
# City as Living Laboratory
## for Sustainability in Urban Design

John Fraser & Mary Miss

NewKnowledge Publication #NSF2.5556.02

NewKnowledge Resource #NSF2.5556.02

This research was funded through National Science Foundation grants # DRL-1240641 and DRL-1115217. The project built on preliminary work through separate funding from the institutional sponsorship of the New York Foundation for the Arts (NYFA). All data collection reported in this document was conducted under the auspices of Research Foundation of City University New York. The authors wish to thank the Institute for Urban Design, the CUNY Institute for Urban Systems, City College and Michael Sorkin for supporting and hosting the public forums.

**Recommended Citation**

Fraser, J. & Miss, M. (2012). City as Living Laboratory for Sustainability in Urban Design (NewKnowledge Publication #NSF2.5556.02). New York: New Knowledge Organization Ltd.

**About NewKnowledge**

NewKnowledge is a non-profit research institute founded to pursue a deep understanding of how people engage with society's grand challenges. The organization works to expand understanding of how knowledge is acquired and acted upon in order to promote a strong democracy that enables all people to live to their greatest potential in harmony with the biosphere.

**About Mary Miss and City as Living Laboratory**

Mary Miss/City as Living Laboratory (MM/CaLL), Sustainability Made Tangible Through the Arts is a non-profit organization spearheaded by artist Mary Miss to illustrate how artists and designers, working in collaboration with scientists, social scientists, urban planners and citizens can lead to new ways to dwell in, build, and imagine our cities.

# Table of Contents




LIFE
VIDA

# Introduction

Through a NSF EAGER grant for informal science education awarded to Principal Investigator John Fraser, President and CEO of New Knowledge Organization Ltd, Dr. Fraser, in collaboration with Mary Miss/City as Living Laboratory (MM/CaLL) and Bill Solecki, Director of the CUNY Institute for Sustainable Cities, explored how a temporary public art installation can be an effective means to foster public discussion about sustainability and how to create new models for the urban street itself as an accessible informal science learning environment. The grant supported a pilot experimental installation incorporating scientific information organized as an art installation. The art experiment, called BROADWAY: 1000 Steps, was installed at 137th St., Montefiore Park, September – December 2011 with the support of the New York City Parks and Recreation Department and through agreement with the New York City Department of Transportation. This publication documents the results of that research.

The publication is divided into seven sections, the first representing the activities undertaken as part of that research followed by a section that provides an overview of findings from the research. The third section considers the significance of this research to informal science learning theory and suggests possible implications that the results from these experiments might have on theory in other related fields. The fourth section outlines how the project has impacted students and those new to the field who helped contribute to the research, and the fifth section documents the public education programs that flowed as a direct result of the project. The last two sections offer a list of resources and the vast array of partners who helped to make this project possible.

As authors and co-principal investigators we cannot thank our partners and supporters enough for their support that helped make this very public experiment in informal science learning possible. In particular, the preliminary work supported through institutional sponsorship of Mary Miss Studio's work through the New York Foundation for the Arts (NYFA), the ongoing advice of Al DeSena, our grant officer at the National Science Foundation, as we worked to bring this project to life, and Michael Sorkin at the Institute for Urban Design and the CUNY Institute for Urban Systems at City College.

We believe this publication demonstrates that pedestrians are very open to using their urban encounters with objects as an opportunity for active science learning. We believe the results represent an important step forward in thinking about how informal science learning can be enhanced by creating true collaborations between scientists who are uncovering new understandings about our planet, and the artists who can help all citizens increase their literacy about science and their role in supporting a better world.

# Overview

A NSF EArly-concept Grant for Exploratory Research (EAGER) was awarded to Principal Investigator John Fraser, PhD, AIA, in collaboration with co-Principal Investigators, Mary Miss and William (Bill) Solecki, PhD, to undertake City as Living Laboratory for Sustainability in Urban Design. The City as Living Laboratory for Sustainability in Urban Design (CaLL) project sought to explore how public art can reinvigorate public discussion about sustainability. The project examined the emerging role of artists and visual thinkers as catalysts for conversation between scientists and the public. In this project, CaLL prototyped a "Kit of Parts" as an art tactic for drawing attention to the visible environment through a temporary art installation on the terrain of a public park. This installation directed the viewer's gaze toward everyday street features such as manhole covers, streetlights, sewer drains and fire hydrants. Passersby were thereby "invited" to think about the connection between city streets and the hidden but essential natural systems that support the infrastructure of their urban neighborhood. Ultimately this direct experience of the connection between the city and the environment was designed to inspire the public to ponder the role of individual actions in the transformation to a sustainable future.

This direct experience of the connection between the city and the environment was designed to inspire the public to ponder the role of individual actions in the transformation to a sustainable future.

