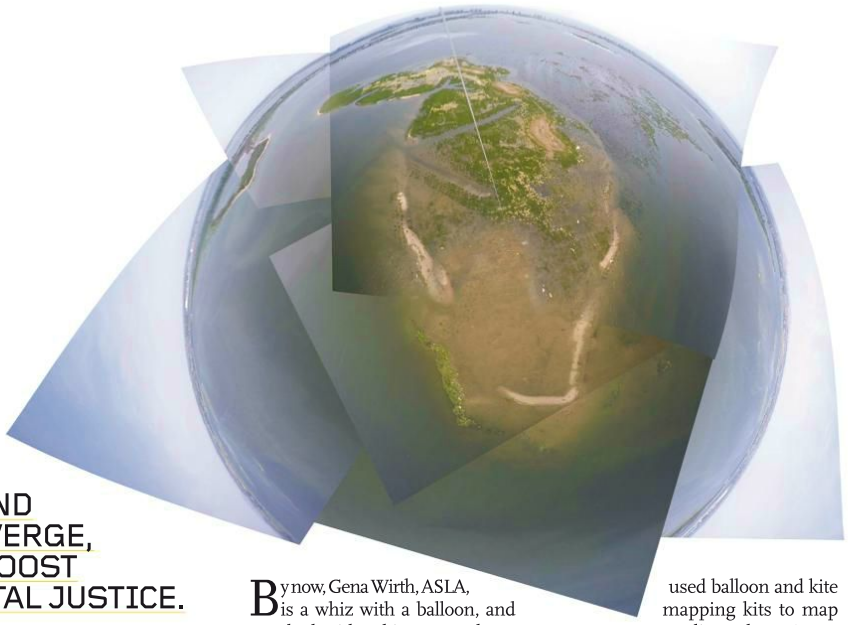
OPEN INVITATION



WHEN DIY CULTURE, OPEN-SOURCE TECH, AND CITIZEN SCIENCE CONVERGE, COMMUNITIES GET A BOOST TOWARD ENVIRONMENTAL JUSTICE.

BY JENNIFER REUT

By now, Gena Wirth, ASLA, is a whiz with a balloon, and not bad with a kite. Over the past few years, Wirth, who is the design principal at SCAPE Landscape Architecture and a member of the Dredge Research Collaborative, has used balloon and kite mapping kits to map coastlines along Staten Island and Jamaica Bay, New York, and produced high-resolution images at a fraction of what more high-tech methods such as drones or small-plane photography cost. Wirth says the setup was "super low tech"—a balloon, a string, and a point-and-shoot camera and a soda bottle rig. Wirth and her colleagues at SCAPE mapped the coastline near Tottenville and Great Kills along Staten Island over the course of three hours. Once they stitched together the images they took, they had a high-resolution representation of the coastline, which they used for the Living Breakwaters project developed as part of the Rebuild by Design competition. It was cheap, relatively easy, and, if the photos on SCAPE's Facebook page are any indication, kind of fun. The kit they used came from Public Lab, which calls itself "a DIY environmental science community." It's a nonprofit founded on the idea that anyone with the right set of low- or no-cost tools can be a warrior for environmental justice.

DREDGE RESEARCH COLLABORATIVE AND PUBLIC LAB

TOP
Tools from Public Lab helped create this composite image of Yellow Bar Island in Jamaica Bay, an island wetland restored with dredged material.

RIGHT
Gena Wirth, ASLA, and Dredge Research Collaborative interns use Public Lab's kite mapping kit in Jamaica Bay.

ABOVE AND BELOW
Emily Silber and Eymund Diegel work with the balloon mapping rig from Public Lab to document the coastline of Staten Island for SCAPE's Living Breakwaters project, below.

"IT'S A MISSING SCALE OF ENVIRONMENTAL DATA THAT HAS NOT BEEN COLLECTED ABOUT URBAN EVENTS BEFORE."

—LIZ BARRY

Public Lab isn't based in New Orleans, exactly, though it has staff there, but it can trace its mission to the region's particular confluence of energy, water, and land. Shannon Dosemagen is Public Lab's executive director and cofounder. She has a background in anthropology and nonprofit management and now multiple appointments in environmental leadership positions, including most recently as a fellow at the Berkman Klein Center for Internet & Society at Harvard University. She says that the Gulf region is a receptive one for "citizen science," the umbrella term for the work of nonscientists who collect data as volunteers, often in collaboration with professionals. "In the region generally, we have a really dynamic, amazing presence of people who are engaged both in organizations and as communities doing their own monitoring," she says. "We have so much oil and gas activity in Louisiana, there's always been an acknowledgment, especially by people living near refining facilities, that there isn't enough monitoring going on, so bringing in community environmental monitoring and community science practices to address those gaps and proactively work with agencies has been part of the culture of the region."

