GARDEN GADGETS
DESIGN & TECHNOLOGY WORKSHOP SERIES 1/6

Pratt 125

PROGRAMS *for*
SUSTAINABLE PLANNING
and DEVELOPMENT

in collaboration with

ARDUINO

GARDEN GADGETS
DESIGN & TECHNOLOGY WORKSHOP SERIES 1/6

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Pratt 125

Embarking on our 125th year, Pratt Institute remains an inviting and beautiful presence within the Clinton Hill neighborhood of Brooklyn. Our main campus serves as a gathering space, public space, workplace and home to local community, faculty, staff and students. Over the years, we have fostered the creative growth of artists, designers, architects and planners through innovative practices incorporating community, technology and the arts.
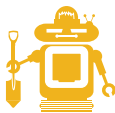
Just as professional practice and technologies have changed over the past 125 years, our campus and curriculum have undergone dynamic changes as well. Perhaps the most significant change being the recognition of climate change impacts and the role of academic institutions in not just training future environmental stewards but showcasing our campuses as leaders in sustainable development.

Our efforts have been most recently recognized by an award from the New York City Department of Environmental Protection's Green Infrastructure Grant Program. This grant program is part of New York City's 2010 Green Infrastructure Plan, an ambitious watershed based plan targeted at the reduction of combined sewer outfalls to our surrounding water bodies through the implementation of green infrastructure (GI) projects on both public and private property.

The award was given to a collaborative proposal from the Institute's facilities team and the Graduate School of Architecture's Programs for Sustainable Planning & Development for the design and construction of two GI projects on the Institute's main Brooklyn campus. The awarded projects, a 5,600 sq. ft green roof on our North Hall building and the green retrofit of a 37,000 sq ft campus parking lot were designed by Pratt faculty, staff and students. Together the projects will divert stormwater from the City's overtaxed sewer system, enhance biodiversity and serve as demonstration projects for local job training programs.

Most importantly, we hope the projects will "make visible" the many benefits of green infrastructure and the connection between land use practices and surrounding water body quality. With our series of community workshops we aim to ensure that all members of the Pratt community have an opportunity to learn of these exciting projects and understand their benefits. We hope to continue our tradition of education through innovation, technology and the arts while we turn our lens on making visible the benefits of GI.

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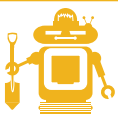
PARTICIPANT LIST

Chris Hamby

Merve Poyraz

Zach Poff

Yair Wolf

Klio Mandalou

Mayank Teotia

Leonel Lima Ponce

Serena Cangiano

Andreas Theodoridis

Thomas Mutell

Caryn Burstein

Garden Gadgets Workshop
by Evren Uzer

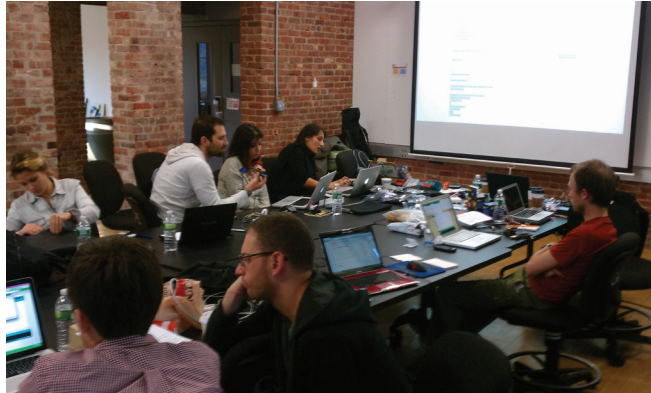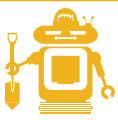As part of the ongoing maintenance and monitoring research of Pratt Institute's NYC DEP Green Infrastructure Grant projects, the PSPD created a series of Design and Technology workshops aimed at making the many benefits of green infrastructure visible. The many local benefits of green infrastructure and its role in the broader context of regional water quality are often times invisible to the passerby. Through the application of design and technology in a workshop to working group model, we hope to make the invisible visible.

Garden Gadgets was the first of six in this workshop series, and was realized September 24th 2012 at Pratt Institute's School of Architecture.

Garden Gadgets was led by David Cuartielles, an interaction designer and facilitated by Evren Uzer (Pratt PSPD). There were 11 participants including students from the Programs for Sustainable Planning & Development (PSPD), Graduate Architecture and Urban Design (GAUD) and invited guests. All but one participant had no prior electronics knowledge.