The project (1) pilot tested and studied new interpretive strategies for urban "place-based" public learning experiences that aimed to focus pedestrians' attention on a city's ecology and existing built sustainability infrastructure; (2) engaged urban design professionals and STEM researchers in an exploration of how these new strategies offer potential to transform how urban design fields inform, dialog and interact with the public about sustainable urban design and planning; and (3) assessed the effectiveness of these public interpretation programs for achieving STEM learning beyond traditional Informal Science Learning Environments (ISEs) such as science museums. The installation at 137th St., Montefiore Park, New York, NY was available for public experience from September – December 2011 and was installed with the support of the New York City Parks and Recreation Department through agreement with the New York City Department of Transportation.

The average pedestrian is open to thinking about how to respond to emerging science data, and will engage in a scientific inquiry process as part of their daily experience in cities.

The project aimed to generate new models for public engagement with science in the city environment. It sought to explore how urban designers and planners who prioritize sustainability as a focus for their work can more effectively collaborate with STEM researchers and the public. The project studied how those who shape cities think about their role in supporting sustainable action, and how engaging in dialogue with urban audiences can change the way science is used to create a sustainable city. Urban design has emerged as the post-professional specialization for architects and landscape architects that influences environmental policy, from transportation and park planning to watershed management and city form. CaLL sought to respond to urban designers' attentiveness to

There are rich opportunities for artists and scientists to explore collaboration to encourage science inquiry in public spaces.

public participation by creating an interactive and educational installation situated squarely in the physical environment.

Results from the CaLL experiment demonstrated that developing provocative encounters with science learning opportunities in urban environments through an intersection with the arts has the potential to engage people who might not otherwise pursue scientific inquiry. Research indicated that the average pedestrian is open to thinking about how to respond to emerging science data, and will engage in a scientific inquiry process as part of their daily experience in cities.

The results revealed that the creation and reception of the installation represented a complex set of super-ordinate goals that appeared to contrast one another based on the point of view of each collaborator: artist; scientist; urban designer; or the general public, all of whom tried to determine whose pedagogical outcomes were of primary importance. We concluded that there are rich opportunities for artists and scientists to explore collaboration to encourage science inquiry in public spaces, and that the greatest opportunities might emerge if the projects are entered into as full collaborations rather than as competing efforts.

# Research and Education Activities

The City as Living Laboratory for Sustainability in Urban Design (CaLL) project investigated the city's potential as an informal science learning environment through art installations focused on sustainability science on city streets.

Cityscapes, in contrast to informal science learning environments like museums and science centers, are experienced every day, and offer a greater opportunity for promoting science learning and revealing technologies designed for urban sustainability in democratic and accessible ways. The results of this project demonstrated that developing provocative encounters with science learning opportunities in urban environments through an intersection with the arts has the potential to engage people who might not otherwise pursue scientific inquiry. The project also examined the special case of artwork as a strategy that can increase science engagement by encouraging thinking beyond simple information transfer.

The artist Mary Miss led a public festival to engage New Yorkers in a celebration of the city's exceptional urbanity and environmental history, featuring artist exchanges about food and resources, and table-top science encounters with leading environmental researchers.

Project deliverables included: a workshop that engaged urban design students in the development of experimental streetscape installations; a pilot installation on streets in the City College of NY; a City as Living Laboratory art-science workshop for Urban Design Week professionals to highlight possible benefits of interdisciplinary collaboration; a panel discussion around new forms of citizen engagement through a "city as a science learning environment"; a forum specifically for National Science Foundation-funded ISE professionals to explore the research findings and potential for collaboration as a strategy to increase science learning; and a public forum where a panel of leading thinkers in the arts explored their response to artists engaging with the public on addressing the impacts anticipated as environmental scientists study the sustainability of our urban systems.

The pilot installation and public-facing nature of this experiment launched to coincide with the Rockefeller Foundation-funded Urban Design Week in New York City on September 15 - 20, 2011 with a focused set of events dedicated to public STEM learning and urban sustainability. The artist Mary Miss led a public festival to engage New Yorkers in a celebration of the city's exceptional urbanity and environmental history, featuring artist exchanges about food and resources, and table-top science encounters with leading environmental researchers. The pilot installation consisted of a set of small-scale, two- and three-dimensional elements including bright green poles and convex mirrors set in a park in Manhattan. We examined both the production and consumption of the installation through in-depth interviews with the creator of the piece, pre-visit surveys followed by post-visit focus groups with urban designers, planners, and engineers, as well as intercept interviews with pedestrians walking through the installation site to determine the impacts of this work.

