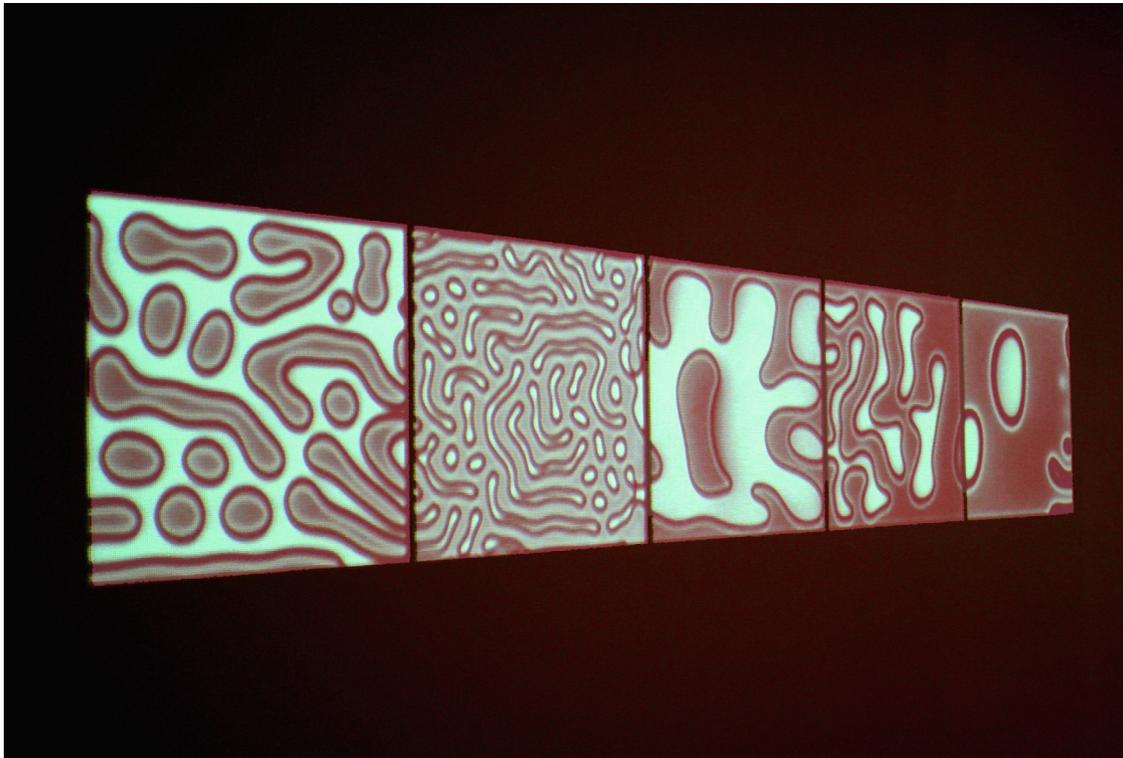


ON TOPIC

A MARRIAGE MADE IN THE LAB: *The Science Side of Science-Art Collaborations*



Drift by Brian Knep (2004). Digital video projection.

By Ashley P. Taylor
Managing Editor

In 2006, biologist Natalie Andrew was trying to decide between postdoctoral positions in Cambridge, in the UK, and at Harvard Medical School, in Boston. One of Andrew's interests is reaction-diffusion, a process by which chemicals spread and react with one another to produce diverse complex patterns. In biology, reaction-diffusion models can be used to explain the developmental patterning of vertebrate embryos, stripes on zebras and zebrafish, spiraling movements of social amoeba communities, and more. When Andrew walked into the Department of Systems Biology at Harvard, the first thing that caught her attention, she told me via Skype, was a piece of art on the wall. But it was a very particular kind of art, one that related to her field: "There on the wall was something very clearly a reaction-diffusion system," she recalled. Andrew had three responses to the artwork, she told me: first, "This is really cool, it's reaction-diffusion," second, "They've got it in artwork," and third, "It's in a science department." Andrew concluded that, "these people are open to something very cool," and joined the lab. The enticing artwork, a non-repeating video installation indeed based on reaction-diffusion, was part of the "Drift" series (2004-2010). Its artist, Brian Knep, was Harvard Medical School's first artist-in-residence.

