

VISITOR STUDIES *Today*

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Visitor Behavior In Zoo Exhibits With Underwater Viewing

Stephanie Clark Ridgway, Margaret Livingston and Steven E. Smith

ABSTRACT

This study employed visitor surveys and observations to assess the factors that significantly influence visitor behavior and viewing time in six zoo exhibits with underwater viewing. Our research revealed that visitor group type, size of underwater viewing windows, animal size, aquatic activity, and presence of infant animals had significant impacts on visitor behavior. We discuss implications for the planning and design of exhibits with underwater viewing.

As more natural environments are affected by development, zoos represent one type of urban open space that is increasingly recognized as a place for visitors to reconnect with nature (Clark 2000). Researchers have indicated that visitors generally attend zoos in groups to socialize, relax, learn about animals, see exotic animals, entertain and educate children, photograph nature, and enjoy the outdoors (Cheek 1976; Martin and O'Reilly 1982; Morgan and Hodgkinson 1999; Wheeler 1980; Wolf and Tymitz 1979, 1981).

Architectural, animal, and visitor characteristics can have a significant influence on visitors' perception of zoo exhibits (Bitgood, Patterson and Benefield 1988; Johnston 1998; Shettel-Neuber 1988). In response to such

findings, zoos have evolved to better accommodate the needs of visitors and animals. For example, third-generation exhibits, which display animals in settings that contain vegetation and land formations simulating the animal's native habitat, have become extremely popular in zoos (Campbell 1984). While these naturalistic exhibits tend to be more difficult to create and maintain, it has been suggested that visitors generally prefer these over more traditional animal enclosures as demonstrated by increased viewing time spent by visitors in these types of exhibits (Johnston 1998; Shettel-Neuber 1988).

Zoo managers aspire to extend visitor viewing time in exhibits, increasing the opportunity for visitor education

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Visitor Studies Moves Ahead

We were very excited at the 2005 Annual Conference in Philadelphia to see the growth and development that is taking place both in the field of Visitor Studies and in our Visitor Studies Association. There was a great range of interesting sessions to choose from, the greatest frustration being that we often wanted to be in two places at once! We are looking forward to being able to publish a number of the papers, so that we can all catch up on those sessions we had to miss. Many thanks to the organising committee in Philadelphia, and thanks in anticipation to those who have already started work on next year's meeting in Grand Rapids.

All of the Committees are working very hard to support the Association as it moves ahead. For our part, we are looking forward to working with Johnny Fraser, David Anderson and the Publication Committee to develop the quality, usefulness and impact of this journal. We have welcomed five new members to our Editorial Board, which now represents five different countries. Again, in this issue, we have a diverse range of international contributions. We hope you enjoy reading them.

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VSA CONFERENCE 2006

The Visitor Studies Association is inviting proposals for next year's conference in Grand Rapids (see pages 34–35 in this issue).

Please consider how you can contribute.



Da Vinci Horse at Frederik Meijer Gardens & Sculpture Park

Visitor Behavior in Zoo Exhibits with Underwater Viewing

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and visitation time to all zoo facilities. Bitgood and colleagues (1985) showed that viewing time was longest for moated exhibits with no visual screens, and shortest for exhibits with bar and fence barriers. Naturalistic elements in the exhibit may quickly draw visitor attention into the enclosure, rendering the physical barriers less apparent. The proximity between visitors and animals in an enclosure can also have an effect on visitor behavior. Viewing time in an exhibit typically increases as the distance between animal and visitor decreases (Bitgood, Patterson and Benefield 1988; Johnston 1998).

Several studies have evaluated the efficiency of interpretive elements associated with zoo exhibits in an attempt to better meet visitor needs and extend viewing time (Bitgood, Patterson and Benefield 1986, 1988; Derwin and Piper 1988; Serrell 1988; Wolf and Tymitz 1979). Research from the 1970's that focused on visitor responses to traditional signage (extensive text, limited graphics) indicated that the majority of visitors typically do not read or even notice exhibit signage (Brennan 1977; Serrell 1977). However, Derwin and Piper's (1988) evaluation of more recent exhibit signage, featuring large graphics and minimal text, revealed strong positive correlations between visitor learning, viewing time in exhibits, the number of informational panels read, and the number of elements explored within an exhibit.

Past research also suggests that animal activity is one of the most influential factors affecting viewing time in exhibits. In some cases, viewing time was nearly doubled due to animal activity compared to exhibits with non-visible or inactive animals (Bitgood, Patterson and Benefield 1988; Johnston 1998; Maple and Finlay 1987; Shettel-Neuber, 1988). Bitgood, Patterson

and Benefield (1988) found that this activity-viewing time relationship remained constant for all animal species evaluated.

Much of the previous research relating to zoo visitor behavior has focused on traditional enclosures and little is known about how this work relates to third-generation exhibits (Shettel-Neuber 1988). The intent of this study was to evaluate visitor behavior and perceptions at third-generation exhibits with underwater viewing, which is considered a particularly popular type of exhibit. This study addressed the following primary research question: What factors significantly influence visitor behavior and viewing time in zoo exhibits with underwater viewing?

METHOD

Exhibits

This research was conducted using six different exhibits with underwater viewing at four zoos in the western United States. The six exhibits all offered underwater viewing, and each featured a single mammalian species commonly exhibited in zoos (capybara [*Hydrochoerus hydrochaeris*], polar bear [*Ursus maritimus*], hippo [*Hippopotamus amphibious*], brown bear [*Ursus arctos*], and two river otter [*Lontra canadensis*] exhibits). These exhibits encompassed a variety of animal sizes, activity levels, ages, and numbers of animals on display.

The capybara enclosure was the only exhibit selected with a single animal on exhibit at all times.

In order for an exhibit to be considered for this study, the water level had to be at least 76.2 cm above floor level of the underwater viewing window. This ensured that most adult visitors could see the animal's underwater habitat and

some of the terrestrial habitat through the pool. All of the exhibits included in this study are protected from the elements by a roof, vegetation or a sun-screening system.

Participants

A total of 331 visitor groups (at least 50 groups at each exhibit) were tracked, observed and asked to participate in a short visitor survey. Group composition was recorded for every participating visitor group and was clarified, if necessary, after observations of the group were completed. Participants were categorized into five group types: parents with one or more children; a single parent with children; large visitor group; individuals; and couples.

Procedure

Observations took place during the summer peak hours of visitation for each zoo, as identified by zoo staff. Observation periods were between 0800 and 1400. At zoo facilities with two exhibits, researchers rotated between exhibits every two hours. In addition, each exhibit was observed on at least one weekend and one weekday.

The observation area was determined by delineating boundaries for each exhibit viewing area, based on each exhibit design. Recorded viewing time, the primary dependent variable in this research, began when the first adult in a visitor group entered the designated viewing area from any side of the exhibit. Viewing time ended when the selected adult exited the viewing area. Viewing time represented the amount of time spent by a visitor or visitor group directly in front of an underwater viewing window and in the immediate vicinity of the exhibit. Researchers maintained an unobtrusive presence in order to minimize influence on visitor behavior.