In exploring both the production and consumption of a public art installation situated in an urban community, the research team applied a mixed-methods approach that incorporated in-depth interviews with the artist; pre-visit online surveys followed by post-visit focus groups with urban designers, planners, and engineers; intercept interviews with pedestrians walking through the installation site; and observational video (Fraser et al, in review). Complementary activities included a literature review focused on the realms of science learning and communication (Halpern & Fraser, in review); a public panel discussion about art and science learning; and a review by arts thinkers to assess the implications of artists working as informal science educators (http://www.newknowledge.org/CaLL_Resources.html).


ENERGY
ENERGÍA
ENERGY
ENERGÍA

# Findings

The public and professional research undertaken for the CaLL project revealed that the average pedestrian appears to be open and interested in pursuing science inquiry as part of their daily experience in cities if offered the opportunity to confront factual information about the concealed aspects of environmental sustainability. It also revealed that artists and visual thinkers have the skills to catalyze conversations between scientists and the public by engaging city residents through making environmental science information available for negotiation and free-choice by pedestrians in public spaces. The data assembled through public interviews suggested that the science facts curated by the artist

> Discourses about art and science learning often perpetuate traditional distinctions that complicate both interpretation by and collaboration among artists and scientists.

along summary accessible themes encouraged some degree of science inquiry by the pedestrian public and promoted richer dialogue about urban sustainability.

These findings, summarized in two papers currently under review at reputable peer-reviewed science education journals, indicated that discourses about art and science learning often perpetuate traditional distinctions that complicate both interpretation by and collaboration among artists and scientists. It would seem that traditional science teaching is perceived as concerned with pre-determined learning outcomes interpreted as the recitation or memorization of facts that implicate the behavior of others, whereas artists' work is perceived as affording interpretation as a more open-ended reconsideration of personal sphere behaviors and the inference about what the science data might mean for future change. For those who categorized the work as deductive scientific transfer of information, whether professional or general public audience, the work was judged on success at sharing information. For those who categorized the installation as an artwork, the implications were more broadly "abductive" or "inductive" science thinking. These reasoning processes are more open to inferring scientifically reasonable implications that were personal and specific based on limited data. They used the signs and information to synthesize their prior knowledge and apply it to general predictions about what the imagined future sustainable environment might entail.

As a matter of process, it emerged in these data that artists, scientists, and urban designers involved with a project that sets out an open-ended exploration for the public based on an artist's choreography and leadership had a tendency to compete over the prioritization of learning outcomes. While scientists traditionally expect a specific type of knowledge acquisition or attitude change to flow from their presentation, artists are more willing to use juxtaposition and inference to guide reasoning without a predetermined science learning outcome. We concluded that this disagreement in learning pedagogies offers a rich opportunity for artists and scientists to explore ways that they can work together to encourage science inquiry in public spaces. We suggest that the discord between traditional deductive, outcome-based science reasoning in contrast to more open humanities discourses that leverage science information in discourse creates a valuable tension in projects that are entered into as

> This exploration of hybrid reasoning appears to permit more productive meaning-making and critical thinking for both the general public and professionals alike.

full collaborations rather than as competing efforts and may have broader consequences that bring the public into the discussion as co-contributors who will desire new responses that address the concerns emerging from the scientific data.

The researchers conclude that these data have broad implications for the future of science learning in public settings. They suggest that the appetite for science information is substantial, that the public is generally aware of environmental issues and is interested in considering them as part of their experience in public spaces. This suggests that public discourses in science can be promoted to a wider public than is found at informal science learning destinations that require concerted effort and planning to explore learning, and may be perceived as outside the interest or financial capacity of some city residents. Further, it suggests that public engagement in science learning can be scaffolded by allowing free-choice reasoning about science information by allowing exploration of the hybrid space between the humanities and science discourses. This exploration of hybrid reasoning appears to permit more productive meaning-making and critical thinking for both the general public and professionals alike. It appears that collaborations between scientists and artists can add interpretive perspectives to the public realm that can? will? improve science learning.

# Significance to Science Learning Theory

## Contributions within Discipline

The project findings contributed to the exploration of how science learning and communication, specifically an analysis of conceptual frames involved in current approaches to science education, and the proposal of a hybrid space in which science reasoning and humanities reasoning intersect. The findings support the proposition that collaboration among scientists and artists offers rich opportunities for encouraging science inquiry and contributing towards public discussion about urban sustainability.

