

Outdoor Exploratorium Summative Evaluation



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Outdoor Exploratorium Summative Evaluation

To get people to notice the science in the environment around them. Cool to see things we don't consciously know around us in the natural world. [Like] Rust Wedge—after looking at the given example you notice the rust in the buildings around you.
—Outdoor Exploratorium Visitor

Introduction

Outdoor Exploratorium (OE) is a collection of 14 interactive exhibits installed outdoors at Fort Mason (FM) in San Francisco, about a mile from the Exploratorium's home site in the Palace of Fine Arts. In 2001 the National Science Foundation (NSF) awarded a \$1.855 million grant (Grant No. ESI-0104478) to the Exploratorium to create a set of exhibits to help visitors notice and explore natural phenomena. The exhibits are located outdoors amid the phenomena they address, including the sky, wind, heat, wave action, ships, seagulls, and rust. The finished exhibition will consist of 20 exhibits, including one exhibit at the Exploratorium linking the two sites and an iPhone application. In addition to the exhibits, the project delivers several workshops, a website, a publication, and navigational tools for visitors with and without disabilities.

Fort Mason is a historic site that is now a part of the Golden Gate National Recreation Area (GGNRA), itself a part of the National Park System (NPS). Fort Mason is home to a variety of nonprofit organizations, many of which focus on the arts. There are also a restaurant, snack bar, and several performance spaces. Entry to the area is free and open to the public.

In early 2009 the Exploratorium contracted with Wendy Meluch of Visitor Studies Services (VSS) to conduct a summative evaluation of OE. Several months earlier, during the fall of 2008, Beverly Serrell conducted a summative evaluation of the first seven exhibits. In Serrell's study, visitors were invited to use individual exhibits and then participate in an interview. That research served to (1) *present a snapshot of the seven stand-alone exhibits; (2) provide remediation for those exhibits; and (3) otherwise serve to inform the development of the remaining exhibits and overall collection.*¹

The summative evaluation reported in this document addresses OE overall. This study includes interviews with visitors who were cued to use several exhibits ("Cluster Interviews"), interviews with visitors who used many or most of the OE exhibits ("Full Interviews"), and unobtrusive observations of visitors at several exhibits. Data collection took place on weekends and weekdays during May and June 2009.

This summative study differs in several ways from summative evaluations in more typical, indoor settings. The size of the area and the distant spacing of the exhibits limited our ability to cue visitors to use OE as a whole. These physical aspects, plus the fact that this venue is open and public, also rendered a tracking-and-timing study impossible. Because exhibits had to be designed to blend in with their surroundings, we did not attempt to assess their attracting power. Please see Research Design & Rationale on page 11 for more information.

The primary focus of this evaluation is to document evidence of exhibit impacts on users. OE goals for visitors are defined by staff as to:

- Help visitors develop skills in noticing phenomena in the natural world.
- Help visitors explore complex systems and interactions at play in an outdoor environment.
- Help visitors come to a deeper understanding of the natural world by applying the principles and concepts of science to the outdoor environment.

¹ *Summative Evaluation of the First Seven OE Exhibits*, Beverly Serrell, March 2009.



Executive Summary

Executive Summary

A two-pronged summative evaluation of Outdoor Exploratorium shows it to be fun and engaging for users as well as effective at meeting most project goals. The table below summarizes evaluation findings about visitor impacts. In total, 71 visitors participated in interviews: 35 who were cued to use several exhibits (“Cluster Interviews”) and 36 who used many or most of the OE exhibits (“Full Interviews”). A total of 75 individuals/groups at several exhibits were the subject of unobtrusive observations.

Each of the three main goals defined by staff has been split into two levels for this study to accommodate the way in which visitors experience and talk about them (shaded columns). Skill Awareness and Knowledge General levels represent an elementary experience of the goals, whereas Skill Practice and Knowledge Specific levels represent a more detailed expression of the impact—and, in some cases, broader application of it.

Engagement (75%–100%), awareness of a complex system as demonstrated with an exhibit (83%), and practicing noticing skills (68%) are the most frequently evidenced impacts in these samples. While nearly half of interview respondents associate the experience with a deeper understanding of the world around them (48%), less than a quarter specifically associate this experience with *science* (22%).

Goals as defined by OE Team	NSF ISE Category Summary	Interviews: n = 71 Observations: n = 75	NSF ISE Category for This Study	Interviews: n = 71 Observations: n = 75
1) <i>Help visitors develop skills in noticing phenomena in the natural world (not just a “noticing” experience).</i>	Skill	82% (interviews) 49% (observations)	Skill Awareness	42% (interviews)
			Skill Practice	68% (interviews) 49% (observations)
2) <i>Help visitors explore complex systems and interactions at play in an outdoor environment.</i>	Skill	89% (interviews)	Skill Awareness	83% (interviews)
			Skill Practice	32% (interviews)
3) <i>Help visitors come to a deeper understanding of the natural world by applying scientific concepts and principles to the outdoor environment.</i>	Knowledge	68% (interviews)	Knowledge General	48% (interviews)
			Knowledge Specific	22% (interviews)
Engagement	Engagement	100% (interviews) 75% (observations)		
Cognitive Impacts [Not specifically included as desired impact by the team.]	Knowledge	42% (interviews)		



Summary of Findings

Summary of Findings – NSF Framework

The table below describes OE’s visitor goals per the NSF ISE Framework, evidence of same, and frequency in the samples. Also presented are representative responses (evidence). Many visitor comments touch on several impacts at once. Because respondents spoke about using individual exhibits as well as their perceptions of OE’s purpose or intent, some comments are personal in nature, others more narrative. Please see Appendices B and C for more visitor comments.

Goals as defined by OE Team	NSF ISE Category	Interviews n = 71 Observations n = 75	Evidence
<p>1) Help visitors develop skills in noticing phenomena in the natural world (not just a “noticing” experience).</p>	Skill Awareness	42% (interviews)	<p>Talking about noticing as a result of the exhibits.</p> <ul style="list-style-type: none"> • <i>[OE] gets you to notice things out in the environment that we take for granted.</i> • <i>To get people to interact with the world around them. Notice how things happen.</i> • <i>The point is to help people observe what is around them. [Did you experience that?] Absolutely! Yes, I observed the rust on the buildings, the bay through the Ship Constellation; on the piling you can see what’s down below on the permanent pilings.</i>
	Skill Practice	68% (interviews) 49% (observations)	<p>Describing how they used noticing skills while interacting with, or as a result of interacting with, exhibit(s)—or discussing the exhibit and what they did with it in such a way that evidences use of noticing skills.</p> <ul style="list-style-type: none"> • <i>[I] noticed the buildings around are falling apart. Makes you really take in the natural state of decay.</i> • <i>[Lift] is fascinating to watch; it is like art; it is like the seagulls; I noticed seagulls fly behind; it is like choreography, like art in motion.</i> • <i>You are noticing so many varieties of living things; you get to be close to the piling and see up close all the little things growing.</i> <p>Observed to use exhibit purposely, repeatedly trying it, apparently looking around and comparing examples or systems.</p>
<p>2) Help visitors explore complex systems and interactions at play in an outdoor environment.</p>	Skill Awareness	83% (interviews)	<p>Voicing awareness of and/or describing phenomena they observed or noticed via exhibit(s).</p> <ul style="list-style-type: none"> • <i>The difference between 6 a.m. and 7 a.m. was remarkable. Seeing the many things going on. It reminded me of the camera obscura, except this one is real photography.</i> • <i>[Wind Arrows is] photogenic...not much wind today, it’s a function of elevation.</i> • <i>The Pier Piling exhibit helped me learn more about creatures I’d seen around...interesting how many foreign organisms have come in.</i>



