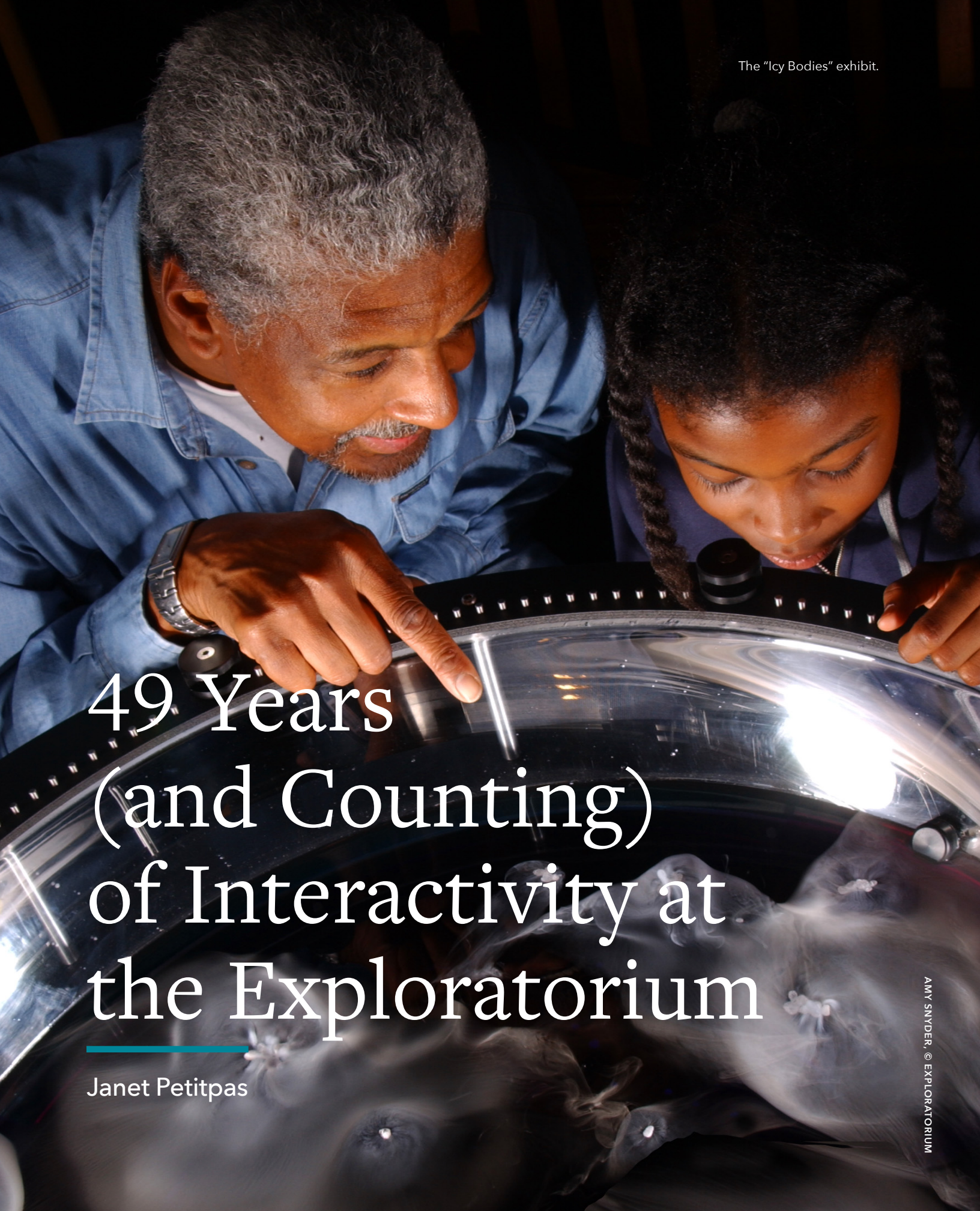

The "Icy Bodies" exhibit.

49 Years (and Counting) of Interactivity at the Exploratorium

Janet Petitpas

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Founded in San Francisco, California in 1969, the Exploratorium was one of a handful of museums at the forefront of the popularization of "interactive" exhibitions. Its work, and that of other nascent science and children's museums of the 1960s, would change the exhibition landscape and bring museum visitors new opportunities for deeper exploration and personal meaning-making.

