ARTICLE

IPOP: A Theory of Experience Preference

ANDREW J. PEKARIK, JAMES B. SCHREIBER, NADINE HANEMANN, KELLY RICHMOND, AND BARBARA MOGEL

Abstract The theory and practice of IPOP emerged from structured observations and interviews with visitors to the Smithsonian Institution museums in Washington, D.C. from the 1990s to the present—a dataset useful in constructing a long view. This research has had one overarching intention: to serve museum visitors better, that is, to provide visitors with experiences that are above average, special, significant, and memorable. In numerous studies and interviews during the last 16 years, visitors have repeatedly spoken about their reactions to Smithsonian museum exhibitions in four typologies distilling their primary interests: I = ideas, P = people, O = objects, and—as we were obliged to add at a later stage—a second P for "physical." The evidence suggests that exhibitions that strongly appeal to all four visitor typologies will be highly successful with visitors.

INTRODUCTION

The theory and practice of IPOP emerged from structured observations and interviews with visitors to the Smithsonian Institution museums in Washington, D.C. from the 1990s to the present—a dataset useful in constructing a long view. This research has had one overarching intention: to serve museum visitors better, that is, to provide visitors with experiences that are above average, special, significant, and memorable. The hope is that IPOP will give curators and other museum personnel new tools with which to design exhibitions that surprise and delight visitors.

In numerous studies and interviews during the last 16 years, visitors have repeatedly spoken about their reactions to Smithsonian museum exhibitions in four typologies distilling their primary interests: I = ideas, P = people, O = objects, and—as we were obliged to add at a later stage—a second P for "physical." These typologies occur in visitors' own descriptions of themselves, and reflect their own words about what excites them within museums. The evidence suggests that exhibitions that strongly appeal to all four visitor typologies—that leave out no one, in effect—will be highly successful with visitors. An accompanying article in this issue, *Shaping a Richer Visitors' Experience: Using an IPO Interpretive Approach in a Canadian Museum*, by Jean-François Léger of the Canadian Museum of Civilization in Ottawa, presents a case study of the theory in active use during the process of designing the exhibition *Vodou*.

IPOP theory is at mid-stage of an evolutionary process. This article will describe the measures we use to discern these differences in primary orientation, and will show how these measures related to visitor behavior and responses in two exhibitions at the National

Andrew J. Pekarik (pekarika@si.edu), senior research analyst, Office of Policy and Analysis, Smithsonian Institution; James B. Schreiber, professor, Duquesne University and associated research fellow at the Smithsonian; Nadine Hanemann, research assistant, Center for Cultural Research, Bonn, Germany; Kelly Richmond, project associate, Office of Policy and Analysis, Smithsonian Institution; Barbara Mogel, project manager (retired), National Museum of the American Indian.

Photo 1: The installation of *Against All Odds* at the National Museum of Natural History, viewed from the entryway. *Photos in this article are by Andrew J. Pekarik and Nadine Hanemann.*

Museum of Natural History (NMNH): *Against All Odds: Rescue at the Chilean Mine* and *Race: Are We So Different?* In analyzing this data we have set out to approach the IPOP model scientifically: to formulate these ideas as a theory, to make claims on the basis of the theory, and to test those claims with empirical data. In order to facilitate ease of reading, this article is divided into an expository section with images of the exhibition, followed by a technical section on data calculation, which includes graphs and other figures.

The flexibility of IPOP theory derives from its four-dimensional construct of experience preferences: *Ideas*—an attraction to concepts, abstractions, linear thought, facts and reasons; *People*—an attraction to human connection, affective experience, stories, and social interactions; *Objects*—an attraction to things, aesthetics, craftsmanship, ownership, and visual language; and *Physical*—an attraction to somatic sensations, including movement, touch, sound, taste, light, and smell. Obviously everyone is drawn to all four of these experience domains in varying degrees. Yet in most of us, one of the four preferences appears to be dominant.

Even outside the museum, arguably, an individual's profile in relation to these four dimensions can influence behavior patterns. Since IPOP theory points to individual decisions that have occurred at subliminal levels of

Photo 2: The introductory text panel describing the mine disaster.

choice-making, this descriptive method may be more fundamental to a person's approach to the world than distinctions derived from the conscious reasons people give for visiting museums. The truth of the typology, we feel, lies in what visitors do, more so than in the concepts they create to explain what they do. It seemed imperative, then, to observe what people actually do in exhibitions as a way to test the theory's claims.

IPOP AS A PREDICTIVE MODEL

IPOP is designed to be a predictive model, not simply a descriptive one, as are most other systems of differentiating visitors. As the IPOP theory is developed and adopted in practice, we believe that it will help exhibition makers to raise visitors' levels of attention and positively influence their behavior. In particular, we claim that an individual's relative attraction to the four IPOP dimensions influences 1) what that individual pays attention to, 2) what s/he does, and 3) how that person responds.

The purpose of this article is to introduce IPOP and to offer empirical data that can clarify these fundamental hypotheses. Further research will be required to fully develop (or revise) the theory. We will suggest specific ways that IPOP theory can be used to help museum staff in their work.

ORIGIN OF THE THEORY

Sixteen years ago, the Smithsonian's Institutional Studies Office was asked to study visitors to *Puja: Expressions of Hindu Devotion*, an exhibition at the Arthur M. Sackler Gallery on Indian devotional practices.[1] *Puja* was the first exhibition created entirely under the control of the education department; it was strongly didactic, and not everyone in this art museum was pleased by this departure from custom. The study sought to answer the question: What did visitors think of the interpretive approach? Were they excited, as the exhibition makers believed? Were they disappointed, as some of the curators believed?

Interviewing visitors, Pekarik observed that individual reactions to this exhibition seemed driven by memories of experiences elsewhere. It was as if each visitor already had a pre-estab-

lished template that was being used to measure both what s/he anticipated and what s/he encountered within the exhibition.

The *Puja* study led to an investigation of "satisfying experiences" as a new focus of research—see Doering (1999); also Pekarik, Doering, and Karns (1999)—which aimed at understanding visitor expectations in the museum experience, and the impact of these expectations on visitor satisfaction.

In this research, Pekarik, Doering, and Karns identified four types of experience, which they defined as: 1) an *object experience*, which has a focus on the object's own authenticity, value, and beauty, or the wish to own the object; 2) a *cognitive experience*, which is the intellectual stimulus to interpret and assimilate the cognitive contents of the exhibit or exhibition; 3) an *introspective experience*, which is the reaction triggered by the object or by the exhibition; and 4) a *social experience*, which occurs in the presence of others (1999).