Summary of Findings

Goals as defined by OE Team	NSF ISE Category	Interviews n = 71 Observations n = 75	Evidence
2) Help visitors explore complex systems and interactions at play in an outdoor environment.	Skill Practice	32% (interviews)	Describing in detail some type of relationship they noticed as a result of these exhibits/An exhibit. <ul style="list-style-type: none"> • <i>It was neat to taste...would make me curious...about the salinity of my own body, tears, salt water: different levels.</i> • <i>I'm curious about Rust Wedge—just curious if that's—I know that they still put rebar in concrete structures. Do they somehow prevent the rust? I have noticed that symptom (spalling) but didn't know the cause of it.</i> • <i>Impressive because it's very clear [that] temperature changes height on a long piece of metal. This is the first time you can see this so clearly with this exhibit [Bridge Thermometer].</i>
3) Help visitors come to a deeper understanding of the natural world by applying scientific concepts and principles to the outdoor environment.	Knowledge General	48% (interviews)	Referencing appreciation/understanding of the natural world or world around us through using these exhibits without specific reference to science. <ul style="list-style-type: none"> • <i>First time experienced and leads to a deeper understanding of life.</i> • <i>To help people understand the world around them...I had no idea that these things were that interesting...the piling, the barnacle one.</i> • <i>Yes, because you have them [exhibits] integrated into the actual environment. You can make the immediate connection with nature as opposed to taking learning from inside an institution outside on your own.</i>
	Knowledge Specific	22% (interviews)	Voicing awareness/examples of science as a way of studying and understanding the world. <ul style="list-style-type: none"> • <i>To draw attention to what's already here and think about the natural science...it's all the water, looking at the movement the waves make in the sand and seaweed. We experience these things every day, but we just don't think about them.</i> • <i>To connect people with scientific aspects of nature. Not just looking at it but learning about things underlying nature, the bridge, clouds etc. E.g., looked at #10, didn't know it rose and fell with temperature changes.</i> • <i>To show people that things in nature are related to science and that understanding them is not just so you get a better diploma/job....To show young people relationship between nature and life.</i>



Summary of Findings

Goals as defined by OE Team	NSF ISE Category	Interviews n = 71 Observations n = 75	Evidence
All	Engagement	100% (interviews) 75% (observations)	<p>Affective language about the experience and/or the exhibits.</p> <ul style="list-style-type: none"> • <i>[Bridge Thermometer] was fantastic! The bridge is not animated, but the real version, live action. I did not know that the bridge rises and falls with temperature...noticed the bridge rose about an inch.</i> • <i>I liked it very much that they take items here in nature and explain them.</i> • <i>I think they are wonderful. Should be in other places in the city.</i> • <i>I love it! Love it, love it, love it!</i> • <i>I love this kind of stuff. Brings the natural world to life.</i> <p>Statements about being engaging and fun.</p> <ul style="list-style-type: none"> • <i>Really interesting, educational, and fun. Like on an Easter egg hunt.</i> • <i>Pretty interesting. Lots of interesting things to learn.</i> <p>Observed to use the exhibit purposefully and/or with prolonged engagement. Observed to enjoy or otherwise react strongly to the exhibit.</p>
Cognitive Impacts [Not specifically included as desired impact by the team.]	Knowledge	42% (interviews)	<p>Voicing that they had learned/never knew something that they discovered with these exhibits. Note that visitors were not specifically asked if/what they learned, but they often volunteered this information.</p> <ul style="list-style-type: none"> • <i>Rust, I never realized, I've seen these buildings before and had wondered why they are like that. So now when I look at a building, I'll know... [Whole group in chorus] spalling!</i> • <i>I did not know anything about this kind of exhibit [i.e., did not have prior knowledge of the content], like how to identify vessels based on lighting pattern.</i> • <i>Yes, the barnacles; I did not know they were related to crabs.</i>



Interviews

Interviews

Key Findings

As noted in the previous Summary of Findings table, interview participants evidence all the desired impacts, several in fairly high numbers:

- 42% talk about noticing as a result of the exhibits.
- 68% describe using noticing skills while interacting with, or as a result of interacting with, exhibit(s). Or by discussing the exhibit and what they did with it, they evidence use of noticing skills.
- 83% voice awareness of and/or describe phenomena they observed or noticed via exhibit(s).
- 32% describe in detail some type of relationship they noticed as a result of these exhibits/an exhibit.
- 48% reference an appreciation/understanding of the natural world or world around us through these exhibits, but without specific reference to science.
- 22% voice awareness/examples of science as a way of studying and understanding the world.
- 100% use affective language about the experience and/or the exhibits, and/or state that it is interesting or engaging.

Other Findings

- 42% of interview participants volunteer that they learned something new with these exhibits.
- 15% volunteered that these exhibits help them/other people reach a deeper understanding of or appreciation for this specific place.
- 37% arrived at FM with intent to visit OE. All of these participants claim to have special interest or training in science, education, and/or exhibitry.
- 65% of interview participants claim to have special interest or training in science, education, and/or exhibitry that ranges from a child headed for science camp to several Ph.D. physicists, professors, and engineers.
- 86% of respondents had heard of the Exploratorium, 68% had been there, and 4% have current memberships. (All members were on site with intent to visit OE.)
- 100% of respondents evidence at least two impacts when we include engagement. Full Interview respondents appear more likely to evidence more impacts than cluster interview respondents who experience fewer OE exhibits.

Anecdotal Findings

- Visitors who arrived with intent to see exhibits most often mentioned having seen OE in the paper (some had newsprint OE maps in hand); a few learned about it on the Web.
- A few visitors who did not arrive with knowledge of OE reported that the map boxes drew their attention to it; others were cued to OE exhibits by interviewers.

Visitor Comments

Visitor Comments About Specific Exhibits

Interview participants responded to a question about which exhibit(s) stood out for them and why; this type of question is common for summative evaluations. In this case, every respondent/group had at least one exhibit that stood out, 63% spoke about a second exhibit, and 28% a third. In a more typical situation, we would use these data to understand which exhibits are most memorable. That would not be appropriate with these data, however, because using the cluster approach for sampling forced some exhibits to receive more attention than others.



Interviews

Listed here are trends that show up in exhibit-specific comments. Again, that some exhibits are not much discussed by visitors is not an indicator of popularity. Rather, it is a function of our sampling technique and/or the visitors' path or attentiveness while passing through the area. The reader is encouraged to peruse visitor comments about exhibits in Appendix B. Many comments evidence more than one impact at once.

People are moved by the beauty and simplicity of **Lift**. They appreciate its artistic presentation and clear lesson that many articulate. Several comment on their being made to think about wind in a new way.

- *I liked its mechanical simplicity, it's artistic, it lets you see how specific the wind gusts are.*

Comments about **Speed of Sound** suggest that visitors connect with it in a variety of ways.

- *Nice because it had three different examples: the buoy, bell, and bridge foghorn. Although the foghorn wasn't working. I did try calling the number.*

Rust Wedge is particularly effective at getting people to consider a complex process. Many describe it, often commenting on either having had partial knowledge of this phenomenon before or having known nothing about it.

- *Learning about the rust wedge and it pushes the cement off. I know iron rusts and causes things to fall apart, but I didn't know why.*

Visitors get excited about **Pier Piling Pivot** because the piling actually moves and gets them close enough to see things they don't usually get to see or even think about.