Workshop day began with a basic introduction to electronics accompanied by

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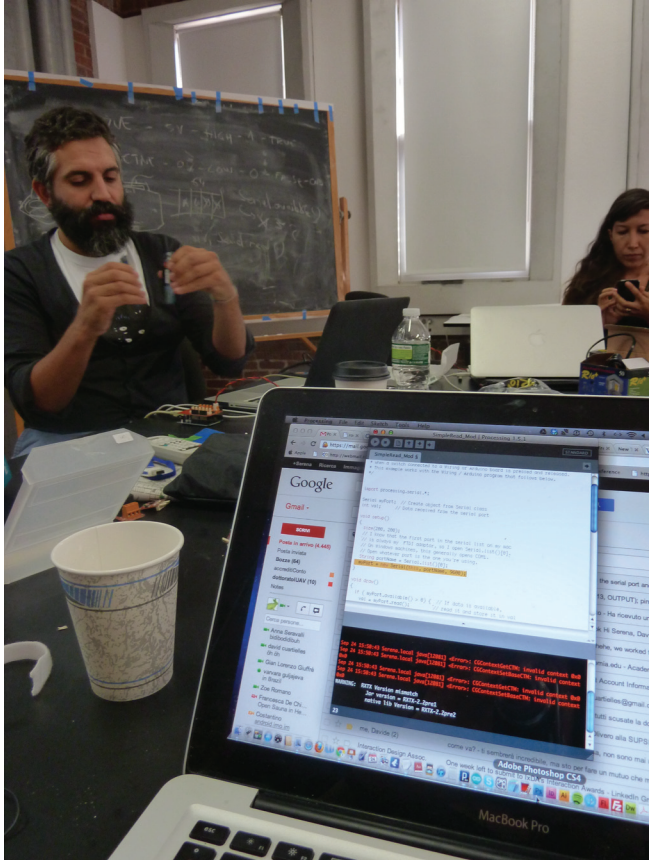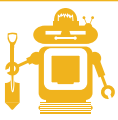
different experiments ranging from easy to more complicated. The goal was to build a base of skills that would eventually lead participants to the creation of a DIY environmental monitoring gadget.

David, after introducing the internet of things [1] and the basics of electronics, used Processing software to teach how to visualize certain geometric forms and make them interactive. He then guided the participants through digital input, output and analog input exercises, using Arduino [2] boards and sensors coupled with Processing platform. These basic exercises included blinking LEDs, connecting visuals made in the Processing [3] software environment with push-buttons and different sensors (temperature, infrared, etc.).

As a part of the afternoon exercises participants tinkered on GPRS/GSM [4] Shield, together with sim cards, which give the system a phone's SMS capabilities. After some tryouts of sending and retrieving text from the Arduino boards, participants began their final exercise on DIY monitoring. This exercise included texting to a submersible water pump to make it
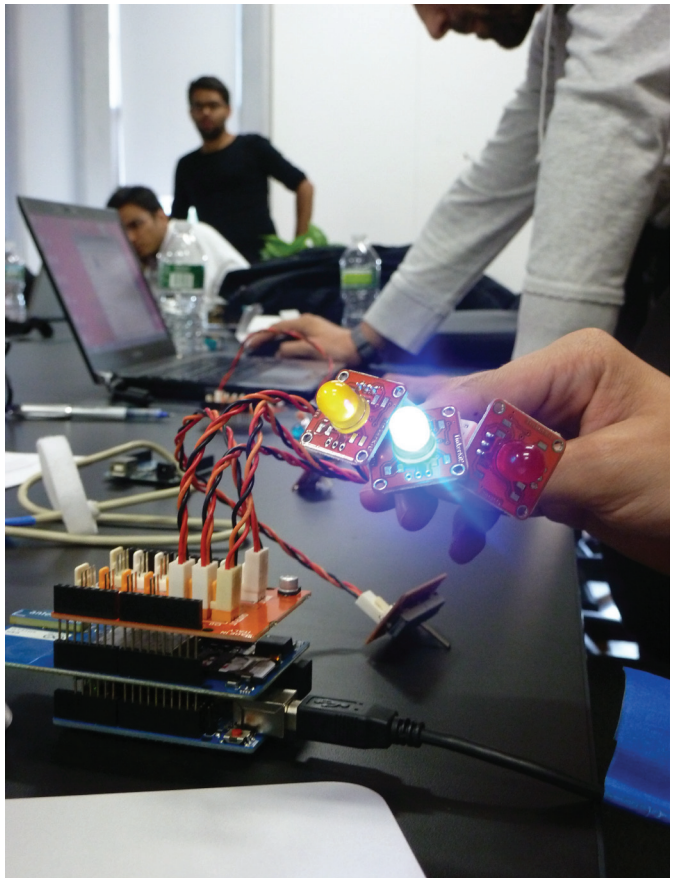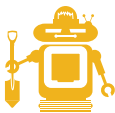
pump water for a certain period of time, when complete the pump reported back via SMS. For many of our participants, the day ended with this exercise. However, along with the Green Infrastructure Fellows, some of the participants formed a working group. Using this workshop to working group model, participants will continue to develop a DIY environmental monitoring system to be integrated into the monitoring program of Pratt Institute's North Hall rooftop garden. Our aim is to combine humidity sensors into water pump and as the readings of soil moisture fall under a certain level, system will send SMS to subscribers a message such as "Water me, I'm thirsty" and the first respondent will activate the water pumps. Making the maintenance a collaborative act. Our hope is this system will make the rooftop garden and its components more visible to a wider audience.