These days, science-art collaborations are everywhere you look. They can take many forms, but a good general description of a science-art collaboration is that artists visit scientists' labs, learn about their research, and then return to the studio to make art. Knep, for example, created at least three different artworks while at Harvard, which involved laboratory frogs, roundworms, and humans, along with computer programming. A scientist's role in the collaboration, on the other hand, is generally to discuss their work with artists. When the work involves lab animals and materials, as Knep's did, the scientists may also have a hand in the art making. The benefit to artists of these collaborations is tangible; science often inspires new works. What do scientists gain from science-art collaborations? Though mostly intangible, those benefits can be of great value, scientists say. We at SAiA strongly support these collaborations; we cannot be fully objective toward them. Yet even we have trouble answering the question of how scientists benefit, so we set out to find some specific answers.

THE ART SIDE OF SOME COLLABORATIONS

Many science-art collaborations exist nationwide. Artists-in-residence are working with scientists at institutions from MIT, Harvard, and the Broad Institute, in Cambridge; to Carnegie Mellon, in Pittsburgh; to the SETI Institute, in Mountain View. UCLA's ArtSci Center promotes collaborations between artists and nanoscientists. Here in New York, Columbia University is home both to CUriosity³, the lecture series about the intersection of art and science, and to Positive Feedback, an effort organized by Columbia's Earth Institute, which brings artists and scientists together to consider climate change. Brooklyn's Pioneer Works offers residencies to both scientists and artists. New York City's Ligo Project facilitates interactions between scientists and non-scientists, and they recently held a gallery night featuring the artworks inspired by six scientist-artist collaborations, a project they called "Art of Science." Here's a closer look at a few of those collaborations.

For The Ligo Project's Art of Science residency program, the Ligo Project recruited six artists and four scientists, stipulated that they should meet at least four times over six months, documented their meetings on video, and organized a show, the "Art of Science Gallery Night,"

as a culmination of the work. Steve Franks, a biology professor at Fordham University, collaborated with two different artists: Gustavo Asto and Caroline Marshall Hill (c.hill). Both artists visited the lab, and attended a lab meeting. Hill and Franks took two "field trips," Franks said, to the American Museum of Natural History and to the New York Botanical Garden.

Working with artists gave Franks an appreciation of "how what you do is interpreted by other people... [I] learned that they really are interested in the most broad concepts." Artist collaborator c.hill, interested in the ecological idea of interconnectedness, created a wall hanging of metro cards connected by telephone wires, each card painted with a cyborg creature, such as an alligator-cello. Asto created a collage of National Geographic clippings that represented Franks' daughter, Nina, in the foliage of her favorite park. The artworks related abstractly to the science in question; an uninitiated viewer would not necessarily guess that they had anything to do with ecology.

Rebecca Ward, executive director of the Department of Systems Biology at Harvard Medical School, happened to be exploring the arts district in Boston a few years ago, she told me, when she walked into the studio of the aforementioned Brian Knep, a digital artist with a background in computer programming who has done computer animation work for films. (Knep was featured in our October 2013 issue). There, she saw an artwork on the floor, like a red and green carpet, that would develop a "wound" when a person walked over it. Like Andrew when she saw *Drift* on the wall, Ward had a moment of recognition. She and Knep started talking, and Ward learned that "the equations used to set this up were derived to talk about biological phenomena." In short, "this guy is making art out of systems biology."

At Ward's invitation, Knep started going to the department to give talks, Ward said. He started spending more and more time there. Ward isn't sure who initiated the collaboration—Knep or the department—but it slowly took form. "He can talk to us in languages we can understand but also takes a very different perspective on things we want to understand," said Ward.

While at Harvard, Knep made two series involving lab animals. In one, Knep took high-

resolution photos of developing frogs, which he cared for in the lab, and used them to create a cyclical video that documented the life of a laboratory frog from tadpole to adult and back again. “Traces/Worms” was a series of microscopic artworks for the millimeter-long nematode worms, *C. elegans*, to explore. One of them, *Namaste* (2009), featured images sent to space aboard the Pioneer Spacecraft; here, the images served as artistic ambassadors to the world of the very small. The sculptures were created using photolithography, a technique in which a design is etched, using light, into a master plate made of light-sensitive material and then serves as a mold for prints into plastic. In the lab, scientists use the technique to create microscopic plumbing systems for manipulating the environments of cultured cells; here, it was SciArtistic lithography akin to the printmaking techniques employed throughout art history.