They further explored these findings in numerous subsequent studies. For an extensive literature review of visitor research related to this and other topics, see Kirchberg and Tröndle, *Experiencing Exhibitions: A Review of Studies on Visitor Experiences in Museums* (2012).

The outcome of the satisfying experiences research at the Smithsonian is summarized in Pekarik and Schreiber (2012).

Research on satisfying experiences at the Smithsonian focused on comparing experiences anticipated before entering an exhibition with those reported as satisfying upon exit. While this helped to explain why some exhibitions were particularly successful and others less so, it did not offer obvious guidance for future projects. Something else was needed. In the fall of 2008, Pekarik began working with an exhibition team at the National Museum of the American Indian (NMAI), a process summarized in Pekarik and Mogel (2010). The NMAI team was planning a multi-year reinstallation of the permanent collection and wanted to choose and describe objects that would speak most effectively to visitors. NMAI had an unusually urgent mandate in that regard, as Mogel explains later in this article. In the course of that work at NMAI, the entire exhibition team conducted studies with visitors, using several methods designed to provide immediate feedback and to create easy adaptability.

As the team investigated what visitors thought and felt about American Indians—their art, history, culture, and their everyday lives today—they began to realize that the experiences that people sought in the museum seemed to be very closely tied to pre-existing individual preferences. Perhaps because of the quick response capability inherent in the study methods—including a "card sort" in which visitors were asked to arrange postcard-sized cards of collections objects in an order based on preferences (Pekarik and Mogel 2010)—patterns began to emerge. It began to seem that some visitors in the study were focused on ideas and learning, others on people and emotions, and still others on objects and aesthetics, a typology that became identified as IPO.

In later years, as more data accumulated, it was necessary to add one important dimension: the attraction to somatic experience, which is included in the model as "Physical."[2]

To approach this research in a more systematic and scientific way, Pekarik began a collaboration in 2011 with Schreiber, a Duquesne University specialist in education research and mathematical methods. An article in this issue, *Technical Note: Using Latent Class Analysis versus K-means or Hierarchical Clustering to Understand Museum Visitors*, by Schreiber and Pekarik (2014), examines mathematical methods of

Photo 3: A view of *Race: Are We So Different?* Both exhibitions were on the same floor of the National Museum of Natural History at the same time.

identifying patterns among visitors, using data directly related to the IPOP theory.

Recent interviews suggest that visitors are excited and pleased when some unexpected aspect of an exhibition opens up a preference category relatively unfamiliar to them. Sometimes people can "flip," that is, have a strong reaction to a different type of experience than the one that generally drew them. Léger describes his own "flip" experience in an exhibition at the NMAI in New York, in *Shaping a Richer Visitors' Experience: Using an IPO Interpretive Approach in a Canadian Museum*, in this issue (2014). A "flip" can energize visitors and give them exhibition experiences that are special, significant, and memorable.

ASSESSING IPOP IN TWO EXHIBITIONS

In the two exhibitions under consideration —*Against All Odds* and *Race*—the team investigated whether IPOP preferences might influence what visitors noticed (thus determining where they stopped), what exhibition elements they engaged with (by making a decision to do so), and even which exhibition they entered and what kind of response they had within it. We sought to see if the data is consistent with our claims. This is the first step in a scientific proof. Our main focus in this article is *Against All Odds*. (*Race* is analyzed in Schreiber et al. 2013).

The Republic of Chile and 33 rescued Chilean copper miners (Los Trienta Y Tres)

Photo 4: In *Against All Odds*, looking toward the drill bit, rescue capsule, video, and several text panels.

joined NMNH in creating *Against All Odds*, the dramatic story of the miners, who were trapped underground for 69 days before being brought to the surface in October 2010 through an international effort. The multimedia exhibition included the Fénix steel rescue capsule that tested the shaft before the rescue, video footage of the unprecedented scale and scope of the world's contribution to the rescue, one of the drill bits that penetrated half a mile of rock to bring the miners to safety, and mementos and stories from the miners (see photo 1). The exhibition opened on August 5, 2011 (exactly one year after the mine collapsed) in the Janet Annenberg Hooker Hall of Geology, Gems and Minerals at NMNH.

This exhibition was selected for study because it contained material that might be considered attractive in all four dimensions. It had descriptions of copper mining that included maps and diagrams and a timeline of the rescue; emotional stories in texts written in a "you are there" style, plus the video with footage of the miners underground and during the rescue; objects from the mine and the rescue, including a bible that a miner had with him underground, helmets, boots, and a rescue capsule; and a touchable object (the drill bit). The exhibition was presented in a room-sized space that was open on one side to a pathway through the larger exhibition *Geology, Gems and Minerals*. The introductory panel was in the middle of that

pathway, and visitors could choose to stop at the panel, turn into the room and its displays, or keep on walking down the pathway. Only those who stopped at the panel or turned into the room were included in the study. Photo 1 is a view of the exhibition as it would be seen by an approaching visitor who was walking through *Geology, Gems and Minerals* in the reverse direction.[3] Photo 4 looks in the opposite direction, at the drill bit, the rescue capsule, the video, and several explanatory panels with photographs.

Race: Are We So Different? is a traveling exhibition created by the American Anthropological Association and first shown at the Science Museum of Minnesota; it is still on the road as of this writing. The exhibition was on view at the National Museum of Natural History from June 2011 until January 2012 in the museum's special exhibitions hall. In the words of the organizers, the exhibition intends "to examine how the idea of race was created, how race differs from human diversity, and how race and racism shape our daily lives."[4] We chose this exhibition for study because we felt that here, too, all four dimensions were addressed to some degree—ideas about race, personal stories, some objects, and interactive stations. In this article the *Race* exhibition is introduced only to demonstrate the IPOP differences of those who chose to enter these two exhibitions.

Randomly sampled visitors to these exhibitions were unobtrusively observed and their stops and stop-times were recorded. As they left the exhibition space they completed a survey that included a rating of their overall experience in the exhibitions (using the scale Poor-Fair-Good-Excellent-Superior), a subset of IPOP questionnaire items (20 in the case of *Against All Odds*), and a few demographic items. The dataset for *Against All Odds* consists of 190 individuals who were tracked and timed and who also completed the post-visit survey.

MEASURING THE FOUR IPOP DIMENSIONS

In each of these four areas—Idea, People, Object, Physical—an individual is assigned a score that indicates the degree to which the individual tends to identify with that type of experience in comparison to all others who have been similarly scored. Scores in each dimension range from -4 to +4 and are distributed in a bell curve with a mean of zero. We can identify a preference—that is to say, a person has a higher score in one dimension than in another—but there is nothing absolute about preferences; the scores are points on a continuum established by comparison with everyone in the dataset.