In one theoretical paper entitled "Rethinking Engagement," the Principal Investigator collaborated with researcher Megan Halpern to consider how discussions in science education, informal science learning, and public engagement with science were challenged by arts discourses. They examined the intersection of how the nature of science discussion in science education was being fully elaborated in informal science settings; the role and purpose of informal science learning as something important to public discourse; and recent shifts away from the measure of specific scientific literacy toward more open-ended public engagement with science. They proposed that a great deal of progress has been made to engage the public in ownership and self-knowledge about science information, but also felt that the focus on Informal Science Learning Institutions may lead to reaching only a small portion of the public for short amounts of time, by focusing too much on specific and limited measurable outcomes that occur the instant following a program at a museum, rather than processes of reasoning that are central to humanities and discourse theory. They felt that by failing to recognize some of the ways people engage with scientific concepts in their daily lives and through public encounters in social settings, the full opportunity for expanding science learning was being short-changed. They conclude with suggestions for broadening thinking to include how science reasoning is pursued naturally by the inquiring mind, considering how more open-ended juxtaposition and statements of reliable fact can be used to better prepare science communicators for understanding the way publics engage with science. They also suggest that a more open-ended frame may allow the natural inquiry process to include more than deductive reasoning in ways that can promote more complex reasoning using the scientific strategies of abduction and induction that are available to those who encounter small amounts of science data in their lives.

> By failing to recognize some of the ways people engage with scientific concepts in their daily lives and through public encounters in social settings, the full opportunity for expanding science learning was being short-changed.

> Developing provocative encounters with science learning opportunities in urban environments through an intersection with the arts had the potential to engage people who might not otherwise pursue scientific inquiry.

The research findings from interviews, focus groups and the public forums revealed that informal science learning through art in urban environments seemed capable of reinvigorating public discussion about sustainability. It revealed that pedestrians negotiating the cityscape were opportunistically willing to engage with science learning. The results demonstrated that developing provocative encounters with science learning opportunities in urban environments through an intersection with the arts had the potential to engage people who might not otherwise pursue scientific inquiry. The pilot installation demonstrated that it is possible to increase science engagement by


encouraging thinking beyond simple information transfer. The results challenge prevailing public discourses that there is a lack of scientific reasoning capability in the public by demonstrating that the average pedestrian is open to provocative science inquiry as part of their daily experience in cities. It found that current discourses about art and science learning have perpetuated an isolation of the two fields in ways that create challenges for professionals and the general public to feel confident in their reasoning and may support bias against the general public as capable of engaging in reasoned scientific thinking.

The examination of professional audiences also revealed that there are multiple interpretations of instrumentality, with competing goals by artists, scientists, urban designers or the general public, all of whom were trying to determine whose pedagogical outcomes were of primary importance. These findings suggest that there is an important emerging role for artists and visual thinkers to help catalyze the conversation between the public and scientists whose disciplinary focus may lead them to discount naïve scientific reasoning as illiteracy rather than a full ability to engage in sound thought processes when confronted with easy-to-understand science fact. These results suggest that science learning theory has the potential to accept a wide range of reasoning processes, but the inductive and abductive processes remain under-valued in the majority of the literature. We conclude that there are rich opportunities for artists and scientists to explore collaboration to encourage science inquiry in public spaces if the public is allowed the opportunity to examine information over time.

## Contributions to Other Disciplines

These findings are particularly relevant to artists and "place-making" professions such as urban design, environmental sustainability engineering, civil engineering, architecture, and planning. The results suggest that traditional outreach and public process has generally been limited by the debate over expertise and whose knowledge is in the best interest

of the public when a change in policy or infrastructure is proposed or being implemented (Halvorsen, 2006; Webler & Tuler 2002; Webler, Tuler & Krueger, 2001). It suggests that engaging artists and public stakeholders in considering the science, affording the opportunity to occupy space with information that can be negotiated as part of daily pedestrian experience, and the opportunity to engage with the data in community discussions can all open up lines of inquiry that are supportive of public intervention. While urban designers may debate or challenge the quality of the art as a transformative vision for the future, and each artist's work might vary in quality or ability to direct the gaze toward scientific information, it is apparent that encounters with data over time have a valuable impact on increasing engagement with imagining better futures based on emerging science data.

The CaLL concept engages with Informal science learning as an ongoing, lifelong endeavor rather than a school subject to learn about science on their own terms, with their own goals in mind.

## Contributions to Human Resource Development

The results of this research suggests that there is value in broadening the channels through which members of the urban design and art professions engage the public in science learning in public spaces. This experiment has shown that informal science learning can contribute directly to professional skills by suggesting ways that these professionals can reach beyond their disciplinary expertise, to engage artists of like mind but who may not have the specific disciplinary knowledge, to create bridges for conversation with the public as part of the making of places in the city. As a human resource development implication, while the project did not directly result in changed skills by professionals other than the artist's team and advisors, it demonstrates a future path for training urban design professionals by helping them to understand the value of mediated discussions with the public before pursuing public process meetings about change in urban form. This skill development may be particularly relevant to those who will need to involve the public in shaping the future sustainability of cities.

