National Museum of Natural History

Scientist Is In
Summative Evaluation

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audience focus

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About Audience Focus:

Audience Focus is an international evaluation, interpretive planning, and professional development organization providing services for museums, cultural organizations, and other informal learning environments. With offices in the USA (Annapolis, MD) and UK/EU (London) we aim to support professionals in their efforts to create and sustain effective and satisfying experiences for diverse audiences.

Executive Summary

Scientist Is In Summative Evaluation
For the National Museum of Natural History
By Audience Focus, Inc
November 15, 2012

In August 2012, the National Museum of Natural History (NMNH) contracted with Audience Focus (AF), a Maryland-based research and evaluation organization, to evaluate visitors' experiences with the *Scientist Is In* program. Specifically, AF was asked to design a comprehensive study that would provide insight into the nature of visitors' engagement with the program, and how participation in the program influenced visitors' understanding of and curiosity about science topics, awareness of science careers, perceptions of NMNH as a research institution, and recognition of the connections between science and their personal lives.

Multiple methods were used to answer the questions posed above and included a combination of a) focused observations, and b) semi-structured interviews and concept mapping activity. For the latter, AF designed a quasi-experimental investigation, with a Treatment group who participated in SII as part of their experience with the Hall of Human Origins (HHO) or Sant Ocean Hall (SOH) exhibits and a Control group who did not participate in SII as part of their visit experience. Both the observations and interviews were conducted on-site within the HHO and SOH exhibitions at NMNH. A total of 92 people were observed interacting with the SII program, and a total of 76 visitors participated in the interview and concept mapping activity (37 Treatment; 39 Control).

Key results include the following:

- The *Scientist Is In* program is successful at attracting visitors and holding their attention: 88% of visitors naturally approach the cart and initiate their engagement with the scientist. Visitors spend an average of 4 minutes and 9 seconds at the program and 94% display non-verbal signs of engagement with the program, including nodding, laughing, pointing, and focused listening.
- Looking at best-practice facilitation strategies, 91% of scientists follow visitors' interests; 88% use objects to illustrate scientific concepts and stimulate interest; 58% use inquiry-based learning strategies; only 30% encourage visitors to explore topics following their experience and only 15% provide career mentoring by discussing or suggesting possible careers to visitors.
- Interactions with the scientists and the objects on display inspire awe & spark curiosity for many visitors: 47% of observed visitors verbally express awe & wonder; 67% demonstrate curiosity by asking at least one question.
- Breadth and depth of conversations among visitors and scientists vary widely; some visitors say very little and may prefer to listen, while others prefer more involved, verbal exchanges with scientists. The degree to which visitors engage in a range of conversations, experience awe, and ask questions is influenced by the degree to which scientists utilize best practice facilitation strategies, including inquiry based and object-based teaching strategies, as well as emphasizing personal connections and drawing up visitors' prior knowledge.
- The *Scientist Is In* positively influences visitors' general interest in science, as well as science careers more specifically. Visitors who participate in the program (Treatment) are significantly

more likely to rate their general science interest high than those who do not participate (Control); they are also significantly more likely to say they "enjoy studying science," and they would like "to be a scientist," than are visitors who do not participate in the program.

- The *Scientist Is In* program does not influence the ways in which visitors describe scientists. Visitors who participate in the program (Treatment) and those who do not (Control) express commonly held stereotypes when describing scientists; however, they also express very positive attitudes towards scientists, describing them as critical thinkers and problem-solvers, creative innovators & discoverers, and as scholarly and knowledgeable disseminators of knowledge.
- The Sant Ocean Hall and Hall of Human Origins exhibitions are successful in increasing visitors' understanding of "ocean science" and "human origins;" both visitors who participate in *Scientist Is In* (Treatment) and those who do not (Control) rate their knowledge of those topics higher following their experience in the exhibitions than it was before their experience.
- *Scientist Is In* visitors (Treatment) rate their understanding of ocean science following their experience in Sant Ocean Hall higher than visitors who do not participate in the program (Control); there were no differences among Treatment and Control visitors in their understanding of human origins.
- The *Scientist Is In* program does not influence visitors' understanding or awareness that NMNH is a research institution; however, this topic is not frequently discussed during the program.
- The *Scientist Is In* program does not influence visitors' understanding or awareness of science careers; however, this topic is not frequently discussed during the program.
- The *Scientist Is In* program supports visitors' ability to see the connections between humans and the natural world; visitors who participate in the program (Treatment) are significantly more likely to say that topics found within the Sant Ocean Hall and Hall of Human Origin relate to their person lives than are visitors who do not participate (Control).
- 84% of visitors who participate in *Scientist Is In* perceive that the greatest benefit and value of the experience, is increasing their knowledge, understanding, or awareness of science topics.
- 51% of visitors who participate in *Scientist Is In* say they are pleased with the program and cannot think of ways it could be improved. For those who did make suggestions, recommendations included improving program content or resources, increasing the number of programs, or improving the delivery of information.

Recommendations for the *Scientist Is In*

Emphasize Mutual Learning & Multi-Directional Dialogue

Currently, the *Scientist Is In* is structured to support a question and response type exchange between the visitor and scientist, where the scientist may respond to questions with the primary goal to communicate their expertise to visitors. While this format brings scientists and the public together and is clearly successful at stimulating conversation among the groups, there could be more emphasis placed on the "mutual learning" model, where the flow of information is more multi-directional. According to McCallie et al (2009), in a "mutual learning" model, experts do more that "just present their knowledge and perspectives," and requires more from visitors than "merely asking questions of experts." The "mutual learning" model is effective in helping the public (as well as the scientists/experts) gain awareness about

their own, as well as others', perspectives on scientific and societal issues, as well as have an increased ability to craft strong arguments about issues. Thus, researchers recommend employing the "mutual learning" model for future *Scientist Is In* programs.

Listen More, Talk Less

To implement a "mutual learning" model in the *Scientist Is In*, it will be important that scientists and experts focus more on listening to visitors' perspectives towards a topic and encouraging visitors to weigh in with their thoughts and opinions before heavily presenting on their own expert knowledge and experiences. It has long been thought that the vast majority of scientists lack expertise and training in communication with public audiences; thus, an obvious recommendation is for trained, NMNH informal educators to spend additional time training scientists in best-practice facilitation and communication strategies. *Portal to the Public* (POP), an NSF-funded project that was designed to create and test a new, specific model for engaging active researchers, scientists, engineers, and other science-based professionals in informal science education, developed resources to help informal science educators provide professional development experiences for scientists, and this might be a good place to look for best-practice ideas for future training experiences. (See http://www.pacificsciencecenter.org/Portal-to-the-Public/implementation-manual.html). Research on the net value of the POP guiding framework found that while scientists indicate that time is a major cost of engaging in prolonged and in-depth training, the opportunity to engage with public audiences, contribute to the community, and network among like-minded science professional outweighed the added time costs (Sickler, J. et al 2011).

Another suggestion for encouraging active listening among scientists is for NMNH to continue to record *Scientist Is In* programs in the future and encourage participating scientists to listen to the audio files following their program, as a way to reflect and improve their communication with the public. Listening to oneself engage in communication with another person often brings awareness about the balance of the conversation and allows one to ask questions like: Am I saying too much? Should I have asked a follow-up question here? How much am I letting the visitor guide his/her own learning and offer his/her own perspectives and values?

Resist Falling into Traditional Roles

Research indicates that unless people make concerted efforts with sustained support, scientists (and the public) often fall back into patterns of interacting with which they are familiar. Or in other words, scientists and visitors need practice moving beyond their typical roles, where the expert talks and the visitor passively absorbs that information. Scientists may need to be very concrete about the purpose of the activity, so that visitors know they are supposed to play an active role in the experience. It is likely that most visitors have been "pre-programed" over the years to expect that their role is to listen and agree, rather than to contribute by asking questions, providing their own perspective or understanding, or even arguing a point; thus, scientists might need to empower visitors by saying things like "it's okay to disagree with me," or "we don't know everything there is to know about this topic, what do you think it could be," or "what you say helps us think about what questions we need to be asking and to understand what is important to people." Another idea is that scientists could frame the experience around a big question(s) that they are attempting to answer, and even display it on a board that is easily visible to approaching visitors. When visitors join the experience, instead of the scientist asking "what questions do you have," or immediately launching into a "presentation" about the topic, s/he could say "tell me what your thoughts are about this topic," or "how would you answer this question/solve this problem?" Often, visitors might not know what questions to ask scientists, so starting with a problem or question to solve, will help scaffold the learning experience from the beginning.

Make It Relevant

Not surprisingly, visitors appear more interested in talking about science topics when they can identify connections that are relevant to their personal lives. Helping visitors make those connections is a current strength of *Scientist Is In* and should be emphasized in future programs. Research has found that many scientists have minimal "glocal" communication skills, or "the skills to take global or general issues and make them locally meaningful" (Leshner 2010). One recommendation is to always ensure that scientists come prepared to talk about the ways their work/research fits within the local context. Encourage scientists to ask questions like – how does this research map to relevant news events or "hot topics?" One idea is to equip scientists with a "cheat sheet" of current topics that may appeal to visitors, or a list of local issues that scientists can refer to throughout their engagement with visitors.

Communicate Purpose through Design

Design communicates a lot to visitors and provides the first visual clue as to what a program is about. Currently, The *Scientist Is In* program consists of an "activity cart," behind which stands the scientist or expert. This set-up presents a natural, physical barrier between the scientist and the visitor, and may reinforce the idea that the scientist will be imparting knowledge from behind a "podium." In this study, some scientists were observed coming out from behind the cart and engaging on a more intimate level and this seemed like a good approach in forming more personal connections with visitors. Additionally, activity carts are widely used in museums and thus visitors may have preconceived notions about what will, or is supposed to happen there (e.g. that they are just supposed to touch the objects and ask what they are, but not to engage in dialogue about current research and larger thematic questions and issues). If the goal is to get visitors to stay longer, and engage in multi-directional dialogue with scientists and each other, then some changes to the design of the experience may help achieve these goals.

Decide What Role Objects Should Play

NMNH staff might want to give thought to what role objects will play in future *Scientist Is In* programs. It is well known, and supported by this study, that objects are effective in attracting visitors and stimulating curiosity and interest around a topic. Depending on what the purpose of the program is, however, the objects might also detract visitors from engaging in dialogue around larger, more abstract topics where they are being asked to communicate about their values and larger scientific and societal issues - espeically if the facilitators are not skilled in connecting the objects to abstract ideas and/or in effectively transitioning from the concrete "what is this" to more abstract "how is this related to my life." This is an issue that has come up in other informal learning settings; for example, a project focused on supporting informal educators to communicate about climate change found that one of the biggest challenges for interpreters was effectively leveraging visitors' attraction to and curiosity about live animals, and connecting it with abstract topics like "climate change" (or topics that interpreters worried visitors would not be as easily interested in). Again, NMNH may consider discussing this challenge with scientists and provide them with strategies for using objects as a way to stimulate deeper discussions.

Strengthen the ISE – Expert/Scientist Bond

Scientists and Informal Science Educators have much to learn from each other. It will be important to share this report with scientists in an effort to build stronger relationships between scientists & informal science environments. This report could launch a series of discussions, workshops and trainings around future *Scientist Is In* programs.

Table of Contents

List of Tables

List of Figures

Introduction

Project Description

The Smithsonian's National Museum of Natural History (NMNH) is the most-visited natural history museums in the world. As a global leader in the field, its Office of Education and Outreach is in the process of restructuring as part of an institution-wide effort to promote the education and outreach activities of the museum to the rigor and renown of its science activities. A related intent is to advance the impact that NMNH has on its visitors and on the field of museum education, particularly the integration of research and practice in an institutional setting and a focus on programming that harnesses and fosters personal connections to collections, research, and scientists.

Public Engagement at NMNH

A central part of the developing vision for the education and outreach at NMNH has been to improve onsite and online public access to collections, research, and researchers, and increase opportunities to develop and use the skills and processes that scientists use to study NMNH connections to science, collections, and scientists in personally and socially relevant contexts. The goals of increasing public access to collections and scientists are three-fold: a) to inspire the public to learn more about the natural and cultural world at the museum, online, and in their daily lives; b) to help the public to develop the skill and the inclination to use evidence to interpret the natural world and our place in it so that they can engage meaningfully in conversations about solutions to natural and human challenges, including taking action toward those solutions; and c) to engage the public with NMNH collections in personally and socially relevant contexts to increase the recognition and perception of natural history research as important to us as individuals and to our world today and in the future.

The *Scientist Is In*

As part of its mission to increase public access to collections and scientists, NMNH implemented the *Scientist Is In*, a program that was designed to support museum exhibitions and provide personal interaction on specific topics by allowing visitors to meet experts in the field and to expand on topics within and related to two, permanent exhibitions – the Sant Ocean Hall (SOH), and the David H. Koch Hall of Human Origins (HHO). Scientists or specialists are stationed within the exhibition where they can show artifacts, specimens, equipment, tools and/or imagery. The target audience is museum visitors that enter the exhibitions and includes local visitors and tourists, intergenerational groups, groups of adults, individuals, and students on school field trips. The expert scientist or specialist speaks informally with visitors about his/her research, new discoveries in the field, and/or other aspects of their work, encouraging a dialogue with visitors where questions are welcomed. The *Scientist Is In* occurs weekly in the SOH, and bi-weekly in the HHO.

Evaluation

Audience Focus Inc (AF), an educational research and evaluation organization, was contracted to conduct a summative evaluation of the *Scientist Is In* program. The summative study was designed to help NMNH staff better understand how audiences make use of and are impacted by the *Scientist Is In* experience. Specifically, three questions guided the study of the *Scientist Is In*:

1. What is the nature and scope of interactions between scientists and visitors through the *Scientist Is In* program?

2. How does interacting with scientists or content specialists influence visitors' understanding of and curiosity about science topics (particularly those presented by scientists), awareness of science careers, perceptions of NMNH as a research institution, and recognition of the connections between science and their personal lives?
3. How do visitors who have participated in the *Scientist Is In* program perceive they benefit from the interaction and what do they find most valuable about the experience?

Methods

Design

In designing the study (and corresponding instruments), AF researchers worked closely with NMNH staff to ensure that evaluation frameworks, metrics, and protocols designed by NMNH were adapted and utilized. For this study, AF researchers and NMNH staff focused on two (of the four) "cornerstones" of NMNH's evaluation framework: *Engagement,* and *Influence*, with evaluation question #1 mapping to *Engagement*, and evaluation questions #2 and 3 mapping to *Influence*. To answer the evaluation questions posed above, multiple methods were used and included a combination of a) focused observations, and b) semi-structured interviews with a concept mapping activity. See Appendix 1 for a detailed description of NMNH Evaluation Framework, Metrics, & Protocols (as they relate to the *Scientists Is In* evaluation study).

Focused Observations

In order to answer evaluation question #1 (measuring the nature and scope of conversations between scientists and visitors through the *Scientist Is In* program), visitors were observed interacting with the *Scientist Is In*. Through focused observations, ILI researchers documented stay times, as well as the depth and breadth of conversations between the visitor and scientist. This portion of the study was designed to provide detailed, observable data to explore the degree to which the following *Engagement* outcomes for the program are being achieved: 1) promote dialogue, 2) inspire awe, 3) hold attention and 4) spark curiosity. [1]

Semi-Structured Interview with Concept Mapping Activity

To answer evaluation questions #2 (measuring the degree to which interacting with scientists influences visitors' experience) and #3 (perceived value), AF researchers conducted a quasi-experimental study that allowed for a comparison of visitor impacts between two conditions at each of the two exhibitions:

1) Treatment group – visitors who attended the *Scientist Is In* program as part of their exhibition experience;
2) Control group – visitors who did not participate in the *Scientist Is In* program.

[1] A fifth outcome, exploration, was not addressed in this study, as it fell outside the scope of the timeline identified by NMNH. However,

Semi-structured interviews were conducted with both Treatment and Control groups. Interviews also incorporated a concept mapping activity that was designed to engage visitors in an activity and elicit their attitudes and perceptions towards scientists. Data collected for this portion of the study was designed to capture a broader understanding of how the program influenced visitors and addressed the degree to which the following *Influence* program outcomes are being achieved: 1) enhance understanding of science content; 2) increase curiosity about science topics; 3) increase awareness of science careers; and 4) enhance the recognition of connections between science and visitors' personal lives.

Data Collection

Focused Observations

AF conducted focused observations of visitors interacting with the scientists and content experts in the Sant Ocean Hall (SOH) and the David H. Koch Hall of Human Origins (HHO) during the months of August and September, 2012. During that time, 7 of *Scientist Is In* programs were held in SOH and 3 in HHO. Observations took place throughout the 2-hour time blocks, with observers recording conversations between scientists and visitors consecutively throughout that time. See Appendix 2 for the observation instrument. Visitors were selected to participate in the study based upon their natural engagement with the program. Visitors were not cued or asked to interact with the *Scientist Is In* program for the purpose of the evaluation; rather, they were observed interacting with the program in an unobtrusive and naturalistic manner. NMNH staff posted a sign near the *Scientist Is In* activity cart alerting visitors that they would be audio recorded during their interaction with the program. AF researchers later transcribed all audio recordings for analysis.

Semi-Structured Interview with Concept Mapping Activity

AF researchers conducted face-to-face, semi-structured interviews with visitors from both Treatment and Control conditions in SOH and the HHO. For the Treatment group, visitors were asked to participate in an interview immediately following their program experience.[2] Visitors in the Control group were randomly approached for an interview upon exiting the exhibition. Interviews consisted of open-ended questions, as well as scales and closed-ended questions to capture quantitative data and demographic and psychographic information as appropriate (see Appendices 3-5). Every effort was made to conduct interviews in the style of a comfortable conversation, in which visitors could share their experiences openly without feeling that there were right or wrong answers.

Description of the Sample

Focused Observations

[2] Due to the expansive nature of the exhibition spaces, and the restricted time during which the *Scientist Is In* program occurred, treatment visitors were intercepted immediately following their participation in the program. The rationale for not attempting to intercept visitors as they exited the exhibition spaces (like the Control group) was based on two hypotheses: 1) treatment visitors may spend an extended time in the exhibition, greatly reducing the amount of time data collectors would have to interview anyone else, and 2) if visitors were randomly approached while exiting the space, the chance of finding treatment visitors would be very low.

A total of 92 target visitors were observed interacting with the *Scientist Is In* program. Thirty-four visitors (37%) were observed engaging with scientists in HHO, and 58 visitors (63%) were observed engaging with scientists in SOH. Using their best visual judgment, observers recorded visitors' gender, age range, and group size and composition.

- ⇒ **Gender:** 62% (n=57) were female visitors; 38% (n=35) were male.
- ⇒ **Age:** 22% of the sample (n=20) were children aged 6-10 years, 20% (n=18) were adults aged 25-34 years, 19% (n=17) were adults aged 35-44 years, 15% (n=14) were children between 11 and 17 years old, 9% (n=8) were young adults aged 18-24 years, 9% (n=8) were adults aged 45-54 years, 5% (n=5) were adults aged 55-64 years, and two visitors (2%) were seniors over the age of 65.
- ⇒ **Group Size:** 19% (n=17) of visitors observed at the *Scientist Is In* program were alone, 35% (n=32) were in a group of 2 people, 15% (n=14) had a group size of 3, 19% (n=17) had a group size of 4, and 12% (n=11) were in a group with 5 or more people.
- ⇒ **Group Composition:** 53% of the visitors in the sample (n=49) were part of a group that included adults and children, 24% (n=22) were part of an all-adult group, 19% (n=17) were visiting alone, and 4% (n=4) were in a group comprised of children under the age of 18.