The scores are calculated from responses to a self-administered questionnaire that, in its full form, currently consists of 38 items.[5] (See Appendix A for the complete survey instrument.) Since a museum visitor survey cannot easily include so many questions of this kind, subsets of this complete set have been used for studies of museum visitors. The version used with visitors to *Against All Odds* included 20 of these items. The shortest variation, the one we now use for museum visitors, contains only eight items, two for each dimension.

As noted above, we make three specific claims for the IPOP theory.

IPOP THEORY IN PRACTICE

1. *Attract*: IPOP Differences Influence Attention / What People Notice

We reason that people will be drawn to possibilities that align with the stronger dimensions in their IPOP profile. In the case of museums, this would mean that the exhibition elements where visitors instinctively stop and pay attention will correlate with their IPOP scores. For

Photo 5: The text panel "Trapped" with its large headline.

example, those with high People scores may be more likely than other visitors to stop at a location that seems to be offering a story about a person. If this is so, then the average People scores of those who stop at that location should be higher than of those who do not stop there.

2. *Engage*: IPOP Differences Influence Behavior / What People Do

Conscious decisions, such as whether to enter a particular exhibition or how long to stay at a particular stop, will also be influenced by a person's IPOP profile. If this is so, the IPOP score profiles of all visitors to two very different exhibitions within the same museum at the same time should be different, and the time spent at a particular location should also reflect IPOP differences.

3. *Flip*: IPOP Differences Influence Response / How People Judge the Quality of the Experience

We believe that when an individual has the kind of experience that s/he is generally drawn to, that person is likely to feel a sense of satisfaction, since expectations will have been met. But when that person has an additional unexpected experience in a dimension that s/he is not generally drawn to, that experience will seem particularly meaningful and memorable. We refer to

Photo 6: The text panel "Rescue" in an earthy clay color.

this encounter with an unexpected IPOP dimension as a "flip" experience, and hypothesize that having flip experiences will be associated with a higher rating of overall experience in an exhibition or museum.

Investigating these claims in detail will require controlled experiments. Until these become possible, we are seeking to refine the theory by collecting data to investigate the degree to which empirical findings are consistent with the theory's predictions.[6]

INVESTIGATING THE DATA

The *Against All Odds* exhibition study, as indicated above, addresses the claim that an individual's relative attraction to the four IPOP dimensions influences what that individual pays attention to, what s/he does, and how s/he responds.

To investigate proposition 1) *Attract:* IPOP Preferences Influence Attention, we considered the IPOP profile of all those who were attracted to the various exhibit locations within the *Against All Odds* exhibition. The observation protocol identified 36 potential targets of attention: text panels, photos, objects, displays (combinations of graphics and text), and the video. A stop was marked when an individual directed his/her attention to one of these and stood still for at least three seconds. Observers also recorded the number of seconds that an individual stayed focused on that target.

Our initial hypothesis was that those who stopped at text panels would have higher Idea scores, on average; those who stopped at the video would have higher People scores; those who stopped at the objects would have higher Object scores; those who stopped at the one touchable object (the drill bit) would have higher Physical scores.

Our analysis focuses on nine locations that met the following criteria: enough people stopped there to allow reliable averages, there were differences in IPOP scores between those who stopped there and those who did not, and these differences were sufficiently large. These stops contained six text panels, two objects, and the video. Three of the text panels had very large, bold, single-word titles: "Trapped," "Rescue," "Survival."

Those who stopped at "Rescue" and "Trapped" had higher People scores than other visitors. Those who stopped at "Trapped" also

had higher Physical scores. Those who stopped at "Survival" had higher Physical scores and lower Idea scores. In other words "Trapped" and "Rescue" were especially attractive in the People dimension, "Trapped" and "Survival" were draws in the Physical dimension, and "Survival" was avoided by those with higher Idea scores. "Survival" suggested the desperate conditions endured by the trapped miners.

Our original hypothesis was that those drawn to text panels generally would have higher Idea scores. This example, however, suggests that the large, highly visible headlines were the determining factor in whether or not individuals noticed and stopped at these panels. "Trapped" and "Rescue" were emotional, and "Trapped" and "Survival" had a distinctly physical aspect.

The one touchable object in the exhibition, the drill bit, drew visitors with higher Object and Physical scores, as expected.

A relatively small text panel on the railing around the large rescue capsule, titled "Leading the Rescue," also drew visitors with higher Object scores. The text panel describes the leadership role taken by the President of Chile. It was the leftmost of three panels on the railing around the rescue capsule. The central panel described how the capsule worked, and the rightmost panel discussed the international nature of the rescue effort. IPOP differences cannot explain this result, although it should be noted that one-quarter of those who were recorded as stopping at this panel had just finished looking at the rescue capsule.

A large panel with photographs about copper mining drew visitors with higher Physical scores. It is possible that the visitors who stopped there were drawn by the visible content—an open pit mine and the title "Buried Treasure."

Three locations were most heavily visited—probably because they were most prominent.

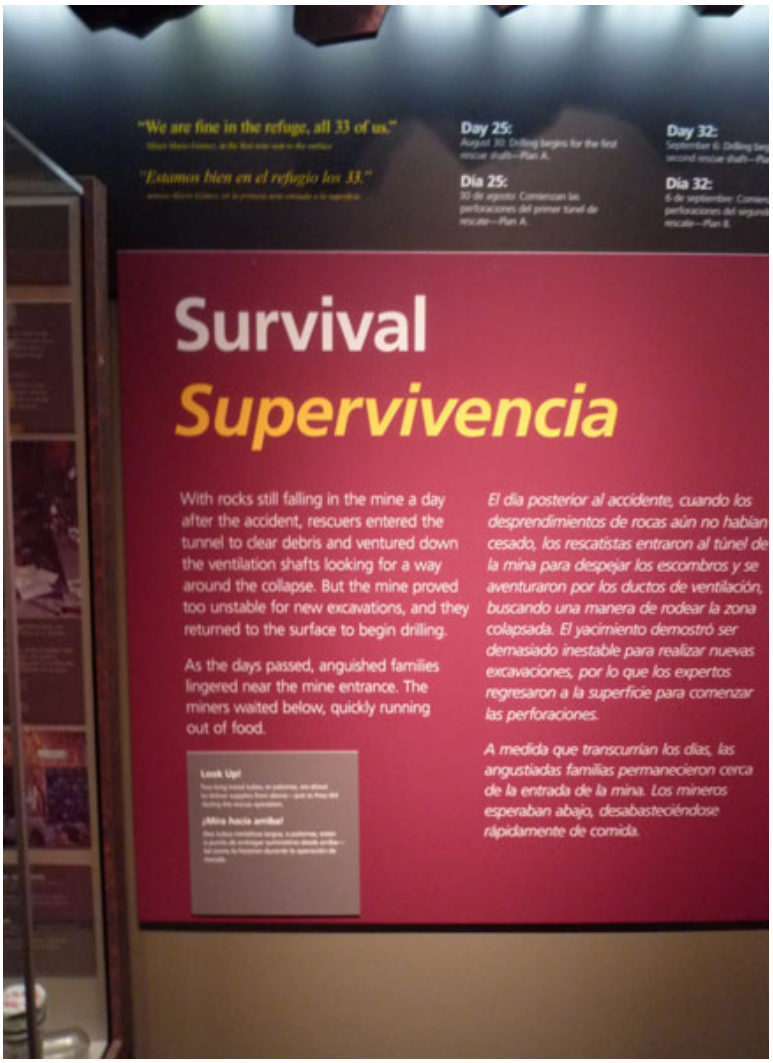

Photo 7: The text panel "Survival" in bright crimson color.