1. Internet of things refers to interconnectedness of uniquely identifiable devices (things).
2. Arduino is an open-source electronic prototyping platform allowing the creation of interactive objects. http://arduino.cc .
3. Processing is an open-source programming language for visually developing ideas in an electronic sketchbook. http://www.processing.org
4. GPRS/GSM Shield provides a way to use the GSM cell phone network to send/retrieve data from a remote location. We have used a shield produced by Arduino and unlocked sim-cards from T-Mobile at Garden Gadgets workshop since they were compatible.

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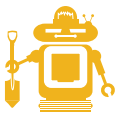
From Hydroponics to Connected Gardens: Arduino has Green Fingers
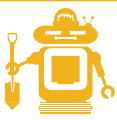by David Cuartielles

One of the first application fields someone imagined for Arduino was hydroponics. It was during one of the first Arduino workshops ever conducted, in Madrid, Spain, and a member of the Cielito Lindo hackerspace told me about his indoor garden and how much work it represented to take care of it, because as you know, a failure in the way the plants get nutrients or water leads to rapid plant death.

This might sound like I am trying to make fun of the whole story, but indoor hydroponics are legal in many countries, Spain is one of those. What fascinated me at the very moment they introduced this concept to me is that it could be applied at some other places where it could represent providing a family with food or a whole village with work at a remote location.

It was 2005, late October, and the idea of a remote controlled garden started to resonate in my head, but I didn't really do anything about it.

Some years later, coming from ITP [1] at New York University, the Botanicalls [2] project made it to the news. This Arduino derivative board would connect to the internet to inform you via email and the rest of the world via Twitter, that a plant which soil's moisture was being analyzed by the microcontroller, would go dry if you

didn't provide it some water. To me this project was not to be taken seriously, it was more of a comment to society and how dependent we are becoming in using communication. I have been into technology my whole life, I worked at 3 different corporations, 2 universities, and had a bunch of customers as a freelance consultant. I have met a whole lot of engineers and I have to admit there was a time that like all the other engineers one of my hottest geek-dream was to control the coffee machine remotely, but forgetting about the fact that someone needs to put new coffee beans in it, and that someone has to clean the filter. Botanicalls represents that same level of naivety, telling us that the plants need water in a public way through the internet is just making us look lame in front of people that really care about plants. It is a little like getting your kid to embarrass you in front of others when telling aloud whatever private family matter he overheard. It cannot be taken as serious, but it is a sign of what technology could become if not used the proper way.

Usman Haque, one of the founders of the now-sold-for-a-pile-of-cash Pachube [3], one of the first public data gathering backbones, explored the idea of the interconnection of gardens in a slightly different way. He thought it would be interesting to let people share the electricity they could generate because of the CO_2 their house plants were recycling every day. His project, called Natural Fuse, was looking into ways how plants would become the fuse for our electricity network. Imagine a different world in the future where you are allowed to consume only the electricity you regenerate by some other means. Your plant would be a fuse that you would eventually burn because of it not capable of recycling as much CO_2 as your own electricity consumption would generate. You could also decide to configure your plant in the Selfless mode, in which your plant gives electricity back to the system but you could also burn your plant if someone was taking too much electricity from you.