Knep also created *Deep Wounds*, an installation in Harvard’s Memorial Hall, a grand edifice replete with towers and stained glass. Completed in 1878, Memorial Hall, was dedicated to the Harvard students who died fighting for the Union in the Civil War; there, the names of those student-soldiers are engraved on the walls. The Confederate veterans, on the other hand, were not mentioned, a controversial omission. *Deep Wounds* was a glowing projection on the floor. As people walked across it, the “skin” opened up to reveal a representation of the Harvard students who died fighting for the Confederacy. The rules for Memorial Hall prevented Knep from using Confederate students’ names, so he represented them using a relationship word, such as “father.”

“I’m English. The Civil War doesn’t have much personal resonance for me,” Ward commented, “yet the hair is standing up on my head as I think about it again.”

While at Harvard, Knep was instrumental in organizing an ongoing series of talks in the systems biology department by artists whose work relates to science. He also helped launch the Transit Gallery within Harvard Medical School. The collaboration lasted from around 2005-2010, Knep said, though it never officially ended.

In 2013, Australian artist Eleanor Gates-Stuart and scientists at The Commonwealth Scientific and Industrial Research Organisation [sic]

(CSIRO) collaborated on a series of art projects as part of the Canberra Centenary celebration, with support from the Centenary Art Science Commission. Several artworks resulted from the collaboration, including titanium weevils, the conception (though not execution) of a human bread sculpture, as well as an interactive sculpture consisting of globes projected with digital images, which are on display at CSIRO now. The theme was wheat, a historically important Australian crop, whose cultivation CSIRO research aims to improve. Though the project yielded many artworks, Gates-Stuart and collaborators assert, in a paper for the 2013 visualization conference, IEEE VIS, that the collaborations themselves were the true fruits of the project.

“People tend to judge the benefits of Science Art collaborations by their tangible outputs, such as artworks, visualizations, and other artefacts [sic] generally accessible to a wide audience. We argue that the process by which these artworks were created can be a significant, or even the principal benefit of these collaborations, even though it might be largely invisible to anyone other than the collaborators.”

ANSWERING THE BIG QUESTIONS

One of those benefits, say those involved, is the chance for scientists to think about their work from a different perspective. Ligo Project co-founder Shane Mayack thinks that it is useful for scientists to step back from their work:

“In my view scientists can benefit from science-art collaborations simply by taking some time to think about science and the work they do detached from the other goals they are usually focused on—ie. the sort of dogmatic view, if you will, of the science question(s) they are asking, getting the next grant, the next paper... All of above are important things, don’t get me wrong, but these questions driving the work perhaps shed a different perspective on the work than say the question ‘how do I communicate what I do to the general public’ and by extension perhaps pushes a scientist to think ‘how does/can my work benefit society.’ I think SciArt collaborations such as through Ligo Project Art of Science challenge scientists to do this whether it is via talking/working with an artist from our program or any non-scientist at our ‘Art of Science Gallery Nights’ and/or other Ligo Project events.”

“Stepping away from your science...can be a great way to break down mental barriers and to think about your question in a new way,” said Harvard’s Ward. “That might be a motivation for connecting art and science, because after all, artists have to break down barriers and think about [things] in a new way...and we can learn from them.”

Similarly, Maryam Zaringhalam, Rockefeller University Ph.D. student and ArtLab founder, said that talking with artists helps her think about the big questions at the root of her work. “Our job is to study a lot about very little. Day to day, there’s very little zooming out to get a broader perspective on our work. It’s only every two to three months that I talk about my work to someone who isn’t doing it.”

Talking with other scientists, who may be competitors, has limits, she pointed out. Scientist to scientist, “there’s a guard that goes up, because you don’t want to get scooped.” “Scooping” another scientist means publishing results of experiments similar or identical to theirs before they can publish them, either by chance or, sometimes, after finding out what another scientist is working on and copying the idea.