- *Brought the evidence right up to your face. Could see "wildlife" in action and up close.*

Tasting the Tides was fun for some and thought-provoking for others.

- *I liked it, I liked the face you made when you spit it out [to partner].*
- *The salination one. The amount of interactivity and to actually taste and adjust the salt content. It's fun. Sometime exhibits just have a description, but I like the interactivity. It's more fun and more memorable. And a great link to where animals live. [F joins in] Oooh, this is where the shark lives. [M continues] But I was a little unsure how to operate it.*

Visitors tend to be surprised and sometimes awed when they understand the message of **Bridge Thermometer**.

- *Bridge was cool. Cool way of measuring. Wouldn't think a bridge like that could fluctuate.*
- *Really captured my imagination. Was a more internal exhibit. Had no idea a bridge could expand and get longer.*

House of Days elicits a range of reasons why people say they enjoy it.

- *Cool to see the difference between foggy and clear days. Amazing views of San Francisco.*
- *[It] could be manipulated. I liked seeing how different the days were; seeing the differences in color.*

Wind Arrows affects people similarly to Lift, but less dramatically.

- *Like a living sculpture by Calder. Had no idea so many levels of wind currents in a small space.*
- *Simple—see different layers of wind. Cool to see happening in front of you.*

Visitor Comments About OE Overall

When talking about OE overall and its purpose, people most often refer to noticing the world around them in general, not just exhibit-specific noticing (the first OE goal) and understanding or appreciating the natural world (the third OE goal). Please see Appendix C for more visitor comments.



Interviews

- *Noticing station is a fabulous phraseology...there's so much to see in this area—these stations help you to stop and focus on one thing...e.g., not seeing wind currents or that the bridge is sagging up and down.*
- *Make people more observant of the world around them. Water, buildings, effect of environment on what we build.*

Some comments about noticing, understanding, or appreciating the natural world—the world around us—specifically mention science; others don't.

- *To show how science is a part of our everyday life and it's happening around us all the time, but people don't notice, don't think about, about the world. We get a lot of accurate information, but just the beauty of physics, and the world.*
- *Gets people outdoors to see the natural and manmade world. OE is showing people similar to what the Exploratorium does: getting a better understanding of the world around us in way that's fun and very San Francisco specific.*

Other purposes of the exhibit that visitors perceive include educating people about the Bay or the Bay Area. Here, and in discussing why OE might be located at FM, visitors touch on many of the intended OE goals but emphasize the idea that the Exploratorium can reach a larger and/or new audience this way. A few also volunteer that they like the fact that being outdoors and public, these exhibits are free of charge.



Observations

Observations

Key Findings

As noted in the Summary of Findings table, observation subjects evidence desired impacts in reasonably high numbers:

- 75% appear to engage actively with exhibits.
- 49% appear to practice noticing skills.

Other Findings

- 21% of observed individuals or groups appeared to be “intentional visitors.”
- 49% linger with the exhibit for three minutes or more; 33% for less than one minute.

Discussion

Though a minority of visitors observed in this study appeared to be on site with intent to find and use the OE exhibits (21%), a large majority of those who approach the exhibits under observation appeared to engage with them (75%). About half (49%) appeared to practice noticing skills. Of the four main exhibits in this study, Speed of Sound enjoys the highest rate of apparent engagement and skill practice.

For this study, *engagement* is defined as reading the label, appearing to use the exhibit to observe or experience the phenomena being demonstrated, and sharing the experience with others in the social group (unless the subject is alone). Practicing noticing skills varies at each exhibit somewhat, but is generally defined as being observed to use exhibit purposely, repeatedly trying it, apparently looking around and comparing examples or systems.

Dwell time also can be an indicator of engagement. Some exhibits can be used well in a short time—such as Wind Arrows, at which most visitors appear to engage and linger for less than one minute. Exhibits that have more label text and/or things to use or consider enjoy longer dwell times, such as Speed of Sound and Fracture Mapping. A majority of visitors at each of these exhibits linger for more than three minutes.

Overall Observations	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
	%	Yes/No/Unclear	%	Yes/No/Unclear	%	<1 min / 1–3 min / >3 min	%	Yes/No/Unclear
n = 75	75%	Yes	49%	Yes	33%	<1 min	21%	Yes
	16%	No	—	—	17%	1–3 min	65%	No
	9%	Unclear	—	—	49%	>3 min	13%	Unclear



Observations

Speed of Sound	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
n = 15	14	Yes	12	Yes	1	<1 min	7	Yes
	1	No	—	—	5	1–3 min	4	No
	0	Unclear	—	—	9	>3 min	4	Unclear

Fracture Mapping	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
n = 14	8	Yes	4	Yes	4	<1 min	4	Yes
	6	No	—	—	0	1–3 min	9	No
	0	Unclear	—	—	10	>3 min	1	Unclear

Bridge Thermometer	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
n = 17	11	Yes	6	Yes	5	<1 min	0	Yes
	1	No	—	—	6	1–3 min	17	No
	5	Unclear	—	—	6	>3 min	0	Unclear

Wind Arrows	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
n = 16	12	Yes	7	Yes	13	<1 min	2	Yes
	2	No	—	—	2	1–3 min	14	No
	2	Unclear	—	—	1	>3 min	0	Unclear

Mixed	Appear to Engage		Appear to Practice Noticing Skills		Dwell Time		Appear to Be Intentional Visitors?	
n = 13 (1 Lift; 2 Mirage; 3 Piling; 7 House of Days)	11	Yes	8	Yes	2	<1 min	4	Yes
	2	No	—	—	0	1–3 min	5	No
	0	Unclear	—	—	11	>3 min	4	Unclear



Research Design & Rationale

Overview & Method

Input from staff and Serrell's summative study informed the evaluator's work to describe evidence that would be indicative of the team's stated goals for visitors. Further, pilot interviews fleshed out the evaluator's understanding of how visitors interpret and discuss their experiences. The resulting framework of evidence includes two tiers for each of OE's three main goals. Please see the Summary of Findings table on page 3.

OE presents several challenges for data collection not found in a typical gallery setting. Chief among them are (1) working in an exposed, outdoor location; (2) the fact that this is a public space that people visit for many different reasons; and (3) the fact that exhibits are spread out in a huge area, many not in sight of the others. Inviting passersby to visit OE as a whole—as we would normally ask visitors to do in a gallery setting, or even a zoo—is unrealistic in this venue. The distances are too great; people on site for other things won't take the time needed to reach and visit more than a few exhibits, if that. Also, with exhibits being so spread out, cued participants can easily leave the area before returning for the interview.

To gather enough data in our limited time frame, we opted to use two sampling approaches for interviews: Cluster Interviews and Full Interviews. We invited randomly selected passersby to visit a *cluster* of three exhibits and then return for a short interview. We did this in two locations: Waterfront and Upper Fort Mason. *Full* Interviews were conducted with people who attended to more than a cluster of exhibits. Including visitors who have not seen every element of an exhibition in a sample for analysis is not uncommon; even when cueing and sampling in a gallery setting, we don't expect most visitors to attend to every element. For all OE interviews, we used the same standardized questionnaire form and gave thank-you gifts to interview participants.

The size and openness of the exhibit area precludes doing a tracking and timing study. Tracking people in a public, urban location could be awkward or even dangerous. Additionally, visitors on site may or may not have any awareness of the exhibits and might not even notice them while present in the area. Rather than tracking individuals as they moved through the site, we collected observations at several elements, watching those visitors who actually did approach the exhibits.