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A floor plan of the viewing area was used to record viewing time, crowding conditions, visitor movement and behavior, and basic animal behavior. Any laughing, reading, or other visitor behavior was recorded as yes or no, without taking into account the length of time engaged in these activities. Observations about social interactions taking place within visitor groups included discussion, child tending, laughing, and smiling. Visitor activities including sign reading, photographing animals, eating or drinking, sitting, and standing on benches were also noted. Certain animal data and behavior, such as swim activity and the number of animals in the water, were mapped for each visitor observation period.

Once the selected individual or visitor group left the boundaries of the viewing area they were approached by the researcher and asked to participate in a short survey to evaluate the underwater animal habitat and viewing area (see Appendix). Once the survey was completed, researchers observed the next adult entering the exhibit.

Visitor groups were instructed to elect a single group representative to complete the survey, although on many occasions multiple group members contributed ideas and opinions. The survey measured visitor learning, perception and enjoyment of the exhibit, and information about visitor characteristics.

Data analysis

Between group differences in mean viewing time were evaluated using t-tests or ANOVA. For those factors where a significant effect on viewing time was detected using ANOVA, Duncan's Multiple Range Tests were conducted to evaluate the significance of differences between pairs of means (Zar 1984).

RESULTS AND DISCUSSION

Visitor characteristics

Visitor profile information collected in this study produced similar findings to previous zoo research on visitor characteristics (Cheek 1976; Kellert 1979; Martin and O'Reilly 1982; Morgan and Hodgkinson 1999; Wheeler 1980; Wolf and Tymitz 1979, 1981). Couples were the group type most frequently observed (32%), followed by parents with one or more children (26%), large visitor groups (19%), a single parent with children (15%), and individuals (8%). The majority of visitor groups lived in the same city (44%) or in a different city but the same state as the zoo they were visiting (22%). The remaining surveyed visitors were from a different state (25%) or a foreign country (9%). Most groups participating in this study reported that they visited zoos for social or recreational purposes (86%), which is in accordance with visitor motivation results from previous studies (Cheek 1973, 1976; Martin and O'Reilly 1982; Morgan and Hodgkinson 1999; Wheeler 1980; Wolf and Tymitz 1979). A small number of visitors reported attending zoo facilities to learn about animals (6%) or to see a particular animal (8%).

Survey responses

Two survey questions requested visitor groups to select what exhibit characteristic they liked best from a prescribed list and what could be improved in each exhibit (Table 1). The prescribed list was based on factors emphasized in past third-generation and naturalistic exhibits. Visitors also had the option to add a category ("other") if it was not included in the prescribed list. Visitor groups most commonly listed the underwater view of animals as their favorite characteristic of the exhibit and also the exhibit element

most needing improvement (Table 1). Comments from visitors were generally enthusiastic about exhibits that provide the opportunity to view animals from an underwater perspective. Water clarity, however, is a critical issue for all zoo exhibits with underwater viewing. Visitors often commented to the researcher that exhibit pools looked "dirty" or "murky." It is difficult to maintain water clarity in exhibit pools because of food and animal matter suspended in the water and animal movement along the pool floor. Exhibit signage in the viewing area could discuss water clarity issues so that visitors become more familiar with natural processes. While most visitors believed that the underwater view needed to be improved, the majority thought that the water was clear enough to view animals swimming.

The majority of visitor groups believed the animal habitats looked natural. However, visitors perceived differences in animal habitat naturalism across exhibits (Table 1). For example, over 95% of visitors perceived the brown bear and one of the otter exhibits, both considered landscape immersion designs (one of the most progressive types of third-generation exhibits), as very natural habitats. In contrast, only a little more than half of visitors to the capybara exhibit believed the animal habitat looked natural. Out of the six exhibits included in this study, this exhibit is the only one with exposed concrete surrounding the animal pool. Although the concrete is textured, this may lead to the perception by visitors that the animal habitat seems less natural.

In general, most visitor groups believed that crowding did not detract from their experience and that it was easy to view the animals in the exhibits (Table 1). However, levels of visitor crowding varied among exhibits. Researchers noted that crowding levels

were highest at the hippo exhibit where a large percentage of visitors (43%) felt that crowding detracted from their experience. Visitors often had to wait for an opportunity to view the exhibit from the most popular viewing areas at this zoo's hippo and polar bear exhibits. During crowded conditions, visitors

frequently stood on benches located near the viewing window to look over visitors in front of them. Any benches placed near viewing windows should be durable and able to withstand such use. Stepped platforms alongside the viewing window were also effective for viewing during crowding at the brown

bear and otter exhibits, while also providing children the opportunity to view above and below the water level.

Visitor Observations

Observations indicated that large visitor groups and couples photographed and discussed more in exhibits than

Table 1. Results of survey administered to visitor groups (N = 331) at six zoo exhibits in the western United States with underwater viewing.

Response	OTTER1*	CAPY.*	P. BEAR*	HIPPO*	B. BEAR*	OTTER2*	Mean
	----- % -----						
What is best about the exhibit?							
Animal habitat	20	19	8	9	31	13	17
Underwater view of animals	53	44	45	49	19	61	46
Being close to animals	14	21	22	19	35	12	20
Benches	0	2	2	0	0	0	1
Exhibit signs	3	0	2	0	0	0	2
Other	10	14	21	23	15	14	14
What could be improved in the exhibit?							
Animal habitat	21	21	14	25	21	15	20
Underwater view of animals	22	34	28	33	29	12	24
Being close to animals	16	6	19	14	17	9	13
Benches	9	15	6	3	8	12	9
Exhibit signs	7	19	14	14	13	27	15
Other	25	5	19	11	12	25	19
Did clear water in the pool make it easy to see the animals swimming?							
Yes	93	45	79	59	86	88	76
No	3	45	6	39	10	2	16
Don't know	4	10	15	2	4	10	8
Did you believe the animal habitat looks natural?							
Yes	76	56	75	80	100	96	80
No	6	8	6	9	0	2	5
Don't know	18	36	19	11	0	2	15
Did crowding detract from the experience in the exhibit?							
Yes	2	6	19	43	8	8	14
No	92	86	73	53	86	88	80
Don't know	6	8	8	4	6	4	6
Was it easy for you to see animals in the exhibit?							
Yes	76	82	85	89	100	86	86
No	21	18	13	11	0	10	12
Don't know	3	0	2	0	0	4	2

* Exhibits: OTTER1 = otter, CAPY. = capybara, P. BEAR=polar bear, HIPPO = hippo, B. BEAR = brown bear, OTTER2 = otter

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the other three group types. Sitting, eating, and photographing significantly affected the amount of time visitors spent viewing an exhibit, with viewing time more than doubling when visitor groups participated in these activities

(Table 2). Visitor group laughing and discussion were also associated with increased viewing time (Table 2). These results suggest that longer viewing time is associated with increased interactions among visitors. If zoo designers can

encourage interaction among visitor groups in exhibits, zoos may be able to increase the overall length of time spent at a zoo facility and increase educational opportunities. Single parents with children (42%) were the most likely visitor group to talk with other visitor groups, followed by other family groups (25%), couples (17%), individuals (8%), and large groups (8%). The number of times visitor groups stopped in an exhibit was also related to viewing time (Table 2). Most visitors made two or three stops in the exhibit viewing area.