In addition to this competitive chill, there can be pressure to emphasize the practical applications of science to a degree that can feel artificial. Scientists often have to tailor their work to fit within the constraints of a particular grant, making explicit how their work will benefit society and human health to justify funding with taxpayer dollars. While Zaringhalam certainly cares about these concerns, they are not necessarily a primary impetus for her research. As there is “l’art pour l’art,” so there is science for science’s sake. “Down the line,” she said, “someone will find a use for [my work].” But the practical applications of her work are not what drive her, in part because it’s hard to predict what those applications might be.

If not the urge to cure cancer, then what does motivate scientists like Zaringhalam to get up and go to the lab every day? The answer is probably different for every person, but that is the kind of question that artists tend to get at, Zaringhalam said. “What an artist is asking,” she continued, “is why you personally care... [artists] ask you the hard questions, innocently.” Though it can be difficult to explain, it’s satisfy-

ing, she said, to “blurt it out and give birth to why you’re actually in this field.”

SPEED DATING: COLLABORATION IN MINIATURE

The challenge of articulating her work is one of the things that Zaringhalam likes about collaborating with artists. She was surprised, she told me, by how long it took her to explain her work, even to other scientists. Wouldn’t it be the ultimate challenge, she remembered thinking, to explain her work to someone in six minutes, as in speed dating? From that conversation, the story goes, the seed of SciArt speed dating was planted in her mind.

Her dream of getting scientists and artists to speed date materialized when Julia Buntaine, science-based artist and founder and editor-in-chief of this magazine, agreed to co-host the event. Buntaine and Zaringhalam signed up about 20 people and arranged to hold the event at The West, a bar and café in Brooklyn. The name of the event was Speed Date//Collaborate; the drink special was “SciArt on the Beach.” Despite the gimmicky speed date format and endless puns, the aim was not romance but professional/intellectual collaboration, Zaringhalam said.

Though it may come as a surprise, Speed Date//Collaborate was not the first SciArt speed dating event in New York. In fact, reporting this story, it was comical how something as seemingly esoteric as SciArt speed dating took on an element of “oh, that again.”

Speed dating for artists and climate scientists is one of the many interdisciplinary events organized by Positive Feedback, a joint effort that initially began at Columbia’s Earth Institute, New York University’s Center for Creative Research, and City University of New York’s Institute for Sustainable Cities and is now housed primarily at the Earth Institute. Positive Feedback has hosted four speed dating events since 2009. In Canada, Toronto’s York University hosted a science-art collaborative speed dating event in April 2009 (watch the event trailer [here](#)); also in Toronto, the interdisciplinary organization Subtle Technologies, “where art and science meet,” has had “Speed Networking” events for artists and scientists at its annual festival since 2011, according to artist Roberta Buiani, an adviser to the festival.



January 2014 Speed Date//Collaborate (SAiA).

In discussions of sci-art speed dating, everyone wants to know: does it work? Do collaborations form through speed dating? Positive Feedback surveyed participants after their most recent speed dating event this November, which was part of the Marfa Dialogues, a series of interdisciplinary events organized around the theme of climate change. Courtney St. John, one of Positive Feedback's co-organizers, reported: "58% of survey respondents said they planned to follow-up with 1-3 potential collaborators, while 29% of respondents said they planned to follow up with 4-7 potential collaborators."

Speed dating can be the beginning of collaboration. Yet Zaringhalam's original motivation for speed dating was to force herself to explain her work in under 10 minutes and to perform the mental distillation that such a brief explanation requires. That short conversation can also be an end in itself.

COMMUNICATING SCIENCE

It is obvious that Zaringhalam, who speaks with confidence, enthusiasm, and a smile, is passionate about science. Yet she feels that as a scientist and blogger, she's limited in her ability to communicate her passion. "The tools that

we have to communicate with are limited to things we can write down," said Zaringhalam. "Art has this way to reach a wide range of people and make them feel something in a way that a jargon-y paper or a talk at a conference that 50 people see can't."

As artists know particularly well, communication has many flavors. Zaringhalam finds that art is helpful in expressing feeling (and most people would probably agree with her about that). Artists can also help scientists convey information. SciArt can raise public awareness of research that otherwise might not reach beyond scientific circles.