Waterfront Cluster & Full Interviews

Waterfront Cluster and Full Interview participants were approached by data collectors along the waterfront, primarily in the area of Speed of Sound. Most respondents who ended up as Full Interview participants were easy to identify as they walked along holding the OE map and stopping at exhibits. Those people were invited to return to the data collector after they felt finished with the exhibits. We encouraged them to return for the interview before heading up to exhibits at Upper Fort Mason, if that was their plan, so we wouldn't lose them.

Other people we approached—those who did not qualify as Full Interview participants—were invited to use the three exhibits in the immediate area and asked to return for the interview. Because these three exhibits are proximate enough to see easily, cued visitors could less readily leave the area before doing the interview.

About two thirds of Full Interview respondents had arrived at FM with intent to visit OE; the rest were intrigued enough upon discovering the exhibits to visit at least five, and usually more. Note: A few of these respondents mentioned that having maps available in situ (in the recently installed map boxes along the railings at the waterfront) was what made them aware of and interested in finding/using the exhibits.



Research Design & Rationale

Upper Fort Mason Interviews

Upper Fort Mason is visible from the waterfront area but is at the top of a bluff. A long stairway leads up to the area from the parking lot. The three exhibits in Upper Fort Mason are along a wide, paved path that runs along the edge of the bluff. The path is very high above the FM parking lot and then goes steeply downhill as you travel east and exit the FM area. Visitors walking from the east into the FM area pass Wind Arrows just before heading up the steep hill. Using this route, Wind Arrows, House of Days, and Bridge Thermometer are on the right. Walking uphill makes lots of people need to stop and rest—having exhibits to stop and look at presents a great excuse to pause. These physical logistics, along with the fact that eastbound (downhill) traffic is dominated by bicyclists who are not always very skilled, dictated that we approach westbound visitors at the bottom of the hill. Agreeable visitors were given an OE map, shown the three exhibits in the Cluster, and told that the interviewer was at the top of the hill. A team of two data collectors worked together at this Cluster, keeping in contact with walkie-talkies.

Unobtrusive Observations

In addition to interviews, we observed visitors at several exhibits. Since OE exhibits were designed to blend in with their environment, this study does not assess attracting power. Observation analysis focuses on evidence of engagement and, when possible, practice of noticing skills among those people who attend to exhibits.

Data collectors observed visitors at specific exhibits during sessions of 30 minutes to 2 hours in length. Rather than using big, obvious clipboards, we used small binders with a standardized form for noting observations.

Exhibits that included a variety of content/activities were selected for observation and for practical reasons. Practical considerations included the need to remain unobtrusive and the need for a sufficient flow of visitors. Fracture Mapping was specifically included in this study because interview respondents less often experienced this exhibit due to its parking lot location, which is distant from the others.

NPS Requirements for Data Collection at Fort Mason

To work on site at FM, the NPS requires that data collectors wear badges identifying them as part of the Exploratorium and that a sign about the study be posted during data-collection periods. In addition, a one-page document explaining the study has to be provided to any person who asks what data collectors are doing. Note that no one ever asked data collectors about their activities, so we never needed to use the one-page document.

NPS regulations do not allow researchers to have site visitors fill out forms, so self-completed instruments were not possible. Collecting identifying or contact information is not permitted either, thereby preventing a follow-up study.

Limitations

As noted above, NPS regulations do not permit us to collect contact information from respondents, so a follow-up interview study was not possible. Follow-up phone interviews would have been helpful in understanding if and how much people continue to notice and ponder the world around them after their OE visit. This study would have benefited from specific inquiry into how intentional visitors learned about the exhibits and what, if anything, drew unintentional visitors to exhibits other than interviewers.



Research Design & Rationale

Conducting interviews in a public venue such as FM means operating with a man-on-the street type of approach that is often awkward for the data collector and usually plagued by very high decline rates. Our decline rate was surprisingly low along the waterfront, up to about 30%. Declines were higher in Upper Fort Mason, about 50%. This decline rate makes sense because the path through Upper Fort Mason is a thoroughfare, not a destination.

As mentioned above, approaching people in a public setting can be awkward, especially in an urban environment. At FM, this dynamic was somewhat mitigated by the fact that data collectors were required to wear badges identifying them as a part of the Exploratorium. While this requirement makes the data collector seem less like a random stranger in the eyes of the potential respondent, the downside is that interviewers are likely to be perceived as insiders by respondents who may color their comments as a result. Known as the “courtesy bias,” the tendency of visitors to want to please the interviewer can skew data to the positive.

Serrell felt that the courtesy bias was very strong in the 2008 summative study, in part because the decline rate had been so high (about 50%). This study experienced a slightly lower decline rate, at least on the waterfront, but we had similarly enthusiastic subjects. In this study some degree of respondent enthusiasm may also be attributable to factors internal to the visitors, i.e., 65% state that they have special interest or training in science, education, or exhibits (for more information, see the Sample Description that follows). When the newness of OE wears off over time, the audience may change to include fewer people who are already rooted in science.

Remediation & Future Projects – A Few Notes

Though this is not a remedial study, staff is eager for findings that can guide further development of OE exhibits as well as future projects at the Museum’s new site. As the findings indicate, visitors are quite happy and impressed with OE as it is. The few visitor comments that make suggestions for improvement tend to focus on making exhibits easier to notice, something that is exactly counter to mandates of the NPS host.

Other complaints or recommendations are specific to individual exhibits and echo findings in Lisa Hubbell’s formative evaluation and Serrell’s study. They include frustration with the nonfunctional buttons on Bridge Thermometer, and wanting sunscreens for visibility and/or protection from the heat on Bridge Thermometer and House of Days.

Visitors enjoy seeking out the exhibits—“It’s like an Easter egg hunt”—but also wish exhibits were easier to spot. One visitor offered a suggestion that may be useful in future efforts: She would have liked to see indicators on each exhibit about where to find the next one. She mused further about having a map of all of them (a permanent sign or engraving) or perhaps an indication of how far and in what direction to go to find the next exhibit.

Interview respondents often wished for more interactive, outdoor exhibits. These people would love to see things such as OE installed all over the city.



Sample Description

Sample Description

Sample Size & Study Overview

Sample	n	Description & Discussion
Cued Interviews: Waterfront Cluster	15 (Goal: 20)	<ul style="list-style-type: none"> Exhibits: Speed of Sound, Rust Wedge, and Pier Piling Pivot (primarily) All members of this sample visited 3–4 exhibits, at least 2 or 3 of those listed above, and sometimes 1 or 2 others along the waterfront. Only 1 of these 15 arrived at FM with intent to visit OE. 8 claim to have special interest or training in science, education, or exhibitry.
Cued Interviews: Upper Fort Mason Cluster	20 (Goal: 20)	<ul style="list-style-type: none"> Exhibits: Wind Arrows, House of Days, and Bridge Thermometer All members of this sample visited 2–3 of these exhibits. Only 2 of these 20 people arrived at FM with intent to visit OE. 14 claim to have special interest or training in science, education, or exhibitry.
Cued & Intercept Interviews: Full	36 (Goal: 40)	<ul style="list-style-type: none"> Exhibits: All; as many as visitors choose to do (≥ 5) Members of this sample visited 5–14 exhibits. About two thirds of these respondents (23; 64%) arrived at FM with intent to visit OE. 24 claim to have special interest or training in science, education, or exhibitry.
Unobtrusive Observations	75 (Goal: 60)	<ul style="list-style-type: none"> Uncued, unobtrusive observations Fracture Mapping: 14 Bridge Thermometer: 17 Wind Arrows: 16 Speed of Sound: 15 Various: 13 (1 Lift; 2 Mirage; 3 Piling; 7 House of Days) 21% appear to be Intentional visitors.