Semi-Structured Interview with Concept Mapping Activity

A total of 76 visitors participated in a semi-structured interview and completed the concept mapping activity. Thirty-seven (49%) were Treatment, 39 (51%) were Control. Twenty-nine (38%) were interviewed after spending time in Hall of Human Origins, and 47 (62%) were interviewed after spending time in the Sant Ocean Hall[3]. (See Table 1)

Table 1: Semi-Structured Interview with Concept Mapping Activity Sample (N=76)

	Treatment		Control	
Exhibition Hall	**n**	**%**	**n**	**%**
Hall of Human Origins	12	41%	17	59%
Sant Ocean Hall	25	53%	22	47%
TOTAL	**37**	**49%**	**39**	**51%**

The demographic and psychographic information reported below, consists of visitors' self-reporting of their gender, age, group composition, ethnicity, residence, occupation, prior visitation to the exhibits, and visit motivations. AF researchers ran tests looking for differences between Treatment and Control groups in regards to demographic and psychographic variables and found that there was an even distribution; thus, the following findings reflect the total sample (N=76).

[3] Sample sizes are lower for Hall of Human Origins as 1) fewer of those programs occurred during the scheduled data collection time period, and 2) visitation was lower in September overall (most likely due to children returning to school and the end of summer tourist/travel season).

⇒ **Gender:** 51% (n=39) were female visitors; 49% (n=37) were male.

⇒ **Age:** 43% of the sample (n=32) was comprised of young adults aged 18-30 years, 27% (n=20) were adults aged 31-64 years, 24% (n=18) were children under the age of 18, and the remaining 7% (n=5 people) were seniors over the age of 65.

⇒ **Group:** 50% of the visitors in the sample (n=38) were part of an all-adult group, while 37% (n=28) were part of a group that included children. The remaining 13% (n=10) were visiting alone.

⇒ **Ethnicity:** 79% percent of the sample (n=63) were reportedly White/Caucasian, 11% (n=9) identified as Asian, 8% (n=6) said they were of Hispanic origin or descent, 4% (n=3) identified as Black/African American, 4% (n=3) identified as American Indian or native Alaskan, and 3% (n=2) were Native Hawaiian or of Pacific Islander origin.[4]

⇒ **Residence:** The majority of the sample resided in the United States (78%, n=59), with the remaining respondents (22%, n=17) living internationally. Visitors living internationally came from the following countries: Australia, Canada, Chile, China, UK, France, Israel, Latvia, and Sweden.

⇒ **Occupation:** 27% of adults (n=15) indicated having a STEM related career and over half of children interviewed (54%, n=9) were interested in a future job in a STEM related field.[5] For adults, STEM occupations included: accountant; architect; engineer; IT manager; physician assistant; veterinarian; and wildlife biologist. Non-STEM occupations included: administrative assistant; attorney; military; carpenter; farmer; homemaker; librarian; police officer; sales; student; and teacher. Children interested in a future STEM career mentioned wanting to be a scientist, mathematician, doctor, chemist, or architect. Other childhood career aspirations included: candy store employee; lawyer; movie director; and teacher.

⇒ **Prior Visitation:** 82% (n=62) were visiting the exhibitions (SOH and HHO) for the first time; the remaining 18% (n=14) had visited the spaces previously.

⇒ **Motivations:** To measure visit motivations, visitors were asked to read a series of statements and select the one that best represented why they were visiting the museum that day. The statements were derived from Falk's (2009) framework of motivational identities. Table 2 shows visitors' motivations for visiting NMNH that day. The majority of the sample, 55% (n=42) came to the museum to have a new experience and just follow whatever sparks their curiosity and interest, 16%(n=12) visited because they like to seek out interesting things to do and NMNH is considered an important institution in DC.

[4] Visitors were allowed to select more than one racial or ethnic origin, so numbers do not equal 100%.

[5] STEM occupations include computer science, mathematics, engineering, physical and life science, medical field, and science education. STEM careers were defined based on a recent study examining STEM degrees and careers in the United States (Langdon, McKittrick, Beede, Kahn, and Doms, 2011).

Table 2: Visitors' purpose for visiting NMNH that day (N=148)

Visit Identity	Description	n	%
Learner/Explorer	I came to have a new experience and just follow whatever sparks my curiosity and interest.	42	55%
Experience seeker	I like to seek out interesting things to do and NMNH is considered an important institution in DC.	12	16%
Social Facilitator	I came to spend time with, and build meaningful experiences and memories with, the people I'm with.	9	12%
Recharger	I came to relax in a beautiful and refreshing environment	6	8%
Professional/Hobbyist	I came to see a specific exhibit and/or learn about a specific topic.	4	5%
National Pilgrim	I came to the Smithsonian out of national pride or because it is an iconic American experience	3	4%

Across all demographic and psychographic variables, researchers looked for differences between the Treatment group and the Control group. These samples were comparable; no significant differences were found.

Description of the Programs

In considering the ways in which visitors make use of and are impacted by the *Scientist Is In* experience, and to assess learning outcomes from the program, it is important to recognize that the experience is very context dependent. The scientist, other visitors, and the target visitor him/herself, as well as the exhibit and overall museum culture are all implicated in the learning experience. Therefore it was important to examine the context in which the learning was occurring, side by side with the outcomes that happened as a result of the experience. Thus, AF researchers recorded key contextual information for each program, including 1) how the interaction between the scientist and visitor was first initiated, 2) which learning tools/props scientists used to engage visitors, and 3) the facilitation approaches scientists utilized during their engagement with visitors. (see Appendix 6 for descriptions of each presenting scientist)

As a way to provide NMNH staff with a lens by which it can situate the *Scientist Is In* program within the broader field of informal science education, and public engagement with science activities specifically, AF researchers mapped the *Scientist Is In* to a framework created by researchers for the 2009 CAISE Inquiry Group report, *Many Experts, Many Audiences: Public Engagement with Science and Informal Science Education*. This study outlined a framework that allows public engagement with science programs and activities to be mapped along a continuum defined by three dimensions, with 5 levels for each dimension: 1) role of the public, 2) role of STEM-related experts, and 3) the content focus of the discussion. Table 3 shows the five levels for each of the three dimension as identified in the CAISE report; areas highlighted in gold show where AF researchers believe the *Scientist Is In* program currently maps within each dimension. Currently, the *Scientist Is In* program maps very closely to Level 2 for the role of the public and STEM expert(s); it maps somewhere between Levels 1 and 3 for its content focus.

Table 3: *Scientist Is In Program* in context

	Role of public	Role of STEM-related expert	Content Focus
Level 1	Publics learn from watching, listening, and viewing Passive receivers of a one-way flow of information	Experts serve as advisors and provide input to the project Contribute ideas, scientific content, and expertise	Focus is understanding the natural and human-made world
Level 2	Publics ask questions of STEM-related experts and participate in interactive inquiry-learning Publics actively involved in interacting with the source of information in order to get information of interest to them Flow of information primarily one-way, but participants choose the topic of some of that information	Experts actively present their expertise to the public Develop and deliver public presentations and may respond to questions and correct misconceptions Intention is to communicate expertise to the public	Focus is the nature of the scientific process or enterprise
Level 3	Publics share views and knowledge with other participants and with STEM-related experts Publics contribute their own views, knowledge, values Flow of information is multi-directional	Experts work to become skilled and informed communicators Intention is to learn how to be a better communicator	Focus is on the societal and environmental impacts and implications of science and technology
Level 4	Public participants deliberate with each other and engage in group problem solving Facilitators keep discussion focused and ensure all get to participate	Experts welcome and value participants' input and direction Actively seek knowledge from the public, including their thoughts, opinions, values, varying perspectives, and advice Seek public input to help them solve problems or answer questions	Focus is personal, community, and societal values related to science and technology
Level 5	Public participants produce recommendations or reports Participants collaborate to produce end products representative of their experience	Experts act on participant input and direction Work together with publics to solve problems and reach conclusions Recognize role of publics in institutional and science policy issues	Focus is institutional priority or public policy change related to science and technology

Who initiates the interaction?

The majority of visitors (88%, n=79) naturally approached the cart or scientist and initiated their engagement with the scientist. This behavior occurred both when the scientist was alone, and when other visitors were already present and engaged to some degree. In a few cases (12%, n=11), the scientist invited visitors over to participate in the program, causing visitors to change their directional path and approach the cart.

Which learning tools are utilized?

Scientists utilized a variety of learning tools (or props) to engage with visitors. Props included: a) specimens (e.g. formerly living creatures), b) models that represented scientific objects or processes, c) images, photographs, or text, d) a plasma screen that showcased video footage, and e) interactive activities.

Table 4 describes the frequency that scientists used props with visitors during the period the target visitor was present at the *Scientist Is In* program.

Table 4: Props used with visitors during the *Scientist Is In* programs (N=92)

Props	n	%
Specimens	52	57%
Models	49	53%
Images, photographs, text	32	35%
Plasma screen	10	11%
Activities	4	4%

*Percentages will not equal 100% as some scientists utilized multiple props

Which facilitation approaches do scientists use?

After completing an observation, data collectors reflected on the facilitation approach(es) the scientist used during his/her interaction with the visitor. Using a three point scale, data collectors indicated the degree to which each facilitation approach or strategy was utilized by scientists, where 0=*did not implement*, 1=*somewhat utilized*, and 2=*fully utilized*. The list below includes interpretation techniques or modes of communication often used by informal science educators/facilitators:

- **Following visitor interests**: The scientist followed visitors' personal interests in order to make the communication more effective.
- **Object-based learning**: The scientist used objects, specimens, images, or models to illustrate scientific concepts. The scientist used real objects as a way to engage with and relate to visitors.
- **Personal application**: The scientist made links between his/her own personal life and the life of the visitor, e.g. sharing stories about one's experiences, background, values.
- **Inquiry-based learning**: The scientist used a visitor-centered, active learning approach that focused on questioning, critical thinking, and problem solving.
- **Post-visit experience**: The scientist attempted to extend the visitors' engagement and curiosity beyond the *Scientist Is In* program by suggesting things visitors can do/see following the *Scientist Is In* experience and/or their NMNH visit.
- **Career mentoring:** The scientist discussed science careers (including his/her own) and/or suggested possible careers with visitors.

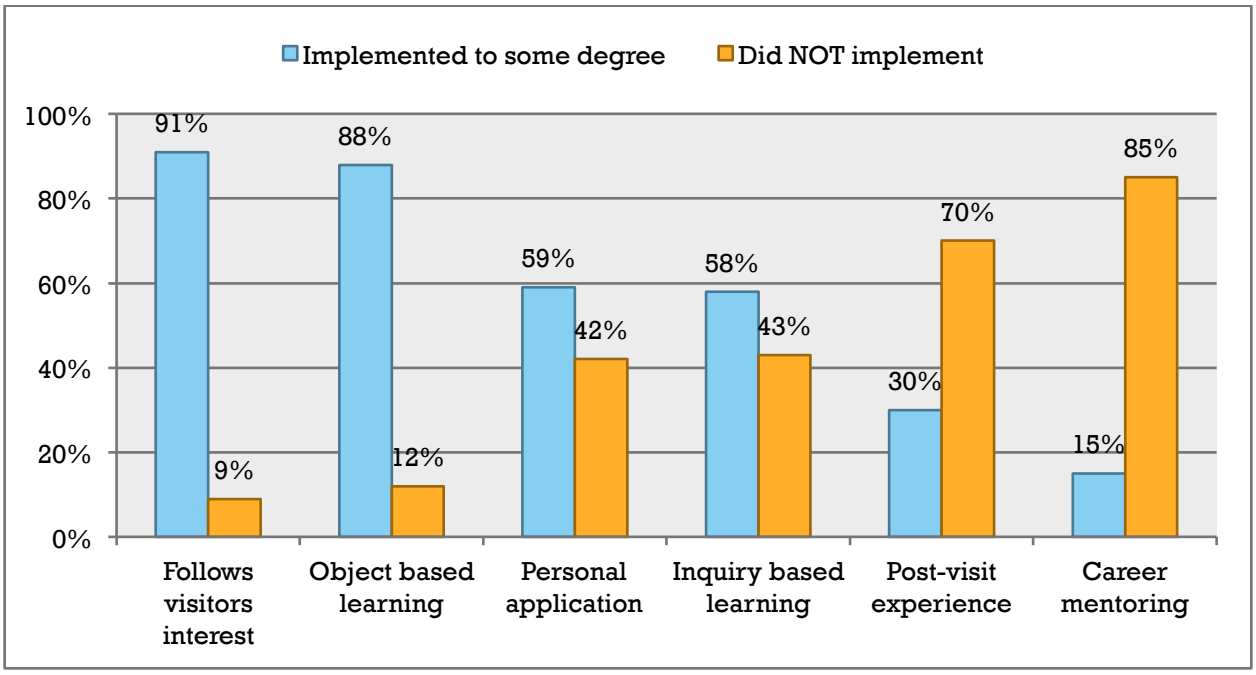
Figure 1 describes the varying degrees to which scientists utilized facilitation approaches with visitors. Note that during analysis, AF researchers combined the scores 1 (*somewhat utilized*) and 2 (*fully utilized*) into one, new category: *implemented to some degree*.[6] During 83 of the 92 total observations (91%), scientists were observed following visitors' interests to some degree. In these cases, scientists tailored the *Scientist Is In* program to connect, on a more personal level, with the objects or topics that interested visitors. During the majority of interactions (88%, n=80), scientists were also observed using objects to illustrate scientific concepts and stimulate interest and curiosity to some degree. In these cases, scientists allowed visitors to hold or look at objects, specimens, images, or models. In over half of the observations,

[6] The rationale for combining the scores into one was to create a binomial variable that could be used to run inferential statistics with a small sample size.

scientists employed a personal facilitation strategy (58%, n=53) and/or utilized inquiry-based learning facilitation strategy with visitors to some degree (57%, n=52).

Facilitation strategies that were utilized less frequently included: encouraging visitors' post-visit experience (during 70%, n=64 of the observations, scientists did NOT implement a post-visit experience), and/or providing career mentoring by discussing or suggesting possible careers to visitors (during 85%, n=77 of the observations, scientists did NOT implement career mentoring).

Figure 1: Facilitation strategies (N=91)



Results & Discussion

In this section of the report, we present study findings according to the three, overarching evaluation questions. First, we set the stage by presenting data on the nature and scope of interactions between scientists and visitors through the *Scientist Is In* program. Then, we explore how those interactions influence visitors' understanding of and curiosity about science topics, awareness of science careers, perceptions of NMNH as a research institution, and recognition of the connections between science and their personal lives. Finally, we look at visitors' who participated in the *Scientist Is In* program's perceptions about the value and benefit of the experience, as well as their suggestions for how the program might be improved in the future.

Section 1: What Is the Nature and Scope of Visitors' ENGAGEMENT with the *Scientist Is In* Program?

One of the primary goals of NMNH is to create programs that "hold attention, inspire awe, spark curiosity, promote dialogue about the natural world and how humans relate to it, and foster an interest in further exploration about the Earth, life's diversity, cultural diversity and change, and current and future challenges." In order to explore the ways in which those goals are currently being met, observers recorded the length of time visitors spent in relation to the overall length of the program (hold attention), the

number of visitors' verbal utterances of "awe & wonder" (inspire awe), the # and types of questions posed by visitors to the scientist/specialist and/or others in the visit group (spark curiosity), and the overall types of conversations that visitors and scientists are having, as well as the breadth and depth of those conversations (promote dialogue). AF researchers also recorded non-verbal behaviors, as a way to ensure all types of engagement were being acknowledged.

Hold Attention

Time spent at the *Scientist Is In* programs ranged from 21 seconds to 27 minutes and 30 seconds, with a median time of 4 minutes and 9 seconds (Table 5).

Table 5: Time spent at the *Scientist Is In* program (N=92)

Time spent	n	Mean	Med.	Stdv.	Min.	Max.
Overall	92	5 min 4 sec	4 min 9 sec	4 min 44 sec	21 sec	27 min 30 sec
HHO	34	3 min 13 sec	2 min 10 sec	2 min 56 sec	32 sec	12 min 54 sec
SOH	58	6 min 9 sec	5 min 5 sec	5 min 15 sec	21 sec	27 min 30 sec

As a second way of measuring the success of the program in holding visitors' attention, observers also looked for and recorded non-verbal behaviors that were seen as indicators that the target visitor had noticed and was paying attention to the scientist. These indicators included: listening, nodding, pointing, laughing, and/or looking up at the scientist while they were talking. Table 6 illustrates visitors' non-verbal engagement with the program. Observers recorded that almost all of the visitors who were observed (94%, n=86) seemed involved, focused, or interested in the scientist and what s/he had to say.

Table 6: Visitor appears engaged or interested in scientist (N=92)

Engagement	n	%
Appears engaged	86	94%
None	6	7%

Inspire Awe

As a way to discover more about the degree to which *Scientist Is In* is inspiring awe and wonder among visitors, AF researchers mined visitors' conversations with scientists and coded target visitors' verbal expressions of "awe or wonder." Expressions of "awe & wonder" included words like: "wow," "that's amazing," and "cool!" About half of observed visitors (47%, n=43) verbally expressed awe or wonder during the *Scientist Is In* program (Table 7).

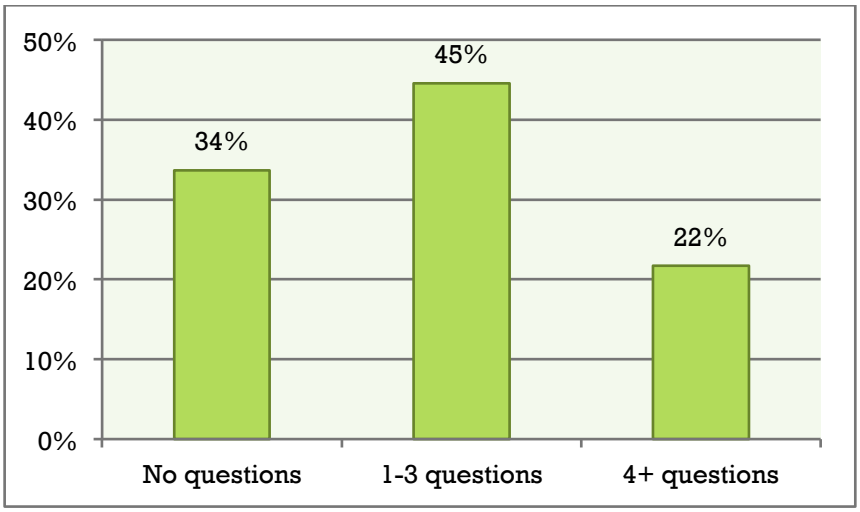
Table 7: Verbal expressions of awe or wonder (N=92)

Awe & wonder	n	%
Expresses awe or wonder	43	47%
None	49	53%

Spark Curiosity

Related to awe and wonder, AF researchers also looked for verbal evidence that *Scientist Is In* was sparking visitors' curiosity and interest in science and the natural world. Curiosity was measured by counting the number and types of questions asked by visitors during their interaction with the program. About half (45%, n=41) of the observed visitors asked between 1 and 3 questions during their engagement with *Scientist Is In*. Twenty-two percent (n=20) asked 4 or more questions. Figure 2 shows the distribution of the number of questions asked, showing that many visitors were inquisitive.

Figure 2: Frequency of questions asked by target visitors (N=92)



Overall, the number of questions asked ranged from 0 to 10 questions with a median of 1 question (Table 8).

Table 8: Number of questions asked by target visitors (N=92)

Questions	n	Mean	Med.	Stdv.	Min.	Max.
Overall	92	2.01	1	2.216	0	10
HHO	34	1.68	1	1.950	0	7
SOH	58	2.21	1	2.353	0	10

To look more closely at the types of questions visitors were asking, AF researchers looked across all questions asked by target visitors and created 6 emergent categories into which all responses were sorted and quantified. Table 9 lists the distribution of questions across the 6 categories.