The introductory panel was in the middle of the hallway that bordered the exhibition. The rescue capsule was by far the largest item in the room. The video was quite loud and was located in a prime spot next to the hallway. In this instance, analysis of the IPOP data indicated who *avoided* stopping at these locations. Those who stopped at the rescue capsule had lower People scores; those who stopped at the introductory panel or the video had lower Object scores. Presumably the panel and video had no

Photo 8: A wall filled with images of miners and cases containing actual objects they had with them in the mine; the text panel "Survival" is at right.

obvious aesthetic interest and the capsule itself was not an emotional draw.

None of the stops in this exhibition showed even a small effect favoring those with higher Idea scores. We conclude from this that while there were some components in the exhibition that attracted those with preferences for People experiences, Object experiences, and Physical experiences, there was nothing that was particularly attractive for those drawn to Idea experiences.

The evidence of this exhibition suggests that our initial hypothesis was too simplistic. In the case of the text panels, for example, it seems to have mattered what the bold, strikingly visible headline of the text said. The evidence implies that visitors stopped at a particular location not because it was a certain type of thing (idea, video, object, interactive), but because of the kind of experience it seemed likely to provide at first glance. In other words, the act of "noticing" involved an unconscious judgment of potential value that was consistent with IPOP preferences. One lesson here is that research such as this helps us to understand more precisely what drives visitor behavior.

To investigate proposition 2: *Engage*: IPOP Differences Influence Behavior, we considered how IPOP preferences might have affected the decision of which exhibition to enter by comparing the IPOP scores of those who chose to enter the *Race* exhibition with those who chose to enter *Against All Odds*. Both exhibitions were on view at the same time on

the same floor of the National Museum of Natural History (see figure 1 below) and were studied around the same time. The comparison cannot be exact, however, since the *Race* exhibition was in an area accessible from major visitor paths, while *Against All Odds* was one room within the larger *Geology, Gems, and Minerals* exhibition. Most of those who had access to *Against All Odds* had already decided to enter *Geology, Gems, and Minerals*. Thus, the profile of visitors in *Against All Odds* was affected by the profile of those who entered the larger exhibition, which contains the Hope Diamond, jewelry, gems, crystals, a replica mine, rocks, and meteorites.

Visitors in *Race* had comparatively higher Idea scores, while those in *Against All Odds* had higher Object and Physical scores. This seems completely reasonable, since one would not expect an exhibition called *Race: Are We So Different?* to include many object or physical experiences, while one about a mine rescue within a larger geology exhibition would be expected to include object and physical experiences but not to be as rich in ideas. Both have an obvious connection to people, however.

To investigate the relationship between IPOP preferences and engagement time, we looked at the three locations where the most visitors stopped: the rescue capsule, the main text label for the rescue capsule, and the video. We calculated the average length of stop and examined the IPOP scores of those who stayed longer (an above-average length of time) against those who stayed shorter (a below average length of time).

Those with higher Physical scores spent less time at the Rescue Capsule label and those with higher Idea scores moved more quickly away from the video. These findings seem reasonable since the label emphasized how the capsule worked, while the video avoided explanation in favor of emotion.

Photo 9: The drill bit, the sole touchable object in *Against All Odds*.

In considering proposition 3) *Flip:* IPOP Preferences Influence Response, we claim that having strong "flip" experiences (those outside of one's normal pattern of preference) will lead people to feel that the overall quality of their experience is higher than usual. To calculate the quality of experience we use Overall Experience Rating, the measure that has been standard for evaluating Smithsonian museums and exhibi-

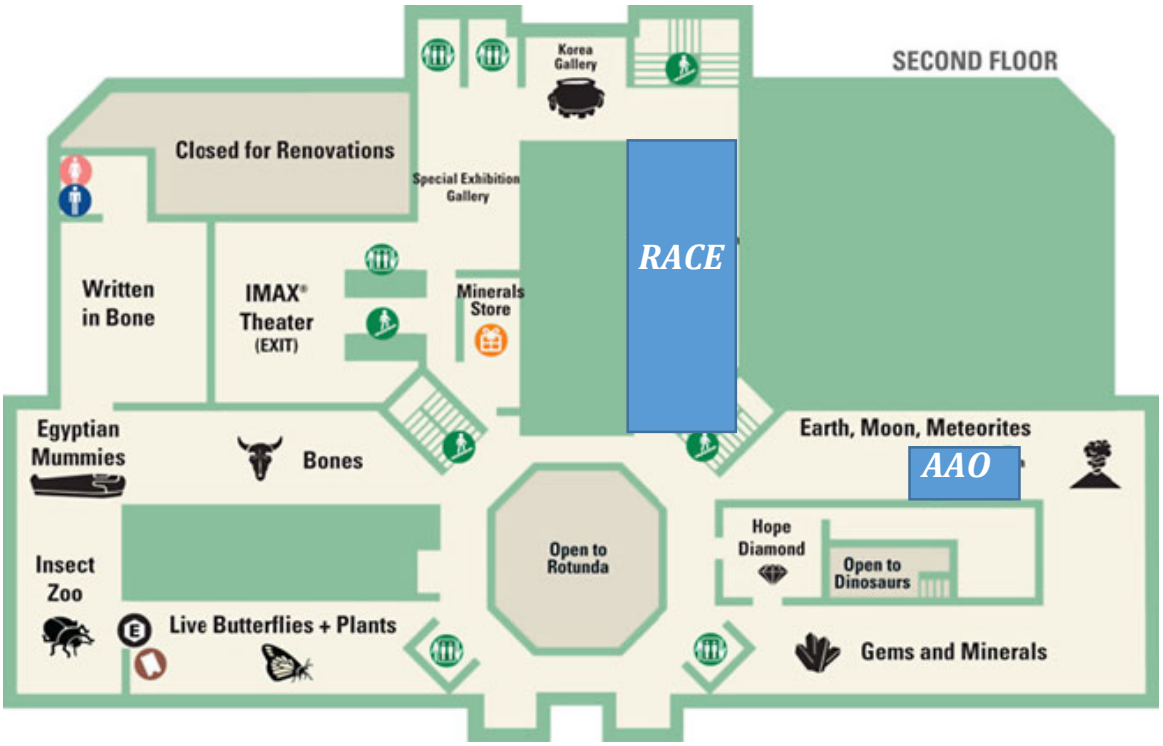

Figure 1. Location of *Race* and *Against All Odds* (*AAO*) in the National Museum of Natural History.