Sample Description

Interview Sample Demographics

n = 71 Interviews	Primary Respondent
35%	Male
24%	Female
41%	Both/Group
11%	Senior
80%	Adult
3%	Teen
6%	Child
1%	English appears to be a Second Language
69%	Live in SF Bay Area
86%	Heard of Exploratorium before
68%	Been to Exploratorium before
4%	Member of Exploratorium currently
72%	Been to Fort Mason before
11%	Seen OE before today
65%*	Have special interest in science, education, or exhibits.* (See next table for details.)

*Special Training or Interest	Frequency (Count)	Description
Work in Science-related field	18	<ul style="list-style-type: none"> • Inventor of Thermo-actuators; biomedical engineering teaching degree • Trained as nautical engineer • Doctor • Engineer (M), architect (F) • Work in an environmental education center • Nuclear physicist (M), genetic counselor/teacher (F) • Molecular biologist; has made an exhibit about what's inside our mouths • Biologist–researcher at UCSF • Biochemist; amateur naturalist • Chemist (2) • Health care professionals • Engineer (3) • Computer engineer • Medical device engineer, so some scientific background • I'm a naturalist.



Outdoor Exploratorium Summative Evaluation

Sample Description

*Special Training or Interest	Frequency (Count)	Description
Educator	10	<ul style="list-style-type: none"> • Teaching kids at summer camps • Used to work at Exploratorium and teach science • University professor of physics and mechanical engineering (in France) • Both librarians, so love helping people to find new knowledge. One is former teacher of environmental education who met Frank Oppenheimer in the 1970s. • Teaches science teachers how to teach • Teaches nature education seminar • Both are educators. • Elementary school teacher and grad student in Earth science • Retired publisher of educational books • Science teacher
Studied or is studying Science	10	<ul style="list-style-type: none"> • One has a degree in chemistry, psychology, and zoology. Another did exhibit design as an art major. • Science background • Graduate student in physics • My parents were science teachers. • Studying biology • Minor in electrical engineering. • Ph.D. in physics • School science projects • Main speaker said he was a chemistry major in college. Other male said he was a biology major in college. • Child is going to science camp this summer.
Museum-related	6	<ul style="list-style-type: none"> • Work in art museum (AF) • Both are fine arts students. • Install art exhibits • Art museum professional • A general contractor and artist; used to work at the Exploratorium 20 years ago. • Ph.D. in information sciences; various museum exhibit research projects.
Interested in Science	2	<ul style="list-style-type: none"> • I have a strong interest in science. • [Teen] interest in sciences



Sample Description

n = 71 Interviews	Group Description
58%	Adults Only
18%	Adults and Kids
24%	One Adult Alone
24%	1 person in group
51%	2 people
8%	3 people
13%	4 people
3%	5 people
1%	7 people
27%	At FM for recreation
37%	At FM for OE (“Intentional”)**
18%	At FM for an event
18%	At FM for other
1%	Attended to 2 exhibits
38%	3 exhibits
10%	4 exhibits
6%	5 exhibits
6%	7 exhibits
1%	8 exhibits
10%	9 exhibits
13%	10 exhibits
3%	11 exhibits
4%	12 exhibits
7%	13 exhibits
1%	14 exhibits

**Everyone who arrived at FM with intent to visit OE stated they have a special interest in science, education, or exhibitry.

**Most Intentional visitors fell into the Full Interview sample. See previous Sample Description table for more information.



Sample Description

Observation Sample Demographics

n = 75 Observations	Primary Subject
23%	Male
15%	Female
61%	Both/Group
5%	Senior
84%	Adult
3%	Teen
1%	Child
52%	Adults Only
27%	Adults and Kids
21%	One Adult Alone

n = 75 Observations	Group Description
21%	1 person in group
41%	2 people
13%	3 people
11%	4 people
5%	5 people
4%	6 people
1%	8 people
1%	10+ people
21%	Appear to be Intentional Visitors

Acknowledgments

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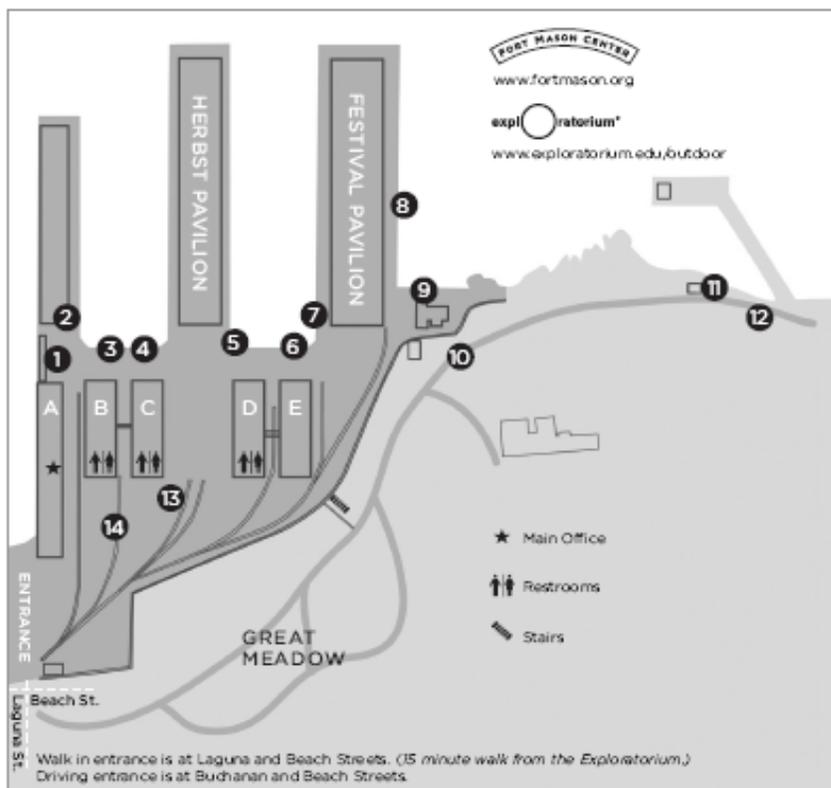
The evaluator would like to thank Beverly Serrell and Lisa Hubbell for their time and input regarding this study. Serrell's earlier summative work was especially helpful in informing the goals and processes of this study. Many thanks are also due to three intrepid data collectors: Theo Lovette, Muriel Maffre, and Jennifer Spotswood. Steve Genrich, Joyce Ma, and the OE team were delightful and interesting. Their enthusiasm for OE exhibits is infectious, and their insights were very valuable to this study.



OUTDOOR EXPLORATORIUM EXHIBITS AT FORT MASON

The Outdoor Exploratorium at Fort Mason was created by the Exploratorium in partnership with the Golden Gate National Recreation Area and Fort Mason Center. These interactive exhibits were designed to help you investigate the subtle phenomena and unseen processes of the everyday world. Fort Mason offers a unique location for observing the movement of wind and waves, the interplay of light, shadow, and temperature, and the interaction between natural and built environments.