Table 9: Types of questions asked by target visitors (N=61)

Question about…	n	%
Specific specimen/model	39	64%
Science topic	34	56%
Scientist's life	10	16%
Ask permission	10	16%
Smithsonian research, program, or exhibit	4	7%
Other	5	8%

*Percentages will not equal 100% as some visitors provided multiple responses

Most visitors (64%, n=39) had specific questions about a specimen or model that the scientist had on display. These visitors were curious to discover more about what the objects were and were they were from, as well as their age and authenticity. Specific examples of these types of questions included:

These are actual skulls?
Is that real?
What's this?
These are coral right?
What type of shell is this?
How old is it?

Over half of the target visitors (56%, n=34) had questions about the science topic or theme that was being discussed that day. Visitors' interests and curiosity about these topics ranged a great deal, from curiosity about the meaning of scientific words and factual information about animal/human behavior and history, to the more complex relationships between different scientific processes and phenomena. Some examples of these types of questions included:

What does "primitive" mean?
What is an anemone?
Does this have any implications on the ecosystems?
What is the difference between lava rock and pumice because it would also get like this because of the gasses right?
Is there anything that can abate a hurricane? Stop it? The land?
So what are the oldest humanoids?

Some visitors (16%, n=10) asked the scientist about his or her life. These visitors were curious about the scientist's personal life and often asked questions about the scientist's career or research. Some sample responses were:

So what are you doing? Research?
Where are you from?
How did you get involved in this work?
Were you interested since you were young?
What did you study?
Do you go and dig for things like this?

Some visitors (16%, n=10) posed questions that were more about asking permission to do or see something, usually to touch the specimen or objects on display. Some specific examples of these types of questions included

Can I hold more stuff?
May I please touch that?
May I take your photo?

Only four visitors (4%) had questions about the Smithsonian and its research, exhibitions, or programs. Some specific examples included

Are you doing Smithsonian research?
What is the name of this museum?

Other questions included questions directed towards members of the visitor group unrelated to science or the program.

Promote Dialogue

This section answers questions related to the types of dialogue visitors and scientists have during an *Scientist Is In* program and assesses the extent to which conversations between scientists and visitors expand on topics within and related to the SOH and HHO exhibits. More specifically, this section examines the degree to which *Scientist Is In* is achieving its goals to "promote dialogue" as indicated by locating evidence of the following types of talk: 1) discussions about the connections between humans and science and the natural world, 2) discussions about NMNH and/or Smithsonian research, and 3) discussions about science careers. As a supporting measure, this section also examines the overall breadth and depth of conversations.

Overview of the Types of Dialogue

Conversation analyses revealed the types of discussions visitors and scientists were having at the *Scientist Is In* program. Table 10 describes the categories of topics that were discussed while the target visitor was present at the *Scientist Is In* program. Note that this includes topics that were discussed by the scientist, the target visitor, and/or other visitors while the target visitor was present and engaged, whether passively or actively.

Table 10: Categories of topics mentioned while the target visitor was present at the *Scientist Is In program* (N=92)

Topics	n	%
Topics within / related to HHO/SOH exhibits	89	97%
Awe & wonder	55	60%
Instructional	45	49%
Personal information	43	47%
Smithsonian/NMNH	20	22%
Negative sentiment	2	2%
Other	1	1%

*Percentages will not equal 100% as multiple topics were discussed during the program

Almost all observed visitor interactions included dialogue directly related to the specific topic being presented by the scientist and/or the HHO/SOH exhibits (97%, n=89). Supporting findings reported above, dialogues also commonly included talk that demonstrated "awe & wonder" (60%; n=55), such as utterances like "cool," "interesting," "awesome," and "that is really neat." Roughly half of the conversations (49%, n=45) included instructional dialogue. This type of talk mainly focused on scientists' providing instructions about how to handle and care for objects. About another half of the conversations (47%, n=43) included personal information about where the visitor or scientist lives, likes to do in his/her leisure time, and any other personal information unrelated to the scientific topic being presented. Some experiences (22%, n=20) included discussions about the Smithsonian Institute or NMNH. Visitors and scientists talked about exhibits, research, or information about the museums in general. In just two observations (2%), visitors expressed a negative sentiment:

I think that if you look at DNA you see that there's some kind of higher intelligence that created all of that and that we don't come from this. We come from GOD.
I'm afraid of apes… I'm kind of creeped out by apes…they torture us.

Connections between Humans & the Natural World

As a way to measure the degree to which the *Scientist Is In* is supporting visitors understanding and awareness of the connections between humans and the natural world, AF researchers mined conversations between the target visitor and the scientist looking specifically for instances of talk related to those types of personal connections. For about one quarter of the observations (24%, n=22) the scientist referred to human/natural world connections, and a discussion about that topic commenced. In these instances, the target visitor asked a follow-up question or provided their thoughts and opinions about the connections. Over half of the time (53%, n=49) the scientist referred to human/natural world connections, but the visitor did not engage in further discussion about the topic. During 23% (n=21) of observations, visitors and scientists did not discuss topics relating to the connections between humans and the natural world (see Table 11).

Table 11: Conversations about connections between humans and the natural world (N=92)

Connections	n	%
Discussed	22	24%
Topic raised	49	53%
Not mentioned	21	23%

The following is an excerpt from a conversation addressing connections between humans and the natural world:

Scientist:	You can also have a tornado in a hurricane. There are tornados, sometimes - but not always. This is a little chart...this is Hurricane Katrina.
Visitor:	Several years ago that hit North Carolina…
Scientist:	Hit New Orleans. This is a weather satellite that takes a picture every 30 seconds, from the West coast of Africa to the Gulf of Mexico. So there are no storm surprises. We see them all the time. We broadcast...When we send out our forecast…you can even get them on your iPhone now.
Visitor:	Yeah, I get the alerts on my phone all the time.
Scientist:	Oh, good for you. It gives weather delays too for airports. Are you from DC?
Visitor:	Yes.
Scientist:	So you went through the derecho?
Visitor:	Yes and all these little tornados. I didn't get a lot though where I live.
Scientist:	You're right, they are isolated.
Visitor:	The derecho is only every 30 years?
Scientist:	On average, we get them once every 3 years. In the Midwest, it's more frequent.

For the instances where visitors and scientists discussed topics relating to the connections between humans and the natural world, AF researchers examined the directionality of conversations (or whether it was the scientist who initiated that conversation, or the visitor who initiated it). In the majority of

observations (80%, n=57), scientists initiated the discussion about connections between humans and the natural world (see Table 12).

Table 12: Directionality of conversations about connections between humans and the natural world (N=71)

Connections	n	%
Scientist initiated the discussion	57	80%
A Visitor initiated the discussion	14	20%

NMNH Research

As a way to measure the degree to which *Scientist Is In* is supporting visitors understanding and awareness of NMNH research, AF researchers mined conversations between the target visitor and the scientist looking specifically for instances of talk related to the research that is being conducted at the Smithsonian in general, or NMNH specifically. Table 13 describes the frequency that visitors and scientists discussed NMNH or Smithsonian research during the program. It was common for there to be no mention made of NMNH research. The scientists may have described their area of research, but did not explicitly specify the connection with the Smithsonian or Natural History museum. It is also important to note that four of the *Scientist Is In* programs had scientists from outside institutions including NOAA National Weather Service, Maryland Department of Natural Resources, and the George Washington University.

Table 13: Discussions about NMNH/Smithsonian research (N=92)

	Overall N=92		NMNH Scientists N=58	
NMNH research	n	%	n	%
Discussed	3	3%	3	5%
Topic raised	4	4%	2	3%
Not mentioned	85	92%	53	91%

The following conversation provides an example of visitors and a scientist discussing NMNH or Smithsonian research:

Visitor:	Is this just going to be a project in the coral reefs?
Scientist:	No, we have used it…the Smithsonian is launching this Marine Geo program which is meant to compare habitats across from the tropics to the poles to more diverse spots, around the world and up and down. We started with marine stations in Fort Pierce, Belize, Panama, out at SERC in the Chesapeake. We have done this in Ft. Pierce in the Indian River Lagoon down in Florida we've deployed these and looked at these to try and build the inventory as well. There are a couple of post-doctoral researchers right now using them. We are trying to be creative in how we do it. One of the problems with deploying them…what do you think happens if you put these on sand?
Visitor 2:	They sink.
Visitor 3:	Disappear.
Scientist:	They don't disappear, but what do they do?
Visitor:	Move around.

Scientist:	They kind of snow shoe in, because the sand starts moving around and they start to bury some of the layers. Trying to put that mesh onto the thing. Then you get all of the sediment in here when you are filtering. It just makes it a mess. We have to find a better way to put them on softer substrates – sea grass meadows. The beauty is the standardization of them.
Visitor 2:	How about fresh water, the Great Lakes or something like that?
Scientist:	We have talked about putting them in. there is this group called the Great Lakes Ecological Observatory Network. We have worked with them on thinking about applying them there. Also putting them out in the gulf, on oil there. Things like that. Anywhere you can slap them on…
Visitor:	Alaska?
Scientist:	Alaska, sure, anywhere

For the instances where visitors and scientists discussed topics relating to Smithsonian research, AF researchers examined the directionality of conversations. While only a few observations included conversations regarding NMNH or Smithsonian research, those that did were primarily initiated by the presenting scientist (86%, n=6), as shown in Table 14. The one visitor who did initiate a conversation about Smithsonian research asked: "Are you doing Smithsonian research?" The scientist then explained that she works for the Maryland Department of Natural Resources.

Table 14: Directionality of conversations about NMNH/Smithsonian research (N=7)

Connections	n	%
Scientist initiated the discussion	6	86%
A Visitor initiated the discussion	1	14%

Science Careers

As a way to measure the degree to which *Scientist Is In* is supporting visitors understanding and awareness of science careers, AF researchers mined conversations between the target visitor and the scientist looking specifically for instances of talk related to science careers. Thirteen percent (n=12) of target visitors engaged in conversation with the scientist about a science career. This was not limited to just the presenting scientist's career, but included science careers in general. In some cases (29%, n=27) the scientist referred to a science career, but the visitor did not engage in further discussion about the topic. In over half of the observations (58%, n=53) the topic of science careers was not mentioned. See Table 15 for the distribution.

Table 15: Discussions about science careers (N=92)

Science careers	n	%
Discussed	12	13%
Topic raised	27	29%
Not mentioned	53	58%

The following conversation represents a discussion about science careers:

Scientist:	We're working on preservatives to keep color.
Visitor:	What kind of scientist are you?
Scientist:	I'm a marine biologist.
Visitor:	Where?
Scientist:	Dumbaron.
Scientist:	I was a business major, but the head of the department changed me.
Visitor:	My uncle is a marine biologist.
Scientist:	Where does he work?
Visitor:	Canada.

For the instances where visitors and scientists discussed topics relating to science careers, AF researchers examined the directionality of conversations. In the majority of observations (82%, n=32), scientists initiated the discussion about science careers, mostly describing their work and the types of things they study or do (see Table 16).

Table 16: Directionality of conversations about science careers (N=39)

Connections	n	%
Scientist initiated the discussion	32	82%
A Visitor initiated the discussion	7	18%

Overall Breadth

As a more holistic measure of the extent of target visitors and scientists' conversations, AF researchers looked across the entire conversation, examining the breadth of topics being discussed. The following rubric was developed to determine the breadth of dialogue between the target visitor and the scientist:

0 - No dialogue - the visitor and scientist did not exchange words;

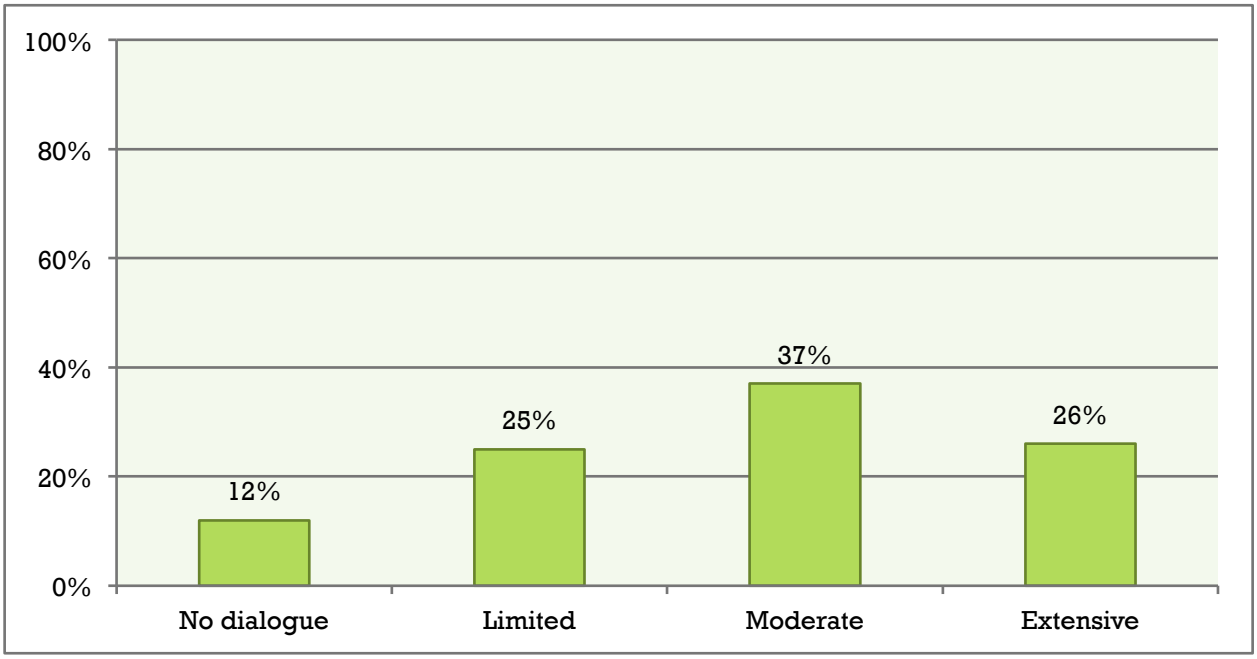
1 - Limited - the scientist may have spoken to the target visitor, but the visitor did not respond, and/or the two exchanged a few words, but not beyond one topic;

2 - Moderate - the scientist and target visitor engaged in a dialogue around 2 – 3 topics;

3 - Extensive - the scientist and target visitor engaged in a dialogue around 4 or more topics.

The breadth of dialogue for the majority of conversations was moderate to extensive (see Figure 3). Thirty-seven percent (n=34) were engaged in dialogue around 2 to 3 topics. About one-quarter of target visitors (26%, n=24) engaged in dialogue around 4 or more topics. Scientists were discussing a variety of topics with visitors. Only 11 of the 92 observed visitors (12%) engaged in no dialogue with the scientist.

Figure 3: Breadth of dialogue between target visitors and scientists (N=92)



Overall Depth

As a more holistic measure of the depth of target visitors and scientists' conversations, AF researchers looked across the entire conversation and assessed the degree to which the two discussed one topic deeply. The following rubric was developed to determine the depth of dialogue between the target visitor and the scientist:

0 - No dialogue - the visitor and scientist did not exchange words;

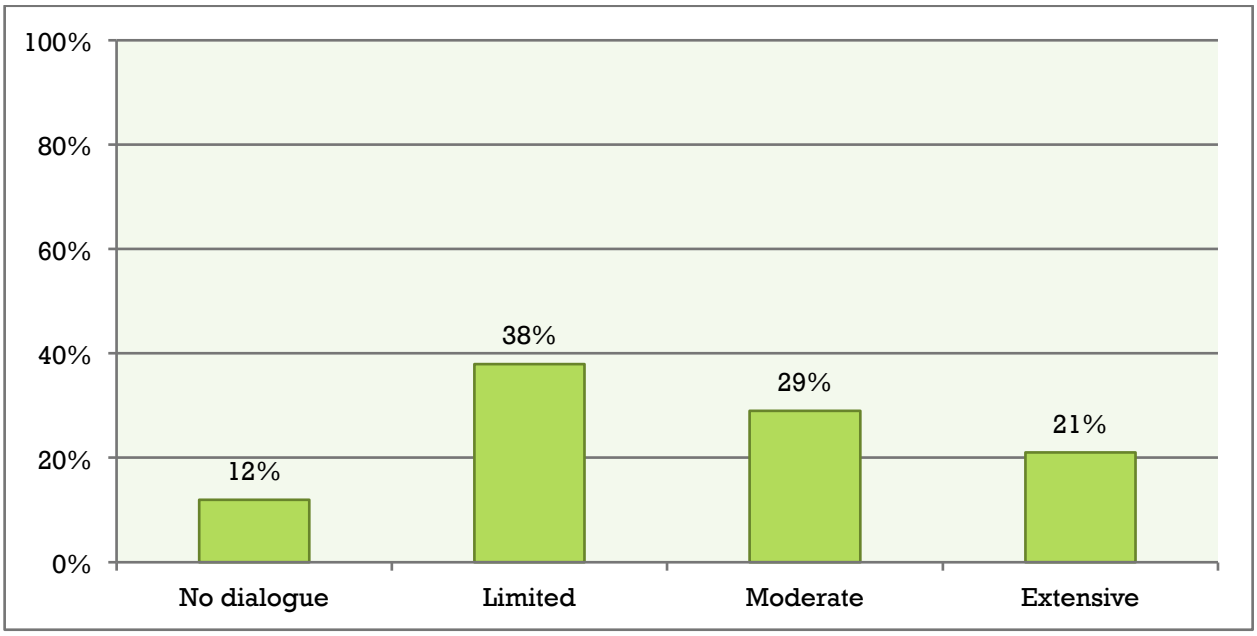
1 - Limited - the scientist may have spoken to the target visitor, but the visitor either did not respond, or simply nodded or said a few brief words (but not with any depth);

2 - Moderate - the scientist and target visitor spoke in moderate depth about a topic, and went back and forth a few times on a particular subject; however, the conversation may still have been more one-sided or did not get beyond the scientists' basic "script";

3 - Extensive - the scientist and target visitor engaged in in-depth conversation about a particular topic, which extended well beyond the scientists' basic "script" and involved a back and forth exchange, often with questioning and answering.

The depth of dialogue between the target visitor and the scientist varied extensively (see Figure 4). Thirty-eight percent (n=35) engaged in limited depth of conversation. These visitors exchanged few words with the scientist, but not with any depth. Twenty-nine percent of visitors (n=27) engaged in moderate depth around topics and 21% (n=19) engaged in extensive depth about a particular topic. These conversations went well beyond the scientist's basic script and involved questioning and discussion.

Figure 4: Depth of dialogue between target visitors and scientists (N=92)



Relationship between Context & Engagement at *Scientist Is In*

During an initial planning meeting, NMNH education staff said they were interested in finding out more about whether "some interpretation strategies work well or not so well," as well as "what types of approaches are more effective in stimulating the types of interactions that encourage the types of outcomes we are looking for." In response to that request, AF researchers ran a series of inferential statistics in the hopes of answering the following hypotheses:

Hypothesis 1: Does the facilitation approach used by the scientist influence: a) the amount of time spent, b) awe & wonder, c) curiosity (or the # of questions asked by visitors), d) overall depth and breadth of dialogue?

Hypothesis 2: Does the directionality of the initiation of interaction (visitor approaches vs scientist invites) influence: a) the amount of time spent, b) awe & wonder, c) curiosity (or the # of questions asked by visitors), d) overall depth and breadth of dialogue?

Hypothesis 3: Do certain demographics and psychographics (age, group size, group composition) influence: a) the amount of time spent, b) awe & wonder, c) curiosity (or the # of questions asked by visitors), d) overall depth and breadth of dialogue?

Hypothesis 1a: Facilitation Approach & Time

Independent samples T-Tests compared whether there were significant differences between the amount of time visitors spent at the program in relation to which facilitation approaches scientists used.

- ✓ During observations where the scientists followed visitors interests, visitors spent more time at the *Scientist Is In* program $t(21)=4.352$, $p<.01$.
- ✓ During observations where the scientists employed inquiry based learning, visitors spent more time at the *Scientist Is In* program $t(81)=3.251$, $p<.01$.
- ✓ During observations where the scientists applied information to visitors' personal life, visitors spent more time at the *Scientist Is In* program $t(82)=3.149$, $p<.01$.
- ✓ During observations where the scientists encouraged a post-visit follow-up, visitors spent more time at the *Scientist Is In* program, $t(33)=2.074$, $p=.046$.
- ✓ Visitors also stayed longer when scientists discussed career mentoring, $t(14)=2.815$, $p=.014$.