tions for the past 10 years. Visitors are asked: "Please rate your overall experience in this exhibition/museum today." The rating scale is Poor-Fair-Good-Excellent-Superior. Excellent is typically chosen by visitors who are satisfied (about 50 percent of Smithsonian visitors overall). Superior ratings are generated by those who feel that "Excellent" is not adequate to describe the quality of their experience (about 20 percent overall).

A person might be drawn to certain museums, exhibitions, displays, or exhibit elements because of a sense that his/her strong preference in an IPOP dimension is likely to be met there. If the expectation matches the reality, the quality of that visit experience will be rated Excellent because it is in line with what was anticipated and desired (consciously or unconsciously). We hypothesize that the experience is more likely to be rated Superior—more meaningful, more memorable, beyond Excellent—when a person is led to a strong experience of a kind that the individual does not normally seek.

The Overall Experience Rating for *Against All Odds* (25 percent Good, 54 percent Excellent, 22 percent Superior) is above the Smithsonian average. No one rated the exhibition Poor or Fair. There is a striking association in *Against All Odds* between this overall rating and the Idea, People, and Object scores of the visitors. Those who gave a rating of Excellent—which is the average rating at the Smithsonian—had IPOP scores that were close to average. Those who rated their experience Superior had higher Idea, People, and Object scores. Those who rated their experience as Good had lower Idea, People, and Object scores. Only the Physical scores showed no association with experience rating—these scores were close to average in all three rating categories.

Overall, *Against All Odds* appears to have worked best for those drawn to Ideas, People, and Objects; it was less notable for those drawn to the Physical. We could perhaps explain the exhibition's impact on those with high People and Object scores by noting that there were specific locations in the exhibition that attracted them. But, as noted above, there were no locations in the exhibition that could be identified as especially attractive to those drawn to Ideas. Why then, were Idea scores so high among those who had a Superior experience?

We believe that one plausible explanation for this finding is the possibility that those with Idea preferences were "flipped" in this exhibition. In other words, although there was nothing that directly addressed Ideas to an outstanding degree, Idea-preferring visitors found such unexpected and compelling People, Object, and/or Physical experiences that they evaluated their exhibition visit at the top of the rating scale.

IMPLICATIONS OF IPOP THEORY FOR MUSEUM PRACTICE

IPOP theory is useful in at least five specific ways[7]:

Appreciating how people differ

Each of us has a tendency to assume that other people are fundamentally like us. In imagining audiences and in making decisions that we believe will serve others, we are influenced by our own experience preferences, just as visitors are. Knowing our own preferences helps us to appreciate how often the experiences provided by exhibitions or museums closely match the preferences of the relevant decision-makers. But museum audiences include a range of experience preferences. Understanding how others differ from ourselves can make us more humble and more open in considering what to present and how to present it.

Encouraging team decision-making

The best way to serve a diversity of experience preferences among visitors is to make decisions within a team of staff members who reflect this diversity. Although everyone has the potential to develop skills in all of the IPOP dimensions, people have a natural advantage in those aspects that are their preferences. Opening up the decision-making process to those with different preferences increases the likelihood that offerings will be multi-dimensional.

Providing a framework for diverse preferences

During the exhibition planning process, it's possible to create a matrix—a grid with vertical columns identified at top as Idea, People, Object, and Physical, and horizontal columns titled "Display 1," "Display 2" and so on. As each prospective display is added to the grid, it is put into one or more of the four primary categories based on whom it is expected to attract. The matrix thus gives an immediate visual description of how many displays are allocated to the "Idea" category, and so on. The matrix helps to identify the pattern of the exhibition, and suggests how multiple types of experiences can be incorporated into the project. Balance in the exhibition plan can thus be created and quickly visualized. Of course, it may not be immediately clear which particular displays are oriented toward one or another of the four IPO categories; these assessments require research, which may be conducted beforehand by showing images or texts to visitors. Eventually, with enough research, we will have general guidelines that will sharpen our ability to know what kinds

of experiences will attract which preference types.

Developing flip experiences

From a logical perspective, displays that have closely related and equally strong Idea, People, Object, and Physical elements are most likely to result in flip experiences. The effectiveness of such displays needs to be tested in further research. The process of making such displays offers an opportunity to identify the most powerful elements in an exhibition and appreciate their interconnections.

Understanding visitors deeply

Because IPOP works with intuitive and subtle traits of consciousness and investigates their impact on experience, it offers a new window that allows us to look into the often unvoiced attitudes and expectations that lead people to do what they do. One of the key values of IPOP for exhibition makers is that it offers staff a way to appreciate how visitor differences can be tapped to inspire the creative process. It takes the emphasis away from the experience preferences of key decision makers and allows more room for the diversity that exists within the staff as a whole as well as within the audience.

For instance, according to their IPOP scores, the team that worked on this project has preferences in three of the four dimensions: Ideas for Andrew Pekarik, Objects for James Schreiber, Physical for Nadine Hanemann, and both Ideas and Physical for Kelly Richmond. Pekarik and Schreiber were the project leaders, Hanemann designed the protocols and led data collection, and Richmond helped in data collection. Barbara Mogel was a key collaborator in originating IPOP theory at the NMAI; when she herself answered the questionnaire, she scored preferences for Object and Physical.

WHY IPO WAS SO WELL SUITED TO NMAI

Mogel has contributed this explanation of why IPO was useful for staff designing new collections exhibits at the National Museum of the American Indian:

> As a contractor at NMAI from 1991 to 1994 and a staff member there from 2002 to 2012, I participated in the effort to move the museum away from a traditional "anthropology curator mode" toward the vision established by NMAI's founding director, W. Richard "Rick" West. In planning for NMAI before it opened on the Washington D.C. Mall, he intentionally changed the traditional museum dynamic in which the curator takes the lead in everything. At the museum's inauguration in 2004, Native perspectives took the foreground and the curators created the settings to support them.
>
> The first stages of this process were destabilizing. Exhibit teams struggled to invent new planning methodologies, projects had to be reconceptualized, scripts needed to be rewritten to account for Native "voice." When we were redesigning Windows on Collections in 2008, we discovered that IPO was neutral to the Native-voice-versus-curators dynamic that we had been struggling with. Instead, we found that by providing text and visuals for People-oriented visitors, we had also found a balanced way to privilege Native perspectives. The team agreed to the premise that visitors have their own preferences and we need to cater to them. When we took the IPO model onto the floor, visitors told us which ideas and objects they were interested in. Curators realized that it was useful to know which objects visitors thought represented an

idea. When visitors avoided objects from far-away cultures, the curators realized they needed to make extra effort to provide additional explanations for those objects. We could find answers within a day's time, if necessary, and curators came to trust the feedback they were getting from visitors.