Please give us your feedback about Outdoor Exploratorium exhibits. During May only, link to our online survey at <http://www.exploratorium.edu/outdoor/survey>



- 1 LIFT**
A series of airfoils rises and falls to graph the flow of moving air at Fort Mason.
- 2 ARCHITECTURAL MIRAGE**
This exhibit lets visitors experiment with a "wall mirage" created by the thin layer of sunwarmed air next to a Fort Mason building.
- 3 PORTABLE OBSERVATORIES**
This kiosk provides pocket guides to heightened observation in Fort Mason's unique landscape.
- 4 SHIP CONSTELLATIONS**
This guide to navigation lights helps visitors decode the visual language of boats on the Bay.
- 5 SPEED OF SOUND**
A light and bell on the Festival Pavillion let visitors learn how distance affects perception of sound. Call 415.202.3809 and hear how long the sound of a Golden Gate Bridge foghorn takes to reach you.

- 6 RUST WEDGE**
This sculptural exhibit illustrates the power of corrosion to slowly shatter waterfront buildings.
- 7 PIER PILING PIVOT**
A movable piling unveils the extraordinary range of plant and animal life making an aquatic home at Fort Mason's piers.
- 8 WAVE TRACING**
A loose piling on the Festival Pavillion traces the movements of currents, waves, and tides.
- 9 TASTING THE TIDES**
A modified drinking fountain allows visitors to experience the surprising range of salt content in local waters.
- 10 BRIDGE THERMOMETER**
This spotting scope reveals the temperature sensitivity of even massive structures—like the iconic Golden Gate Bridge.

- 11 HOUSE OF DAYS**
An automatic camera creates a visual record of changing atmospheric conditions.
- 12 WIND ARROWS**
The wind's direction changes dramatically with even small differences in altitude.
- 13 FRACTURE MAPPING**
Embedded symbols in the Fort Mason Center parking area let visitors decipher the hidden geological stresses beneath their feet.
- 14 AUDIO POST**
This exhibit turns a parking lot into an interpretive resource by allowing visitors to use their car radios to hear short programs on local phenomena.

outdoor expl^oatorium[®] fort mason

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Appendix B – Visitor Comments About Specific Exhibits

Appendix B – Visitor Comments About Specific Exhibits

The frequency of an exhibit's mention in visitor comments does not reflect its popularity. Rather, it is a function of the Cluster approach to sampling. Please see Research Design & Rationale on page 11 for more information.

Lift

- Fun to watch and relaxing.
- It is artistic and visually interesting
- Coincidental—was like an artwork.
- Creates a definition of space and movement of wind.
- I liked its mechanical simplicity, it's artistic, it lets you see how specific the wind gusts are.
- It is fascinating to watch; it is like art. [Did it make you curious about anything/Did you notice anything new or interesting?] It is like the seagulls; I noticed seagulls fly behind; it is like choreography, like art in motion.
- It is visually appealing; it makes you notice the speed and the direction of the wind (AF); it helps with comprehension.
- Lift—it's so visual like a sculpture. You can see it go up and down and whether you know it's 20 or 15 mph doesn't matter. [New information?] Yes, I still don't understand it. [Her engineer friend launches into an explanation.]
- Easy to tell what was going on. Showed something about nature you wouldn't otherwise know.
- How it alters according [to] the wind speed.
- Didn't know that the wind could vary that much in such a small area.
- It made me realize the strength of the wind.
- Airfoils—I can tell what's going on, it's dynamic, changes second to second.
- Both boys very interested in airplanes so could appreciate Lift seeing how the foils shaped like wings moved up and down. Easier to learn by seeing and interacting than just reading books.
- Heightens sense of power in wind. Shows how suddenly wind stops and starts and striking how wings go up and down.
- It's very educational, made you think about wind in a different way because it's spread out. A diversity of wind, how it spreads out at different speeds across the 2-D matrix.
- (SF) So much variation in a small area. Can't ever see wind. It's a way to visualize different patterns in a small area.
- Very cool and aesthetically pretty. Looks like birds in flight, bird wings.
- We live in a marsh. Would be wonderful outside our house. Must be gorgeous when wind is really blowing. Someone took the time to think about how we could better understand wind in an artistic, beautiful way.

Architectural Mirage

- Liked learning about wall mirages. Would experience them in a different way.
- Have to come on a less windy day for the Architectural Mirage one. [They tried but could not see phenomena.]
- It was cool, a cool visual effect.
- It was fun.

Portable Observatories

- Could take it home with you.



Appendix B – Visitor Comments About Specific Exhibits

Ship Constellations

- I did not know it [navigation lights code] existed.
- All these were great. I hope to return and look at the others. Ship Constellation is incredible! I thought it would be a diagram, but I didn't see any power, I wanted to see how it worked. Batteries? I don't know.
- Got to see pretty lights [Child].
- Navigation lights were new to us, we didn't know that lights are different on different boats.
- Ship constellations were great.

Speed of Sound

- When I was a kid in 8th grade, wondered how speed of sound worked. Experimented with dropping a stone down a well. Neat to have this exhibit outside so you have the distance. and it's a quieter environment to learn in....
- It really worked and was clear. Taught me something I didn't know.
- Especially for kids, to press button and have sound happen. Four-year-old just liked pressing button. Seven-year-old could understand speed of sound and light and appreciate the difference of the science.
- Interactivity is what matters; there is a clear learning experience.
- Interesting and easy to understand.
- Nice because it had three different examples: the buoy, bell, and bridge foghorn. Although the foghorn wasn't working. I did try calling the number.
- Really cool demonstration of something you already know. Loved that it's not static, but three-dimensional.
- Ringing the bell. You get an immediate result, gratification. Delayed 1.5 second.
- Interesting. Can't see sound—brought it into perspective with distance.

Rust Wedge

- Discovered something about how buildings age and weather [Child's favorite].
- I didn't realize that oxidative force can split concrete.
- I'm curious about Rust Wedge—just curious if that's—I know that they still put rebar in concrete structures. Do they somehow prevent the rust? I have noticed that symptom [spalling] but didn't know the cause of it.
- Learning about the rust wedge and it pushes the cement off. I know iron rusts and causes things to fall apart, but I didn't know why.
- Noticed the buildings around are falling apart. Makes you really take in the natural state of decay.
- Relates to all of the concrete buildings around. Shows how decay is something growing and expanding, and that decay is a slow process.
- Rust—how much it relates directly to the buildings, makes it more interesting.
- Rust, I never realized, I've seen these buildings before and had wondered why they are like that. So now when I look at a building, I'll know...[All in chorus] spalling.
- Showed a process we'd noticed but didn't know why it was going on in the buildings.
- Showed the power of chemistry. Saw an example of that at nearby old Aquatic Park piers where saw similar cracking.



Appendix B – Visitor Comments About Specific Exhibits

- Totally cool. I was unaware of that happening.
- With rust, they are using the actual architecture and pointing out what's here. We need more of that. The world is so interesting!

Pier Piling Pivot

- It makes you wonder about the range of the tide because I noticed that only three feet on the piling had life on it.
- You are noticing so many varieties of living things (AF); you get to be close to the piling and see up close all the little things growing.
- Pulls the sea right up to you so you can see what's down there.
- Barnacles and things, it was cool, I've never seen that up close (MC).
- Because you can see what's under the water...noticed seaweed. Made me hungry. Seaweed is my favorite food. Saw the algae and barnacles.
- Brought the evidence right up to your face. Could see "wildlife" in action and up close.
- Factoids about sea life and its layers. Actually saw the sea life; was the real thing.
- I never thought about it before, it was cool (F).
- it is something that you not usually see up close
- It wasn't obvious that the pile would rise. It was fun surprise. And to see all the sea life stuff was fascination. Not something you normally see. Sea lettuce, algae, bitty barnacles.
- Like limpets—they were sticking their tongues out at us [Child].
- It was unexpected that something would come up out of the water.
- The barnacles; I did not know they were related to crabs; I have a boat and don't like barnacles on the boat.
- That piling thing is impressive. The Exploratorium building can't have something like that indoors because it's too big.
- The button was cool, interactive. Provides the comparison right there. Can see the sea up close and personal and then on the pilings around each pier.
- The piling, but I had trouble finding the animals.
- This exhibit showed what a dynamic environment the Bay area is with marine plant species from other parts of the world coming in on boats.
- Had a dead crab in it!