Public Lab arrived on the national stage after the BP oil spill (also known as the Deepwater Horizon oil spill) in April 2010, when a group of volunteers provided do-it-yourself balloon mapping kits to blindsided Gulf Coast residents to document the extent of the spill when authorities wouldn't permit aerial photography. The kits had been originally developed by Grassroots Mapping for a project in Lima, Peru, but when repurposed in the Gulf region, they allowed local residents to take up-to-the-minute pictures of the oil spill in real time and at close range. The images were digitally stitched together by volunteers who collaborated online and, as the only source of high-resolution, real-time images of the spill, they became something of a media sensation.

The success of that endeavor eventually produced the Public Laboratory for Open Technology and Science, or Public Lab. In the six years since the oil spill, Public Lab has

SCAPE LANDSCAPE ARCHITECTURE AND PUBLIC LAB

TOP LEFT
Public Lab's Shannon Dosemagen.

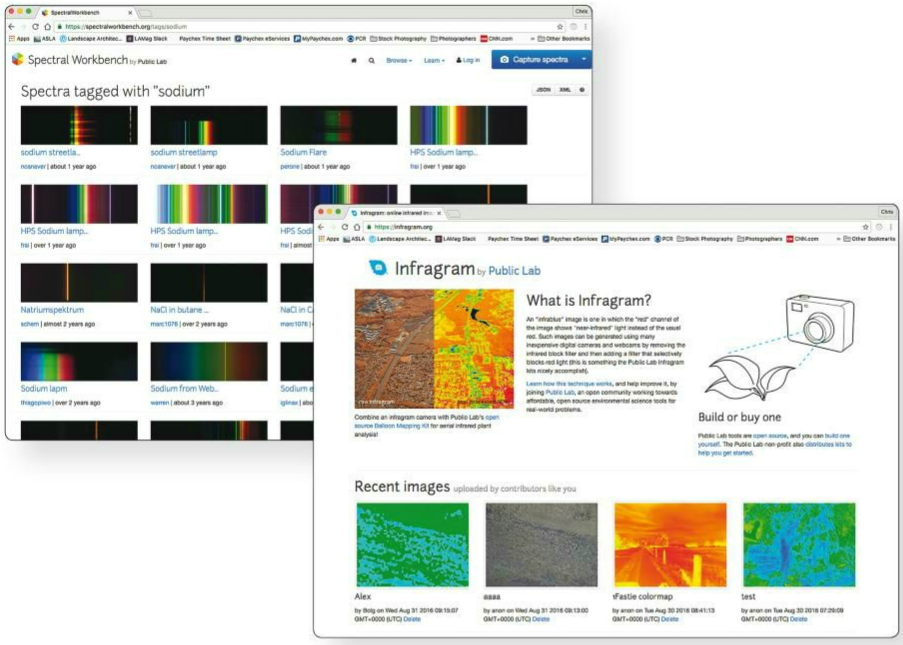
TOP RIGHT
Low-cost DIY tools like (1) the Desktop Spectrometry Kit, (2) Riffle, and (3) Balloon Mapping Kit are available through Public Lab.

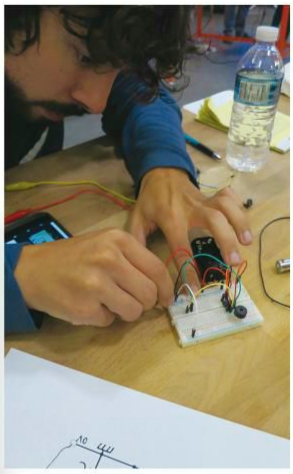
grown and expanded its scope, and the answer to the question, "What is Public Lab?" is that it's the kind of entity that could exist only now. On one hand, Public Lab is an organization with nine full-time staff distributed in various places. That staff provides support to people who see an environmental problem (contaminated water runoff, for example) or identify a question (where is that coming from, and what's in there?) in the places they live but don't have the money, expertise, or social or political capital to get answers. Public Lab also sells kits from its online store with the tech tools people can use to do the environmental testing and get answers to their questions. These include balloon mapping kits but also devices that can provide baseline data about water quality, air quality, plant health, and changes in the landscape. This is the offline Public Lab.