Overall, mean viewing time did not increase significantly when a visitor group looked at or read exhibit signage (Table 2). Placement of signage in exhibits is a complicated issue, but signage appeared to be most utilized in this study when associated with "bottleneck" (congestion) points within an exhibit.

Viewing times were significantly longer at exhibits with larger surface areas for underwater viewing windows (Table 3). This may be partially explained by visitors' perceptions of being more immersed in the exhibit when the viewing area is relatively large. The effect of water level height on viewing time was less clear cut. Water levels at one-third and three-fourths of the window height were associated with shorter viewing time whereas water levels at one-half and two-thirds of window height were associated with longer viewing time (Table 3). Other factors such as size or species of animal on exhibit may have influenced these results.

Our results support previous research, indicating that animal size has a considerable effect on visitor viewing time and behavior (Balmford 2000; Bitgood, Patterson and Benefield 1988; Johnston 1998; Maple and Finlay

Table 2. Mean viewing time related to visitor behavior (N = 331 groups).

Visitor behavior	Mean viewing time (seconds)	Number (%) of groups
Sitting in exhibit		
Yes	233 ^{A*}	52 (16)
No	96 ^B	279 (84)
Eating in exhibit		
Yes	262 ^A	18 (5)
No	110 ^B	313 (95)
Photographing in exhibit		
Yes	228 ^A	33 (10)
No	106 ^B	298 (90)
Number of stops in exhibits		
1 stop	76 ^C	102 (31)
2 or 3 stops	122 ^B	207 (63)
More than 3 stops	271 ^A	22 (6)
Talking with other visitor groups		
Yes	215 ^A	12 (4)
No	114 ^B	319 (96)
Laughing in exhibit		
Yes	166 ^A	49 (15)
No	110 ^B	282 (85)
Discussion in exhibit		
Yes	149 ^A	136 (41)
No	96 ^B	195 (59)
Sign reading in exhibit		
Yes	124 ^A	99 (30)
No	115 ^A	232 (70)

* Mean viewing time (in seconds) differed significantly ($p < 0.05$) among groups based on ANOVA and Duncan's Multiple Range Tests. Means followed by the same superscript letter are not significantly different.

CONCLUSIONS

A major goal of zoo managers and planners is to increase viewing time in exhibits. It is believed that this leads to increased opportunities for visitor education and visitation to all zoo exhibits. Longer viewing time in exhibits with underwater viewing appeared to be most affected by animal activity and visibility, and size of the viewing window, the latter being the most distinctive design element in these exhibits (Bitgood, Patterson, and Benefield 1988; Johnston 1998; Shettel-Neuber 1988). Specifically, large underwater viewing windows were associated with longer mean viewing time than smaller viewing windows. Larger viewing windows allow visitors to view more of the animal's aquatic activities and habitat, and may provoke a feeling of being in the underwater animal habitat. Zoo visitor attraction to third-generation exhibits is likely grounded in the complex habitat setting that offers enough information to maintain interest while also providing a unique perspective of feeling close to the animals and their activities (Johnston 1998; Kaplan and Kaplan 1982). In addition, large viewing windows typically allow many visitors to simultaneously view an animal enclosure, even when crowding occurs. Visitors may spend less time in exhibits with smaller viewing windows because they are not as intrigued with the experience and feel obligated to leave the viewing area in order to give other visitors an opportunity to view the exhibit. Ideally, providing multiple viewing windows that are sized appropriately for the displayed animal (small windows for small animals) may encourage longer visits. For example, at the capybara exhibit, visitors are able to view the animal in small terrestrial and underwater viewing windows, and

Table 3. Mean viewing time related to physical characteristics of exhibit (N=331 Visitor Groups).

Physical characteristics of exhibit	Mean viewing time (seconds)	Number (%) of groups
Surface area measurement of viewing window (sq. m)		
2.2	70 ^C	70 (21)
5.9	47 ^C	52 (16)
15.1	120 ^B	103 (31)
26.0	156 ^B	52 (16)
53.3	207 ^A	54 (16)
Water level height		
One-third window height	47 ^C	52 (16)
One-half window height	120 ^B	103 (31)
Two-thirds window height	182 ^A	106 (32)
Three-fourths window height	70 ^C	70 (21)

* Mean viewing time (in seconds) differed significantly ($p < 0.05$) among groups based on ANOVA and Duncan's Multiple Range Tests. Means followed by the same superscript letter are not significantly different.

1987; Shettel-Neuber 1988; Ward et al 1998). Mean viewing time at exhibits with large animal species (polar bear, hippo, black bear) was more than two times greater than visitor viewing time at exhibits with small animal species (capybara, otter) (Table 4). Researchers have noted that children appeared as enthralled with smaller animals such as otters as they were with the larger animals, perhaps due to the "newness" of these experiences. Adults seemed more captivated by larger animals than by smaller ones. Regardless, visitors remained for a surprisingly long time (mean: 53 seconds) in exhibits looking for or waiting to see animals even when none were visible.

Considering all animal species in this study, mean viewing time was more than twice as long in exhibits with

animal aquatic activity (Table 4). In addition, an increase in the number of animals present in an exhibit was associated with increased viewing time. For example, viewing time was nearly one-and-a-half times greater in exhibits with two or more animals swimming than in exhibits with one animal swimming. Longer viewing time was also associated with animals participating in enrichment activities, such as feeding or playing with toys (Table 4). In this study, the hippo enclosure was the only exhibit with an infant animal present. Viewing time was considerably longer when the infant hippo was with its mother, compared to when the adult male hippo was alone in the exhibit (Table 4).

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Table 4. Mean viewing time related to animal characteristics (N=331 groups, except viewing with infant animal; n=54 groups).

Animal characteristics	Mean viewing time (seconds)	Number (%) of groups
Animal size		
Small species	76 B*	173 (52)
Large species	163 A	158 (49)
Animal aquatic activity		
Yes	159 A	163 (49)
No	78 B	168 (51)
Number of animals swimming		
None	78 B	168 (50)
1 animal swimming	122 B	90 (28)
More than 1 animal swimming	205 A	73 (22)
Animal enrichment		
Yes	338 A	7 (2)
No	113 B	324 (98)
Number of animals visible in exhibit		
No animals visible	53 B	64 (19)
1 or more animals visible in exhibit	136 A	267 (81)
Presence of infant animal (SDZ hippo exhibit)		
Yes	236 A	34 (63)
No	158 A	20 (37)

* Mean viewing time (in seconds) differed significantly ($p \leq 0.05$) among groups based on ANOVA and Duncan's Multiple Range Tests. Means followed by the same superscript letter are not significantly different.

from an elevated viewing platform overlooking the exhibit.

