks Garden is multi-layered, mimicking an integrated ecological system that supports life along a deep sectional column. Elements being developed for the underwater-scape include: biophilic concrete as the anchor on the seafloor and as undulations and indentations integrated into the underside of the garden to facilitate sub-aquatic growth; mussel single-drop stockings, kelp and oyster farms. The biophilic concrete elements are being provided by collaborator Evelyn Tickle. Her proprietary concrete mix is formulated to match the oyster shell and provides early stage nutrition to a range of species, and has been tested and used widely to demonstrable success. The BlueBlocks Garden system is sustainable, modular, and multipurpose. Production will serve as a model for sustainable, local manufacturing and resilience for industrial coastlines. The modular design allows for serial production, and  expansion into archipelagos for multiple site conditions and uses. Components can be adapted to function as walkways, coastline buffers, gathering spaces, oyster and mussel nurseries, kelp gardens, renewable energy fields, and seal sunning platforms.  We are also excited to imagine other possibilities together.

# Fieldwork

*communicating climate science to students*

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## Beam Center

The public activities developed during the workshop were based on important, local socio-scientific issues, namely the role of climate change in urban environments and the disparate effect is already having on communities across the world.

Over four days in August 2021, the scientists and artists from the Communicating Climate Science through the Arts brought their activities to an audience on Governors Island. These included high-school students from the Beam Center's summer program, everyday passers-by, and visitors to the Invengenuity Fest, a free public festival over the weekend of 21st and 22nd August.

Over the course of the 4 days, over 2,000 members of the public engaged with the newly developed activities. In addition, we developed and ran several in depth bespoke classes for Beam Center high schoolers as part of their summer program. This was a new opportunity for many of the students, mostly from underserved public schools, to meet with, talk to, and engage with practicing scientists and researchers around issues of sustainability and climate science.

Beam Center brings together youth, artists, engineers, and educators to produce ambitious, collaborative projects that support youth to take bold steps towards meaningful futures and foster conditions for educational equity.

Beam Center reaches NYC youth who might not otherwise get the chance to build, create and learn within a collaborative environment. We help students and teachers integrate projects and hands-on creation into the culture of the classroom.

"The Communicating Climate Science through the Art program was a fantastic way for our young people to engage with cutting edge research and meet real scientists. The team's interdisciplinary and equity-focused approach really resonated with what we aim to achieve at the BEAM Center, and we look forward to working with them again."

- Brian Cohen, Executive Director, Beam Center

## Bee’s Pollinator

*One out of every three bites of food Americans consume comes from a plant pollinated by honeybees or other pollinators. Yet 90% of pollinating bees are not honeybees: native bees live in dirt, reeds, cracks in rock and other unobtrusive spaces. We know relatively little about their nesting habitats except that their natural habitats are greatly diminished and under constant threat by development. Which in turn threatens the pollination of 75% of global non-agricultural environments.*

*How can we build habitat for the species that are foundational to our food production?*

*How can we introduce the idea of native bees to inform people’s understanding of critical and overlooked participants in their gardens and green spaces?*

## Learning Objectives

After a fun-filled day out in the sun getting closer to nature, our participants left this session with a renewed sense of appreciation for our pollinating friends. Not only did participants develop a new walking tour and event around the novel ball game Rug-bee, but they also learned to inhabit and embody the life of a bee. Guests left the session having experienced bee vision and foraging, having designed various habitats at different scales, and a new understanding of a bee's visual framework. All in a day's work for a busy bee!

Professor Ariane Harrison making elongated straws to sip sun-tea; to drink like a native bee.


Yellow aproned honey bees getting instructed on chasing native bees to collect pollen balls.

Yellow aproned honey bees getting instructed on chasing native bees to collect pollen balls.