Texas A&M University's Kathryn Shamberger, who studies coral reefs, collaborated with artist Joseph Ingoldsby through the Synergy project, which paired artists with scientists from Woods Hole Oceanographic Institution and MIT. Artworks from the Synergy Project collaborations were displayed at the Museum of Science in Boston last year. Ingoldsby created a photographic collage based on photos Shamberger, who was then at Woods Hole, provided. Of her research, Shamberger commented that it's "hard to communicate [my research] to someone who hasn't been on a coral reef." The artwork helped people see, and therefore better understand, what Shamberger studies and tries to protect.

"There's no value in discovery that no one knows about," the Ligo Project's Mayack says, "and working with an artist/through art is one way that allows them to communicate their discoveries to a broader non-science community."

In addition to conveying emotions and raising awareness of research in general, artists can also help scientists more effectively visualize their data. In a paper presented at the IEE VIS 2013, Francesca Samsel, a professor in the CyberShARE Center of Excellence Visualization Lab of University of Texas at El Paso, wrote that data visualizations "are tools for conveying

complex information in a comprehensible form. Alternatively, art presents layers of visual connections, analogies, and metaphors, asking the viewer to complete the picture. Unlike visualization, its intent is to raise questions rather than provide answers. The distinction is in the primary intent. Understanding the components of Art-Sci-Tech collaborations gives us the ability to choose when, where, and in what strength to apply the tools of each discipline. That said, all visualizations are a blend of disciplines. All lie in the spectrum between seeking answers and asking questions.”

When asked how working with artists via the Ligo Project had influenced his science, Franks answered that while it didn’t necessarily change the way he did science, it did help him think about the way he presents his work: “It makes you think more about the visual presentation of things. More of an aesthetic appreciation.”

All this doesn’t mean that SciArt is another form of PR. “Something I’ve struggled with,” Zaringhalam said, “is that I don’t think it’s necessarily good to make art in service of my science. I think it’s important that an artist feels inspired to make a work.” There’s a blurry line between art, scientific illustration, and data visualization. Artistic methods and creativity are involved in all these.

SO HOW DOES THIS HELP ME IN THE LAB?

The collaborations may help scientists communicate their work or see it differently. But do they actually help scientists do their research?

“Not very directly,” said Andrew, of the way working with Knep at Harvard influenced her own science. “I’m not sure it would be the same for everyone. I’ve always felt that artists and scientists are so similar in so many ways. That was illuminated. It pointed out that a lot of the things that we do are the same. It gave me permission to keep opening my mind to different ideas. Because Brian’s work was using these ideas to address more social things, less literal things, I started thinking of those things, too.” Franks and Shamberger had similar sentiments.

“Of course, we hope so,” Mayack commented, when asked if she believed that working with artists would help scientists in their research. “But, this is sort of hard to put an immediate metric around, I think, in science. Re-iterating some of the above, our goal is that in having

scientists think about their science in a different way (through sci-art collaboration and communicating more with non-scientists about their work) that this will over time perhaps add or shape a new perspective to their research.”

In a meta-twist, sci-art collaborations can sometimes help not only the collaborating scientists but also the project organizers. Sabine Marx, one of the founders of Positive Feedback at Columbia, is a social scientist who researches the way people make decisions, and in studying the way people respond to science-art collaboration, she has gained insight into her research questions. Marx explained to me that research suggests that experiences are more effective than reading in getting people to take action. “Our assumption is that art will trigger emotional responses,” Marx said. “Does that lead to behavior change?” Marx is trying to learn about how art, especially public art, influences people’s decision-making. For example, does a public installation about rising sea levels inspire people to reduce their carbon footprints or take other action in response to global warming? The science-art collaborations help their research because what they are researching is the way art affects people.

FRINGE BENEFITS

Andrew helped Knep with some of the photolithography work for his “Traces/Worms.” Though working with Knep did not necessarily change the way she did science, it did change her life in more ways than one. “One consequence [of the collaboration with Knep] was that I became an artist myself,” Andrew said. She now works part-time in a Harvard lab and spends the rest of her time making artworks, many of which relate to biology and science. Her current project involves growing a fairy ring of shaggy ink cap mushrooms on a bed of shredded scientific papers. Eventually, the ink from the mushrooms could then be used to pen future scientific ideas.

Andrew and Knep have been married for two years.

“I think the answer has to be yes,” Andrew answered, when asked, rather directly, if her marriage was one benefit of the science-art collaboration. “It didn’t happen overnight... We were friends for quite some time. He left. Then he came back.”