Interestingly, results from our research indicate that longer viewing time was not consistently associated with the exhibits with higher water levels. This suggests that partial viewing through water combined with a view of the display animal's terrestrial habitat may be most effective in maintaining visitor attention. Furthermore, the actual

height of the water level relative to the eye level of visitors and the size of the animal may influence viewing time more than the relationship between the viewing window and relative water level height. Confounding factors such as species and size of display animals needs to be considered in future research.

While zoos promote conservation, education and recreation as their highest

priorities, only a small number of visitor groups surveyed in this study attended zoo facilities primarily for educational purposes. This study suggests that encouraging social interactions between and within visitor groups, and increasing stimulation through larger exhibit viewing windows and a variety of animal activities, may be effective in increasing viewing time. Indeed, zoo exhibits that promote visitor participation are becoming more common because they often yield multiple benefits including increased attention span, visitor learning, recreational enjoyment, and family togetherness (Brody 1981; White and Marcellini 1986). These results provide a behavior-based foundation for the planning and design of future zoo exhibits with underwater viewing.

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Appendix

This survey was designed to help zoos understand visitor activities in underwater exhibits. Your responses to the following questions will help zoos build better underwater exhibits in the future. Please return this clipboard and survey to the researcher before leaving this exhibit. Thank you!

1. Please estimate the amount of time you spent in this exhibit:

- under 2 - 3 4 - 5 over 5
1 minute minutes minutes minutes

2. Do you visit this exhibit every time you visit this zoo?

- Yes No Doesn't apply,
new visitor

**3. What do you like best about this exhibit?
Please mark one box only.**

- The animal habitat looks natural
 The underwater view of animals swimming
 Being close to animals
 Benches in the viewing area
 Exhibit signs
 Other: _____

**4. What could be improved in this exhibit?
Please mark one box only.**

- The animal habitat
 The underwater view of animals swimming
 Being close to animals
 More benches in the viewing area
 Exhibit signs
 Other: _____

5. The animal habitat in this exhibit looks natural.

- Agree Disagree Don't know

6. It was easy for me to see the animals in the exhibit today.

- Agree Disagree Don't know

7. The clear water in the pool makes it easy to see the animals swimming.

- Agree Disagree Don't know

8. Did visitor crowding detract from your experience in this exhibit?

- Agree Disagree Don't know

9. Where do you live?

- Tucson, Arizona a different a different
AZ state country

10. What is your main reason for visiting the zoo today? Please mark one box only.

- To learn about animals and conservation
 To see a particular animal or exhibit
 To photograph animals
 To spend time with your family or friends
 Children in my group wanted to visit the zoo
 I am visiting this city - bringing a visitor to the zoo
 To have fun
 To be outdoors
 To exercise
 Other: _____

11. Did you or your group learn anything new about this animal today? Mark all boxes that apply.

- Information about the animal
 Information about the animal's habitat
 Information about people living near the animal
 Other: _____

Thank you for your time! Have a great day!

Museum Field Trips in Taiwan: Teachers' Perceptions of Large Group Visits to a Science Museum

Jui-Chen Yu

ABSTRACT

The purpose of this study was to investigate teacher perceptions of group visits to a science museum in Taiwan. Specifically 30 teachers who traveled with large groups were interviewed. The interview questions were focused on two issues: the involvement of travel agents and the size of the group. The findings indicate that responsibility and administrative details were the primary reasons that teachers chose to travel with a larger sized group, or with assistance provided by a travel agency. Curriculum fit was not the first consideration in planning field trips. The study also found teachers' ability and attitudes to using museums as an educational resource need to be improved. The author suggests that teacher education institutes should work with museums to help both pre- and in-service teachers to connect museum experiences with their classroom instruction.

INTRODUCTION

School teachers and students are always target audiences of science museums. Most science museums around the world are trying very hard to expand their relationship with nearby schools, not only to increase their attendance but also to foster lifelong learners. The educational value of field trip experiences in museums has been recognized by many researchers (Anderson & Zhang, 2003; Michie, 1998). However, these experiences are not always as effective as they could be.

In Taiwan, countless school groups visit science museums every year during regular school hours. Generally speaking, these groups are led by classroom teachers, but this is not always true. Based on my own informal observation in the National Science and Technology Museum (NSTM), some schools hire travel agents to plan and conduct field trips, the teachers being just one of the group members traveling

with their students. Another problem observed was that some schools bring more than one class group at a time without an appropriate plan.

The literature discussing large group field trip visits to museums is limited, although Price and Hein (1991) found that "the size of the group can affect learning" (p. 511). For large groups, opportunities to respond to individual students' problems and make time for hand-on experiences are limited. Michie (1995) identified the problems of large group visits, such as limited space, less benefits, and less serious students. No research could be found regarding the involvement of travel agents in school field trips. Hence, it was considered necessary to allow teachers to express a range of opinions regarding these two issues. The aim of this study was to explore the factors underlying the problems observed in the field.

THE SITE

The National Science and Technology Museum is a large science museum with floor areas of 1.23 million square ft, sited in Kaohsiung, the second largest city in southern Taiwan. Opened in November 1997, the museum has become a popular location for school field trips. The museum exhibitions focus on contemporary science and technology subjects and contain both hands-on displays and artifacts. It can be classified as a combination of science center and technology museum, with a target audience of K-12 students and family visitors.

In 2002, a total of 1,036,237 people participated in NSTM programs, including 134,136 students who came to the museum on field trips in 1,320 groups (an average of 102 students per group). The percentages of each age group visiting in groups of different size are reported in Table 1. These data indicate that almost 70% of students

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Table 1. Percentage of students of each level visiting in different group sizes

Group Size	Pre-School*	Elementary School	Junior High	Senior High	College/University	Total
Less than 49	25%	15%	9%	10%	49%	16%
50–99	34%	14%	5%	4%	27%	15%
100–199	30%	32%	13%	9%	24%	23%
200–299	6%	21%	10%	15%	0	14%
More than 300	5%	19%	63%	62%	0	33%
Total	25,431	51,841	32,285	20,281	4,478	134,316

* including pre-school and kindergarten groups

visited the museum with large groups (over 100), especially in elementary school, junior high school and senior high school levels. Therefore, this study focuses on large groups in these three school levels.

PROBLEMS

When schools groups visit museums in Taiwan, guided tours of the exhibitions are frequently requested by teachers to fulfill the educational goal of the field trip. The NSTM has 10 full-time explainers and 120 volunteers, each volunteer donating at least 3 hours per week. Under ideal circumstances, every class can be assigned either a full-time or volunteer explainer to guide students through an exhibition. That means every explainer needs to take care of at least 30–40 students at a time. Comparatively, in some museums in the US, 15 or fewer students per guide are usually recommended for tour experiences (Ybor City Museum Society, n.d.).