What made up the foundations of interactivity as the Exploratorium was starting up in the late 1960s? How has the concept of interactivity changed over the years for the Exploratorium? What does the future of interactivity look like to current staff members? On the cusp of the institution's 50th birthday, staff has been reflecting on where we've been, what we've learned, where we think we are going, and examining what the role of interactivity is in exhibitions today. This article explores these questions, drawing on the Exploratorium's documented history and gathering information through interviews with long-term and new staff members in spring 2018.

The Early Years

The Exploratorium was founded in 1969 by Frank Oppenheimer (1912–1985), a high school and university physics teacher who had developed a "library of experiments" to illustrate physical properties.[1] His philosophy was that visitors should control content directly and that staff or volunteer "explainers" could help users understand what was happening. At the core of the experience would be intriguing phenomena in its raw form, which he believed would spark curiosity and motivate people to direct their own learning (fig. 1).

A year before founding the Exploratorium, Oppenheimer outlined his approach in "A Rationale for a Science Museum," an article that appeared in the journal *Curator*. In the article, he stated that most attempts at teaching science

> are at a disadvantage because they lack props; they require apparatus which people can see and handle and which display phenomena which people can turn on and off and vary at will. Explaining science and technology without props can resemble an attempt to tell what it is like to swim without ever letting a person near the water.[2]

A pioneer in hands-on exhibitry through the creation of experiments for high school science students, Oppenheimer succeeded in opening a museum that encouraged visitors to experiment and notice natural phenomena to learn science. He believed that "conveying to our visitors a sense that they can understand the things that are going on around them may be one of the more important things we do."[3]

Many of the elements that Oppenheimer felt were important for the process of exhibit development – as well as the final exhibit product – are ones that that staff members still strive to incorporate today. These include:

- authentic experiences
- an iterative creation process that incorporates visitor testing
- visitor-led, free choice experiences
- the phenomenon and/or experience at the center
- a commitment to simplicity
- inspiring civic engagement and empowerment

1 Joanne Cleaver, *Doing Children's Museums* (Charlotte, VT; Williamson Publishing Company 1992), 10.

2 Frank Oppenheimer, "A Rationale for a Science Museum," *Curator* 11, no. 3 (November 1968), 2.

3 Sally Duensing, "Science Centres and Exploratories: A Look at Active Participation," *Communicating Science to the Public*: CIBA Foundation Conference (Chichester: Wiley, 1987), 134.

NANCY RODGER, © EXPLORATORIUM

fig. 1.
Exploratorium founder Frank Oppenheimer.

While the Exploratorium was an early interactivity pioneer, in 1969 there were existing organizations and projects that inspired Oppenheimer's thinking. As Claire Pillsbury, a past exhibit developer and currently the Program Director, Osher Fellowships notes,

> you can read about Frank's influences in his essays. He was inspired by the Children's Gallery at the Science Museum in London, by the Elementary Science Study (1965, EDC) that showed how children's learning was enriched when they experimented directly with phenomena, and the Palais de la Decouverte in Paris, that had table-top experiment exhibits with young college students as facilitators.[4]

Frank Oppenheimer remained the executive director of the Exploratorium until his death in 1985. Since that time, the Exploratorium has been led by several influential executive directors, and, in 2013, relocated to Piers 15 and 17 in San Francisco (figs. 2 & 3).

To gather information about these interim years, current staff members (both new and long-standing) shared their thoughts about the factors and attributes that they believe have made Exploratorium exhibits some of the most interactive, influential, and copied exhibits found in science museums throughout the world.

Trends in Interactivity at the Exploratorium from 1985 to the Present

Under senior staff leadership in the 1990s, the Exploratorium formed a Visitor Research and Evaluation department staffed by evaluators Sue Allen (former Director of Visitor Research and Evaluation) and Joshua Gutwill (today Director of Visitor Research and Evaluation). They were charged with taking a deep look at interactivity and engagement to determine what qualities best encouraged engagement and how exhibits and experiences could be designed to incorporate those findings. "Our project was to figure out what the problem space of interactivity is. What are the boundaries and aspects? How do we design for interactivity? The question," said Gutwill in a March 19, 2018 interview, "doesn't have a final answer because there are always additional aspects we can think about exploring."