Technically this system was implemented by remotely controlling a plant through the internet. The plant is meant to regenerate enough electricity to allow the use of

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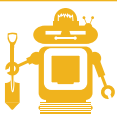
a small home appliance for a limited amount of time each day. Examples are: a small lamp, a fan, etc. The plant would have two different liquid containers to feed it: one would contain water, while the other included some vinegar in the mix, which if delivered, would kill the plant. In this way, the connected plant would be fed with a substance that would kill it if the system was configured in a certain way and the electricity demand was too high. Natural Fuse is a much more clear critique to our current social structures, than Botanicalls is. At the same time it presents a different type of conflict and brings the idea of plants talking to plants as well as plants as interface... or more precisely as human computer interface. The plants become our entrance to a network, their life and death represents our way of abusing that network and its resources.

Connecting plants and gardens seems almost like a frivolity, but it is not. Connectivity is a way of allowing scaling at locations where space is scarce. There is limited space in cities, at the same time there is little usable space in deserted areas. Connected gardens can be a way to allow scaling at a minimal expense. Getting sensors to talk to other sensors and to report back and let us know that our tiny carrot plantation is doing fine will allow us time to take care of the tomatoes or plan to spend our time doing something else.
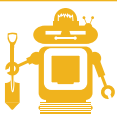
As it turns out, having the chance to plan our time is a human right. Helping people minimize the impact of their work on their personal time allows them to experience that right. This is one of those cases when technology does actually make sense.

1. ITP is a program at Tisch School of the Arts, NYU Interactive Telecommunications Program.
2. Botanicalls is a system that allows thirsty plants to reach out for human help (by sending SMS), originally created in 2006 at ITP in New York City.http://www.botanicalls.com/
3. Pachube, now Cosm, is a secure, scalable platform that connects devices and products with applications to provide real-time control and data storage. Using Cosm's open API, individuals and companies can create new devices, develop prototypes, and bring products to market in volume. Cosm offers a way to launch internet enabled products without having to build any backend infrastructure. As a LogMeIn company, our platform runs within LogMeIn datacenters, providing world-class security and reliability." https://cosm.com

Do it Yourself Environmental Monitoring
by Ross Diamond (Pratt Institute Green Infrastructure Fellow)

Environmental monitoring has traditionally been practiced by trained professionals and research scientists. However, innovations in sensor technology have decreased the sizes and costs of equipment, creating opportunities for do-it-yourselfers and tinkerers to take environmental monitoring into their own hands and homes. This accessibility to the equipment and the proliferation of wireless and mobile technologies has opened the door for a real time network of localized, open source environmental monitoring. Some of the environmental conditions currently being monitored in such an open source way include; air pollution, water quality, toxicity, light, noise, and evapotranspiration.

At Pratt, we plan to tie into this network by using our new green infrastructure projects (a 5,600 sq.ft. green roof on North Hall and a retrofit of the parking lot at Dekalb & Classon avenues) as models and community hubs for environmental monitoring. The Garden Gadgets workshop was step one in this process. The North Hall Green Roof will use its own weather station and will communicate the performance of the roof as water detaining infrastructure but will also communicate the co-benefits of a green roof, including; the reduction of urban heat island effect, filtration of particulates from the air and the creation of habitat for birds and insects. .

Some of the monitoring equipment deployed will be professional in nature and will contribute to a city-wide database of green roof performance. However, through continued development of our Design & Technology workshops we hope to generate a culture and collection of community generated environmental monitoring systems.   By taking environmental monitoring into our schools, churches and businesses, we can enable the communication of localized needs without relying on government agencies for environmental data, and ultimately connect people with the cities they live in.

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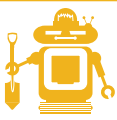
A workshop Participant's View
by Merve Poyraz (Pratt GAUD - student)

Garden Gadgets workshop which I participated in was a chance to understand the basic steps of how I can use scripting and arduino boards as an interactive component of an action. It was really useful for me to figure out how the system works. It is also a huge inspiration to a designer. As we think about future scenarios of architecture, I believe 'change' is the keyword for how architecture will react to new life styles.

"Life is where the subject and the object touch to each other." says Goethe, the German philosopher. Since the beginning of my architectural education, I have always considered the meaning of "merging" these two terms into life as well as in art and architectural science. For a long time, I found my attention focusing on space as a moving and kinetic experiment, focusing on the production of progressive and situational instead of static and permanent. With a world that is rapidly entering an informational era, why would we not create objects for which all parameters are changeable? Isn't it possible to design something/object responding to its user/subject? Today, new design technologies can shape the future design practice. Moving towards this information era, as architects our responsibility is to adapt our approach to design according to the new technologies. While adapting, these kind of experiments and workshops are the baby steps of the way to interactive architecture. If we can understand the concept in a smaller scale it can be adapted to different scales. Furthermore we can use these tools as an active component of design.