Fall and spring are two primary seasons for school field trips. Many schools arrange for the entire school, or all students in the same grade, to take trips together to museums or other cultural institutes. Many of these groups have

over 300 students and a few even have over 1,000. For such large groups, orientation and guided tours are the only services the museum can provide. Sometimes, so many students come at the same time that the museum cannot provide enough docents to give quality tours. Hundreds of students are left unsupervised in the exhibition halls and have no idea what to look for, or how to use the exhibitions. This kind of field trip has little educational value.

As a museum educator, I have been working on promoting the concept of using museums as an educational resource for several years. This requires that teachers play an active role in facilitating students' learning. Although many teachers work very hard to help their students learn at the museum, some teachers still allow travel agents to do their jobs for them, especially those who travel with larger sized groups.

METHOD

In order to explore the factors underlying these observed problems, an interview survey was designed and conducted on site. In this study, large school groups referred to groups with over 100 students. In Taiwan, the

average number of students in a class is 30 in elementary schools, 36 in junior high schools, and 40 in senior high schools. Thus, when 3 to 4 classes travel together the total number of students in a group is usually over 100. Interviewees were selected from the teachers in these groups. The interview questions included school information, interviewee information, and 8 semi-structured questions. The interviews were conducted after the groups finished their visits and before leaving the museum. In total, 30 teachers accepted the request for interviews in October and November 2003.

RESULTS AND DISCUSSION

Analysis of teacher demographics showed the teachers involved in this study had 2–36 years of teaching experience, and included 24 elementary, 4 junior high, and 2 senior high school teachers. Most of their schools were located in the southern part of Taiwan, except for two from the north. The two junior high schools stayed in the museum for 1 to 1.5 hours, and the two senior high schools stayed 2 to 2.5 hours. The visiting time for elementary school groups ranged from 1 to 6 hours, with 17 groups staying longer than 4

hours and 7 groups staying less than 4 hours. There was one school that only stayed for 1 hour to view the IMAX film. In summary, then, elementary school groups visited the museum for a longer time than junior and senior high school groups.

The interviews included both closed- and open-ended questions. Teachers' responses to each question were summarized as follows:

Q1. Did your school hire a travel agency to handle this trip? If yes, why?

In total, 12/30 (40%) of teachers hired travel agencies to handle the trip for them. Planning and implementing a field trip for such large groups is not an easy job. Travel agencies in Taiwan usually provide many services to help schools conduct field trips. Their services include communicating with museum staff to set up the visit agenda, arranging transportation and lunch, and even hiring an assistant for each class to help teachers keep constant watch over their students. All these efforts make teachers' jobs easier on field trips when they are responsible for large numbers of students. Some schools even make this a required policy. Thus, teachers can concentrate on monitoring students' behavior and safety, ensuring the agents do their jobs, or enjoying the exhibitions themselves.

Q2. Did you think the visiting time in this museum today was enough? If no, how many hours do you think is enough for one visit?

Nearly half (14/30) of the interviewed teachers felt that the visiting time was not long enough, and they should have stayed 1 to 3 hours longer in the museum. Overall, most teachers thought at least 4 hours was needed to tour the museum. Some groups reported

having rushed in and out because they had arranged more than one place to visit in a day. This reflects another issue, which is the lack of preparation for the trip. If a field trip is to fulfill educational purposes, teachers need to know in advance how many hours are needed. Travel agents should not be left to make this decision – it should be the teachers' responsibility.

Q3. How did your school decide the visiting site for this trip? Was curriculum relevance the key factor?

Many factors other than curriculum relevance were reported to influence the decision to visit NSTM. Some of the responses were:

- They chose a city first, and then chose field trip venues from that city;
- To let students to see what a museum is, and to enjoy an interesting 3D movie;
- To provide an eye-opening experience for rural students; and
- To give students familiarity with modern technology.

Only seven of the 30 teachers mentioned that they had come to see a particular exhibition or film because they were currently teaching a related topic in the classroom. Unlike other studies done in North America (Anderson & Zhang, 2003; Hannon & Randolph, 1999), this study found that curriculum fit was not the primary consideration in field trip planning. This cultural difference should be paid greater attention by school and museum educators in Taiwan.

Q4. Did you help students prepare for this trip beforehand? If yes, how?

Although the importance of providing pre-trip orientation activities has been emphasized by researchers (Gennaro,

1981; Hooper-Greenhill, 1994; Martin, Falk & Balling, 1981), only two teachers reported having talked about their trips with students before leaving school to help students get ready for their trip. Some of the interviewees mentioned that the travel agency had provided worksheets for students to use in the gallery. Also, there was one senior high school teacher who asked students to prepare by searching for information about the museum and exhibitions before the trip. It seems most of the teachers did not feel they were responsible to provide worksheets or help students to prepare for the trip in advance.

Q5. What did you do while students were visiting or participating in activities?

Most teachers accompanied students as they visited the exhibitions or participated in activities. Two junior high schools had hired assistant guides to accompany students, allowing teachers the freedom to undertake their own visits. Six interviewees reported that they had not accompanied their students all the time during their visits, three of these having left their groups when a guided tour or movie came to the end. No teacher mentioned that he/she was teaching students in the exhibition halls. Observation studies are necessary to find out what teachers really do when they accompany students visiting exhibitions.

Q6. Based on your observation, how was students' learning in the museum? Were you satisfied and why?

Teachers whose students received museum guided tour services during their visits reported satisfaction with their students' learning. Teachers whose students had no explainer to lead them through the exhibitions often reported

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Figure 1: Students gather in the main lobby of the National Science and Technology Museum in Taiwan. The spacious main lobby is the first and the last stop in the museum for student groups and has a capacity of approximately 800.

this as a reason for their dissatisfaction regarding students' learning. It was obvious teachers relied heavily on explainers to help their students learn in the museum. Maybe it was because teachers didn't have enough confidence to help their students to interact with exhibits.

The data gathered from Q5 and Q6 indicated that most teachers believed they had little responsibility to engage students in learning in the museum. This finding is similar to the one reported in Griffin & Symington's (1997) study.

Q7. Have you ever taken one class out of school for a field trip? Please compare the strengths and weaknesses of traveling with multiple classes rather than one class.

Sixteen of the thirty interviewed teachers had never experienced bringing only one class of students out for a field trip. Seven of these teachers stated that they preferred to travel with multiple classes and had no intention

of taking one class to revisit NSTM in the future. Regarding the strengths and weaknesses of multiple-class and one-class trips, the responses of interviewees were:

Strengths of multiple-class trips:

- The school would hire travel agencies for large groups to handle the whole process of field trips;
- Travel agents take care of most things, making it easier for teachers on field trips;
- The school would assign administrators to help teachers; and
- The more classes that traveled together, the more teachers (and sometimes administrators or travel agents) could share responsibility.

Weaknesses of multiple-class trips:

- Too many students crowded around a tour guide was not good for learning;
- Time consumed on gathering students, waiting for each other;
- Inflexible schedule (difficult to make modifications);

- Too many students getting together caused poor behavior (difficult to control);
- Due to the limitation of space, classes have to be assigned to visit different exhibitions; and
- Require more tour guides (they are not available all the time).