4 Claire Pillsbury, interview with author, March 5, 2018.

While the Exploratorium's Visitor Research and Evaluation department has completed hundreds of related studies,[5] Visitor Research and Evaluation staff report that two in particular are frequently asked about, referenced, and used by Exploratorium exhibit developers. These are the Active Prolonged Engagement (APE) Study, conducted in 2005,[6] and the Exhibit Designs for Girls Engagement (EDGE) Study of 2016, which looked at exhibit attributes that encourage deeper science engagement by girls without negative effects on boys.[7]

The APE study, funded by the National Science Foundation, noted a distinction between "planned discovery" exhibits and exhibits at which users experienced prolonged engagement. Both types of exhibits are successful in their own ways, illustrating that interactivity can come in many forms and incorporate different goals and strategies. As Joshua Gutwill explains,

> One of the big moves we made was to distinguish between initial engagement and prolonged engagement. These can conflict with each other. Everyone knows what to do with a push button so they will come right up and engage because the rules are clear. But strong initial engagement frequently discourages prolonged engagement. Initial engagement is at odds with open-ended, rich, prolonged engagement. We were up-front about this tension and tried to come up with design solutions to deal with this.

A surprising finding from the APE study was that interactivity for its own sake and not in service of the exhibit experience can be problematic. In 2004, Sue Allen and Joshua Gutwill articulated early findings on this topic in an article in Curator titled "Designing With Multiple Interactives: Five Common Pitfalls," which points out that multiple interactive features can overwhelm visitors and that interactivity can disrupt the phenomenon being displayed.[8] In other words,

5 Studies can be accessed at: www.exploratorium.edu/education/visitor-research/reports.

6 APE study information can be accessed at: www.exploratorium.edu/vre/ape/ape_intro.html.

7 The EDGE study can be accessed at: www.exploratorium.edu/education/research-evaluation/edge.

8 Sue Allen and Joshua Gutwill, "Designing With Multiple Interactives: Five Common Pitfalls" *Curator* (April 2004), 201, 204.

fig. 2. The Exploratorium on Piers 15 and 17, San Francisco.

GAIL LAIRD, EXPLORATORIUM

GAIL LAIRD, EXPLORATORIUM

fig. 3. A view inside the Exploratorium.

ESTHER KUTNICK, © EXPLORATORIUM

fig. 4. The "Heat Camera" exhibit.

not all interactivity is helpful or needed and can, in fact, detract from the success of an exhibit.

One of the exhibits the study explored was the "Heat Camera," which provides a seating area for visitors with a heat camera pointed towards users. The exhibit shows differing levels of body temperature on a screen facing the group and includes a table with metal shapes, which appear as cold areas after visitors touch them (fig. 4). "We looked at the Heat Camera exhibit as part of the APE study," said Master Exhibit Developer Diana Whitmore. "We put a bunch of tools out with the exhibit and found that people tried everything then walked away. They had a much shallower level of engagement with more objects available, so items needed to be carefully curated to enable people to focus on the main point of the experience."

Two design features that emerged from both the APE and EDGE studies as engaging to wide audiences include a high level of open-endedness and exhibits that offer multiple stations, encouraging social engagement. "Multiple stations are a design element that prolongs engagement; providing multiple stations that are identical or related," explains Joshua Gutwill. "offers visitors the opportunity to riff off each other and the initial engagement becomes easier."

Sometimes interactive features can get in the way of the experience of an exhibit. Master Exhibit Developer and Artist Charles Sowers talked about his recollections of the development of the "Icy Bodies" exhibit. Created by Shawn Lani, an artist and director for the Exploratorium's Studio for Public Spaces, this exhibit features a glass-covered bowl of colored water into which small kernels of dry ice drop (intro image). The beauty of this exhibit comes through observing the mesmerizing paths the ice makes through the liquid rather than through direct interactivity. Charles Sowers noted, "It's not always the right thing to do, to make things interactive. I remember when "Icy Bodies" was developed and visitors could add dry ice themselves and all they did was flick in the ice and not pay any attention to what was happening in the basin. Now

it's not interactive, but it's a very popular exhibit that involves a great deal of observation." While as exhibit developers and designers we often think of interactive elements as kinetic, in the view of Exploratorium staff, that is not necessarily the case. Careful observation can be deeply engaging and result in deep contemplation and engagement.