## Contributions to Resources for Research and Education

The project archive provides both research methods and theoretical explorations with the intersection of humanities and science reasoning. The archival materials at Provisions Library and the permanent records on NewKnowledge.org represent ongoing resources to introduce this cross-disciplinary exploration and to engage discussion about the research papers.

Two peer-reviewed journal articles are being submitted for review to the *Journal of Research in Science Teaching* and *Qualitative Research*. Presentations on the findings have been made at the Visitor Studies Association 2012 Annual Conference and at the American Psychological Association 2012 Annual Convention. A public forum sponsored by the Lilly Foundation in Indianapolis, IN also created further interest in that community and linked ongoing work from the Butler University Center for Urban Ecology to the archival records for expanded thinking about the role of art in their informal science efforts surrounding the Reconnecting Our Waterways citywide initiative.

## Contributions Beyond Science and Engineering

Given the significance of urban growth and the concomitant challenges, locally and globally, the project findings suggested important new considerations for managers and policymakers on how to promote understanding and valuing of the ecological and urban systems that sustain urban well-being among city dwellers.

The CaLL concept engages with Informal science learning as an ongoing, lifelong endeavor rather than

a school subject, with informal learning as a way for learners to seek opportunities to learn about science on their own terms, with their own goals in mind.

Two principal areas of difference between formal science education and informal science learning present themselves. The first is the lifelong nature of informal science learning, by comparison with the classroom-based learning in the formal sphere. The second is the emphasis not on scientific knowledge or methods, but on reflection and identity. Both approaches share a commitment to science as a way of knowing as well as a set of facts, methods, observations, and theories.

CaLL is an attempt to bring reason and imagination together again, to foster the idea that meaning-making and critical thinking are not separate, or even separable, ideas.

Two relationships are described between art and science: art either uses science for inspiration or technique, or an artist is perceived as assisting scientists in communicating or understanding concepts. It may be difficult to overcome the ways in which artists and scientists fall into these patterns of collaboration. Artists are interested in engaging with science information to provoke discussion or passion around a topic, while scientists who prioritize science learning seek to use artists as instruments to achieve predetermined learning outcomes.

One opportunity to develop such sociocultural meanings that resonate with science learning is to foster the kind of hybrid space created by the Montefiore Park installation. In such a space, dichotomies may be made whole. But there is no language for such a space. This is not a new problem. The key to expressing this truth was imagination. But at the turn of the nineteenth century, imagination was divorced from science in the same way reason left the arts. CaLL is an attempt to bring reason and imagination together again, to foster the idea that meaning-making and critical thinking are not separate, or even separable, ideas.

## References

Fraser, J., Plemons, K. & Halpern, M. (in review). Science learning in public spaces: Exploring the city as living laboratory for sustainability in urban design. *Journal of Research in Science Teaching*.

Halpern, M. & Fraser, J. (in review). Rethinking engagement. *Journal of Public Understanding of Science*.

Halvorsen, K. E. (2006). Critical next steps in research on public meetings and environmental decision making. *Human Ecology Review*, 13(2), 151-160.

Webler, T. & Tuler, S. (2002). Unlocking the puzzle of public participation. *Bulletin of Science Technology Society*, 22 (3), 179-189.

Webler, T., Tuler, S., & Krueger, T. (2001). What is a good public participation process? Five perspectives from the public. *Environmental Management* 27(3), 435–450.

# Training and Development

The project forums and journal report development offered informal learning opportunities and engaged students from the Urban Design program at City College of CUNY, from the Sustainability Science program at the Earth Institute at Columbia University, the student population interested in the intersection between arts and science at Hunter College of CUNY, and Megan Halpern, a doctoral candidate from Cornell University interested in exploring the intersection of art and sustainability science.

The artist, Mary Miss, emphasized the importance of engaging with people outside of the world of art galleries and museums, with people who may not normally have any connection to the arts. When Miss described decisions she made along the life of the project – from the location, to content organization, to including Spanish translations – she consistently referred to the partners who helped her arrive at those decisions or made the decisions with her. Artists often partner with organizations, experts in other fields, and other artists in their creative process. Involving students helps them see the city in a "different way." We consider these groups as a class of collaborators or "co-conspirators" who offered ways of seeing and interpreting information from their professional perspectives. We refer to them as co-conspirators because they offered information to the artist, but the artist then contextualized and interpreted their work as part of an overall site experience, that is, a single art encounter comprised of an array of parts and indicators that she believed would culminate in a whole experience that could only be understood from within.

# Public Programs

The installation itself engaged community members in the New York neighborhood surrounding Montefiore Park at Broadway between 137th and 139th Streets, including the students at City College of CUNY who traverse the site from the #1 train to their campus two blocks away. Programs included forums with urban design students, faculty, and professionals, who were involved in the discussion about art, urban space, and science learning immediately following the installation and as part of the coursework taught by faculty member and project advisor, Urban Designer Michael Sorkin.