Hypothesis 1b: Facilitation Approach & Inspire Awe

Chi-square tests were run to determine whether facilitation strategies inspired awe and wonder among visitors. No significant findings emerged.

Hypothesis 1c: Facilitation Approach & Curiosity

To determine how facilitation methods influence curiosity, independent samples T-Tests were conducted to compare the number of questions asked.

- ✓ There were significantly more questions asked by target visitors when scientists followed visitors interests, $t(52)=6.499$, $p<.01$.
- ✓ There were significantly more questions asked by target visitors when scientists emphasized object based learning, $t(24)=2.437$, $p=.023$.
- ✓ In observations where the scientists encouraged a post-visit follow-up, visitors asked more questions during the *Scientist Is In* program, $t(46)=2.319$, $p=.025$.
- ✓ Visitors also asked significantly more questions when scientists discussed career mentoring, $t(17)=2.126$, $p=.049$.

Hypothesis 1d: Facilitation Approach & Breadth & Depth of Dialogue

Chi-square tests examined how facilitation strategies impacted the breadth of conversations.[7]

- ✓ As can be seen by the frequencies cross tabulated in Table 17, there was a significant relationship between inquiry based learning as a facilitation strategy and breadth of conversations. When scientists' implemented inquiry based learning, visitors were more likely to engage in a dialogue around more topics.

[7] Note that in some instances, cell counts were too low to run analyses.

Table 17: Inquiry based learning facilitation method's impact on the breadth of conversations (N=76)

	Did not implement		Implemented		Significant
Breadth	n	%	n	%	
None	8	21%	3	6%	Yes p=0.009
Limited	12	31%	11	21%	
Moderate	15	39%	18	35%	
Extensive	4	10%	20	39%	

Chi-square tests examined how facilitation strategies impacted the depth of conversations. No significant findings emerged.

Hypothesis 2: Nature of Approach and Time, Inspire Awe, Curiosity, and Breadth/Depth of Dialogue

Inferential tests were conducted to explore the extent to which visitors' initial interest in the program (visitors who approached the cart/scientist on their own) influenced the nature of their engagement with the program. For all the dependent variables explored (time, awe, curiosity, and depth/breadth of dialogue), no significant findings emerged.

Hypothesis 3: Demographics/Psychographics and Time, Inspire Awe, Curiosity, and Breadth/Depth of Dialogue

Inferential tests were conducted to explore the extent to which demographic and psychographic variables (age, group composition, and group size) influenced the nature of visitors' engagement with the program. For all the dependent variables explored (time, awe, curiosity, and depth/breadth of dialogue), the following significant findings emerged:

- ✓ A one-way ANOVA was used to test for time differences among three visitor **group sizes** (small, medium, or large). Time spent at the program differed significantly across the three groups, F (2, 89)=4.66,p=.012. Tukey post-hoc comparisons of the three groups indicated that the visitors in a medium-sized visitor group (3-4 people) spent a significantly longer amount of time than visitors in a small visiting group (1-2 people). Comparisons between the other groups were not statistically significant.

Section 2: How Does Interacting with Scientists or Content Specialists INFLUENCE Visitors' Understanding of and Curiosity about Science Topics, Awareness of Science Careers, Perceptions of NMNH as a Research Institution, and Recognition of the Connections between Science and their Personal Lives?

Another primary goal of NMNH is to "play a significant national and global role in connecting people with the natural world, shaping complex ideas about the world and their place in it, and increasing active involvement in preserving and sustaining the diverse natural and cultural world." More specifically, NMNH was interested in exploring the ways in which the *Scientist Is In* program influences visitors' understanding and curiosity about science topics, their awareness of science careers, their perceptions of NMNH as a research institution, and their recognition of the many connections between science and their personal lives. In order to explore the ways in which those goals are currently being met, AF researchers asked

visitors a series of open-ended and close-ended questions, including: general self-report ratings of their interest in science, as well as their top-of-mind perceptions towards "scientists" (attitudes & perceptions), self-report ratings of their knowledge of exhibit topics, science careers, and NMNH as a research institute (awareness & understanding), their reflections on any questions they had about the exhibit (curiosity), and reflections on whether they saw any connections between the exhibit and their personal lives and what those connections were (connections).

Attitudes & Perceptions

General Science Interest

To assess the impact of the *Scientist Is In* program on visitors' interest in science, a general science interest scale (Moore & Foy, 1997) was used. The general science interest scale consisted of 12 items, all rated on a 5-point scale where the bottom of the scale was strongly disagree and the top of the scale was strongly agree. The scale was highly reliable, meaning that we can be confident that participants responded to the items in consistent ways. Specifically, Cronbach's Alpha for the pre-program scale was .780 and for the post-program scale was .708.

First, AF researchers examined the mean ratings of the total sample, comparing how all study participants rated their interest in science prior to visiting SOH or HHO (pre-visit) with how they rated their interest in science after visiting SOH or HHO (post-visit). A paired samples T-Test comparison showed that the post-visit means were significantly higher than the pre-program means $t(75)=-4.059$, $p=.000$. These results suggest that visitors from both conditions' overall science interest increased significantly after visiting the SOH and HHO exhibitions, regardless of whether they experienced the *Scientist Is In* program.

Next, tests were run to see if differences existed between visitors who experienced the *Scientist Is In* program (Treatment), and those who did not (Control) in how they rated their 1) pre-visit, and 2) post-visit interest in science. Independent-samples t-tests were conducted to compare increases in attitudes and perceptions in treatment and control groups. This comparison showed that for post-visit means, visitors who participated in the *Scientist Is In* program were significantly more likely to rate their general science interest high (M=4.16, SD=.453) than were those who did not participate (M= 3.89, SD=.645), $t(74)=-2.11$, $p=.038$; significant differences between pre-visit ratings for that General Science Interest scale were not found.

In looking more closely at the 12 individual items that made up the General Science Interest scale, other differences were found. Most notably, visitors who participated in the *Scientist Is In* program were significantly more likely to rate the post-visit statement "I enjoy studying science," higher (M=4.62, SD=.545) than those who did not experience the program (M=4.26, SD=.818), $t(74)=-2.27$, $p=.026$; significant differences between pre-visit ratings for that item were not found. Visitors who experienced the *Scientist Is In* program were also significantly more likely to rate the post-visit statement "I would not want to be a scientist" lower (M=2.03, SD=1.067) than those who did not experience the program (M=2.64, SD=1.513), $t(74)=2.04$, $p=.045$; again, significant differences between pre-visit ratings for that item were not found. Table 18 below shows the results for each of the scales, with the summated "General Science Interest" scale first, followed by the 12 individual statements that made up that scale.

Table 18: Pre to Post increases in science attitudes & perceptions: T vs C (N=76)

SCALE (1-5, with 1=strongly disagree and 5=strongly agree)	MEANS Treatment Pre (37)	Treatment Post (37)	Control Pre (39)	Control Post (39)	SIGNIFICANT [a] T vs C Pre	T vs C Post
General interest in science (Moore & Foy, 1997)	**4.04**	**4.16**	**3.77**	**3.90**	**N**	**Y**
I enjoy studying science	4.27	4.62	4.05	4.26	N	**Y**
I may not make great discoveries, but working in science would be fun	4.00	4.22	3.41	3.77	**Y**	N
The search for scientific knowledge would be boring	1.35	1.38	1.87	1.74	**Y**	N
Only highly trained scientists can understand science	1.59	1.59	1.97	1.97	N	N
Scientific work would be too hard for me	2.05	1.97	2.54	2.51	N	N
I would not want to be a scientist	2.16	2.03	2.69	2.64	N	**Y**
Scientific work is only useful to scientists	1.35	1.30	1.18	1.21	N	N
Most people are unable to understand science	2.43	2.22	2.37	2.23	N	N
Every citizen should understand science	3.65	3.76	3.67	3.77	N	N
Anything we need to know can be found out through science	3.35	3.41	3.16	3.37	N	N
People must understand science because it affects their lives	4.16	4.19	3.64	3.92	N	N
A major purpose of science is to help people live better	4.03	4.30	4.13	4.18	N	N

[a] Independent Samples T-Test used, p<.05, comparisons between Control and Treatment Pre scores & Post scores.

Attitudes & Perceptions towards Scientists

Emergent Responses

As part of the interview, visitors were asked to participate in a concept map activity. Visitors were shown a piece of paper with the word "scientist" printed in the center and given the opportunity to jot down any words, ideas, images, phrases, or thoughts that come to mind when they think of a scientist. During analysis, AF researchers looked across all responses and created 7 emergent categories, into which all responses were sorted and then quantified. Table 19 lists the distribution of responses across the 7 categories.

Table 19: Concept map responses (N=76)

Response	n	%
1. Scientific processes	53	70%
2. Scientific discipline	46	61%
3. Personality/disposition	41	54%
4. Scientific instruments or tools	32	42%
5. Value/purpose of scientists or their work	25	33%
6. Specific scientist	22	29%
7. Other	12	16%

*Percentages will not equal 100% as some visitors provided multiple responses

The majority of visitors (70%, n=53) referred to the processes scientists use in their work. For example, visitors wrote words like "hypotheses," "experiments," "research," "discovery," and "test theories and figure out how things work."

Many visitors also listed specific, scientific disciplines (61%, n=46), and/or the topic/objects being studied within that discipline. Sample responses include "fossils," "weather," "math," "anthropology," "paleontology," "medicine," and "science."

Visitors also used adjectives or descriptive words to describe the personality or disposition of scientists (54%, n=41). These responses mentioned some of the following words: "historians;" "curious;" "adventurous;" "educated;" and "innovative."

Many visitors (42%, n=32) described the instruments or tools scientists use, and/or the clothes or equipment that they wear. Sample responses included: "lab coats;" "goggles;" "beakers;" "test tube;" and "Bunsen burner."

One-third of visitors (33%, n=25) referred to the value of scientists and/or the purpose of their work. Some of these responses included:

> *It's important to study energy because without it, we couldn't live.*
> *A lot of what we have today is because of scientists. Science is knowledge and knowledge is power.*
> *When you listen to the history of fossils, that makes you smarter.*

Finally, a few visitors listed a specific scientist by name and/or referred to someone they personally knew; for example "Einstein;" "Michael Crichton;" "Andrew;" "children;" "my dad;" and "Bill Nye."

Chi square tests were run to look for differences in responses among Treatment and Control groups. As shown in Table 20, no significant differences were found.

Table 20: Concept map responses by condition (N=76)

	Treatment		Control		Significant
Response	n	%	n	%	
1. Scientific processes	23	62%	30	77%	No
2. Scientific discipline	24	65%	21	54%	No
3. Personality/disposition	19	51%	22	56%	No
4. Scientific instruments or tools	16	43%	16	41%	No
5. Value/purpose of scientists or their work	13	35%	13	33%	No
6. Specific scientist	8	22%	14	36%	No
7. Other	5	14%	7	18%	No

*Percentages will not equal 100% as some visitors provided multiple responses

Stereotypes

According to the NSF publication "National Science Board Subcommittee on Science & Engineering Indicators," published in 2002, when children have been asked to draw images of scientists, the following features associated with stereotypical images of a scientist have been noted:

- A lab coat (white)
- Eyeglasses, or goggles
- Facial growth or hair

- Scientific instruments and laboratory equipment
- Books and filing cabinets
- Light bulbs
- "Mad," "Crazy" "Nerdy," "Geeky"

Because one of the goals of the *Scientist Is In* program is to help visitors build positive attitudes towards scientists and science careers, NMNH staff were curious to find out whether stereotypes of scientists prevailed among visitors, and whether participating in the *Scientist Is In* program helps reverse, or dislodge, common stereotypes and misconceptions. In response, AF researchers conducted a second round of analysis – this time looking specifically for evidence of prevailing stereotypes across visitors' responses. Table 21 displays the frequency that visitors' concept maps contained one or more commonly held stereotypes. Just under half (42%, n=32) of the visitors provided at least one stereotypical description of a scientist.

Table 21: Perceptions of scientists that are stereotypes (N=76)

Stereotypes	n	%
Stereotype mentioned	32	42%
None	44	58%

Chi square tests were run to look for differences in responses among Treatment and Control groups. As shown in Table 22, no significant differences were found.

Table 22: Perceptions of scientists that are stereotypes by condition (N=76)

	Treatment		Control		Significant
Stereotypes	n	%	n	%	
Stereotype mentioned	15	41%	17	44%	No
None	22	60%	22	56%	

Scientists Are People Who…

According to the same NSF publication "National Science Board Subcommittee on Science & Engineering Indicators," published in 2002, studies have shown that while the persistence of stereotypes are difficult to dislodge, "most people believe scientists lead rewarding professional and personal lives" and maintain positive perceptions towards scientific careers. The studies also uncovered other public perceptions towards scientific occupations, for example, that many scientific jobs are "dangerous." In attempt to uncover more of these types of perceptions towards scientists and their careers, AF researchers conducted a third round of analysis, looking only for those responses that specifically described the "dispositions" or "characteristics" of a scientist (e.g. the way they think, the life they lead). Table 23 shows the distribution of responses across 8 categories.

Table 23: Perceptions of science careers (N=76)

Perceptions	n	%
1. Critical thinker/problem solver	45	64%
2. Creative/innovator/discoverer	41	59%
3. Book worm/scholar	34	49%
4. Adventurer/explorer	17	24%
5. Savior/change agent	12	17%
6. Disseminator of knowledge	10	14%
7. "Amazing" scientist	9	13%
8. "Mad" scientist	5	7%

*Percentages will not equal 100% as some visitors provided multiple responses

Over half of the visitors (64%, n=45) referred to scientists as people who engage in critical thinking & problem solving (including analysis, observation, and experimentation). Some of these responses included: "test;" "experiments;" "searching for answers;" "observations;" "analysis;" "hypotheses;" "research;" "critical Thinker;" and "scientists have to problem solve."

Visitors also profiled scientists as people who are naturally curious, creative, imaginative, or as people who generate new ideas and ways of thinking. Over half (59%, n=41) mentioned responses like "natural curiosity," "innovative," "knowledge seeker," "learn about things we do not know," "discovery," "invention," and "creation."

Many visitors (49%, n=34) referred to scientists as studious individuals, or people who spend a lot of time in school studying or reading. Sample responses included: "school," "studying," "highly educated," "intelligent," "knowledgeable," "specialist," and "expert."

About a quarter of visitors (24%, n=17) referred to scientists as people who explore the world or have adventure: "scientists explore the world," "expeditions," and "explore."

Some visitors (17%, n=12)) described scientists as people whose work changes or saves lives. These visitors mentioned "changes the world by discovering cures for diseases," "helps us improve our environment," and "fix problems."

A much smaller percentage, 14% of visitors (n=10) discussed how scientists are responsible for bringing knowledge to the rest of the world. Responses contained statements such as "learning & interpreting for common knowledge" and "share knowledge."

A few visitors (13%, n=9) referred to scientists in positive ways: "amazing," "interesting," "cool," and "successful." Only five visitors mentioned the concept of a "mad" scientist.

Chi square tests were run to look for differences in responses among Treatment and Control groups. As shown in Table 24, no significant differences were found.

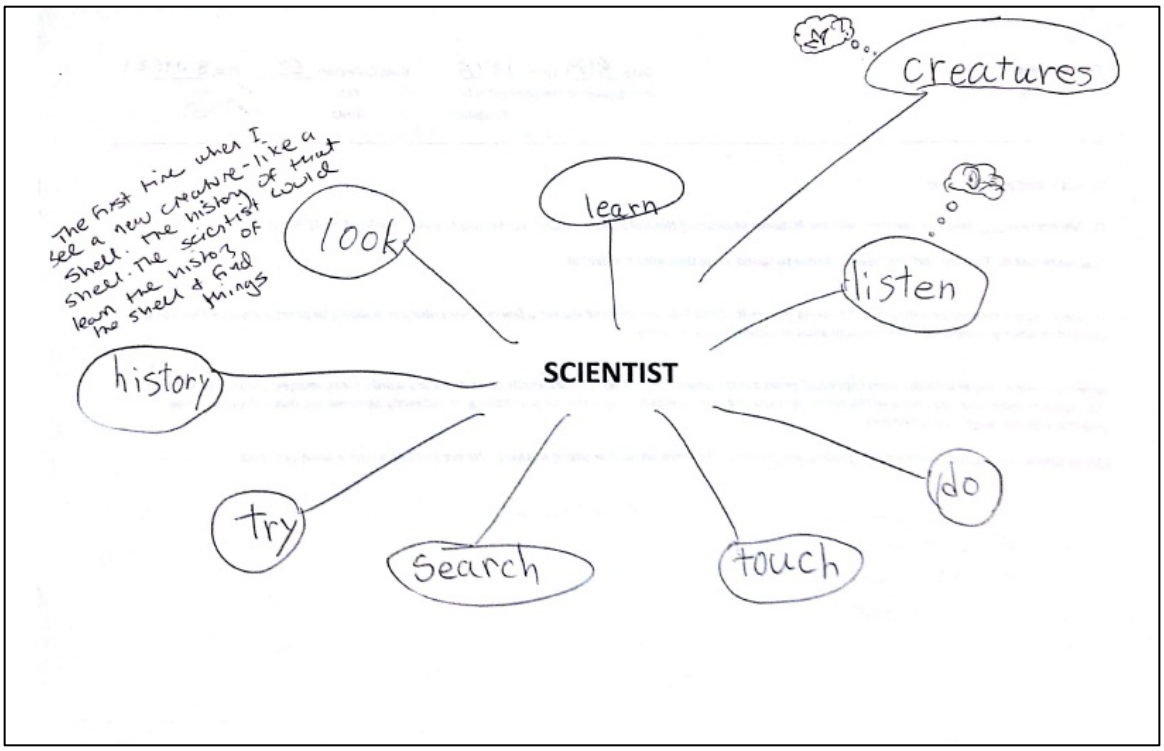
Table 24: Perceptions of science careers by condition (N=76)