Over time, the words used by the Exploratorium exhibit development teams have evolved and "interactive" has replaced "hands-on," which was popular in the 1990s. Another example of an exhibit that is interactive but not hands-on is "Marilyn Einstein," which consists of a hybrid image of Marilyn Monroe and Albert Einstein (fig. 5). From up close, the image of the Hollywood bombshell appears, but from afar, the image shifts to that of the physicist. As Exploratorium Exhibit Developer and Engineer Emeritus Tom Tompkins notes, "Interactivity doesn't have to mean hands-on. I think of Marilyn Einstein as an interactive exhibit – visitors walk closer or walk away and don't do anything with their hands, but they see a change, think about it, engage with it."

Or as Senior Exhibit Developer and Exhibit Developer Group Manager Denise King observes,

> We've evolved into recognizing that sometimes interactivity is observational. We've expanded into subject areas that lend themselves more to observational interactivity than just playing with stuff on a table or physics demonstrations. Observation is interactivity when it's directed. The trick is to come up with something complex and interesting enough that people are compelled to observe it.

Today, when beginning planning for an exhibition with interactive elements, Exploratorium developers ask themselves the following questions:

- Is there a compelling experience at the heart?
- Is there a real phenomenon that sparks curiosity in the exhibit?
- Is an interactive exhibit the right medium for the content (as opposed to a film, wall graphic, article, webpage or other medium)?
- Is the effort proportional to the experience?
- Can the exhibit be open-ended or is it didactic, with only one outcome?
- Can the exhibit be multi-user, multi-sided, social?
- Do we see opportunities for initial engagement? Prolonged engagement?
- Can the phenomena be enjoyed at different levels/varying depths?

Looking towards the future

What do staff members at the Exploratorium think is the next frontier of interactivity? Staff reiterated their belief that the Exploratorium's past has served – and continues to serve – as a launch pad into the future. The past has provided an important foundation that is being used to plot new directions. When asked about the future of interactivity, staff currently charged with visioning exhibitions and developing specific exhibits identified the following internal trends.

1. **Social engagement and experiences that encourage the observation of self and others.** Increasingly, the Exploratorium is bringing exhibits to public spaces outside of the museum and using exhibits to explore who we are, who we are with, and how we behave together. "While we have the ability to go deeply into virtual realities," notes Claire Pillsbury, "people still want to do things with

CAMILLA ROSSI, © EXPLORATORIUM

fig. 5. The "Marilyn Einstein" exhibit.

other people. Social engagement continues to be a strong part of the museum experience and more than ever, we need experiences that allow us to engage with our companions as well as with strangers." Chris Cerrito, New Media Exhibit Developer, cites the importance of watching others. "We found when developing the Science of Sharing (an NSF-funded social science exhibition opening in 2014)[9] that people were having experiences watching other visitors using the exhibits. People sometimes wait to use exhibits and those interviewed waiting in lines were making interesting observations about the people currently using the exhibits. People became the phenomena themselves." And as Denise King observes, "We are moving more and more towards getting visitors to interact with each other rather than with objects and exhibits."

2. **Narratives and storytelling – experiences in which visitors can see themselves and choose their own points of entry.** Personal narratives can humanize content and open doors to individual meaning-making. Exhibits that offer opportunities for visitors to contribute stories and recognize the diversity of our audiences have greater power to engage and be remembered. "Bringing narrative and space for personal reflection is an important component of interactivity," notes Diane Whitmore. "Visitors need to see themselves in the story and understand how what is being presented relates to them." For Doug Thislewolf, New Media Exhibit Developer, it's also about finding relevance:

> If you are trying to encourage prolonged engagement, I've noticed that if you give people ways that they can link to content that is important to them we've gotten a good response. If people can add their birthday or see their reflection and find themselves in the exhibit and do what's important to them without restrictions, it's a powerful tool that we've been able to leverage. A discovery in this way is more meaningful for people.