The next step was to weight the visual information for the designers, so that the images and objects that visitors most liked came forward in the design of the exhibition. This was also challenging, but the designers found ways to take in visitor preferences and also refine the object organization to reflect the curator's ideas. Through media, portraits, and historical photographs, the presence of Native people was unmistakable. IPO had painlessly made the whole exhibit team accountable to the visitor, and had also served director Rick West's original vision.

TECHNICAL DESCRIPTION: ANALYZING IPOP SCORES

The rest of this paper presents an extensive technical description of the methods used to generate IPOP scores and analyze the data. Before individual IPOP scores were calculated, a confirmatory factor analysis on the IPOP items from these visitors was conducted using the software program EQS 6.1. We considered the data from the survey instrument to be ordered categorical and used maximum likelihood estimation with robust standard errors and tested a four-factor model. Results confirmed that a four-factor model was the best fit.

Individual scores were then calculated for each of the four dimensions using a Rasch model (Rasch 1961; de Ayala 2009). The *Against All Odds* visitors' responses were entered as part of a larger data set of 891 individuals who have answered the same 20 IPOP questions to date. Calculating scores using Rasch models in the context of a larger data set provides more accurate and sensitive results than is possible with a more limited set. We used the Rasch Model software Winsteps 3.75.

Rasch models were originally used to examine test items, relating the difficulty of questions (high difficulty = many got the item wrong) to test-taker ability (high ability = got many items right). The relationship between difficulty and ability is non-linear. With this scale—Not me at all; A little me; Me; Very much me—we changed the terminology from "difficulty and ability" to "endorsement and agreeability." High item endorsement means that many respondents make a choice at the high end of the scale for a particular item and high agreeability means that an individual chooses the high end of the scale ("Me" and "Very much me") for many items. Items that receive low ratings are more difficult to endorse. A person who has high total scores on a set of items is more agreeable with respect to that set than are persons with low scores on that set. Within the reduced set of eight items used in surveys of museum visitors, for example, "how things are made" is the easiest to endorse and "divide into categories" is hardest to endorse among over 4,000 persons in our current dataset. (Appendix A contains the eight-item survey.) Some individuals give high ratings on many items (high agreeability), while others give middling ratings on many items (low agreeability).

Among *Against All Odds* visitors, those who gave high ratings on People items endorsed few Physical items. In the article in this issue, *Using Latent Class Analysis versus K-means or Hierarchical Clustering to Understand Museum Visitors*, by James B. Schreiber and Andrew J. Pekarik, see figures 3 and 4 for illustrations of response patterns in the *Against All Odds* IPOP data.

The Rasch Model was run four times, once on each dimension, and it calculated standardized measures for each of the IPOP dimensions. These measures compare individuals to one another within the set of 891 respondents. Although they are standardized measures, they have different means and standard deviations, since they were calculated independently. (Idea: Mean = 0.8, SD = 1.8; People: Mean = 0.5, SD = 2.0; Object: Mean = -0.8, SD = 1.2; Physical: Mean = -0.4, SD = 1.5). These measures were then expressed as Zscores. The Zscores are linear transformations of the four measures such that the means are all 0 and the standard deviations are 1. These are the IPOP scores. Since the scores all have means of 0 and equal standard deviations, they can be compared directly across the four dimensions and the scores themselves represent standard deviations above and below the mean.

Preferences can be identified for each individual by noting which of the scores is highest. In order to allow for measurement error, we require that scores for preferences are at least 0.2 standard deviations above the other scores.

Our current dataset includes over 400 individuals who have taken the full 38-item survey (mostly museum staff), 600 people who were surveyed with a 20-item version at *Against All Odds* and a 25-item version at *Race*, and over 3,000 visitors to six Smithsonian museums who were surveyed with the 8-item version. Across this entire dataset, 79 percent of all cases have one IPOP score that is at least 0.2 standard deviations greater than their other three scores. These individuals seem to have a clear preference in one of the four dimensions. The remaining 21 percent have two (or, rarely, three) scores that are close to one another, and these individuals seem to have shared preferences in two or three of the four dimensions. Single preferences are evenly distributed across Idea, People, and Object, but there are more cases with a Physical preference. (18 percent Idea, 18 percent People, 19 percent Object, 23 percent Physical, 21 percent No single preference)

Data can be analyzed either using a categorical IPOP preference variable or by comparing the scores themselves. In this article we use only the scores.

USING IPOP SCORES TO EXAMINE BEHAVIOR

Where Visitors Stopped

In order to have reliable score percentages for the visitors who stopped at a particular location, we looked only at the attraction points where at least 25 of the 190 tracked individuals stopped. There were 25 of the 36 stops in *Against All Odds* that met this criterion. For each of these stops we calculated the mean Idea score, People score, Object score, and Physical score of all those who stopped there. We subtracted (from those means) the mean scores of people who did *not* stop there. When this difference is positive, that is, when the mean score of those who stopped is greater than the mean score of those who didn't stop, it suggests that people with higher scores in that dimension were attracted to this location. If the difference is negative, that is, if the mean score was greater for those who did not stop when compared to those who did stop, then people with high scores in that dimension were averse to that location. This calculation is useful in determining which people were most attracted to this stop—in other words, who is more likely to be here—versus which people were least likely to be attracted.

The size of the difference can be understood as the power of the attraction—that is, the larger the difference, the greater the attraction (or aversion). A standard statistic for evaluating

the strength of a difference is the effect size statistic known as Cohen's *d*. Cohen's *d* is the difference between two means divided by the pooled standard deviation (Cohen 1992). Since the pooled standard deviation for all of these scores is 1, the difference between the mean score of those who stopped and those who did not stop is equivalent to effect size. Positive effect sizes are measures of attraction, while negative effect sizes are measures of aversion.

How large a difference is meaningful? Statistical significance is driven by sample size. The larger the sample, the easier it is for a small difference to be statistically significant at .05. Effect sizes are a reaction to this problem because they describe the difference between two distributions in terms independent of sample size. With Cohen's *d* an effect size of 0.2 is generally considered small, 0.5 is medium, and 0.8 is strong. An effect size of 0 indicates that both means are at the same point, and an effect size of 1.0 means one group is at the 84th percentile of the other group.