Wave Tracing

- Different patterns you could trace. How do they erase it?
- The factoids. Interactive. Hallmark of Exploratorium is having things hands-on.

Tasting the Tides

- I liked to see _____ making faces while tasting the water.
- Loved the idea of the saltwater even though I didn't taste it.
- Has a school project about sharks which this exhibit was relevant to.
- I liked it, I liked the face you made when you spit it out [to partner].
- It shows the different saline levels around the Bay.
- It was salty [child].
- Saltwater tasted so bad [Child].
- Neat to taste. Would make me curious...about the salinity of my own body, tears, salt water—different levels. First time experienced and leads to a deeper understanding of life.
- That you could taste something you wouldn't otherwise taste. That made me curious about varying levels of salinity in Bay.



Appendix B – Visitor Comments About Specific Exhibits

- The salination one. The amount of interactivity and to actually taste and adjust the salt content. It's fun. Sometime exhibits just have a description, but I like the interactivity. It's more fun and more memorable. And a great link to where animals live. [F joins in] Oooh, this is where the shark lives. But I was a little unsure how to operate it.

Bridge Thermometer

- Because today it's busy, thousands of people [are on the bridge], but it needs a sun shield for visibility. [On this day there was morning sun as well as many Girl Scouts walking across the bridge for a special event.]
- Bridge was cool. Cool way of measuring. Wouldn't think a bridge like that could fluctuate.
- Bridge was fantastic. Bridge is not animated, but the real version, live action. Did not know that the bridge rises and falls with temperature. Noticed the bridge rose about an inch.
- Found the notion of the temperature change fascinating.
- Hard to recognize Bridge on screen. Don't expect it to respond or move like that.
- I couldn't believe that it moves the much—five feet is remarkable!
- Idea of thermometer awesome. Shows it would be better to jump off on a cold day.
- Impressive because it's very clear temperature changes height on a long piece of metal. This is the first time you can see this so clearly with this exhibit.
- Oh, of course it would shift. But would never have thought of it. Taken that for granted. Liked seeing cars too.
- Really captured my imagination. Was a more internal exhibit. Had no idea a bridge could expand and get longer.
- Very interesting to see how much variation in height there is, but people are capable of processing more information than shown.
- Thought it was a telescope and looked for viewfinder. Liked diagram and the process it showed and that it was a screen.
- Took more figuring out.
- Didn't get it. Finger-holds, knob?...

House of Days

- Architectural reuse of an old building. Came here on Monday when it was foggy and so could see images of when the weather changed.
- Best name of all three exhibits. But could be online and provide better experience, e.g., could be anywhere other than its current location.
- Compared the images of different days at different times to find out when it would be good to go for an outing.
- Cool to see the difference between foggy and clear days. Amazing views of San Francisco.
- Could be manipulated. Liked seeing how different the days were; seeing the differences in color.
- Could do things with pictures: zoom in, see overview, etc.
- I liked the sky already. Interesting how it got dark sooner in March and April, and how cloud formations were different. Made me curious about clouds.
- Liked being able to explore all different types of weather.
- Nice to see on different days what the weather was.



Appendix B – Visitor Comments About Specific Exhibits

- Pictures of the bay. How the days happen, change. Nice record of the days.
- Really interesting. Can really see how the weather changes from hour to hour within the city. Well demonstrated in the photographs.
- Spectacular photos. And to see the times of day and the air quality of the city.
- The difference between 6 a.m. and 7 a.m. was remarkable. Seeing the many things going on. Reminded me of the camera obscura, except this one is real photography.
- Took awhile to figure out how to work. Looked at May 30th and was just what I remembered the day looking like.
- We loved coming upon it. It's so poetic, the name is something you could find in Pompeii. [They go on musing about the exhibit name for a bit.]
- Stuck on 7th of April. Interesting, but so what? Only fun for two minutes and then loses appeal.
- Had trouble with interface and cursor.

Wind Arrows

- A bird landed on one of them while we were looking at it. See different ways they pointed and amazing that one a short difference in height would make them point differently.
- It's photogenic, nothing new, not much wind today. It's a function of elevation (M).
- Like a living sculpture by Calder. Had no idea so many levels of wind currents in a small space.
- Nice to see how wind changes in relation to height.
- Not realizing wind came at different altitudes. Artwise, is a beautiful thing. Combination of art and science.
- Simple—see different layers of wind. Cool to see happening in front of you.
- The red one, something about the sun reflecting, I wondered if it was spinning, it caught my attention. My friend does stuff with wind to generate light. I was surprised it wasn't moving, the wind is probably blocked, that might not be the right spot for it.
- Truthfully, I've been to the Exploratorium and I'm not sure I get it. Wind Arrows, I got, an example of different speeds of wind.
- Was like my boat.



Appendix C – Visitor Comments About OE Overall

Visitors offered these comments when asked what they believe is the purpose of OE. Single responses can touch on many of the intended goals for the exhibit. Because exhibit-specific references (Appendix B) do not tend to reflect OE's goals for visitors to use science as a means of understanding the world around them, those references are highlighted here.

Included in the first list below are those comments that discuss using science as a way to understand and appreciate the world. The second list includes similar sentiments, but without a specific reference to *science*. Other purposes of the exhibit that visitors perceive include educating people about the Bay or the Bay Area. Here, and in discussing why OE might be located at FM, visitors touch on many of the intended OE goals, but emphasize the idea that the Exploratorium can reach a larger and/or new audience this way,

Using Science to Appreciate the World Around Us, the Natural World

- Connect people with scientific aspects of nature. Not just looking at it but learning about things underlying nature, the bridge, clouds etc. E.g., looked at #10, didn't know it rose and fell with temperature changes.
- Engage the public by showing old and new technology. Points out something right front of you and show the science behind it. [Did you experience?...] Understand Thermo-expansion. Engineering of bridge so it doesn't break.
- Entertainment. A good destination and diversion. Nice experience. Quick way to learn one snippet of science at own pace. Can do other things at same time. [Experience that?] Yes, it is a unique San Francisco experience alongside the more mainstream attractions. It piques curiosity about nature, physics, this part of the environment. Helps you to remember to notice things. E.g., knew metal changes size but good to capture it in the viewfinder of the Bridge Thermometer.
- Gives people a very small taste of science without needing to commit to visit a science museum. E.g., just walk by and see. [How experienced?] Both boys very interested in airplanes so could appreciate Lift, seeing how the foils shaped like wings moved up and down. Easier to learn by seeing and interacting than just reading books.
- Natural phenomena: wind, waves. Sparks curiosity. The principles of physics—see them in practice. Surrounded by these things like wind every day—the exhibits were showing a deeper understanding of these processes. Experienced that with Bridge Thermometer and Pier Piling—showed things to people they wouldn't otherwise see.
- Science education. [Probe] To show how science is a part of our everyday life and it's happening round us all the time, but people don't notice, don't think about, about the world. We get a lot of accurate information, but just the beauty of physics, and the world. It's nice. [Probe] I'm a science junkie. I'm naturally involved in that way—it's always on my mind.
- Teach science very hands on (AF); highlight natural phenomena in sensory ways. [Would you say it is to show people...] Elements in their natural place (AM). [...To help people...] understand the world around them and make you slow down.
- To draw attention to what's already here and think about the natural science, I guess. [Probe] Yes, it's all the water, looking at the movement the waves make in the sand and seaweed. *We* experience these things every day, but we just don't think about them.
- To engage people in science and the outdoors. Make them think outside the box, open your mind. These exhibits are very Exploratorium-ish.
- To explain to lay people nature, physics, science. [Did you experience that?] Gave a mini-museum experience.
- To get people to notice the science in the environment around them. Cool to see things we don't consciously know around us in the natural world. [Can you give me an



Appendix C – Visitor Comments About OE Overall

example?] Rust wedge—after looking at the given example, you notice the rust in the buildings around you.