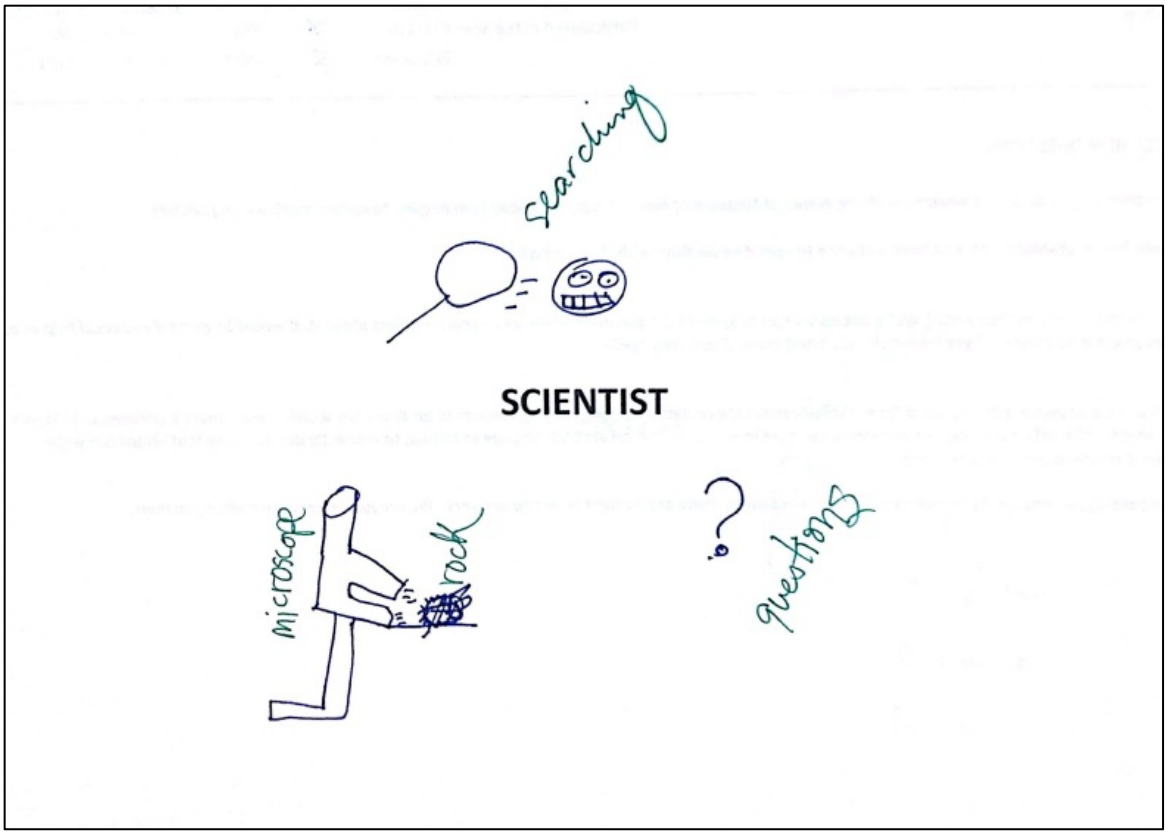
	Treatment		Control		Significant
Types of Questions	n	%	n	%	
Critical thinker/problem solver	20	61%	25	68%	No
Creative/innovator/discoverer	18	55%	23	62%	No
Book worm/scholar	16	49%	18	49%	No
Adventurer/explorer	6	18%	11	30%	No
Savior/change agent	7	21%	5	14%	No
Disseminator of knowledge	6	18%	4	11%	No
"Amazing" scientist	5	15%	4	11%	No
"Mad" scientist	2	6%	3	8%	No

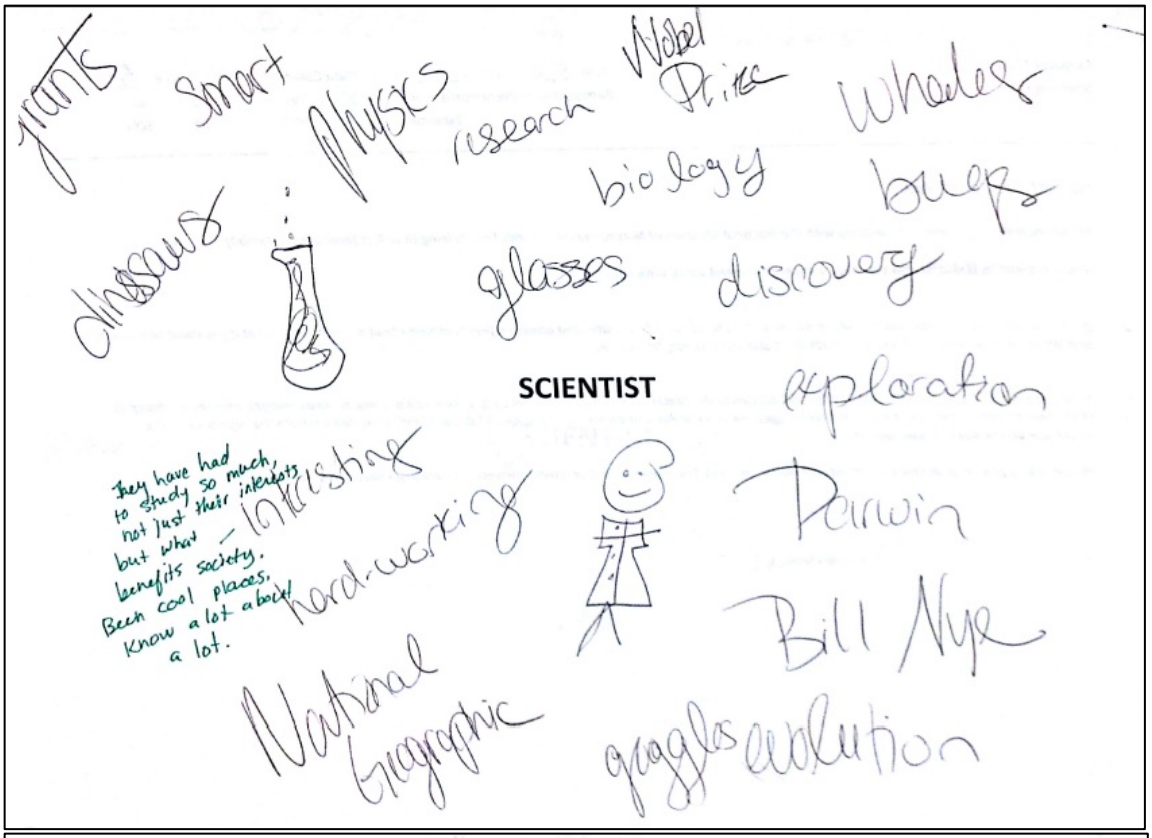
*Percentages will not equal 100% as some visitors provided multiple responses

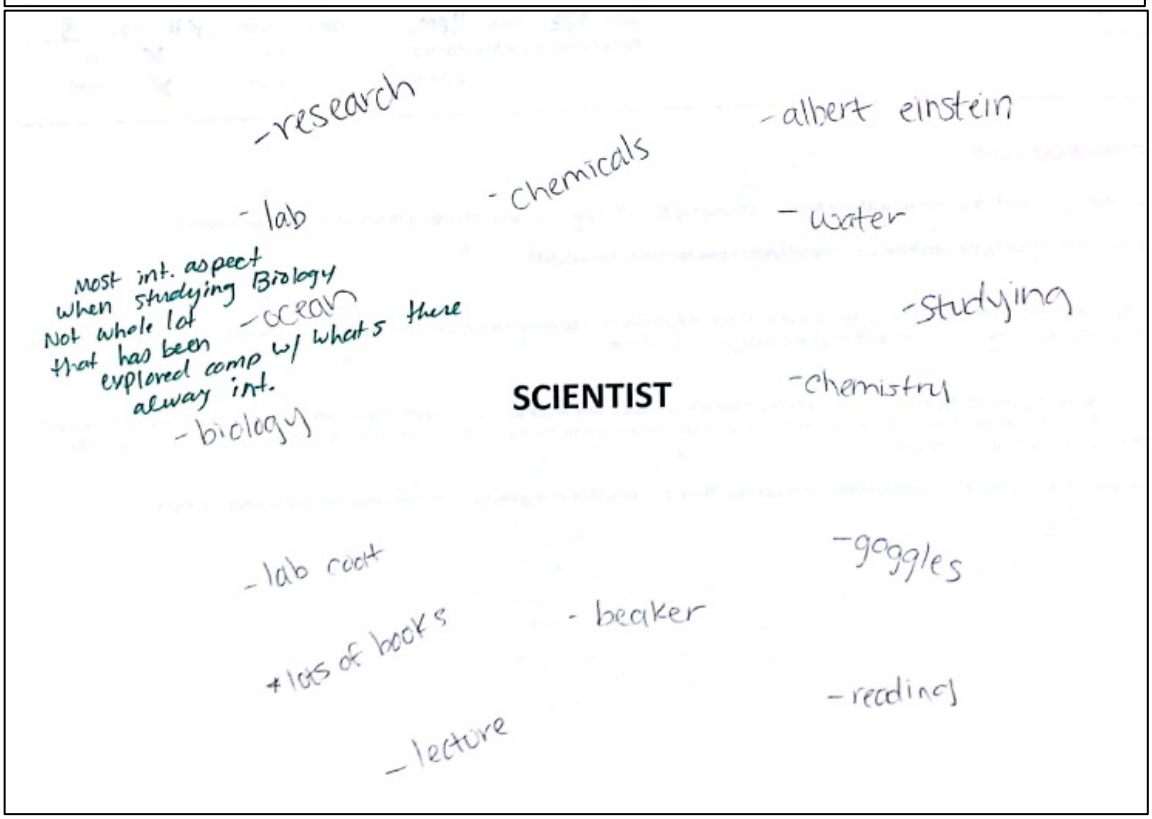
Sample concept maps are included below.

Figure 5: Sample concept maps






Smart
Physics
research
Nobel Prize
Whales
biology
bugs
dinosaurs
glasses
discovery
SCIENTIST
exploration
they have had to study so much, not just their interests but what benefits society. Been cool places. Know a lot about a lot.
interesting
hard-working
Darwin
Bill Nye
National Geographic
goggles
evolution


-research
-albert einstein
-chemicals
-lab
-water
Most int. aspect when studying Biology Not whole lot that has been explored comp w/ what's there always int.
-ocean
-studying
SCIENTIST
-chemistry
-biology
-lab coat
-goggles
-beaker
+ lots of books
-reading
-lecture

Awareness & Understanding

In the interview, visitors were asked to rate their understanding of three different topics – the exhibition theme (Human Evolution or Ocean Science); NMNH is a research institution; and science careers – on a scale of 1-5, where 1=nothing and 5=a lot. For each of these topics, visitors were asked to rate their understanding at two different points in time – after visiting the exhibition and before their museum visit, using a retrospective pre-post method.

First, AF researchers examined the mean ratings of the total sample, comparing how all study participants rated their understanding of the topics prior to visiting SOH or HHO (pre-visit) with how they rated their understanding after visiting SOH or HHO (post-visit). A paired samples T-Test comparison showed that the post-visit means were significantly higher than the pre-program means for understanding of "Human Evolution" ($t(28)=6.669$, $p<.001$), "Ocean Science" ($t(46)=8.221$, $p<.001$), "Science Careers" ($t(75)=5.742$, $p<.001$), "NMNH as a research institution" ($t(75)=9.379$, $p<.001$). These results suggest that visitors from both conditions' overall understanding of the exhibition themes, that NMNH is a research institution, and of science careers increased significantly after visiting the SOH and HHO exhibitions, regardless of whether they experienced the *Scientist Is In* program. Table 25 shows visitors' understanding of these topics, before their visit and after their visit.

Table 25: Pre to Post increases in understanding (N=76)

SCALE (1-5, with 1=nothing and 5=a lot)	Prior to visiting the exhibition			After visiting the exhibition			Significant	
	N	Mean	Med.	N	Mean	Med.		
Human Evolution	29	2.69	3	29	3.55	4	YES	p<.01
Ocean Science	47	2.96	3	47	3.74	4	YES	p<.01
Science Careers	76	2.64	3	76	3.20	3	YES	p<.01
NMNH as a research institution	76	2.39	2	76	3.50	4	YES	p<.01

Next, tests were run to see if differences exist between visitors who experienced the *Scientist Is In* program (Treatment), and those who did not (Control) in how they rated their 1) pre-visit, and 2) post-visit understanding of the three topics. Independent-samples t-tests were conducted to compare increases in awareness and understanding in treatment and control groups. This comparison showed that for post-visit means, visitors who participated in the *Scientist Is In* program were significantly more likely to rate their understanding of Ocean Science higher (M=4.00, SD=.913) than were those who did not participate (M= 3.45, SD=.671), $t(45)=-2.306$, $p=.026$; significant differences between pre-visit ratings for understanding of Ocean Science were not found.

Table 26: Differences in understanding between treatment and control groups (N=76)

SCALE (1-5, with 1=strongly disagree and 5=strongly agree)	n	MEANS				SIGNIFICANT [a]	
		Treatment		Control		T vs C	T vs C
		Pre	Post	Pre	Post	Pre	Post
Human Evolution	12 (T), 17(C)	2.92	3.67	2.53	3.47	N	N
Ocean Science	25 (T), 22(C)	3.16	4.00	2.73	3.45	N	**Y**
Science Careers	37 (T), 39(C)	2.65	3.32	2.64	3.08	N	N
NMNH is a research institution	37 (T), 39(C)	2.49	3.73	2.31	3.28	N	N

Curiosity

To gauge curiosity, visitors were first asked whether they had any questions about the concepts within the gallery. As shown in Table 27, the majority of visitors (59%, n=44) had at least one question about the exhibition.

Table 27: Questions about concepts within the gallery (N=76)

Questions	n	%
Had at least one question	44	59%
No questions	31	41%

Chi square tests compared the number of questions asked between the treatment group and control group. As shown in Table 28, no significant differences emerged.

Table 28: Questions about concepts within the gallery by condition (N=76)

	Treatment		Control		Significant
Questions	n	%	n	%	
Had at least one question	18	49%	26	68%	No
No questions	19	51%	12	32%	

As a second part to the question, those visitors who did have a question were asked to describe what that question was. During analysis, AF researchers looked across responses and coded for the types of questions visitors had about the concepts within the gallery (Table 29).

Table 29: Types of questions asked about the exhibition (N=44)

Types of Questions	n	%
Abstract Questions (I wonder…)	30	68%
Concrete Questions (What are the facts…)	16	34%
Logistical Questions (How do I…)	4	9%
Other	1	2%

*Percentages will not equal 100% as some visitors provided multiple responses

The majority of visitors (68%, n=30) had abstract questions about how something happened, and/or imagined how something looks, feels, or smells. These people mentioned the following questions:

How are other animals and humans linked right now?
Made me think, what else is out there?
What the ocean surface might look like? Don't know what's underwater. What the surface looks and feels like.

Another 34% of visitors (n=16) had concrete questions about facts including a date, origin of object, or authenticity. Some examples included:

How much is real and what is a replica?
What is the oldest date that someone's found a human skull and where?
Wondering whether the shark jaw was fossilized or just the tooth.

A few visitors (9%, n=4) asked logistical or practical questions about way-finding or orientation. Examples included:

> *How do I follow it? Maybe I'm not supposed to.*
> *The layout of the show. We study a lot about museum culture and curatorial stuff. How they take all the stuff and organize it into a coherent exhibition.*

Chi square tests revealed that the types of questions asked about the exhibition did not differ between treatment and control groups. See Table 30.

Table 30: Types of questions asked about the exhibition by condition (N=44)

	Treatment		Control		Significant
Types of Questions	n	%	n	%	
I wonder…	13	72%	17	65%	No
Give me the facts	5	28%	11	42%	No
How do I…	2	11%	2	8%	No
Other	1	6%	-	-	No

*Percentages will not equal 100% as some visitors provided multiple responses

Connections

To gauge whether the *Scientist Is In* program is supporting visitors' ability to see the connections between humans and the natural world, visitors were asked if anything they saw or did while in HHO or SOH was related to their life in any way. The vast majority (70%, n=53) responded, "yes," they recognized the connections between the exhibition and their personal lives. "Research supports the connection between relevance and learning – people tend to be more willing and more effective learners when they have a direct, personal interest in the topic (Falk et al, 2007)"

Table 31: Connections between science and visitors' personal lives (N=76)

Made Connections	n	%
Yes	53	70%
No	23	30%

Table 32 compares whether visitors' recognized the connections between science and their personal lives between the Treatment and Control groups. Visitors in the Treatment group were significantly more likely to find that the exhibition related to their life (χ^2=4.397, df=1, p=.036). It is possible that the *Scientist Is In* program helped visitors make connections between science and their personal lives.

Table 32: Connections between science and visitors' personal lives by condition (N=76)

	Treatment		Control		Significant
Made Connections	n	%	n	%	
Yes	30	81%	23	59%	Yes
No	7	19%	16	41%	p=.036

As a second part to this question, visitors who responded "yes" to the question were then asked to describe the ways in which the exhibition related to their lives. Researchers categorized the types of relationships visitors described. (See Table 33).

Table 33: Types of connections made between science and visitors' personal lives (N=53)

Types of Connections	n	%
Direct, personal relationship	29	55%
Historical relationship	16	30%
Life-cycle relationship	7	13%
Other	4	8%

*Percentages will not equal 100% as some visitors provided multiple responses

Over half of visitors (55%, n=29) made a direct, personal connection between the science in the exhibition and their personal lives. These responses may be related to where the visitor lives or has traveled, and/or to his/her profession or hobby. Sample responses included:

> *Jellyfish – my brother was stung by one, and I like to look at them.*
> *Sargassum. It washes ashore in Texas where I live.*
> *In science we did a whole unit on water.*

Thirty percent of visitors (n=16) described a historical relationship. These responses mostly related to human origins. Visitors talked about how evolution relates to them as a human, indicating that the past influenced the present:

> *Tells us where we came from and how we got there. Idea of it is "Human Origins."*
> *We all are from the same species. 99% of our DNA is the same, besides looking different [on the outside].*
> *We evolved from them.*

Some visitor responses related to life cycles and how humans fit in with the natural world (13%, n=7):

> *Everything in life has to do with the ocean.*
> *Without water we wouldn't be able to survive.*
> *Without the ocean we don't breath. Fish give us oxygen. We use the ocean to survive just as the ocean needs us to survive.*

There were no statistically significant differences between the types of connections visitors' made between conditions, as shown in Table 34.

Table 34: Types of connections made between science and visitors' personal lives (N=53)

	Treatment		Control		Significant
Types of Connections	n	%	n	%	
Direct, personal relationship	18	60%	11	48%	No
Historical relationship	7	23%	9	39%	No
Life-cycle relationship	2	7%	5	22%	No
Other	3	10%	1	4%	No

*Percentages will not equal 100% as some visitors provided multiple responses

Section 3: How do visitors who have participated in the *Scientist Is In* program perceive they benefit from the interaction and what do they find most valuable about the experience?

As a way to capture emerging trends, visitors who participated in the *Scientist Is In* program were asked additional questions related to their self-perception of how they benefited from the experience. Visitors were asked why they decided to participate in the program, what they perceived was the benefit or value, and what suggestions, if any, they had for improving the program.

Motivation for Engagement

When asked what made them stop and participate in the *Scientist Is In* program, just over half of the visitors (51%, n=58) said they were motivated by the social aspect of the program, or their desire for human interaction. These people said things like the following:

Enjoy one-on-one interaction – do some Q&A.
Someone to actually explain, instead of just reading.
Scientist spoke to us and was friendly.
She is demonstrating her knowledge and passion.

Visitors were also attracted to the *Scientist Is In* program because of curiosity or a desire to find out more (46%, n=17). Responses mentioned included:

Curiosity, personal interest.
Saw her talking to a kid about pumice and I thought that looked interesting.
Wanted to know what was in the jars.

About one quarter of the treatment visitors (24%, n=9) stopped to participate in the program because they had a personal connection with the topic being presented.

Asked where she was from and she started talking about the wetlands. We were going to Maryland and she talked about little crabs.
Real life experience with the storm …

Another 24% (n=9) were motivated by the hands-on or interactive nature of the program:

I like hands on.
Very excited to hold the megladon tooth.
Interactive exhibits are better.

Table 35 displays the frequency for each category of response.

Table 35: Motivations to stop and participate in SII (N=37)

Motivations	n	%
Social aspect	19	51%
Curiosity	17	46%
Personal connection with topic	9	24%
Hands-on/Interactive	9	24%
Other	4	11%

*Percentages will not equal 100% as some visitors provided multiple responses

Perceived Benefit & Value

Both Treatment and Control visitors were asked to describe the most interesting thing they saw, did, or talked about while in the HHO or SOH exhibition halls. It is important to note, that close to one-third of the Treatment visitors (12 people, 32%) said the *Scientist Is In* program was the most interesting thing they did.

Later in the interview, Treatment visitors only were asked to describe how they felt they benefited from their participation in the *Scientist Is In* program. The vast majority of *Scientist Is In* participants perceived that the greatest benefit and value of the experience, was increasing their knowledge, understanding, or awareness of science topics (84%, n=31). These responses mention the following topics: new information, identification of specimens, objects, countries, human connections to the natural world, science careers, scientific processes, and animal biology, behavior, adaptions, or survival tactics. Sample responses included:

Supposed link between chimps and humans.
Learned a few things I didn't know about the field of work.
I know what a sea bean is.
It was cool learning how the pumice finds its way from Belize and trickles its way down.
Born with a backbone and then over time become invertebrates.
Children and adults got to learn something new.
Knowledge, made me think about things you never.
Learning about something I didn't know.