Strengths of one-class trips:

- Fewer students are easier to control;
- Flexible schedule (easy to make modification); and
- Easy to monitor students' learning.

Weaknesses of one-class trips:

- The school may not approve a one-class trip;
- Higher cost (less students to share expenses);
- The teacher needs to handle the trip alone (because schools seldom ask administrators to help teachers make arrangements, if they decide to bring only one class); and
- The teacher will be the only one taking full responsibility.

In Michie's studies (1995, 1998), the difficulties of working with large groups have been identified, such as limited services, unsatisfactory learning behaviors, and safety issues. From the responses above, it is clear that teachers are aware of the problems caused by taking a large number of students on a field trip. However, other factors such as administrative details, responsibility and discipline, lead teachers to choose to travel with a large group, regardless of its inefficiency.

Q8. Will you bring one class to NSTM in the future instead of coming with a large group? And, why?

Eleven interviewed teachers said they would NOT take one class to visit the museum in the future. The reasons were:

- Far away from my school;
- School policy does not allow to do so;
- Have to take full responsibility (no one to share);
- Not teaching science related subjects;
- Administrative procedures and other practical details discourage them; and
- Safety considerations.

Clearly, traveling long distances between the school and the museum is a barrier that discourages teachers from taking students on field trips. Teachers believe that the longer distances they have to travel, the greater responsibility they have to take.

Teachers in other studies have often reported that cost is one of the important elements to be considered in planning a field trip (Anderson & Zhang, 2003; Orion, 1993). However, in this study, only one teacher mentioned cost. Traditionally, field trips in Taiwan are paid for by the parents. Parents usually view field trips as a part of school activities and seldom have arguments about sharing the trip expenses.

Nineteen interviewed teachers said they WILL take one class to visit the museum in the future. The reasons were:

- To see more exhibitions;
- To participate in hand-on programs for different subjects;
- For students to gain more knowledge; and
- The effectiveness of students' learning could be better on one class visit

Apparently, these teachers thought one visit with a large group did not allow enough time and freedom to do the things they wanted to do in the museum. However, the trip did motivate

these teachers to visit the museum again with smaller groups.

IMPLICATIONS

Previous studies have identified that teachers' responsibilities in relation to field trips include communicating curriculum objectives with museum educators, doing pre-visit activities, and following up students' learning (Hannon & Randolph, 1999). Teachers' concerns regarding the division of responsibility between themselves and their administrations have also been identified (Anderson & Zhang, 2003). In this study, many teachers mentioned the word "responsibility" more than once during interviews. However, their perspective was totally different from that reported in the previous studies. In Taiwan, any unpleasantness that happens to students during a field trip will be considered the teacher's responsibility. For this reason, teachers feel more comfortable traveling with a larger sized group, or with assistance provided by a travel agency, in order to share the responsibility. However, it

is difficult for the museum to take care of such large groups and to meet the individual needs of students. Involving travel agents in the trip may shift the focus to the entertaining rather than the educational aspects of the trip. These are not the trips we as educators would like to see in the museum. When traveling with large groups is inevitable, more communication and preparation are needed in advance to work out ways to better serve a large number of students at the same time.

Without guidance from teachers or museum staff, most students do not know how to visit a museum. If teachers prefer visiting museums with a large group, they need to know how to help their students learn in the museum. Using worksheets was mentioned by a number of interviewed teachers. However, for some groups, their worksheets were not provided by either teachers or museum staff, but by travel agents. Do these worksheets really meet the needs of student learning? This is a question that needs to be considered before asking students to use them.



Figure 2: Students line up to see the Robot Show.

Overall, the schoolteachers' ability and attitudes toward using museums as an educational resource need to be improved. Some teachers in this study acted like "visitors" in the museum - there was a lack of active participation in students' learning, and a lack of awareness of the need for appropriate pedagogical activities. Although travel agents can help teachers to take care of administrative procedures and practical details, they cannot replace the role teachers should play in field trips. However, as most teachers in Taiwan have had limited museum experiences themselves, it is not easy for them to recognize the educational functions of museum field trips.

Most museums in Taiwan offer various opportunities, such as lectures, workshops, and printed materials, to help teachers make good use of museum resources. These efforts will have limited chance of success unless teachers understand the need to become involved as partners with the museum. Teacher training/education institutes need to attend to this issue, in order to influence teachers' views on the educational uses of museums. There are many successful collaborative programs in which museums and teacher education institutes work together to help pre-service teachers develop the abilities and attitudes to use museum resources (Chin, 2004; Hodgson, 1986; Leroux, 1989; Stillman, Butler, & Vukelich, 1983). Such programs should be integrated into the curriculum for all students who choose teaching as their career.

Teachers should not be allowed to overlook the potential of museums in enhancing students' learning (Commission on Museums for a New Century, 1984). Teachers' perceptions

of museum field trips, and the way they handle such trips, will have a great influence on the next generation. It is hoped that the issues emerging from this study will lead to better partnerships between teachers and museums in the future.

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What is Museum Fatigue?

Gareth Davey

ABSTRACT

Research in the 1920s and 1930s revealed that museum visitor interest towards exhibits decreased as visits progressed, and this concept was coined “Museum Fatigue”. Since then, studies have shown that several behavioural changes characterise fatigued visitors, but the literature has not drawn them together. Further, the causes of museum fatigue remain speculative, and have not been evaluated in detail. This article reviews recent research about museum fatigue, and discusses its causes. Visitor attributes, the museum setting, and interaction between them, seem to underpin fatigue, and their relative importance differs according to the behavioural changes under investigation. An updated definition of museum fatigue is provided, along with suggestions for museum professionals to investigate fatigue within their museums. Further research is needed, particularly with cognitive psychologists, in order to unravel visitors’ cognitive mechanisms that play a role in interest towards exhibits.

The earliest visitor studies were conducted by Benjamin Gilman in the 1910s, Edward Robinson in the 1920s, and Arthur Melton in the 1930s (Gilman, 1916; Robinson, 1928; Melton, 1933, 1935; 1936). They noticed that some visitor behaviour was consistent across different museums, and these patterns are now considered to be rules of thumb within the Visitor Studies field. One example is “Museum Fatigue”, a term that characterises decreased visitor interest towards exhibits as visits progress (Gilman, 1916; Robinson, 1928; Melton, 1935; Falk et al., 1985). Since these early studies, research has shown that other behavioural changes characterise fatigued visitors. For example, it has been shown that visitor interest also decreases across a small number of exhibits, and fatigued visitors tend to cruise around galleries with increased selectivity towards exhibits (Falk et al., 1985). Museum fatigue is comprised of different phenomena but the literature does not draw them together, and the concept remains ambiguous. Further, explanations for museum fatigue

remain speculative, and have not been evaluated in detail. Understanding museum fatigue is important because visitor interest is correlated with effective communication of exhibit messages, and visitor learning (Falk, 1983; Serrell, 1997; Hein, 1998; Bitgood, 2002; Falk and Dierking, 2002; Falk and Storksdieck, 2005). To address these issues, this article reviews and analyses the literature about museum fatigue, presents an updated definition, and provides an entry point for museum professionals to research, and counteract, museum fatigue in their institutions.