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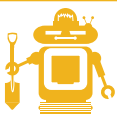
Bird Facts to Inspire Monitoring Gadgets
by Green Infrastructure Fellow Ross Diamond

Identification:
Bird calls and sight of birds are the most common methods for identifying birds. During migration, many species fly during the nighttime. On evenings that are clear with good moon-light, experienced birders can get figures for some species based on silhouette alone.

Food:
Foraging – each species has its preferences for what it eats, and how it eats it. This is dependent on what can be found and where. A more diverse habitat will lead to more diversity in its inhabitants, and likewise what visits the area to forage will then also be more diverse.

Some birds are insectivorous and eat chiefly insects, some are frugivorious and eat fruit. Some are opportunists that eat just about everything.

Passing by urban areas:
Time of year – NYC doesn't have all that many resident birds but does have over 300 species that migrate through it during the spring and fall.

Migratory birds have, almost across the board, experienced population decline. The chief reason for this is habitat loss in Central/South America but also habitat loss in North America.
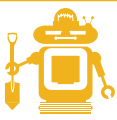
Other facts:
Some factors that can affect the biodiversity that uses a space are: moisture, temperature, canopy height, shelters, structural diversity, topography, and wind.

Birds have ecosystem services, chiefly endozoochory, ie the dispersal of seeds through digestion.

There is research that indicates many bird species can visually sense ultraviolet light.

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References for DIY Environmental Monitoring and Arduino

Arduino website http://arduino.cc
(Arduino software, exercises and other useful information related to Arduino)

The software needed to run electronic projects with
Arduino http://arduino.cc/en/Main/Software

The software needed to make data representation using a
computer: http://processing.org

Existing DIY environmental monitoring projects

> Botanicalls: http://www.botanicalls.com/

> Weather Station Receiver
> http://www.practicalarduino.com/projects/weather-station-receiver

> Yet Another Weather Station
> http://hackaday.com/2011/11/30/arduino-weather-station-to-internet-bridge/

> Garduino
> http://www.instructables.com/id/Garduino-Gardening-Arduino/
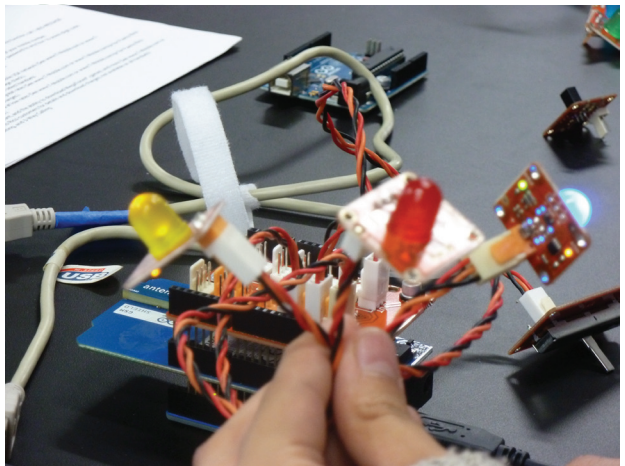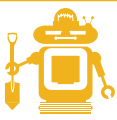
Books,
Emily Gertz and Patric Di Justo, 2012, Environmental Monitoring with Arduino: Building Simple Devices to Collect Data About the World Around Us, Maker Press.

Joshua Noble, 2009, Programming Interactivity: A Designer's Guide to Processing, Arduino, and Openframeworks, O'Reilly Publications
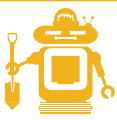
Green Infrastructure Fellowship
by Green Infrastructure Fellow Leonel Lima Ponce

Funded by the 2012 NYC Department of Environmental Protection Green Infrastructure Grant program, Pratt Institute has embarked upon several initiatives to make the many benefits of green infrastructure more visible. Our initiatives have come to fruition under the leadership of our Green Infrastructure Fellows. The fellows, three competitively selected PSPD students each semester, form a support system for the NYC DEPGrant initiatives, ensuring continued PSPD student body participation in the North Hall green roof and Cannoneer Court parking lot projects. In the first, design semester of each site, Fellows have been tasked with creating maintenance, environmental monitoring, and community outreach plans that go above and beyond the requirements of DEP's program. Each of the three Fellows have been tasked with a specific topic; Leonel Lima Ponce is devising a maintenance plan, Ross Diamond is putting together an environmental monitoring program, and Andreas Theodoridis is organizing Design and Technology Workshops geared at increasing community education and public awareness around green infrastructure. For the first three years of life of the constructed projects, Fellows will engage in hands-on maintenance and monitoring of each project, and continue to host community and student education events around green infrastructure. To ensure increased exposure within the PSPD's students, Fellows will rotate each semester, with interested students applying for a single term. After the first 3 years, a trained workforce from the Facilities Management office of Pratt Institute will take over maintenance duties, while Fellows will continue to monitor co-benefits of each project, and to serve as ambassadors of innovative green infrastructure and their benefits to the student body and surrounding communities.