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## Blueblocks Gardens

*We are woefully unprepared for the sea level rise and stronger storms that come with a changing climate. But it's important to recognize that the climate mitigation and adaptation solutions we need are already here. These include renewable energy, replanting ecosystems, regenerative farming, retrofitting buildings, electrifying transportation and reducing waste.*

*How can we as designers support conversations about positive human and non-human co-habitation of the urban environment to create more diverse urban coastal habitats?*

*Could we imagine invisible habitats, and make them visible and comprehensible to the public at large?*

## Learning Objectives

The blue waters and gentle waves of the nearby Atlantic couldn't have been better for our Blueblocks co-design session. In this event, participants learned valuable lessons about marine life's role in our overall environment and carbon cycle. Participants not only enjoyed the surf and water-based game but reflected on their own personal and sensory (real or imagined) experiences with blue carbon ecosystems. They also left this session with imaginations reinvigorated and illuminated to the value of ecosystems historically under-appreciated.

*''The longer we wait to enact strong ocean and climate policies, the more vulnerable people of color and low-income people in coastal communities will become. Our solutions must be grounded in environmental justice and create good jobs in the Blue Economy.''*

Excerpt from the Opinion piece written by Ayana Elizabeth Johnson in the Washington Post, December 10,2019.

Professor Elliott Maltby, wearing blueblock fascinator, talks through the training brief.

Beam Center students engrossed in a string game, and solving ecological puzzles.

Participant Dolores Bartholomew aka a microbe, teaching microbe moves to students.

## Field Biogels

*Urban manicured lawns are ecologically unsustainable, require extensive resources, water, fertilizer, soil, maintenance and care. Yet these grasses have psychological associations to social order and safety. A well kept lawn affords visibility and surveillance over shared public space. In our suburbs, lawns are a symbol of wealth, beauty, home ownership, and the American dream.*

*How might we as designers engage with wider audiences to rethink our shared relationships with urban grasses, nature, and our own diverse bodies?*

*How might we engage with our shared biases around safety, beauty, aging, and time?*

## Learning Objectives

After tackling both the sky and the sea with our previous two sessions, we decided to take a closer look at the land around us, more specifically: grass. With recent movements rising up against the curated and manicured lawns of the past, participants were invited to get their hands dirty, converting grass to pulp and pulp to bioplastics. Participants gained valuable insights into what alternatives the future might hold if we repurpose these grass spaces and substances. Members of the public also practiced the art of manufacturing novel materials using simple and accessible techniques.

*"Materials and making are tools and processes that can bring people together. As these projects prove, working on a common undertaking with a common purpose generates and knits together groups and communities, engaging in minds and hands."*

Radical Matter: Rethinking materials for a sustainable future, Kate Franklin and Caroline Till

Kids getting their hands *grassy, engaging with nature in minds and hands.*

Participants exploring different recipies with grass to create bioplastics.

Participants posing with their grass based bio-plastics.

# Participants

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## Ariane Lourie Harrison

*Principal and co-founder of Harrison Atelier*
*Coordinator of the Masters of Science in Architecture and Urban Design programs at the Graduate School of Architecture, Pratt Institute*

# Bee's Pollinator


**Design Team:**
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Training Brief

## Elliott Maltby

*Founding Partner Of Thread Collective*
*Professor In Pratt's Panning And Sustainable Environmental Systems Programs*

## Blueblocks Pavilion

**Elliott Maltby, urban and landscape design director**
Ms. Maltby believes that art and design can improve the sustainability and vitality of the urban environment. She brings a detailed and nuanced understanding of landscape elements to each project, including how plants can be compelling design elements, carrying sensory experiences and cultural narratives, while also providing ecosystem services. Her research explores the influence ecological conditions have on the current built and cultural environment. Most recently, she has detailed the history of Collect Pond, identifying its widely varied influence on the contemporary city ranging from our municipal water supply to the founding of Chase Manhattan Bank. In addition to working with architects, Ms. Maltby has collaborated over the years with artists and scientists to creatively address urban design, climate change, and resiliency.