In this article, for the sake of brevity and clarity, we discuss only the nine stops with effect sizes of at least 0.3 in at least one of the four dimensions. An effect size of 0.3 indicates that the mean of the one group is at the 62nd percentile of the other group. The two distributions are starting to be apart.

Two text panels, "Trapped" and "Rescue," had very similar, positive effect sizes in the People dimension. "Trapped" also had a positive effect size in the Physical dimension, as shown in figure 2.

The one touchable object in the exhibition, the drill bit, had a positive effect size in the Object and Physical dimensions, and the text panel on the railing around the large rescue capsule, titled "Leading the Rescue," also had a positive effect size in the Object dimension (figure 3).

Figure 2. Effect sizes across IPOP Dimensions for "Trapped" and "Rescue" Text Panels.

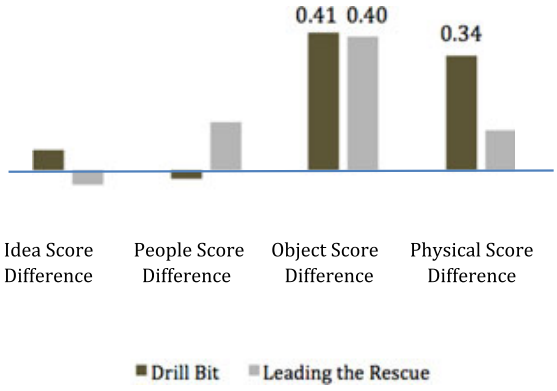

Figure 3. Effect Sizes across IPOP Dimensions for Drill Bit and "Leading the Rescue."

Two panels—the "Buried Treasure" text about copper mining and the "Survival" text—had positive effect sizes in the Physical dimension, but "Survival" also had a negative effect size in the Idea dimension (figure 4).

For the three locations most heavily visited, notable effect sizes were negative. In other words, what stands out is not who stopped in these locations, but rather who *avoided* stopping there. Those who stopped at the rescue capsule had lower People scores; those who stopped at the introductory panel or the video had lower Object scores (figure 5).

None of the 25 stops where at least 25 people stopped showed even a small effect favoring those with higher Idea scores, although a number of these stops showed small negative effects

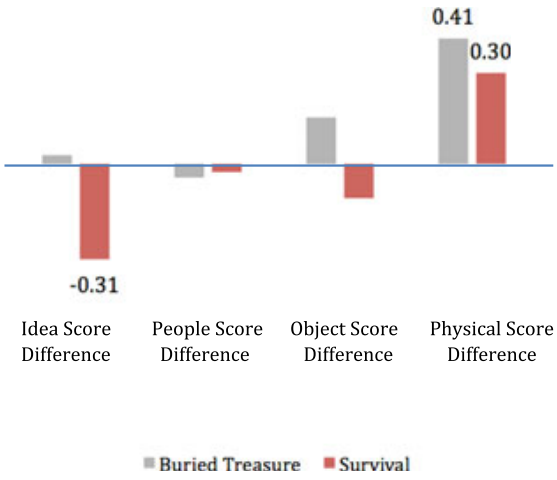

Figure 4. Effect Sizes across IPOP Dimensions for "Buried Treasure" and "Survival"

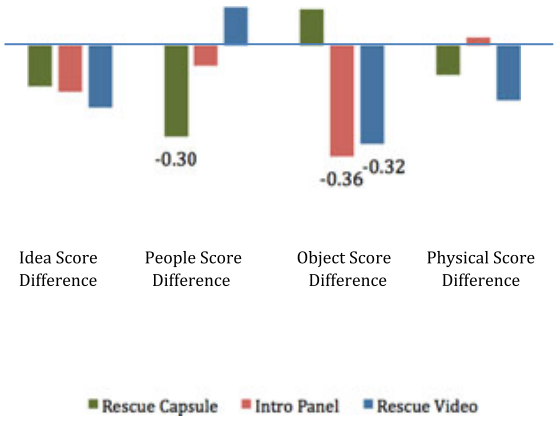

Figure 5. Effect Sizes across IPOP Dimensions for the Rescue Capsule, Introductory Panel and Rescue Video.

Figure 6. Effect Sizes in the Idea Dimension for All Stops with More Than 25 Visitors.

(figure 6). We conclude from this that while there were components in the exhibition that attracted those with preferences for People experiences, Object experiences, and Physical experiences, there was nothing that was particularly attractive for those drawn to Idea experiences.

Engagement Time

To investigate the relationship between IPOP preferences and engagement time, we looked at the places where more than 25 people stopped for an above-average length of time. There were only three: the rescue capsule, the main text label for the rescue capsule, and the video. We calculated the difference between the average IPOP scores of those who spent more than the average length of time at these three locations and those who spent less than the average length of time at these locations. This difference is the engagement effect size.

The rescue capsule label had a negative effect size in the Physical dimension, and the video had a moderate negative effect size in the Idea dimension. The rescue capsule itself had a positive effect size in the Object dimension that was just under our cutoff of 0.3 (figure 7).

Exhibition Entered

To support the point that IPOP preferences affect the decision of which exhibition to enter,

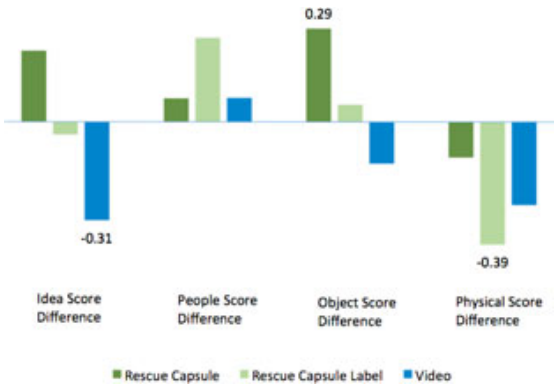

Figure 7. Engagement Effect Sizes for Rescue Capsule, Rescue Capsule Label, and Video.

we compared the IPOP scores of those who chose to enter the *Race* exhibition with those who chose to enter *Against All Odds*. As figure 8 illustrates, visitors in *Race* had comparatively higher mean Idea scores, while those in *Against All Odds* had higher Object and Physical scores. In this instance the sample sizes are large enough to allow for a t-test. The differences between the two exhibitions are statistically significant for all dimensions except People (Idea: $t(624) = -2.260$, $p = .024$; People: $t(623) = -0.981$, $p = 0.327$; Object: $t(398.861) = 3.854$, $p = 0.000$; Physical: $t(557.829) = 2.848$, $p = 0.005$).