A REVIEW OF MUSEUM FATIGUE

Gilman (1916) was the first to describe museum fatigue and his definition focused on the effort required to observe displays. He noticed that some exhibits at the Boston Museum of Fine Arts demanded more effort to view because of the way they were presented. He found that “after a brief initial exertion he [the visitor] will

resign himself to seeing practically everything imperfectly and by a passing glance”. In a later study, Robinson (1928) showed that museum fatigue generalised across four museums with varying characteristics. Melton (1935) provided further evidence for the concept; he varied the number of paintings in a museum gallery and observed decreased visitor interest as the number of displays increased.

More recently, Falk, Koran, Dierking and Dreblow (1985) investigated museum fatigue at the Florida State Museum of Natural History. Visitors were observed, during their entire visits, for the occurrence of behaviours indicative of either interest in museum exhibits, interest in other aspects of the museum setting, attention towards other people, or self-interest. They found that people’s interest initially reached a high plateau, then remained constant for about 30 minutes, and later decreased to a lower level. Visitors’ orientation changed from initial slow movement around the exhibits, to cruising around halls, and more selective stopping

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behaviour (indicative of diminished interest towards exhibits).

Beverly Serrell has conducted a large amount of work on the duration and allocation of visitors' time in museums. In a study at over 100 exhibitions (Serrell 1997; 1998), she found that visitors typically spent less than 20 minutes in exhibitions regardless of topic and size. Her research supports the notion that visitors have a limited time frame after which their interest towards exhibits diminishes.

Museum fatigue has also been observed in zoos. For example, Bitgood, Patterson and Benefield (1986) found that visitors in Birmingham Zoo's reptile house viewed the first reptile exhibit for longer than subsequent exhibits, and this pattern was upheld when visitor flow was reversed. Similarly, Marcellini and Jenssen (1988) tracked visitors as they travelled through a reptile house and observed similar behaviour. This pattern also existed when traffic flow was reversed. They state "In normal flow, exhibits A-E were more attractive and held visitors significantly longer than areas D-F....However, reversing the traffic flow dramatically reversed the situation. Areas D-F became more attractive and held visitors significantly longer than A-E". In another approach, Mitchell et al. (1990) found that an exhibit near a zoo entrance received significantly more visitors than an exhibit further away. A third exhibit, even further from the main path, received less visitors. All cages were almost identical in form, and the location effects persisted when animal inhabitants were swapped. A possible explanation for this result is visitor fatigue because fatigued visitors are more selective, and therefore likely to skip exhibits (Robinson, 1931; Falk et al., 1985).

The research summarised above shows there are several scenarios of how visitor interest decreases during museum visits. The behavioural changes could be grouped together under the umbrella definition of "museum fatigue" because they all denote decreases in visitor interest during visits. The following conclusions may be drawn from this literature:

1. The traditional view of museum fatigue is that visitor interest decreases as visits progress. For example, it has been shown that interest reaches a high plateau for the first 30 minutes of a visit, and decreases thereafter.
2. A second pattern, whereby visitor interest decreases within smaller areas (such as a succession of displays), has also been reported.
3. The behavioural changes that categorise fatigued visitors include cruising through galleries, relatively rapid rates of viewing without rest periods, and increased selectivity towards exhibits.
4. Patterns of fatigue are generally constant and predictable within an institution and, further, the concept generalises across different museums.

CAUSES OF MUSEUM FATIGUE

The reasons previously put forward to explain museum fatigue will now be reviewed. It is generally regarded that the manner in which people interact with the museum environment is determined by people's individual attributes, factors associated with the museum environment, and interaction between them (Melton, 1935; Falk et al., 1985; Bitgood, 2002). These explanations have never been explicitly stated as hypotheses before, and are therefore discussed here. The first explanation focuses on visitor attributes

(termed the "Visitor Attributes Hypothesis"), whereas the second explanation emphasises environmental factors ("The Environmental Attributes Hypothesis"). Each hypothesis will now be evaluated using the literature reviewed above.

1. The Visitor Attributes Hypothesis

This hypothesis posits that factors associated with visitors are responsible for decreases in visitor interest. For example, one attribute (put forward by Melton, 1935) is "physical fatigue", whereby visitors become physically tired as their visits progress. Indeed, Melton (1935) compared a museum visit with a hike. However, this explanation is limited. Visitors sometimes display fatigue after only a few minutes, or across a small number of exhibits: "truly an exceedingly short time for the production of pronounced physical fatigue" (Melton, 1935). Can physical fatigue really explain decreased interest across a few exhibits in succession?

Cognitive processing has also been proposed as a determinant of fatigue (Melton, 1935; Bitgood, 2002), although this suggestion is difficult to evaluate because of the lack of integration between cognitive psychology and visitor studies. Some researchers have argued that cognitive processes such as attention capacity (attention span) play a role; the amount of processing capacity that people possess is limited (the cognitive resource decreases with time and effort), and people tend to focus on one thing at a time (Kahneman, 1973; Hampson and Morris, 1996; Bitgood, 2002). According to this explanation, limited attention capabilities underpin museum fatigue because there is insufficient capacity for attention towards exhibits during later stages of visits (due to the mental effort exerted

during initial stages of a visit; Melton, 1935; Bitgood, 2002). Support for this argument comes from the fact that decrements in visitor interest are relatively predictable; for example, the study by Falk et al. (1985) showed that visitor interest remained at a high plateau for the first 30–45 minutes, before museum fatigue set in. This predictable change in visitor interest is consistent with the view that attention capacities deplete, and reach a level of saturation, until a critical point. Another area of cognitive psychology that could play a role in museum fatigue is the “mere-exposure effect”. Repeated exposure to a stimulus may initially increase likeness towards it, but over-exposure may result in “wear out” (that is, an observer’s response is no longer positive; Kail and Freeman 1973; Van den Burgh and Vrana, 1998; Nordhielm, 2000). Research has shown that the mere-exposure effect is a determinant in preference for works of art (Leder 2001). This is a viable explanation for museum fatigue because exhibits may share similarities (such as similar theme or size), and repeated viewing of them during a visit could lead to “wear out”. However, further research is needed to investigate the possible role that the mere exposure effect, and attention capacity, play in museum fatigue.

There are other visitor attributes that could explain museum fatigue. It is well documented that some exhibits could appeal to specific gender groups or to people with certain personality factors. Visitors differ widely in their past experiences, interests, visit agenda, intellectual capabilities and their familiarity and comfort; all of these factors influence how people interact with museums (Falk et al., 1985; Diamond, 1994; Falk and Dierking, 2000). This suggestion is nicely summed up by Falk et al. (1985)

who state, “this view suggests that the best way to predict visitor behaviour is to know more about the visitors as individuals. Thus, X% of the visitors would be most attracted to exhibit A, while Y% would not show interest in A”. This view is supported by studies that have reported behavioural differences between different demographic groups (Diamond, 1994). The generality of museum fatigue suggests, however, that visitor attributes are not important determinants; fatigued visitors seem to display similar and predictable patterns despite wide variations in their demographics and other characteristics (Falk et al., 1985). Further, museum fatigue may generalise across countries and, therefore, culture - my research, for example, found decrements in visitor interest amongst Chinese visitors (Davey, 2005).