## Chronology of Public Programs

Open Park Day, 9/17/11: On Saturday, September 17, 2011 from 11:00 a.m. to 2:00 p.m., the project supported an Open Park Day hosted by Mary Miss Studio/City as Living Lab to celebrate the completion of the test installation and to engage a broad section of the public, with a particular focus on local residents. It was promoted as a program to answer citizen questions about the history of the landscape and architecture of Hamilton Heights, and how the infrastructure of the surrounding area including roads, sewers, trees, and transportation impact the health of the environment and its residents. These subjects were covered at round-table discussions with leading experts including ecologist and WCS Welikia Project Director Eric Sanderson, author Tony Hiss, architectural historian Gwen Wright and engineer Adam Sadowsky. In preparation for the installation, students from the City College Academy for Professional Preparation (CCAPP) Division of Science were enlisted by MM/CaLL to canvas the surrounding community to help determine the issues of greatest environmental concern for local residents. This student effort was conducted as a teamwork and problem-solving exercise during a summer session in preparation for their first year as college science majors. With the epidemic rise in obesity and diabetes, the dominant concern expressed by residents living near the installation pertained to access to fresh food. Elements of the installation were developed specifically to address food and sustainability science. As part of Open Park Day, artist Heather Hart was invited to create an interactive project around food. Hart, whose work addresses cultural identity through everyday expressions such as cuisine, invited local residents to engage in a recipe exchange. Participants in the exchange received a recipe from the CaLL studio for paella and a BROADWAY: 1000 Steps keepsake in the form of a pendant necklace or keychain. Over 100 local residents participated in this exchange, and these recipes have been posted on the BROADWAY: 1000 Steps website.


Round-table discussion, City College, 9/18/11: The production and promotion of an arts and science learning round-table discussion was held in the Auditorium at the City College, Spitzer School of Architecture at 141 Convent Ave. @ 135th St., New York, on September 18th, 2011. The forum introduced community stakeholders, the general public attending Urban Design Week, and professional urban design professionals to a cross-disciplinary exploration of the implications of the project. The event was co-hosted by the City College Urban Design Department and the Institute for Learning Innovation to expand understanding of how the installation provoked thinking about how the public engages with future sustainable design. In total 45 people participated, with data from this program included in the research dataset.

Broadway Walk, 5/6/12: The test hub at 137th Street was the first of Broadway: 1000 Steps that will incorporate approximately 20 sites from the Bronx to the Battery in the spring of 2013. Using her "tool kit" at each of the hub sites, Mary Miss will continue to focus on the universal subjects of Land, Air, Water, Waste, Energy, and Life through a local lens, and solicit recommendations from neighborhood constituents for issues of particular relevance in their immediate areas. On May 6, 2012 Mary Miss/City as Living Laboratory in partnership with the Municipal Art Society (MAS) leveraged the energy arising out of the Montefiore Park installation to convene and lead a 14-plus mile, 12-hour walk down the length of Broadway to explore the environmental science evident in the city. This event was not funded through this grant. On this tour, guided by a group of approximately twenty scientists, artists, and community activists, 200-plus participants could see the interconnections of ecological, engineering, social, and historical decisions that have shaped the iconic Broadway corridor.

Mary Miss also worked to develop relationships with city organizations and community groups around Montefiore Park where the installation was built. She claimed that her work "galvanized" and "energized" these community groups by drawing attention to their area. Miss also felt that her work with city representatives helped to bring clarity to the project and helped shape the content about place. Her co-conspirators felt that art/science installations are temporary and iterative processes that change over time, producing more relevant products in each iteration by increasing input into the parts and pieces. Though these partnerships form an important part of the work, the artist also sought to produce a mediated installation that did not necessarily align with any one organization in order to ensure a more inclusive and democratic array of science information.

Preliminary Findings Meeting, 5/9/11: On May 9th, City as Living Laboratory convened a gathering of approximately 40 New York City arts and civic leaders where co-principal investigator Mary Miss reported on the project's evolution and principal investigator John Fraser offered an overview of the preliminary findings reported in this publication. The program was introduced by Agnes Gund, President Emerita, Museum of Modern Art (MoMA).