3. **Deep collaboration and co-creation**. Co-creation has been at the core of many of the Exploratorium's most creative recent work, which strives to bring its philosophy of authentic experiences into partnership with hospitals, art museums, history museums, and public spaces as partners. Co-creation means sharing leadership and goals and serving as equal partners with equal voices in the development process. Current collaborators have encouraged the Exploratorium to be more cross disciplinary and cross cultural, and to better blend exhibits with user needs. "The Exploratorium is engaging more and more with partners who want to bring our style of interactive, direct engagement experiences to different types of museums and environments," says Erik Thogersen, Project Director and Senior Exhibit Developer. "We have completed successful projects at different types of museums and public spaces combining the Exploratorium's type of inquiry with more varied content and physical spaces." An example is a series of exhibits created in partnership with the UCSF children's hospital, where the common goal was to provide positive, transformative moments of wonder to young patients and their families during their treatment – to engage their senses and minds, and empower them to discover and explore, at a time of uncertainty and stress. Exhibits were created in both large scale as well as on mobile bed-side carts so that they could be accessible to children with limited mobility.

4. **Technology and interactivity serving the content, audience, and desired experience.** Technology is one tool in the toolbox but is not the best one for all situations. Both interactivity and technology can be powerful when used appropriately, but can detract from an experience if they aren't in service to the exhibit's core idea. "Technology always presents a new, cool thing but that type of interaction becomes outdated really quickly," observes Doug Thislewolf. "I've learned that timeless experiences are really important. The Exploratorium has so many timeless exhibits where the technology behind it isn't at the core. What matters is the experience that people are having."

9 More about the *Science of Sharing* can be found at: www.exploratorium.edu/visit/west-gallery/science-of-sharing.

5. **Using technology to expand interactivity to expose content in new ways.** New types of content can now be explored interactively through new technologies and techniques. Exhibit developers can now give visitors direct influence over microscopic material, manipulatable data, and remote geographic locations that can't necessarily be seen and touched. How can we make the invisible manipulatable and point visitors toward information that is most relevant to the big questions of our day – with the aim of encouraging people to form their own conclusions and make informed decisions? As New Media Group Manager Jill Fantauzza notes, content can be explored interactively using technologies that previously would have needed to be presented statically.

> New media is sometimes better at exhibiting certain types of phenomena, like time-based phenomena or asynchronous phenomena, and providing tools to represent the phenomena when the actual phenomena are invisible. Microscope imaging stations succeed in this way. There are also phenomena that can't be interacted with directly, like our Flock exhibit that lets visitors influence the patterns of birds in flight. Data is an invisible, abstract thing that can't be physically handled but new media sometimes makes that visible and manipulatable in interesting ways.

6. **Civic Engagement.** Exhibits have the potential to inspire people to be positive forces of change in their communities and can give us new ways of engaging with the world around us. For the Exploratorium, this is a recognition of the power of exhibits, and should be acted upon. As Joshua Gutwill points out, it also raises many questions.

> This is new for us, although we are founded on a vision about empowering people to not be coerced and not accept propaganda, we've never looked at to what extent does that happen and how hard do we push on that. It's very exciting to be taking on that charge. What does it mean to have people engaged civically based on a workshop, program, or exhibit? Is that about people thinking differently? Are we making people politically active? Are they more engaged in their community? We're not sure how to make it happen or how to assess but we are eager to find out.

Exploratorium staff members are excited and eager to push on these new directions in exhibit interactivity. Teams have been forming to develop research agendas surrounding some of these trends while looking at them academically as well as through various exhibit mediums – all in keeping with the Exploratorium's unique way of working. We are passionate about continuing to be learners as we push ourselves to appeal to broader audiences in locations outside of our museum walls and directly in our communities. We are hopeful that the next 50 years will be as eventful as the past 50 and that we can continue to learn from the field and make valuable contributions to push us towards greater impact through innovation, interactivity, engagement, and connection.

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