Relationship of IPOP Scores to Overall Experience Rating

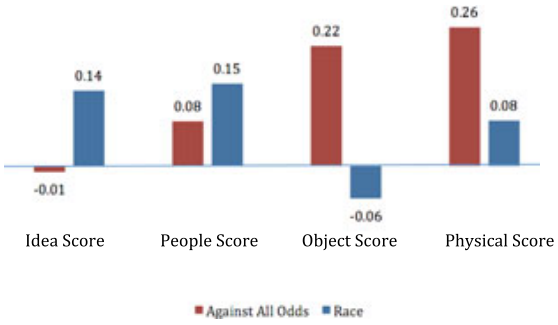

Figure 8. Mean IPOP Scores for Visitors to *Race* and to *Against All Odds*.

Figure 9. Mean IPOP Scores for Overall Experience Ratings in *Against All Odds*.

The Overall Experience Rating for *Against All Odds* (25 percent Good, 54 percent Excellent, 22 percent Superior) is above the Smithsonian average. Figure 9 illustrates the strong association in *Against All Odds* between this overall rating and the Idea, People, and Object scores of the visitors. Those who gave a rating of Excellent had IPOP scores that were close to average. Those who rated their experience Superior had higher Idea, People, and Object scores. Those who rated their experience as Good had lower Idea, People, and Object scores. The effect sizes in the Idea, People, and Object dimensions between those who rated the exhibition Superior and those who rated it Good are all moderate in strength (Idea 0.64; People 0.54; Object 0.56). The differences in Idea, People, and Object scores between those who rated Good and those who rated Superior are also statistically significant using the t-test (Idea: $t(85) = -3.052$, $p = 0.003$; People: $t(85) = -2.288$, $p = 0.025$; Object: $t(85) = -2.374$, $p = 0.020$; Physical: $t(85) = -0.322$, $p = 0.748$).

NOTE TO RESEARCHERS

We are fortunate to have been able to research this theory with Smithsonian visitors across multiple museums and in relatively large numbers. As of this writing, our complete dataset contains over 4,000 cases, primarily the responses of visitors in Smithsonian museums. In the future we hope to include substantial numbers of non-museum-goers, as well as visitors to non-Smithsonian museums both in the United States and abroad. Until other large IPOP datasets are created we are prepared to help any researchers interested in this theory who would like to develop and test it on their own. Please contact either Andrew Pekarik

(andrewpekarik@gmail.com) or James Schreiber (jbschreiber@gmail.com). END

NOTES

1. The Institutional Studies Office, predecessor to the Office of Policy and Analysis, functioned as an internal consultancy for all Smithsonian units, providing audience studies. The *Puja* visitor study report can be accessed at: http://www.si.edu/content/opanda/docs/Rpts1998/98.02.Puja.Final.pdf
2. The theory originally included a "reflective" dimension, but this was dropped on the basis of the mathematical model. See Schreiber et al. (2013). Retrospectively we realized that all four IPOP dimensions had been evident in Pekarik (1997), an analysis of comment cards from the exhibition *Flight Time Barbie* at the National Air and Space Museum. On 1,766 individual comment sheets, visitors wrote about their visit to this display of air- and space-related Barbie dolls. Visitors were invited to comment on their expectations, what they preferred to see, and what they actually saw. The analysis demonstrated that individuals wanted to see more interpretative frameworks and clearer labels (ideas); more social engagement, such as a person dressed up as Barbie (people); more Barbie dolls and Barbie related items (objects); and more interactives (physical). These expectations revealed clear preferences for what should be in an exhibition and how an exhibit should be presented. The visitor studies report on *Flight Time Barbie* can be accessed at: http://www.si.edu/content/opanda/docs/Rpts1996/96.11.Barbie.Final.pdf
3. More information from *Against All Odds*, including the video that was shown in the exhibition, can be viewed at http://www.mnh.si.edu/exhibits/against-all-odds/. Additional photographs of the NMNH installation can be found at: http://www.flickr.com/photos/rambledan/sets/72157629102473102/.
4. Accessed at http://www.aaanet.org/resources/RACE-Are-We-So-Different-Exhibit-to-Arrive-at-the-Smithsonian-National-Museum-of-Natural-History.cfm.
5. The 38-item version was originally created under the assumption that there were five dimensions. Confirmatory factor analysis of the first several hundred results demonstrated clearly that only the four IPOP dimensions were valid. See Schreiber et al. (2013). The complete set of questions can be found in Appendix A.
6. For example, in Schreiber et al. (2013) we point out in regard to the *Race* data: "Though preliminary, using a small Bayesian network model with the four preference scores as predictors and stops as the outcome, we can predict the first two stops in the exhibit correctly 85 percent of the time."
7. The real-life application of these principles was described as a case study in Pekarik and Mogel (2010) and in Léger, *Shaping a Richer Visitors' Experience: Using an IPO Interpretive Approach in a Canadian Museum*, in this issue (2014). In both of these cases, however, the model did not include the Physical dimension.

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APPENDIX A: IPOP SURVEY INSTRUMENTS

This appendix includes three IPOP survey instruments: the full 38-item version, the 20-item version used with visitors to *Against All Odds*, and the 8-item version used with museum visitors generally.

The response set for each item is:

O Not me at all O A little me O Me O Very much me

38-item version:

For each of the following items, please indicate the degree to which that activity describes you.

I like to…

imagine living in the past
study how things work
help others in person
jog/run for fun
know how things are made
ski
shop on ebay
talk to people about their families
spend my leisure time with other people
gain insights into myself
identify patterns
collect seashells
play musical instruments
make concept maps
divide things into categories
teach children how to play sports
know the reasons behind things
keep a journal of my experiences
buy things
read biographies
construct a convincing argument
analyze situations
feel inspired by nature
dance
go camping
play competitive sports
construct things
understand personality types
go to yard sales
think about my life
sit alone in a quiet place
touch things in museums
movies make me think about my life
connect with others emotionally
skateboard/rollerblade
write in a journal
bring people together
learn philosophy

20-item version

Help us to understand your interests. For each of the following items, please indicate the degree to which that activity describes you.

I like to…

study how things work
help others in person
jog/run for fun
know how things are made
ski
talk to people about their families
spend my leisure time with other people
gain insights into myself
identify patterns
divide things into categories
buy things
analyze situations
go camping
play competitive sports
construct things
think about my life
connect with others emotionally
write in a journal
bring people together
learn philosophy

8-item version

Help us understand your interests. For items below, select the degree to which each describes you:

I like to….

bring people together
divide things into categories
identify patterns
jog/run for fun
know how things are made
play competitive sports
spend my leisure time with other people
shop