- To promote scientific thinking; that science is around us; we don't think about it otherwise (AF); to promote the museum. [Did the exhibits made you think about science then?] Yes. [Can you give me an example?] The Architectural Mirage: you don't think about that
- To show people that things in nature are related to science and that understanding them is not just so you get a better diploma/job. [Probe led to] To show young people relationship between nature and life.
- To think about the natural environment, be more curious in a scientific way. [Probe] Yeah, the pilings, it was interesting to have different species at different depths.
- [To show people] that science is fun; mixing science and the everyday (AF); it did not seem to be there for a purpose; there is no overarching theme. [Did you experience that science is fun?] Yes. [Can you give me an example?] The same examples as earlier.
- Natural history education. Everyday physics.
- Science tells you more about the weather and climate in the city.
- Like a museum to provide understanding and appreciation of the area. Intriguing for people to think about things. [To show people] nature, physical sciences.
- To help people...understand the environment they live in, especially the physical and scientific aspects, e.g., the Pier Piling Pivot. Weathering of buildings at joints [Rust Wedge]. Would not have noticed otherwise.
- Understand the environment...to show people everyday science...understand physics principles. [Did you experience that?] Yes. [Can you give me another example?] Corrosion; it is a part of the things that you don't notice or think about.

Appreciating the World Using These Exhibits (No Specific Reference to Science as a Tool for This Appreciation)

- [To show people] what is going on outdoors. How everything works together. Gives you a chance to play with nature in a hands-on fashion.
- To show people the interface between human use and the environment, history and explaining changes in conditions between different locations (AM). Extending Exploratorium ideas that you can do outside and learn the principles of physics. Can see how they work, can "get them" and have time to play with them. Open-ended vs. classroom learning.
- Because at the Exploratorium it is inside; here the exhibits allow you to do things you couldn't do inside (AF); it connects the environment of Fort Mason with nature. [Did you do things you couldn't do inside then?] Yes (AF); observing the waves moving the sand; because it is the only way to experience it; you need the waves; also the sound being affected by the atmosphere; the rusty beams are here; you get to notice; it makes you look at things more. Yes, that's it!
- Educate people. Give people more information. [Did you experience that?] Yes, didn't know about the climate here. Gives tourists a chance to learn about the environment they are visiting.
- Education, connection to your environment and to yourself (M) and more appreciation of your environment [All agree]. The point is to help us appreciate the Bay Area and our environment; for example, steel rust causes, I never knew that it's two to four times larger. It's interesting to have more information about the process that I've never known about before.
- Exhibits are showing things you would not have conscious thought about otherwise.
- Gets people outdoors to see the natural and manmade world. Great tourist destination. OE is showing people similar to what the Exploratorium does: getting a better understanding of the world around us in way that's fun and very San Francisco specific.



Appendix C – Visitor Comments About OE Overall

- Interacting with the local environment. I'm loving it. I work at Pier 23 so I have an affinity for it. These are things I think about anyway. It's exciting!
- It's related to the natural environment to creatively demonstrate the effects of the environment. [Probe] They all do, and the wind, and the sky changes—patterns, it's cool to see the patterns.
- Seeing what's around. Puts people's attention on environment. E.g., Pier Piling makes you think about what's under the water on other pier supports. As a result of Rust Wedge, we started noticing other rusted things like the old staircase down into the water.
- Teaches people about the natural phenomena and how it affects the "constructed" world. Makes you more aware of the natural world.
- To bring people in touch with the environment. To see and think about forgotten elements of the nature around us. Fun and educational.
- To educate and to make people curious and want to learn more. [Probe] Yes, I programmed my phone with the sound and light number.
- To explain and help us understand wind, wave, and temperature action. Learned about our current environmental surroundings.
- To help people better understand the processes that are going on around them and are happening here. [Probe] Yes, with rust, the air foils, the piling when it has more growth.
- To help people understand the world around them (FC). [Probe] I had no idea that these things were that interesting, the piling, the barnacle one.
- To raise the social consciousness of people, to understand that places like Fort Mason need to [be] protected if they are to survive. To help young people get interested in science.
- To show people...the wonders of everyday life. Making people observe the awesomeness of things. Educational. Yes, I think I could extrapolate this to apply elsewhere.
- To tell us about natural phenomena. E.g., Bridge One moved with changes in temperature.
- Yes, because you have them integrated into the actual environment. You can make the immediate connection with nature as opposed to taking learning from inside an institution outside on your own.
- I have the urge but not the experience. This is good for me to help me know, interact with the world. And they're so simple and easy.
- Yes, it's a good way to intrigue people about the Exploratorium. More people are here, and they are here to experience the environment. This adds a little "awe" about how the world works.
- Yes, nice to be in situ. Lets people be outside on nice days. Much stronger connection between manmade and natural world.
- Yes, casually encounter education. "Real" thing. Not education in a "dry way." Don't have to produce fake wind because we are with the real thing.
- Yes, here you are in the world and all of nature is here around you. Wouldn't make sense out of context.

Noticing More the World Around Us

- Noticing station is a fabulous phraseology. E.g., there's so much to see in this area—these stations help you to stop and focus on one thing, like seeing wind currents or that the bridge is sagging up and down.
- Always to look at day-to-day phenomenon with informed insight. Helped me experience...the inherently aesthetic nature of everyday phenomenon.
- Because at the Exploratorium it is inside; here the exhibits allow you to do things you couldn't do inside (AF); it connects the environment of Fort Mason with nature. [Did you do things you couldn't do inside then?] Yes (AF); observing the waves moving the



Appendix C – Visitor Comments About OE Overall

sand; because it is the only way to experience it; you need the waves; also the sound being affected by the atmosphere; the rusty beams are here; you get to notice; it makes you look at things more. Yes, that's it!

- To get people to interact with the world around them. Notice how things happen. Man versus the natural world.
- For “Wow” factor. Gets you to notice things that you didn't notice. Now you do notice everywhere—for example, on the neighboring piers. To show people about the Exploratorium. Extending its purpose, fun and playfulness from indoors into and outside setting and making it fun.
- Educate about environment in the bay and notice things you'd normally take for granted. E.g., with wind exhibits—you know it's windy, but now how the height of wind differs. Re #3, never stopped to look at seagulls, now I would.
- To show you about the environment. Expansion of the Exploratorium's mission. Get you to notice things out in the environment that we take for granted.
- The point is to help people observe what is around them. [Did you experience that?] Absolutely! Yes, I observed the rust on the buildings, the bay through the Ship Constellation; on the piling you can see what's down below on the permanent pilings.
- To heighten awareness, teach, something. [Probe] I like to think I learned—learning why cement falls off the iron rebar in buildings.
- Make people more observant of the world around them. Water, buildings, effect of environment on what we build.