Public Lab is also, and perhaps most of all, a community of volunteer collaborators—professional and amateur scientists, technologists, makers, advocates, and plenty of intrepid citizens—that does the work of collecting, observing, and interpreting the data that communities need. Scattered around the world but connected through various digital channels, Public Lab collaborators discuss, share data, and help each other figure out how to do the research they need to do, almost entirely through online platforms. They do this networking through Public Lab's Wiki *(publiclab.org/wiki*, a website that users co-create and edit), which anyone can join, upload to, edit, and comment within, as well as discussion lists, place-based chapters, and a monthly "open hour" on Google Hangouts where people talk about a particular topic. Together they form a network of shared work spaces that are central to Public Lab's efforts. Software and hardware are open source, meant to be adapted, changed, and improved, and nothing is owned, but there is an operating ethic within the Public Lab community to share back whatever you learn.

With this dispersed, volunteer-driven model, Public Lab has been able to turn around the traditional notion of citizen science, working with a model of community-led, rather than scientist-led, research. In that way, it is different from many nonprofits that may be hired by public agencies or developers to do community engagement for environmental problems. Individuals or groups approach Public Lab with a question about their environments, and then Public Lab tries to figure out what that community needs or wants to know. For example, in New Orleans, where flooding is common and not just a crisis event, a flood-sensing project is just getting under way. "Every drop of water that falls in the city has to be pumped out, so you can imagine the stress that falls on the infrastructure," says Stevie Lewis, Public Lab's outreach manager. "We know flooding happens within the city—everyone knows that—so how do we put data and words behind what we're talking about so we can advocate for what we want to see?" she says. The flood-sensing project began with trying to figure out where flooding happens and for

COURTESY NATE DAPPEN/CROWD & CLOUD. CROWDANDCLOUD.ORG. LEFT; COURTESY PUBLIC LAB. RIGHT





COURTESY PUBLIC LAB

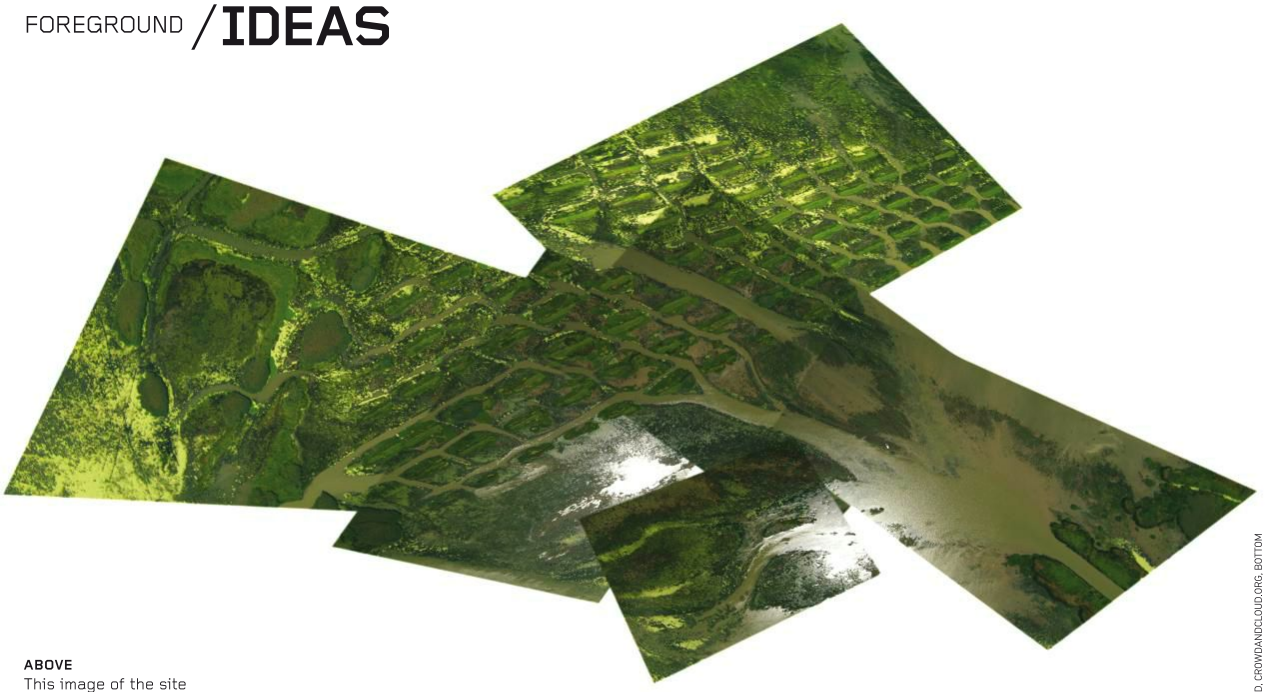
TOP LEFT
Public Lab's website hosts work spaces for uploading and analyzing data.