Sixteen-percent (n=6) benefited from engaging with real objects:

Stuff I have never seen or touched.
Good interaction with specimens and you're invited to participate with hands on things.

Others (14%, n=5) felt they gained social connections from the *Scientist Is In* program. These visitors enjoyed spending time with and/or connecting with others (scientist or others in the group). They liked talking to a person or learning about the scientist's life. These responses included:

Connecting with an individual who's passionate about something.
Watching his [son] excitement.

Three visitors (8%) expressed how the *Scientist Is In* program changed their attitudes, values, or perspectives:

Made me open to visit other museums. More willing to learn.

Learning about scientist's point of view about the storm. I just have the residents' point of view.
Broad appreciation of how we as humans fit into ecosystem with whales and fish.

Only one visitor found "no real benefit" of participating in this experience.

Table 36: Perceived benefit and value of participating in the SII program (N=37)

Value	n	%
1. Increased knowledge, understanding, awareness of science topics	**31**	**84%**
a. New information	14	38%
b. Identification of specimens, objects, countries	6	16%
c. Human connections to the natural world	4	11%
d. Science careers	4	11%
e. Scientific processes	4	11%
f. Animal biology, behavior, adaptions, survival tactics	3	8%
2. Engagement with real objects	**6**	**16%**
3. Social connections	**5**	**14%**
4. Change in attitudes, values, or perspectives	**3**	**8%**
a. Towards a certain topic, issue, event	2	5%
b. Towards the museum	1	3%
5. Other	**3**	**8%**

*Percentages will not equal 100% as some visitors provided multiple responses

What could NMNH do to enhance the success of the program for future visitors?

Treatment participants were encouraged to provide suggestions to help improve the *Scientist Is In* program for future visitors. As shown in Table 37, over half (51%, n=19) were pleased with the program and could not think of ways it could be improved. These visitors had positive feedback which included:

Don't think so. Pretty cool. She knew what she was talking about.
Perfect. I'm loving it!
I like everything.

Table 37: Suggestions for improving the SII program (N=37)

Suggestions	n	%
No suggestions	19	51%
Made a suggestion	18	49%

Of those who did make suggestions, recommendations included improving program content or resources, increasing the number of programs, or improving the delivery of information. Other suggestions were unrelated to the *Scientist Is In* program. Sample suggestions included:

Some more real life pictures of what actually went on.
Maybe more interactive sessions.
A more engaging, enthusiastic scientist.
More one on one encounters.
Any other time we've come there hasn't been a scientist out...so it was an improvement having him here.

Table 38: Types of suggestions for improving the SII program (N=18)

Types of Suggestions	n	%
Content/resources improvement	6	33%
Increase number of SII programs	6	33%
Facilitation improvement	5	28%
Other	3	17%

*Percentages will not equal 100% as some visitors provided multiple responses

Conclusions

1) What is the nature and scope of interactions between scientists and visitors through the *Scientist Is In* program?

The *Scientist Is In* program appears successful at attracting visitors and holding their attention. Visitors who engage with the program demonstrate natural interest and curiosity in the program by approaching the activity cart on their own. Once at *Scientist Is In*, visitors spend an average of 4 minutes and 9 seconds at the program, during which time the vast majority (94%) display non-verbal indications of engagement (including nodding, smiling, observing and handling objects, and focused listening).

Interactions with the scientists, and the objects on display, seem to inspire awe among many visitors who participate in the program. These visitors delight in discovering something new, and/or having the opportunity to touch something that is ancient, rare, and aesthetically pleasing. The *Scientist Is In* experience also appears to spark curiosity among many visitors; these participants ask questions and try to discover more about the objects on view, the scientific topic being discussed, and/or about the scientist's life, career, or research experiences. As part of its new approach to public engagement, NMNH acknowledges that experiences that involve using authentic objects in authentic contexts encourage understanding and motivation among visitors to learn more. This study supports that claim, as a high percentage of visitors' awe and curiosity revolves around the authentic objects on view; objects also seem to play a significant role in attracting and holding visitors attention.

As a primary focus of the program, *Scientist Is In* does appear successful in its ability to promote dialogue between the public and scientists, and among groups of visitors. During the program, most visitors who approach the cart converse with the scientists to some degree. The breadth and depth of those conversations vary widely; some visitors say very little, and may prefer to listen and/or watch as others engage, while others prefer to have a more involved, verbal exchange with the scientist. The extent to which visitors engage in dialogue with scientists is at least partially influenced by the facilitation approaches utilized by the scientist, as well as the group size (in the case of breadth of dialogue). When scientists utilize best practice facilitation strategies, including inquiry and object-based teaching strategies, as well as emphasizing personal connections and drawing upon visitors' existing interests, the dialogue is more likely to last longer, inspire more awe and curiosity, and extend the topic of conversation beyond just one or two themes.

Overall, scientists appear to have an understanding of the goals and purpose of the program. During most programs, scientists make attempts to engage visitors in dialogue around key NMNH strategic areas, especially, drawing connections between humans and the natural world. While scientists are less likely to discuss science careers with visitors, and/or to make explicit connections to the research that is happening at NMNH and other Smithsonian Institutions, many scientists do attempt to address those topics in their

conversations with visitors. It is possible that scientists find these topics more challenging to approach, especially if the majority of visitors' questions are focused on the objects and if visitors do not follow-up with questions about science careers and research when the topics are raised.

2) **How does interacting with scientists or content specialists influence visitors' understanding of and curiosity about science topics (particularly those presented by scientists), awareness of science careers, perceptions of NMNH as a research institution, and recognition of the connections between science and their personal lives?**

This study shows that the *Scientist Is In* program positively influences visitors' general interest in science, as well as science careers more specifically. While all study participants rate their general interest in science higher after visiting SOH or HHO than they do before visiting those exhibitions, additional tests show that visitors who participate in the *Scientist Is In* program are significantly more likely to rate their general science interest high than are those who do not participate. Additionally, this study also reveals that visitors who participate in the *Scientist Is In* program are significantly more likely to say they "enjoy studying science," and that they would like "to be a scientist" following their experiences in SOH or HHO than those who do not experience the program.

This study does not show that the *Scientist Is In* program helps reverse, or dislodge, common stereotypes and misconceptions about scientists; both visitors who participate in the program and those who do not, express commonly held stereotypes when describing scientists. However, stereotypes are usually deeply ingrained, as acknowledged in the NSF publication "National Science Board Subcommittee on Science & Engineering Indicators," which found "the persistence of stereotypes are difficult to dislodge." Additionally, it is worth taking into consideration that given the brief encounter between the scientist and visitor, it is unlikely that an evaluation conducted immediately following an intervention like *Scientist Is In* would register changes in long-held, and culturally reinforced, beliefs. This study does show, however, that many visitors have very positive attitudes towards scientists and describe them as critical thinkers and problem solvers, as creative innovators and discoverers, and as scholarly and knowledgeable disseminators of knowledge (among others). One could hypothesize that the more *Scientist Is In* scientists and experts focus on discussing scientific processes, new discoveries and advancements in science, and how their academic achievements and resulting research have real world application, existing positive attitudes will be reinforced, and hopefully increase.

This study also shows that visiting the SOH and HHO exhibitions increases all study participants' understanding of "Ocean Science" and "Human Evolution" (respectively); indicating that the exhibitions are successful at helping visitors to increase their awareness and understanding of those topics. This is a positive finding given that not all visitors, all the time, will have access to (or will want to participate in) supporting programs like *Scientist Is In*. Having multiple interpretive strategies is effective in engaging the wide variety of learners coming to NMNH. With that said, this study does show that visitors who participate in the *Scientist Is In* program in the Sant Ocean Hall are significantly more likely to rate their understanding of Ocean Science higher than those who do not participate; the study does not show the same result for visitors' understanding of "Human Evolution." It is undetermined as to why similar conceptual changes were not uncovered in the Hall of Human Origins. One theory is that visitors may perceive human origins as a topic they have more familiarity with (e.g. it may be featured more in history books, and in the media); thus, finding out something new about ocean research may seem like a greater leap.

Findings from this study also reveal that visitors' overall understanding that NMNH is a research institution, and of science careers increases significantly after visiting the SOH and HHO exhibitions, regardless of whether they experience the *Scientist Is In* program; the study does not show any differences between those who participate in *Scientist Is In* and those who do not. One explanation is that very few scientists discuss science careers with visitors, and even less draw direct connections between the work they are doing and the research that is being conducted at NMNH and/or the Smithsonian.

One area where the *Scientist Is In* has a definite positive impact is in supporting visitors' ability to see the connections between humans and the natural world. This study found that visitors who participate in the program are significantly more likely to find that the SOH and HHO exhibition topics and themes relate to their personal lives than visitors who do not participate. Of all the facilitation strategies that scientists implement, "following visitors' interests" is the most common. One can hypothesize that this approach may play a positive role in ensuring that visitors see the unique connections between their existing interests and daily lives and the scientific topics being discussed.

3) How do visitors who have participated in the *Scientist Is In* program perceive they benefit from the interaction and what do they find most valuable about the experience?

The majority of visitors who participate in *Scientist Is In* are motivated by the social aspect of the program and the desire to interact with people who are knowledgeable and passionate about their work. Visitors are also attracted to the program because of an innate curiosity to find out more and to have an authentic experience with scientific and historic objects.

Participants' perceptions of the value of the *Scientist Is In* closely align with NMNH's intended goals for the program, which is an encouraging finding that shows the program is well aligned. Overwhelmingly, participants agree that the program helps them to increase their understanding of science topics, especially in their ability to identify new species, material culture, countries on a map, and to make important connections between their own lives and the natural world, scientific processes, and careers. Some participants also value learning more about other people, including the scientists themselves, as well as other people in their group. Finally, some participants perceive that the *Scientist Is In* is the most interesting aspect of the SOH and HHO experience.

Recommendations

Emphasize Mutual Learning & Multi-Directional Dialogue

Currently, the *Scientist Is In* is structured to support a question and response type exchange between the visitor and scientist, where the scientist may respond to questions with the primary goal to communicate their expertise to visitors. While this format brings scientists and the public together and is successful at stimulating conversation among the groups, there could be more emphasis placed on the "mutual learning" model, where the flow of information is more multi-directional. According to McCallie et al (2009), in a "mutual learning" model, experts do more than "just present their knowledge and perspectives," and requires more from visitors than "merely asking questions of experts." The "mutual learning" model is

effective in helping the public (as well as the scientists/experts) gain awareness about their own, as well as others', perspectives on scientific and societal issues, as well as have an increased ability to craft strong arguments about issues. Thus, researchers recommend employing the "mutual learning" model for future *Scientist Is In* programs.

Listen More, Talk Less

To implement a "mutual learning" model in the *Scientist Is In*, it will be important that scientists and experts focus more on listening to visitors' perspectives towards a topic and encouraging visitors to weigh in with their thoughts and opinions before heavily presenting on their own expert knowledge and experiences. It has long been thought that the vast majority of scientists lack expertise and training in communication with public audiences; thus, an obvious recommendation is for trained, NMNH informal educators to spend additional time training scientists in best-practice facilitation and communication strategies. *Portal to the Public*, an NSF-funded project that was designed to create and test a new, specific model for engaging active researchers, scientists, engineers, and other science-based professionals in informal science education, developed resources to help informal science educators provide professional development experiences for scientists, and this might be a good place to look for best-practice ideas for future training experiences. (See http://www.pacificsciencecenter.org/Portal-to-the-Public/implementation-manual.html). Another suggestion is for NMNH to continue to record *Scientist Is In* programs in the future, and encourage participating scientists to listen to the audio files following their program, as a way to reflect and improve their communication with the public. Listening to oneself engage in communication with another person often brings awareness about the balance of the conversation and allows one to ask questions like: am I saying too much? Should I have asked a follow-up question here? How much am I letting the visitor guide his/her own learning and offer his/her own perspectives and values?

Resist Falling into Traditional Roles

Research indicates that unless people make concerted efforts with sustained support, scientists (and the public) often fall back into patterns of interacting with which they are familiar. Or in other words, scientists and visitors need practice moving beyond their typical roles, where the expert talks and the visitor passively absorbs that information. Scientists may need to be very concrete about the purpose of the activity, so that visitors know they are supposed to play an active role in the experience. It is likely that most visitors have been "pre-programed" over the years to expect that their role is to listen and agree, rather than to contribute by asking questions, providing their own perspective or understanding, or even arguing a point; thus, scientists might need to empower visitors by saying things like "it's okay to disagree with me," or "we don't know everything there is to know about this topic, what do you think it could be," or "what you say helps us think about what questions we need to be asking and to understand what is important to people." Another idea is that scientists could frame the experience around a big question(s) that they are attempting to answer, and even display it on a board that is easily visible to approaching visitors. When visitors join the experience, instead of the scientist asking "what questions do you have," or immediately launching into a "presentation" about the topic, s/he could say "tell me what your thoughts are about this topic," or "how would you answer this question/solve this problem?" Often, visitors might not know what questions to ask, so starting with a problem or question to solve will help them scaffold the experience from the beginning.

Make It Relevant

Not surprisingly, visitors appear more interested in talking about science topics when they can identify connections that are relevant to their personal lives. Helping visitors to make those connections is a current strength of *Scientist Is In* and should be emphasized in future programs. Research has found that many scientists have minimal "glocal" communication skills or "the skills to take global or general issues and make them locally meaningful" (Leshner 2010). One recommendation is to always ensure that scientists come prepared to talk about the ways their work/research fits within the local context. Encourage scientists to ask questions like – how does this research map to relevant news events or "hot topics?" One idea is to equip scientists with a "cheat sheet" of current topics that may appeal to visitors, or a list of local issues that scientists can refer to throughout their engagement with visitors.

Communicate Purpose through Design

Design communicates a lot to visitors and provides the first visual clue as to what a program is about. Currently, The *Scientist Is In* program consists of an "activity cart," behind which stands the scientist or expert. This set-up presents a natural, physical barrier between the scientist and the visitor, and may reinforce the idea that the scientist will be imparting knowledge from behind a "podium." In this study, some scientists were observed coming out from behind the cart and engaging on a more intimate level and this seemed like a good approach in forming more personal connections with visitors. Additionally, activity carts are widely used in museums and thus visitors may have preconceived notions about what will, or is supposed to happen there (e.g. that they are just supposed to touch the objects and ask what they are, but not to engage in dialogue about current research and larger thematic questions and issues). If the goal is to get visitors to stay longer, and engage in multi-directional dialogue with scientists and each other, then some changes to the design of the experience may help achieve these goals.

Decide What Role Objects Should Play

NMNH staff might want to give thought to what role objects and specimens will play in future *Scientist Is In* programs. It is well known, and supported by this study, that objects are effective in attracting visitors and stimulating curiosity and interest around a topic. Depending on the purpose of the program, however, the objects might also detract visitors from engaging in dialogue around larger, more abstract topics where they are being asked to communicate about their values and larger scientific and societal issues if the facilitators are not skilled in connecting the objects to abstract ideas and/or in effectively transitioning from the concrete "what is this" to more abstract "how is this related to my life." This is an issue that has come up in other informal learning settings; for example, a project focused on supporting informal educators to communicate about climate change found that one of the biggest challenges for interpreters was effectively leveraging visitors' attraction to and curiosity about live animals, and connecting it with abstract topics like "climate change" or topics that interpreters worried visitors would not be as easily interested in (Fraser et al, 2011). Again, NMNH may consider discussing this challenge with scientists and provide them with strategies for using objects as a way to stimulate deeper discussions.

Strengthen the ISE – Expert/Scientist Bond

Scientists and Informal Science Educators have much to learn from each other. It will be important to share this report with scientists in an effort to build stronger relationships between scientists & informal science environments. This report could launch a series of discussions, workshops and trainings around future *Scientist Is In* programs.

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Appendices

Appendix 1 NMNH Evaluation Framework, Metrics, & Protocols (as they relate to the *Scientists Is In* evaluation study)

Engagement

Definition: The museum connects with its audiences through dynamic offerings that inspire awe, hold attention, spark curiosity, promote dialogue about the natural world and how humans relate to it; and foster an interest in further exploration about the Earth, life's diversity, cultural diversity & change and current and future challenges.

Outcomes	Corresponding metric/indicator identified by NMNH	Corresponding metric/indicator developed by AF
Inspire Awe	[did not see corresponding metric]	# of verbal utterances related to awe & wonder (including tone of voice)
Hold Attention	Sweep rate index; Staying power index	Time spent; Non-verbal signs of engagement
Spark Curiosity	# and quality of questions about a topic	# and type of questions
Promote Dialogue	#/% of contacts involving interaction with staff or volunteers	Breadth & depth of conversation; types of conversations discussed
Foster Exploration	# and type of people with whom persons discussed their NMNH experience; # and frequency of exploration behaviors following contact with NMNH	N/A – Not within the scope of study; Collected e-mails if NMNH wants to pursue this line of questioning in the future

Influence

Definition: As a trusted institution, supported by human and scientific resources, the museums plays a significant national and global role in connecting people with the natural world, shaping complex ideas about the world and their place in it and increase active involvement in preserving and sustaining the diverse natural and cultural world.

Outcomes	Corresponding metric/indicator identified by NMNH	Corresponding metric/indicator developed by AF
Connections to natural & cultural world	Rating of attitudes about topics encountered at NMNH before and after NMNH contact	Conversations relating to "connections" between scientists & visitors; Open-ended interview question directly asking visitors whether they saw connections
Complex Ideas	Complexity index (depth and breadth) for ideas about topics encountered at NMNH	Retrospective pre/post scaled items for: interest in science, understanding of exhibit topics, science careers; Post concept mapping activity for: "scientist"
Active Involvement	Actions taken beyond exploration following contact with NMNH	Not within the scope of study; Collected e-mails if NMNH wants to pursue this line of questioning in the future

Appendix 2 Observation Instrument

Observation Date: _____ Time: _____ Data Collector: _____ ID #:_____
Scientist Is In ☐ HHO ☐ SOH

Time spent: _____ (min:sec)
Initiates with *Scientist Is In* ☐ Target visitor approached ☐ Scientist invited

Conversation

Observed Behaviors

Interacts with Scientist

- ☐ Engaged/Interested in the scientist (listening, nodding, pointing)
- ☐ Participates in activity
- ☐ Mentions to another visitor/staff member
- ☐ Other: _____

Props used with Visitors

- ☐ Plasma Screen
- ☐ Specimens
- ☐ Models
- ☐ Activities
- ☐ Images, photographs, text
- ☐ Other: _____

Observation Date: _____ Time: _____ Data Collector: _____ ID #:_____
Scientist Is In ☐ HHO ☐ SOH

Conversation cont.

Observed Demographics

Age category: 6-10 11-17 18-24 25-34 35-44 45-54 55-64 65+ Sex: Male Female

Visitor Group Size: 1 2 3 4 5+ Social Group: Alone Adults Adults & Children

Total visitors present at SII: _____ Total visitor groups present at SII: _____

Facilitation

	Did not implement	Somewhat utilized	Fully utilized
Follows visitor interests	0	1	2
Inquiry based learning	0	1	2
Object based learning	0	1	2
Personal application	0	1	2
Post-visit experience	0	1	2
Career mentoring	0	1	2

Appendix 3 Concept Map

SCIENTIST

Map Date: _____ Time: _____ Data Collector: _____ ID #:_____

Is In Participated in the *Scientist Is In* Exhibition ☐ Yes ☐ No ☐ HHO ☐ SOH

ERVIEW QUESTIONS

ame is ____ and I am working with the National Museum of Natural History. Today I am helping to collect feedback on [Exhibit].

e just in [Exhibit], did you have a chance to spend some time with the exhibit?

s spent time in the Exhibit] *We're asking visitors to spend 5-10 minutes and answer a few questions about it. It would be great if you could help us out us what you think.* (If yes from both adult and child) *Great, let's begin…*

piece of paper with the word "scientist" printed in the center. Please take a few seconds to jot down any words, ideas, images, phrases, or thoughts ne to mind when you think of this terms [gesture in a circular motion around the page as talking, to indirectly demonstrate that visitor can write e on the page, in any fashion].

ake a few seconds share anything that comes to mind. There are no right or wrong answers. We are just interested in what you think.