**Gita Nandan, sustainability + interiors director, principal, RA, LEED AP**
Ms. Nandan believes in sustainability as a holistic and supple design approach, integral to all aspect of design and construction.  She is at the forefront of sustainability in New York, having served in various roles to help shape public policy, most recently board co-chair of the New York Rising Community Reconstruction Program Red Hook Community Committee ; member of the Homes Committee for Urban Green Codes Task Force (2012); and the Building Resiliency Task Force (2013). Gita further puts her beliefs into practice as an architectural educator, currently a visiting assistant professor at Pratt Institute and the School of Visual Arts where she teaches the Green Infrastructure Studio, Sustainable and Resilient Existing Building Design and thesis. Gita received her Master of Architecture from UC Berkeley and is a registered architect in New York and New Jersey, an accredited LEED professional and Enterprise Green Communities Technical Assistant.

**RETI Center / Four Pillars**

RETI Center was conceived and born in response to the need to strengthen economically and environmentally vulnerable urban coastal areas. As urgent needs arise, we respond using a myriad of solutions that fall under our four core competencies:

RESILIENCE: PLACE-BASED PLANNING AND COMMUNITY DEVELOPMENT
EDUCATION: THE GREEN-BLUE PIPELINE
TRAINING: GREEN-BLUE COLLAR WORKFORCE
INNOVATION: RESILIENT PRODUCT DEVELOPMENT

Training Brief

## Jessica Fertonani-Cooke

*Brazilian socio-ploitical researcher, activist and multidisciplinary artist.*

## Field Biogels

**Supermrin** is an Indian artist working at the intersections of architecture, art, and design. She is interested in conceptions of reality, pleasure, and nature within eastern practices. Supermrin is a Visiting Artist at the Graduate Architecture and Urban Design (GAUD) Program at Pratt Institute, and an Assistant Professor of Art at the School of Art, University of Cincinnati. She founded Streetlight in 2016 as a critical spatial research and design laboratory for decolonizing public space.

**Jessica Fertonani-Cooke's** mestiza heritage (Brazil and Hawaii), informs her research of third-place identities. Influenced by her involvement with indigenous communities throughout the Americas (primarily Tohono O'odham and Guarani), her performances utilize tribal knowledge to create border-crossing rituals between sites and identities. Her projects on the US-Mexico border are the foundation for Field's territorial research. Her past works equip her to engage with diverse communities and develop collaborative performances within politically loaded spaces.

**Jil Berenblum** is an industrial designer at the Cartier Innovation Lab and a biomaterials researcher with Expressive Matter at Genspace. She is working on building a set of skills that both understand the needs of existing commercial fabrication spaces, but can also answer the urgency with which we need to integrate more sustainable and responsible practices in design.

**Ane Gonzalez Lara** is an Assistant Professor of undergraduate architecture at Pratt Insitute's School of Architecture, and the co-founder of Idyll Studio. Her professional work with Idyll balances social and cultural concerns with extensive formal and material research. She has developed academic research initiatives as part of her studio teaching that have examined the United States-Mexican border and the Korean demilitarized zone, and has attended conferences on these topics including a roundtable at the 2018' Venice Biennale.

Training Brief


## Pratt Team

*(L-R) Ariane Lourie Harrison, Jubin Titus, Simran Shah, Dhvani Shah, Mark Rosin, Vineeta Mudunuri*

## Mark Rosin

*Director, Guerilla Science*
*Professor of Maths and Science, Pratt Institute*

## Guerilla Science

Founded in 2008, Guerilla Science is on a mission is to revolutionise how people connect with science through transformative experiences. We believe in a world in which everyone feels that science belongs to them and where science is celebrated as an intrinsic part of human culture.

Our ethos of practicing ‘science by stealth’ has enabled us to stretch traditional boundaries of how people engage with science, inspiring them to examine the everyday and the spectacular with an alternative perspective.

Guerilla Science has directly reached over 100,000 adults across the UK and US via our live events. We have a strong media profile with an accumulative reach of over 10 million people through coverage including The New Yorker, VICE and the BBC.

Guerilla Science brings the world’s greatest discoveries out of cloistered laboratories and stuffy classrooms and into the realm of playful celebration, with the conviction that scientific insights belong to everyone and should be enjoyed by all.

We specialize in connecting audiences to scientific thinking by combining science with art, music and play to tell stories that inspire, challenge, and amaze. All of our work is driven by a core belief that science belongs to everyone, regardless of age, ethnicity, gender, education or socio-economic status.