CUNY Panel, 6/5/11: On Tuesday, June 5, the CUNY Institute for Sustainable Cities hosted a panel of arts professionals, critics and cultural thinkers to discuss how artists can engage the public in a dialogue about sustainability and the environment, using Mary Miss/City as Living Laboratory's project, BROADWAY: 1000 Steps, as provocation. The public discussion event was titled "Meeting Environmental Challenges with Art in the Public Sphere: Perspectives on Mary Miss's City as Living Laboratory for Sustainability in Urban Design and its Project, BROADWAY: 1000 Steps." This National Science Foundation (NSF)-supported discussion explored research into public art as a foundation for informal science learning in public spaces. In total, 82 people participated in the program and the proceedings were recorded and posted on the project website at http://www.newknowledge.org/CaLL_Resources.html and through Provisions Library at George Mason University.

Professional Presentations, 7/26/11, 8/5/11, 3/14-15/12: Three professional presentations were also produced to introduce the Informal Science Professional communities to the emerging results from the project. On March 14th and 15th, 2012, Mary Miss and John Fraser attended the NSF ISE Principal Investigators meeting in Washington DC and shared results through a poster presentation on the project. On Thursday, July 26th, 2012, John Fraser presented research results from this project as part of a four-panelist presentation entitled Art + Science = New Engaged Communities at the Annual Visitor Studies Association Conference held in Raleigh, NC. Dr. Fraser used the same presentation as the basis for a presentation to the American Psychological Association Annual Conference on August 5th, 2012 in Orlando, FL as part of a larger panel on creativity and science learning hosted by APA's Division 10. All three presentations were well received by discussants, most of whom commented on the face validity of the results and encouraged submission of publications.

# Publications

## Print publications

Mary Miss / City as Living Laboratory, 2011a. *BROADWAY: 1000 Steps* [Pamphlet]. New York, NY: Mary Miss Studio.

Mary Miss / City as Living Laboratory, 2011b. *BROADWAY: 1000 Steps* [Booklet]. New York, NY: Mary Miss Studio.

Mary Miss / City as Living Laboratory, 2011c. *BROADWAY: 1000 Steps* – Montefiore Park [Booklet]. New York, NY: Mary Miss Studio.

## Magazine articles

"Mary Miss: Knowing your Place" by Nancy Princenthal, *Art in America*, April 2012.

"Desperately Seeking Innovation: Making Connections Between Art and Science," by Robert Stein, *Dimensions magazine*, March-April 2012.

"Seeing Cities" interview with Mary Miss by Jim Fleming, To the Best of Our Knowledge, Wisconsin Public Radio, Public Radio International, October 15, 2012, http://ttbook.org/book/seeing-cities

"Mary Miss" interview by Maddie Oliver, *The City Atlas*, September 30, 2012, http://newyork.thecityatlas.org/people/mary-miss/#article

## Websites

http://www.newknowledge.org/CaLL_Resources.html
This section of the NewKnowledge website provides a project overview, images from the experiment, an overview of the findings, and video about the impact of artist as community organizer engaging with emerging science data.

http://www.cityaslivinglab.org
This website presents the site-specific installations developed as part of Mary Miss/City as Living Laboratory (CaLL) that promote public engagement with the environment, including BROADWAY: 1000 Steps.

http://broadway1000steps.com
This site hosts information on the various hubs along Broadway that comprise Mary Miss/City as Living Laboratory's BROADWAY: 1000 Steps project, which builds upon the NSF-funded experimental hub at Montefiore Park.

## Audiovisual records

A full set of audiovisual records of the program content, guide-by-cell materials, and digital records of the audio arts and science learning panel hosted by CUNY's Institute for Sustainable Cities on June 5, 2012 were all produced and edited for archival use.

Video from the CUNY panel and documents from Mary Miss Studio are available as a public archival record through Provisions Library, an online archival repository for art projects based at George Mason University in Washington, DC.

In addition, select materials are available on the CaLL project website at NewKnowledge.org with all project data available through the New Knowledge Data Resources Library consistent with the requirements of the National Science Digital Library for federally funded projects and may be obtained by email to library@NewKnowledge.org.

# Partners

## Project Leadership

CUNY Institute for Sustainable Cities, Hunter College of CUNY [DRL-1240641]
John Fraser, PhD AIA Principal Investigator (2012)
William Solecki, PhD, Co-principal investigator

Institute for Learning Innovation [DRL-1115217]
John Fraser, PhD AIA Principal Investigator (2011)

Mary Miss/City as Living Laboratory, Inc. (MM/CaLL) [DRL-1240641 & DRL-1115217]
Mary Miss, Co-principal investigator
Olivia Georgia, Project Coordination

Graduate Urban Design Program, City College of CUNY [DRL-1115217]
Michael Sorkin, Public Forum Coordination

## Organizations

New Knowledge Organization Ltd. research and project coordination

Mayor's Office of Long-Term Planning and Sustainability

New York City Department of City Planning

Ennead Architects provided in-kind design and project management services

## Scientific Partners

Eric Sanderson, Ph.D, Senior Conservation Ecologist, Wildlife Conservation Society