Appendix 4 Hall of Human Origins Interview

Interview Date: _____ Time: _____ Data Collector: _____ ID #:_____

Scientist Is In Participated in the *Scientist Is In* ☐ Yes ☐ No

Hall of Human Origins

1. What was the most interesting thing you saw, did, or talked about while in the Hall of Human Origins? *[Probes: Why was that? Can you tell me more about that?]* ☐ Did ☐ Saw ☐ Talked about

2. Thinking about the Hall of Human Origins exhibition, what are some questions you have about the concepts within the gallery? *[Probe: What questions do you have about Ocean Science / Human Evolution?]*

3. Is what you saw in the Hall of Human Origins today related to your life in any way? ☐ Yes ☐ No
(*If yes, in what ways?*)

4. Have you been to this exhibit before? ☐ Yes ☐ No
(*If yes, when was your last visit?*)

5. We have found that visitors to museums often talk about the purpose of their visits in one of these 6 ways. [Show card.] I'm wondering which of these statements most closely aligns with the purpose of your visit today. You'll probably identify with more than one, but try to narrow it down to one if you can. Would you like me to read them aloud?

☐Explorer ☐Facilitator ☐Professional/hobby ☐Experience seeker ☐Recharger ☐National Pilgrim

TREATMENT ONLY

6. What made you decide to stop and participate in The Scientist is In program? *[Probe: Can you tell me more about that?]*

7. How did you benefit from your participation in this experience? What was the value? *[Probe: What do you feel you gained through participation in the program]*

8. Do you have any suggestions to help improve this program for future visitors?

Please Tell Us About You

Below are some statements about science. For each statement, we want you to tell us whether you agree or disagree with it, both before you visited the Human Hall of Origins and now. Please rate each statement on a scale of 1-5, where *1=strongly disagree; 2=disagree; 3=unsure; 4=agree; and 5=strongly agree.*

Prior to visiting the Exhibition						After visiting the Exhibition				
Disagree				Agree	Statement	Disagree				Agree
1	2	3	4	5	I enjoy studying science.	1	2	3	4	5
1	2	3	4	5	I may not make great discoveries, but working in science would be fun.	1	2	3	4	5
1	2	3	4	5	The search for scientific knowledge would be boring.	1	2	3	4	5
1	2	3	4	5	Only highly trained scientists can understand science.	1	2	3	4	5
1	2	3	4	5	Scientific work would be too hard for me.	1	2	3	4	5
1	2	3	4	5	I would not want to be a scientist.	1	2	3	4	5
1	2	3	4	5	Scientific work is only useful to scientists.	1	2	3	4	5
1	2	3	4	5	Most people are unable to understand science.	1	2	3	4	5
1	2	3	4	5	Every citizen should understand science.	1	2	3	4	5
1	2	3	4	5	Anything we need to know can be found out through science.	1	2	3	4	5
1	2	3	4	5	People must understand science because it affects their lives.	1	2	3	4	5
1	2	3	4	5	A major purpose of science is to help people live better.	1	2	3	4	5

For each statement, we want you to tell us how much you knew, both before you visited the Exhibition and now. Please rate each statement on a scale of 1-5, where *1=nothing and 5=a lot!*

Prior to visiting the Exhibition						After visiting the Exhibition				
Nothing				A lot!	Statement	Nothing				A lot!
1	2	3	4	5	Human Evolution	1	2	3	4	5
1	2	3	4	5	Science careers	1	2	3	4	5
1	2	3	4	5	NMNH is a research institution	1	2	3	4	5

Are you male or female?

☐	Male
☐	Female

What is your age? _____

If you are an ADULT, what is your occupation? _____

If you are a CHILD, what job would you like to have when you grow up?_____

Are you visiting alone or with other people?

☐	I am alone
☐	I am with other people

Other than yourself, how many people are with you?

_ _	Number of adults (18 and over)
_ _	Number of youth 10 to 17
_ _	Number of youth under 10

Are you of Hispanic or Latino origin?

☐	No
☐	Yes

What race do you consider yourself? (Mark one or more)

☐	African American/ Black
☐	American Indian/ Native Alaskan
☐	Asian
☐	Native Hawaiian/ Pacific islander
☐	White

Do you live in the United States or other country?

☐	United States, specify zip code: _____
☐	Another country, specify: _____

We are interested in contacting visitors who have used this exhibit a few weeks from now. Would you like to participate in this email survey? If so, please provide your email address.

Email address: _____

Thank You!

Appendix 5 Sant Ocean Hall Interview

nterview Date: _____ Time: _____ Data Collector: _____ ID #:_____
cientist Is In Participated in the *Scientist Is In* ☐ Yes ☐ No
ant Ocean Hall

1. What was the most interesting thing you saw, did, or talked about while in the Sant Ocean Hall? *[Probes: Why was that? Can you tell me more about that?]* ☐ Did ☐ Saw ☐ Talked about

2. Thinking about the Ocean Hall exhibition, what are some questions you have about the concepts within the gallery? *[Probe: What questions do you have about Ocean Science?]*

3. Is what you saw in Ocean Hall today related to your life in any way? ☐ Yes ☐ No
(*If yes, in what ways?*)

4. Have you been to this exhibit before? ☐ Yes ☐ No
(*If yes, when was your last visit?*)

5. We have found that visitors to museums often talk about the purpose of their visits in one of these 6 ways. [Show card.] I'm wondering which of these statements most closely aligns with the purpose of your visit today. You'll probably identify with more than one, but try to narrow it down to one if you can. Would you like me to read them aloud?

☐Explorer ☐Facilitator ☐Professional/hobby ☐Experience seeker ☐Recharger ☐National Pilgrim

TREATMENT ONLY

6. What made you decide to stop and participate in The Scientist is In program? *[Probe: Can you tell me more about that?]*

7. How did you benefit from your participation in this experience? What was the value? *[Probe: What do you feel you gained through participation in the program]*

8. Do you have any suggestions to help improve this program for future visitors?

Please Tell Us About You

Below are some statements about science. For each statement, we want you to tell us whether you agree or disagree with it, both before you visited the Sant Ocean Hall and now. Please rate each statement on a scale of 1-5, where *1=strongly disagree; 2=disagree; 3=unsure; 4=agree; and 5=strongly agree.*

Prior to visiting the Exhibition						After visiting the Exhibition				
Disagree				Agree	Statement	Disagree				Agree
1	2	3	4	5	I enjoy studying science.	1	2	3	4	5
1	2	3	4	5	I may not make great discoveries, but working in science would be fun.	1	2	3	4	5
1	2	3	4	5	The search for scientific knowledge would be boring.	1	2	3	4	5
1	2	3	4	5	Only highly trained scientists can understand science.	1	2	3	4	5
1	2	3	4	5	Scientific work would be too hard for me.	1	2	3	4	5
1	2	3	4	5	I would not want to be a scientist.	1	2	3	4	5
1	2	3	4	5	Scientific work is only useful to scientists.	1	2	3	4	5
1	2	3	4	5	Most people are unable to understand science.	1	2	3	4	5
1	2	3	4	5	Every citizen should understand science.	1	2	3	4	5
1	2	3	4	5	Anything we need to know can be found out through science.	1	2	3	4	5
1	2	3	4	5	People must understand science because it affects their lives.	1	2	3	4	5
1	2	3	4	5	A major purpose of science is to help people live better.	1	2	3	4	5

For each statement, we want you to tell us how much you knew, both before you visited the Exhibition and now. Please rate each statement on a scale of 1-5, where *1=nothing and 5=a lot!*

Prior to visiting the Exhibition						After visiting the Exhibition				
Nothing				A lot!	Statement	Nothing				A lot!
1	2	3	4	5	Ocean science	1	2	3	4	5
1	2	3	4	5	Science careers	1	2	3	4	5
1	2	3	4	5	NMNH is a research institution	1	2	3	4	5

Are you male or female?

☐	Male
☐	Female

What is your age? _____

If you are an ADULT, what is your occupation? _____

If you are a CHILD, what job would you like to have when you grow up?_____

Are you visiting alone or with other people?

☐	I am alone
☐	I am with other people

Other than yourself, how many people are with you?

__ __	Number of adults (18 and over)
__ __	Number of youth 10 to 17
__ __	Number of youth under 10

Are you of Hispanic or Latino origin?

☐	No
☐	Yes

What race do you consider yourself? (Mark one or more)

☐	African American/ Black
☐	American Indian/ Native Alaskan
☐	Asian
☐	Native Hawaiian/ Pacific islander
☐	White

Do you live in the United States or other country?

☐	United States, specify zip code: _____
☐	Another country, specify: _____

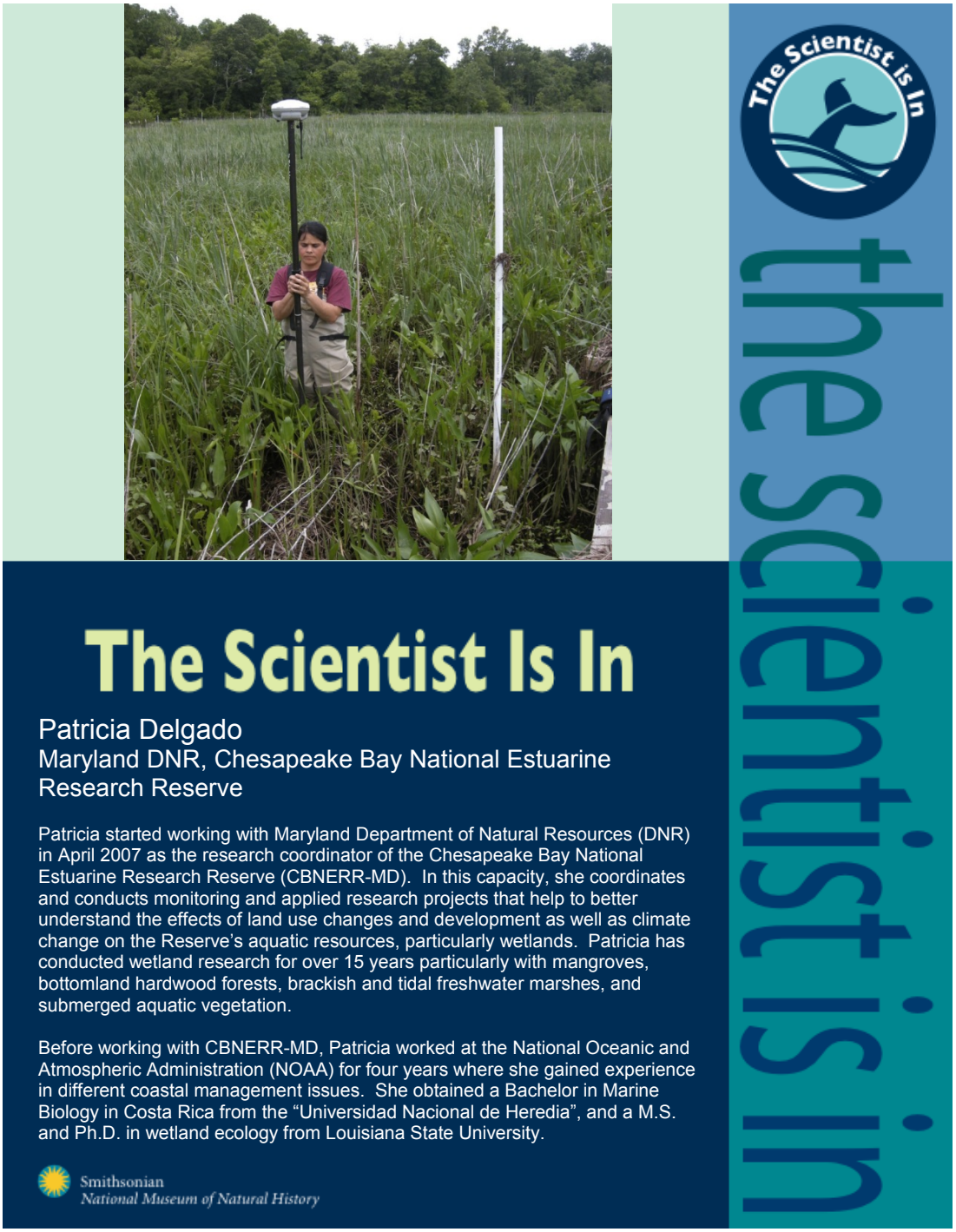
We are interested in contacting visitors who have used this exhibit a few weeks from now. Would you like to participate in this email survey? If so, please provide your email address.

Email address: _____

Thank You!

Appendix 6 Descriptions of Presenting Scientists

***The Scientist Is In*: Patricia Delgado**
Wednesday, August 15, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution



***The Scientist Is In*: Sarah Barks**
Thursday, August 16, 2012
Location: Hall of Human Origins, NMNH, Smithsonian Institution

***The Scientist Is In*: John Pojeta**
Wednesday, August 22, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution

The Scientist Is In

John Pojeta, Jr
Adjunct Scientist, Department of Paleobiology

Dr. Pojeta's research interests are in the study of fossil mollusks and what the fossil record shows about the origins and early evolution of the classes of mollusks. His studies are mostly concerned with pelecypods (bivalves), chitons, and the extinct class Rostroconchia from Cambrian and Ordovician rocks.

Dr. Pojeta holds a B.S. from Capital University, and an M.S. and Ph.D. from the University of Cincinnati. He served as Chief, Branch of Paleontology and Stratigraphy, U.S. Geological Survey (USGS) from 1989 to 1994 and as Chairman, USGS Geological Names Committee from 1990 to 1994. In addition to his work at the Smithsonian, he remains active in research as a USGS Emeritus Scientist.

Among honors and awards held by Dr. Pojeta is the USA Medal for service in Antarctic. Pojeta Peak is a mountain in Ellsworth Land in West Antarctica.

Smithsonian
National Museum of Natural History

the scientist is in

***The Scientist Is In*: Marguerite Toscano**
Wednesday, August 29, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution

The Scientist Is In

Marguerite A. Toscano
Research Geologist, National Museum of Natural History

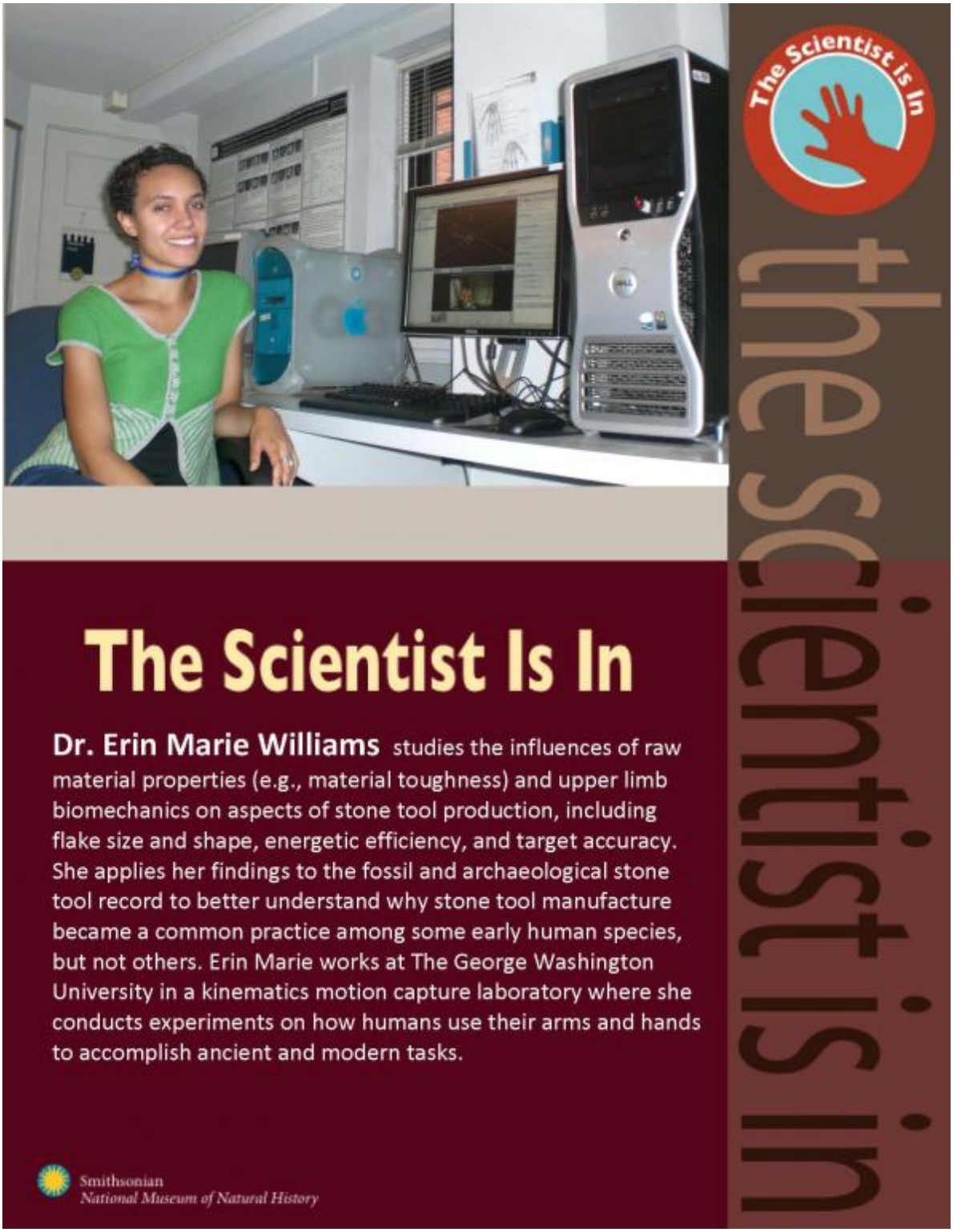
Dr. Marguerite Toscano, a Research Geologist in the Department of Paleobiology, is an expert on Holocene sea level rise of the Caribbean region. Her research, funded by the National Science Foundation, focuses on the geologic history of coral reefs and mangrove peat deposits, analyzing and interpreting them as past sea-level indicators, and using this information to calibrate geophysical sea level change models. She is also studying recent rates of sea level rise and corresponding rates of land loss around low-lying islands, and investigating the transport of volcanic (floating) pumice from Guatemala into the Mesoamerican Barrier Reef via western Caribbean surface currents. Her field sites include Belize, Florida, the Florida Keys, St Croix, and Panama.

Dr. Toscano holds MS and PhD degrees in Geology and Geological Oceanography. Her academic awards include the Denise Gaudreau Award for Excellence in Quaternary Studies (American Quaternary Association), and National Research Council and CIRA (NOAA) post-doctoral fellowships.