TOP RIGHT
Assembling a Coqui, a device available through Public Lab that senses water conductivity.

how long and looking at what plans were already in place. That process has led to other questions about the efficacy of the city's drainage systems and the accuracy of the city's models and programs to manage water. Then, Lewis says, it's a matter of figuring out "What are the things we want to know, and how do we collect that information?"

Lewis is the point person at Public Lab for the flood-sensing project, and though they've had a few workshops and hackathons and begun looking at the public agencies' plans, she says it's still too early to tell where the project will go. A new DIY tool could be developed, or an existing Public Lab tool such as the Coqui (a Public Lab device that measures conductivity, temperature, and ambient light) might be adapted. Because water is a conductor of electricity, she says, it could be as simple as placing a sensor that alerts people to when water has risen high enough under a bridge to make a circuit, or something more complex. It's the opposite of the ambitious scale of some urban data gathering such as Google's Sidewalk Labs, but arguably more nimble in its potential to improve urban life.

Grassroots organizations like Public Lab are not new. "There's a long history of communities looking at intractable problems where they might not even clearly understand what's driving them," says Liz Barry, the New York-based director of community development for Public Lab. What is new, Barry says, are the "21st-century modes of Internet-mediated common space and peer-to-peer production"—the virtual lab spaces for tinkering with data sets. Fusing these new modes of communicating and working with more traditional grassroots environmental advocacy is one of the things that sets Public Lab apart in the world of environmental justice. Barry, who trained as a landscape architect, with a BLA from North Carolina State and a master's degree in urban planning from Columbia University, says she was "always interested in participatory urban environments," but it wasn't until after the recent recession that the possibilities changed as to what environmental advocacy could be. She says that there was more consumer technology and more tools for collaboration online. There was an opportunity in the open hardware and software movement to make tools available, and together they brought the potential to lower research costs to where ordinary people could do scientific testing and environmental monitoring that would be accepted



ABOVE
This image of the site of a federal ecological restoration project in Plaquemines Parish, Louisiana, shows vegetation emerging in places where sediment has been collecting. The lattice figure in the landscape is a series of terraces that are part of the restoration program.

BELOW
Jeff Warren, Scott Eustis, and Stevie Lewis.

in the policy community. In addition, the data that could be collected by individuals working in their neighborhoods offered a different view—more incremental and better able to capture change. "It's a missing scale of environmental data that has not been collected about urban events before. This kind of high-resolution spatial and temporal data is unique. Government agencies don't collect at this scale," Barry says. The downside, Dosemagen says, is that although community-centered research may cost less money, it takes more time, which raises the question of, "Do people have the time resources to do this?" she says.

In the long aftermath of Hurricane Katrina and the BP oil spill along the Gulf Coast, cycles of flooding and land loss continue. On the Bayou Plaquemine, Scott Eustis, a coastal wetland specialist for the Gulf Restoration Network (a monitoring group and one of Public Lab's many partners) and an active Public Lab volunteer organizer, is seeing another phenomenon: While much of the Gulf Coast is being washed away, Plaquemines Parish is making land. "The river has actually started carving a new channel to the east, and it's started building land on its own," Eustis says. "Because this is a natural phenomenon, no public agency has the mandate to record it. We've been out there and been able to record the new land that the river is building on the east bank of Plaquemines Parish. So that's exciting."

Ostensibly, land making along the Gulf is a good thing, Eustis says, but not everyone wants new land, or at least, wants the same kind of new land. Fishing and energy industries, public agencies, and restoration advocates all have a stake in the mix of sediment, vegetation, salt, and fresh water, and those stakes can overlap as easily as they can conflict. The complexity of this cultural, economic, and ecological mix means that restoration has to be highly sensitive to place, balancing the often conflicting needs of people, industry, and ecology, and that's why accurate documentation is key. The pictures that Eustis, along with students from Tulane University and the assistant professor of photography Annie-Laurie Erickson, made using Public Lab's balloon mapping kit "speak the language of government agencies," so they can be used to document what has otherwise been invisible. "We're excited about the new land, and we at least want it to be in that conversation between the government, the oil and gas industry, and the oysterman," Eustis says. ●

SCOTT EUSTIS, STEVIE LEWIS, AND ARCHITECTURE STUDENTS AT WASHINGTON UNIVERSITY IN ST. LOUIS. TOP: COURTESY NATE DAPPEN/CROWD & CLOUD, CROWDANDCLOUD.ORG. BOTTOM