Sabine Marx, Ph.D, Columbia University, Center for Research on Environmental Decision-Making

Mary Leou, Ph.D, Director of the Wallerstein Collaboration of Urban Environmental Education

Cynthia Rosenzweig, Ph.D, Senior Research Scientist, NASA Goddard Institute for Space Studies (GISS)

Stuart Gaffin, Ph.D, Research Scientist, NASA Goddard Institute for Space Studies (GISS)

## Academic Partners

Boston Architectural College

City College of City University of New York

Research Foundation of CUNY (RF CUNY)

Marymount Manhattan College

Massachusetts Institute of Technology (MIT)

Parsons The New School for Design

Pennsylvannia State University

Pratt Institute

University of Virginia

City University of New York (CUNY) Graduate Center

## Partnership Funding

Lily Auchincloss Foundation Ford Foundation

Graham Foundation for Advanced Studies in the Fine Arts

Agnes Gund

Catherine Gund

Wendy Evans Joseph

Dorothy Lichtenstein

Emily R. Pulitzer

Robert Rauschenberg Foundation

Rockefeller Cultural Innovation Fund

Shelley Rubin

Neil and Angelica Rudenstine

Linda and Andrew Safran

## Montefiore Park Event Program Leaders

Heather Heart, Artist

Tony Hiss, Author

Adam Sadowsky, Engineer

Eric Sanderson, Ph.D., Urban Geographer

Gwen Wright, PhD., Architectural Historian

## Advisory Committee

Steven Barshov, Partner, Sive, Paget & Riesel

Amanda Burden, Chair, New York City Planning Commission/Director, Department of City Planning

Mary Elana Carr, Associate Director, Columbia Climate Center

Gabriella De Ferrari, Art Historian and Writer

Ray Gastil, Visiting Professor and Chair in Design Innovation, Stuckeman School of Architecture and Landscape Architecture, Pennsylvania State University

Agnes Gund, President Emerita, MoMA

Adam Holland, President, Jackson Management

Wendy Evans Joseph, Partner, Cooper Joseph Studio

Richard Kahan, Founder & CEO, The Urban Assembly

Laurie Kerr, Joint Project Director, Institute for Market Transformation, Natural Resources Defense Council (NRDC)

Benn Lewis, Vice President, Airtek Environmental Corp.

Charles McKinney, Principal Urban Designer, Parks & Recreation, City of New York

Dr. Franco Montalto, PE, Assistant Professor, Drexel University; President, eDesign Dynamics LLC

Richard M Olcott, FAIA, FAAR, Partner, Ennead Architects LLP

Emily Pulitzer, Founder & Chairman, Pulitzer Foundation for the Arts

Linda R. Safran, Art Appraiser

Patterson Sims, Independent Curator, Writer, Consultant

Byron Stigge, Engineer, Director, Level Agency for Infrastructure

Karen Van Lengen, Professor, University of Virginia School of Architecture

John Woldenberg, Film, Television, and Digital Media Producer

## NewKnowledge.org Staff

Karen Plemons

Kenneth Lo

Shelley J. Rank

Jennifer Scarlott

Laura Tietjen

## Institute for Learning Innovation Staff

Jessica Luke, PhD

Sharisse Butler

Erin Johnson

Karen Plemons

## Mary Miss Studio Staff

Olivia Georgia, Executive Director

Stacey Anderson

César A. Cotta

Sarah Hollars

Kiersten Jennings Chou

Belinda Kanpetch

Tina Maidhof

Ismaelly Pena

Phil Silva

Logan Winston

## CUNY Institute for Sustainable Cities Staff

Carina Molnar

Leslie Patrick

## Art & Science Theory Consultant

Megan K. Halpern

## Art Criticism

Nancy Princenthal

## Interpretation and Text Consultant

Tony Hiss

## Organizational Partners

Columbia University: Columbia University Earth Institute, Center for Research on Environmental Decisions

Institute for Urban Design

## Other Collaborators

Montefiore Park Neighborhood Association

City College Academy for Professional Preparation

Manhattan Community Board 1

NYC Department of Transportation

NYC Department of Parks & Recreation

## Cultural Review (Participants)

Eleanor Heartney

Niels van Tomme

Tom Finkelpearl

Patricia Phillips

## Media Production

Erin Johnson, Animation, Editing & Post-Production Services

GameGurus, Web Development






The project built on preliminary work through separate funding from the institutional sponsorship of the New York Foundation for the Arts (NYFA). All data collection reported in this document was conducted under the auspices of Research Foundation of City University New York. The authors wish to thank the Institute for Urban Design, the CUNY Institute for Urban Systems, City College and Michael Sorkin for supporting and hosting the public forums.