Smithsonian
National Museum of Natural History

***The Scientist Is In*: Linda Cole**
Wednesday, September 5, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution

***The Scientist Is In*: Erin Marie Williams**
Thursday, September 6, 2012
Location: Hall of Human Origins, NMNH, Smithsonian Institution



***The Scientist Is In*: Chris Meyer**
Wednesday, September 12, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution

***The Scientist Is In*: Ron Gird**
Wednesday, September 19, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution

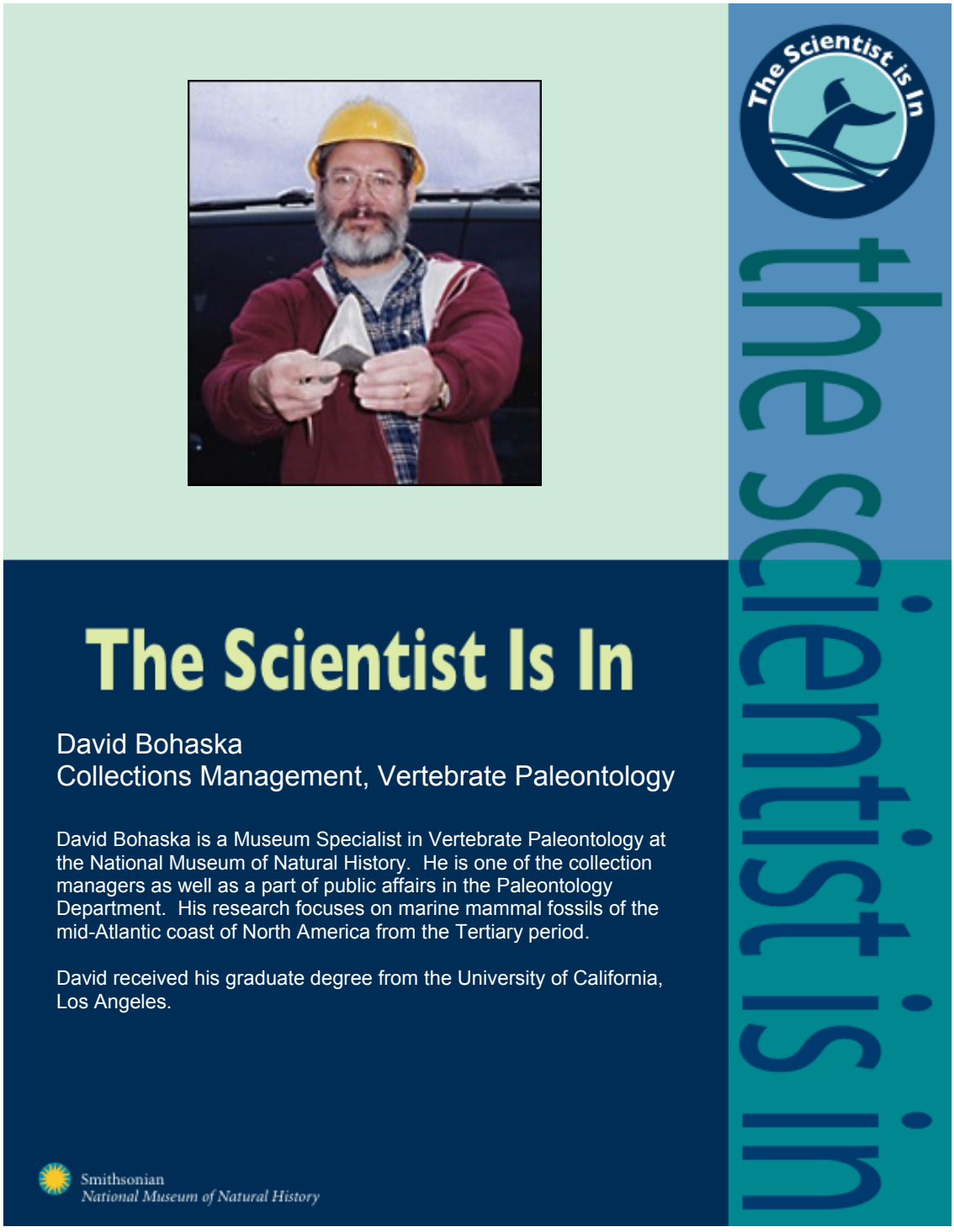
The Scientist Is In

Ron Gird
Meteorologist, NOAA National Weather Service

Ron Gird is a meteorologist with NOAA's National Weather Service (NWS) and is responsible for the NWS Customer Outreach and Education Programs, a position held since December, 1998. Mr. Gird is a member of the California State University-Satellite Education Association Advisory Board. He has served as a consultant to Plan!TNOW, Time/Life Books, The American Meteorological Society, the National Geographic Society and the Smithsonian National Air and Space Museum. Previous assignments included work with the NOAA Satellite Program, NWS Satellite and Spaceflight Programs, the NWS Storms Prediction Center, and The Analytical Sciences Corporation (TASC). He received his B.S. in meteorology from the Pennsylvania State University.

Smithsonian
National Museum of Natural History

***The Scientist Is In*: David Bohaska**
Wednesday, September 26, 2012
Location: Sant Ocean Hall, NMNH, Smithsonian Institution



Appendix 7 Coding Rubrics

Coding Rubrics for Observations

PART 1

_____ # of **questions asked by visitor**

[If visitor asked a question] **Types of questions** asked by **visitor** (circle all that apply)

(1) Question about specific model/specimen (e.g. is this real? What is this? Is this xyz?)
(2) Question about the scientist's life (her life, work, research)
(3) Question about the science topic (more broadly)
(4) Question to ask for permission (e.g. can I touch that, can I take your picture, etc)
(5) Question about another Smithsonian exhibit, program, research, etc…
(6) Question about orientation or wayfinding that is unrelated to the topic being discussed
(7) Other question

Does the visitor verbally express **awe & wonder** while engaging with the scientist?

(1) No, the visitor does not make any verbal expressions of awe & wonder
(2) Yes, the visitor verbally expresses awe & wonder (says things like: "wow," "that's amazing," "cool")

Do the visitor and the scientist discuss **NMNH/Smithsonian research**?

(0) No mention is made of NMNH research
(1) Somewhat (topic raised)- the scientist refers to NMNH/Smithsonian research, but the visitor does not engage in further discussion about the topic
(2) Yes (discussed)- the scientist refers to NMNH/Smithsonian research, and a discussion about that research commences (e.g. the visitor asks a follow-up question, or makes a comment about the research)

[If visitor and scientist discuss NMNH/Smithsonian research] **Directionality of conversation** between the target visitor and the scientist

(1) Scientist initiates the discussion about NMNH/Smithsonian research
(2) A visitor initiates the discussion about NMNH/Smithsonian research

Do the visitor and the scientist discuss **science careers**?

(0) No mention is made of science careers
(1) Somewhat (topic raised) - the scientist refers to a science career (whether it is his/her own career, or some other science career), but the visitor does not engage in further discussion about the topic
(2) Yes (discussed) - the scientist refers to a science career (whether it is his/her own career, or some other science career), and a discussion about that career commences (e.g. the visitor asks a follow-up question, provides his/her thoughts and opinions about the career, and so on)

[If visitor and scientist discuss science careers] **Directionality of conversation** between the target visitor and the scientist

(1) Scientist initiates the discussion about science careers
(2) A visitor initiates the discussion about science careers

Do the visitor and the scientist have a conversation about the **connections** between humans (including themselves) and science/the natural world?

(0) No, visitors & scientists to do not discuss topics relating to the connections between humans and the natural world
(1) Somewhat (topic raised), the scientist refers to human/natural world connections, but the visitor does not engage in further discussion about the topic
(2) Yes (discussed) - the scientist refers to human/natural world connections, and a discussion about that topic commences (e.g. the visitor asks a follow-up question, provides his/her thoughts and opinions, and so on)

[If visitor and scientist discuss **connections** between humans and science/the natural world]
Directionality of conversation between the target visitor and the scientist
(1) Scientist initiates the discussion about connections between humans and science
(2) A visitor initiates the discussion about connections between humans and science

PART 2

What are the **categories of topics** that are mentioned while the visitor is present (this includes topics that are discussed by the scientist, the visitor, and/or other visitors while the visitor is present and engaged – whether passively or actively). (Select ALL that apply)
(1) **Facts & Information** directly related to the topic being presented by the scientist
(2) **Personal information** about where the visitor/scientist lives, likes to do in leisure time, where they are coming from, or any other personal information unrelated to the scientific topic being discussed
(3) **Discussion about science careers** and/or what the visitor/scientist does for a living (or wants to do for a living), and/or what others do for a living as it relates to a science career
(4) **Discussion about the Smithsonian/NMNH** (including talk about other exhibits, research, etc)
(5) **Orientation & Wayfinding**
(6) **Instructional** (this is how you hold it, here touch this, etc)
(7) **Positive Affective**
(8) **Negative Affective**
(9) **Other**

What is the **breadth** of dialogue between **the target visitor** and the scientist?

(0) No dialogue (the visitor and scientist do not exchange words)
(1) Limited (the scientist may speak to the target visitor, but the visitor does not respond, and/or the two exchange a few words, but not beyond one topic)
(2) Moderate (the scientist and target visitor engage in a dialogue around 2 – 3 topics)
(3) Extensive (the scientist and target visitor engage in a dialogue around 4 or more topics)

What is the **depth** of dialogue between **the target visitor** and the scientist?

(0) No dialogue (the visitor and scientist do not exchange words)
(1) Limited (the scientist may speak to the target visitor, but the visitor does not respond, and/or the two only exchange a few words, but not with any depth)
(2) Moderate (the scientist and target visitor speak in moderate depth about a topic – going back and forth a few times, but still may be more one sided and/or does not get beyond the scientists' basic "script")
(3) Extensive (the scientist and target visitor engage in depth about a particular topic – extending well beyond the scientist' basic "script" and involving a back and forth exchange, and questioning and answering)

Coding Rubrics for Concept Maps

*** 1st Round of coding - looking across all responses**

Categorical – Type of Response (Inductive/Emergent)			
CODE	Code Name	Description of Code	Examples
1	Scientific Discipline	Visitor refers to a scientific discipline and/or the topic/objects being studied within that discipline	"Chemistry," "Chemicals," "Biology," "Nature," "Animals," "Geology," "Physics," "Energy," "Water," "Fossils, "Weather" "Math" "Anthropology,"
2	Value / Purpose	Visitor refers to the purpose and/or value of scientists/scientific work	"It's important to study energy because without it, we couldn't live;" "A lot of what we have today is because of scientists. Science is knowledge and knowledge is power;" "When you listen to the history of fossils, that makes you smarter"
3	Scientific Process	Visitor refers to processes scientists use in their work (including scientific habits of mind, thinking & communicating skills)	Scientists look at animals and study the bones inside and then that helps identify the unknown animals; Hypotheses; Experiments: They have to talk with partners so everyone knows what it means; research; lectures; reading; studying; solving; Discovery, "Coming up with testable hypotheses is the main tool for scientists to discover and test theories and figure out how things work."
4	People	Visitor refers to a specific person (or type of person)	Einstein; Michael Chricton; Andrew; the Slonz; Children; My dad; Bill Nye;

		who is a scientist – *does not include adjectives about the personality of a scientist	Darwin
5	Scientific Instruments / Tools	Visitor refers to a the instruments or tools scientists use, and/or the clothes that they wear	Lab coats; Goggles: Lab: Beakers; Lots of Books; White coat; Bunsen Burner
6	Personality / Disposition	Visitors use adjectives/descriptive words to describe the personality/disposition of scientists	Inventors; Smart; Intelligent; Imaginative; Wondering; Believing; Adversity; Competition; Challenging; Historians, Curious; adventurous; take-risks; Educated; Precise; Innovative; Mad; Pioneers; Successful
7	Other / Outliers	Response that does not fit in other categories	

*** 2nd Round of coding - looking specifically for evidence of prevailing stereotypes**

According to the NSF publication "National Science Board Subcommittee on Science & Engineering Indicators," published in 2002, when children have been asked to draw images of scientists, the following features associated with stereotypical images of a scientist have been noted:

- A lab coat (white)
- Eyeglasses, or goggles
- Facial growth or hair
- Scientific instruments and laboratory equipment
- Books and filing cabinets
- Light bulbs
- "Mad," "Crazy" "Nerdy," "Geeky"

Perceptions of Scientists – Stereotypes (Deductive)		
CODE	Code Name	Description
0	None	Responses do NOT reflect commonly held stereotypes
1	Stereotype mentioned	Responses contain one or more commonly held stereotypes (see above)

*** 3rd Round of coding - looking specifically for responses representing the following Scientist Profiles**

According to the same NSF publication "National Science Board Subcommittee on Science & Engineering Indicators," published in 2002, studies have shown that while the persistence of the stereotype is difficult to dislodge, "most people believe scientists lead rewarding professional and personal lives" and maintain positive perceptions of scientific careers. The studies also uncovered public perceptions that scientific occupations are "dangerous." The following categories look at visitors' emergent perceptions of scientists & science careers.

Perceptions of Scientists and/or Science Careers (Inductive/Emergent)

* Code YES/NO for each			
CODE	Code Name	Description	Examples
1	The Adventurer / Explorer	Responses refer to scientists as people who "explore the world" and/or have "adventure."	Scientists explore the world; Expeditions; Explore;
2	The Creative / Innovator / Discoverer	Responses refer to scientists as people who are "naturally curious," "creative," and "imaginative," and/or as people who generate new ideas and ways of thinking	Natural curiosity; Innovative; Knowledge Seeker; Discoverer of the new; Learn about things we do not know; Discovery; Invention; Creation; Linking ideas; Broad imagination
3	The Critical Thinker / Problem Solver	Responses refer to scientists as people who engage in critical thinking, & problem solving (including analysis, observation, experimentation)	Test; Experiments; Searching for answers; Observations; Analysis; Hypotheses; Research; Critical Thinker; Scientists have to problem solve
4	The Book Worm / Scholar	Responses refer to scientists as studious individuals, or people who spend a lot of time in school studying or reading.	School; Studying; Highly educated; Intelligent; Expert; Specialist; Knowledgeable; Academic;
5	The Disseminator of Knowledge	Responses refer to scientists as people who are responsible for bringing knowledge to the rest of the world	Learning & interpreting for common knowledge; Share knowledge
6	The Savior / Change Agent	Responses refer to scientists as people whose work changes/saves lives	Changes the world by discovering cures for diseases; Helps us improve our environment; Help humanity; Protect environment; Fix problems; healer
7	The "Mad" Scientist	Responses refer to scientists as "mad," "crazy," or "odd"	Crazy [cause of the hair]; Genius?; geek; nerd
8	The "Amazing" Scientist (general positive perceptions)	Responses refer to scientists in generally positive ways.	Interesting, cool, amazing, awesome, successful

Coding Rubrics for Interviews

What was the most interesting thing you saw, did, or talked about?		
CODE	Description of code	Examples
1	*Scientist Is In* Program	"The *Scientist Is In* exhibit." "Talking to scientist. We bee-lined to talk to her – haven't seen much else. Explanation of what she does in field." "That scientist back there is interesting." "Talking with *Scientist Is In* about hurricanes – really into weather and lived through Katrina." "and the hurricane explanation – in Australia we have hurricanes, so it was interesting from that perspective."
0	Other	"Big fish they thought was extinct, they found recently. The fish went from Africa to Indonesia." "The sand stone made me most interested. They study it to evaluate the amount of oxygen in the air." The big whale "Globe, watched it two times. And coral reefs and fishes [aquarium]. Pretty awesome!" Exhibit on human population growth Timeline from becoming upright Prehistoric life; Evolutionary concepts

Did the visitor have any questions about the concepts within the gallery?		
CODE	Description of code	Examples
1	Has at least one question	
0	No questions / Unsure	"None. Don't have many questions – majored in college in it." "No." "Nothing, I watch a lot of TV."

What types of questions do visitors have about the concepts?		
CODE	Description of code	Examples
1	**"Give me the facts"** (visitor has a concrete question about a date, origin of object, authenticity, etc)	"What is the oldest date that someone's found a human skull and where?" "How much of it is real or are they models?" "Wondering whether the shark jaw was fossilized or just the tooth." "Wonder if some were not real fossils"

2	**"I wonder…"** (visitor has an abstract question about how something happened, and/or imagines how something looks, feels, smells, etc…)	"Made me think, what else is out there?" "Why do trilobites look so weird?" "How they lost their fur?" "What the ocean surface might look like? Don't know what's underwater. What the surface looks and feels like." How are other animals and humans linked right now?
3	**"How do I…"** (visitor asks logistical / practical questions about wayfinding, orientation, etc)	"How do I follow it? Maybe I'm not supposed to." "The layout of the show. We study a lot about museum culture and curatorial stuff. How they take all the stuff and organize it into a coherent exhibition."
4	Other	

In what ways did visitors describe how the exhibit was related to their lives?		
CODE	Description of code	Examples
1	**Direct, Personal Relationship** (may be related to where visitor lives or has traveled, and/or to his/her profession or hobby)	"Jellyfish – my brother was stung by one, and I like to look at them." "Sargassum – it washes ashore in Texas where I live." "The hurricanes – live in New Orleans by Gulf of Mexico, so also a lot of plant and fish life." "In science we did a whole unit on water."
2	**Life –Cycle Relationship** (related to larger cycles of life and how humans fit in with the natural world, e.g. "the ocean is necessary for human life")	"The ocean we don't know a lot about it. Very important. Everything has to do with the ocean." "Water is necessary to life. Without water and the ocean we wouldn't be here." "Without the ocean we don't breathe. Fish give us oxygen. We use the ocean to survive just as the ocean needs us to survive."
3	**Historical Relationship** (mostly related to human origins, visitors talk about how evolution relates to them as a human – the past influenced the present. May discuss similarities between apes and humans)	"We evolved from them." "How we conquered disease." "The evolution of how relationships with other humans evolved." Population growth and the part that shows you how you're human – makes you conscious that you are human
4	Other	"There would be no 'fishsticks.'"

Motivations to stop and participate in the SII program		
CODE	Description of code	Examples
1	Curiosity / Desire to find out more	"Curiosity, personal interest." "Saw her talking to a kid about pumice and I thought that looked interesting." "Wanted to know what was in the jars."
2	Personal connection with topic	"Asked where she was from and she started talking about the wetlands. We were going to Maryland and she talked about little crabs." "Real life experience with the storm…"
3	Social aspect /Desire for human interaction	"Enjoy one on one interaction – do some Q&A." "Someone to actually explain, instead of just reading." "Probably because a human being is better able to communicate than I can looking at something." "You can always ask questions." "…scientist looked knowledgeable." "Scientist spoke to us and was friendly." "She is demonstrating her knowledge and passion."
4	Hands-on/interactive	"I like hands on." "Very excited to hold the megladon tooth." "Interactive exhibits are better."
5	Other	

Q7. How did you benefit from your participation in this experience?			
CODE	Description of code	Sub code	Examples
1	Increased Knowledge, Understanding, Awareness of Science topic(s) – Get information	1a. Human connections to the natural world (life cycles and systems)	"Supposed link between chimps and humans."
		1b. Science careers	"Learned a few things I didn't know about the field of work."
		1c. Identification of specimen, objects, countries	"I know what a sea bean is."
		1d. Scientific processes	"It was cool learning how

			the pumice finds its way from Belize and trickles its way down."
		1e. Animal (including human) biology, behavior, adaptations, survival tactics	"Born with a backbone and then over time become invertebrates"
		1f. New information (general/broad response)	"Children and adults got to learn something new." "Knowledge, made me think about things you never." "Learning about something I didn't know."
2	Engagement with real objects		"Stuff I have never seen or touched." "Good interaction with specimens and you're invited participate with hands on things."
3	Social connections / enjoyment of spending time with and/or connecting with others (scientist or others in the group)		"Connecting with an individual who's passionate about something."
4	Change in Attitudes, Values, or Perspectives	4a. Towards the museum	"Made me open to visit other museums. More willing to learn."
		4b. Towards a certain topic, issue, event	"Learning about scientist's point of view about the storm. I just have the residents' point of view"
5	Other		

Do visitors have suggestions to help improve this program?		
CODE	Description of code	Examples
1	No / None	"No." "I like everything." "Not really, really enjoyed."
2	Yes – has suggestion	

What types of suggestions do visitors have?

1	Content / Resources improvement	"Some more real life pictures of what actually went on."
2	Delivery of information improvement	"Maybe more interactive sessions." "A more engaging, enthusiastic scientist."
3	Increase number of programs	"More live interaction." "More scientists, spread out more." "More one on one encounters." "Any other time we've come there hasn't been a scientist out…so it was an improvement having him here."
4	Other suggestion / unrelated to SII program	"The general people in the exhibit can be a nuisance – school groups for instance." "Jumping around – like point A to B."