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People
2012 Green Infrastructure Fellows

Ross Diamond began his career in wildlife biology and since pursuing a degree in environmental systems at Pratt, has strived to co-join the two disciplines. Green roofs have been the manifestation of these two interests, with a particular focus on biodiversity and providing habitat for neotropical migratory birds. Ross is currently working part time as an environmental compliance specialist and is a Fall 2012 Green Infrastructure Fellow at the Pratt Institute.

Leonel Lima Ponce is an architectural design professional from Rio de Janeiro, Brazil. A graduate of The University of Texas at Austin's School of Architecture and candidate for Pratt Institute's MS in Urban Environmental Systems Management, Leonel has worked at Mitchell Giurgola Architects, Brooklyn Greenroof, and Inhabitat, and entered design competitions with Architecture for Humanity and ARCHIVE Institute. He hopes to apply his experience in developing the design curriculum of Pratt's UESM degree and as a Green Infrastructure Fellow into implementation of equitable, sustainable infrastructures for New York City and his native Rio.

Andreas Theodoridis is a practicing architect and engineer. He is principal and founder of 207×207 architects , an Athens based design studio, having built several residences, office buildings, retail and entertainment facilities, outdoor spaces and prominent buildings, including the embassy of Kuwait in Greece. Theodoridis was a visiting critic at Columbia University's global networking program in Greece and is currently a candidate for the MS Sustainability Management Program at Pratt Institute in New York. His work has been published and exhibited in a number of venues including the Venice Bienalle and the Design Hub of Barcelona.
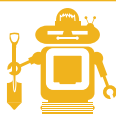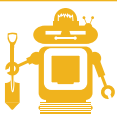
Organizers

David Cuartielles is head of the Prototyping Laboratory at K3, Malmö University in Sweden. Conducts his doctoral thesis analyzing the boundaries between technology, arts and society. Co-founder of Arduino, an open-source electronics prototyping platform and involved in Living Lab Fabriken. David also runs the 1scale1 prototyping studio, owns a toy making company, and does micro-company creation projects for the Spanish Agency of International Cooperation (AECID). He has been a guest researcher at Interaction Design Institute Ivrea and Samsung Art and Design Institute, and has curated part of Ars Electronica festival, dedicated to quick prototyping. Websites: http://david.cuartielles.com and http://www.arduino.cc

Jaime Stein directs the Urban Environmental Systems Management program at Pratt Institute, a Master of Science in sustainability studies with a curriculum at the nexus of environmental design, science and policy. Ms Stein has 12 years experience in advocating for sustainable communities, beginning as a Peace Corps volunteer in the West African nation of Burkina Faso and ranging as wide as solid waste management in biomedical research at The Wistar Institute of Philadelphia. After leaving Sustainable South Bronx as their Environmental Policy Analyst in 2011, Ms Stein has focused on revamping the Environmental Systems curriculum to train environmental professionals with a systems thinking approach to solid waste, energy and water quality management. Her recent focus on water has lead to the creation of a professional certificate in Green Infrastructure at Pratt's Center for Continuing and Professional Studies and a 2012 NYC DEP Green Infrastructure grant award to the Institute.

Evren Uzer is an urban planner and currently Assistant Professor at Pratt Institute PSPD. She holds a PhD in Urban and Regional Planning on disaster risk at historical urban areas. She has socially engaged art practice at art collective roomservices (www.roomservices.org) and works on projects and runs workshop on public participation and urban interventions via Istanbul based group imkanmekan (www.imkanmekan.org). She has previously worked as a lecturer at Creative Technologies BSc in Auckland University of Technology in New Zealand, Bergen School of Architecture in Norway and at Istanbul Technical University in Turkey.

SECOND DESIGN AND TECHNOLOGY WORKSHOP
D.I.Y. Aerial Imaging and "Map Knitting"

October 25th , 2012
will be led by Liz Barry,
The Public Laboratory for Open Technology and Science (PLOTS)

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