2. The Environmental Attributes Hypothesis

Research over many years has shown that the museum environment (the arrangement of displays and exhibit architecture) affects visitor interest. Steve Bitgood has done a large amount of work on this topic and his recent review (Bitgood, 2002) is a good point of entry into the literature. Exhibit design factors include isolation, size, contrast with setting background, sensory features (sound, smell, or touch), lighting, and line-of-sight placement (Melton, 1935; Screven, 1974; Bitgood, 1989; Bitgood and Patterson, 1993; Ogden, Lindburg and Maple, 1993; Bitgood, 2002). In zoos, animal variables such as presence, activity, size, colour and visibility also influence visitor behaviour (Bitgood et al., 1988; Johnson, 1998). People’s traffic flow is influenced by the attraction of a salient object, distraction of an open door, and arrangement of displays (Melton, 1935; Bitgood, Benefield,

Patterson, & Litwak, 1991; Bitgood, 2002). Most studies have focused on the influence of one or two variables. A more comprehensive approach came from Johnston (1998) who conducted an extensive investigation into the influence of many factors (initially 50 variables). He found that structural aspects of exhibit appearance had the most significant effects on visitors’ viewing time. Environmental attributes help explain why visitor interest varies between exhibits but they present difficulty for explaining museum fatigue during entire visits. As Falk et al. (1985) argue, visitor interest should resemble consistent peaks and troughs, rather than gradual decreases, if exhibit factors are the most important determinant of behaviour.

It seems that there is support for both hypotheses. Is one set of factors more salient? Museum fatigue consists of several phenomena, and it seems likely that the causes of fatigue, and their importance, differ according to the scenario. For example, physical exhaustion seems a likely candidate during a long museum visit, whereas environmental factors probably provide a more convincing explanation for decreased interest over a small number of successive exhibits. Considering visitor and environmental factors as independent causes may be too simple. An integrationist view, in which both groups of factors are believed to interconnect to shape museum fatigue, may provide a better explanation. This idea is perhaps best illustrated using research from cognitive psychology that centres on the cognitive determinants of object attractiveness. Several design variables are known to influence cognitive processing and, therefore, object attractiveness (Clore, 1992; Reber, Schwarz, & Winkielman, 2004). Thus, there is interplay between visitor attributes (cognitive processing) and

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environmental factors (exhibit design). Indeed several design variables (such as the presence of vertical and horizontal patterns, amount of information, symmetry, and figure-ground contrast) are believed to influence aesthetic preference because of their ability to facilitate cognitive processing (Reber et al., 2004), and some research has been conducted using works of art and paintings as stimuli (Nicki Lee, & Moss 1981; Leder 2001; Reber et al. 2004). However similar research has not been conducted in museums, or with visitors, and there is certainly a role to be played by cognitive psychologists in understanding how cognitive processes interact with the museum environment.

This review shows that the traditional view of fatigue offered by early museum workers (that is, decrements in visitor interest during visits) is in need of updating. On the basis of the literature discussed in this review, museum fatigue can be considered to denote

“a collection of phenomena that represent predictable decreases in visitor interest and selectivity either during entire visits, within smaller areas (such as exhibit galleries), or across a few successive exhibits. These changes are likely to be attributed to a combination of visitor factors (such as cognitive processing, physical fatigue, and individual characteristics), factors in the environment (such as exhibit architecture and the museum setting), and interaction between them”.

PRACTICAL IMPLICATIONS FOR MUSEUMS

Museum fatigue has wide-ranging significance for museums. Fatigue influences the extent to which visitors

engage with exhibits, and may affect learning because viewing time correlates with the amount of learning that takes place (Falk, 1983; Serrell, 1997; Hein, 1998; Falk and Dierking, 2002; Falk and Storksdieck, 2005). However, finding a solution to fatigue may not be straightforward because of the complexity of the concept, and lack of knowledge about why it occurs. Fortunately, a large amount of research has probed the relationship between viewing time, visitor learning, enjoyment, and exhibit design. This research is easily accessible to museum professionals. The work of Steve Bitgood and Beverly Serrell provides a good starting point. For example, Serrell (1997; 1998) provided a method for measuring how visitors use exhibits and provided examples of good exhibit design that engages visitors. Serrell believes that developing appropriate communication objectives is essential for good exhibit design and recommends that every exhibit area contains attractive elements and carefully designed labels. Designers should seek ways to capture visitor attention. As Bitgood (2002) points out, in order to hold visitors' attention, it is first necessary to attract it. His suggestions include:

- Increase exhibit distinctiveness (such as size, contrast with setting background, line-of-sight placement, etc), and locate exhibits in relation to traffic flow (landmark objects, hotspots of visitor attention, inertia, and the right-turn bias; Melton, 1935; Bitgood et al., 1991; Bitgood, 2002).
- Reduce mental effort required to understand exhibits by considering how information is presented.
- Motivate visitors to engage with exhibits by asking questions, correcting misconceptions, interesting content, mental imagery, handouts, 3-D objects

and opportunities for interaction (Robinson, 1928; Screven, 1992; Peart, 1984; Bitgood, 2002).

- Minimise distractions such as sounds, competition from other exhibit elements and novelty in the surroundings.
- Provide opportunities for visitors to take breaks (because they will help to replenish attention capacities).

It is important to note that not all researchers interpret visitor behaviour in the same way. For example, Rounds (2004) argues that selective use of exhibits enables visitors to focus only on exhibit elements that interest them, thereby minimising time and effort. He states that “partial use of exhibitions is an intelligent and effective strategy for the visitor whose goal is to have curiosity piqued and satisfied” (Rounds, 2004, p.389). This is an interesting interpretation but it has not been evaluated using visitor studies.

SUMMARY

Museum fatigue is a complex and important concept that influences the amount of time visitors spend in entire museums, galleries, and at a small number of exhibits. There are likely to be various explanations for museum fatigue, including visitor attributes, environmental factors, and interaction between them. More research is needed, particularly in collaboration with cognitive psychology researchers. It is recommended that museum professionals investigate the characteristics of viewing time and fatigue in their institutions, and then develop strategies to counteract fatigue.

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Understanding Graphic Maps at the Bronx Zoo

John Fraser, Jessica Bicknell and Jessica Sickler

ABSTRACT

Zoos frequently use geographic maps and science terms to educate visitors about animal habitats. There is, however, very little about visitors' ability to interpret these mapping conventions. This study sought to discover how easily adult visitors to the Bronx Zoo were able to identify two continents and countries on maps, and their interpretation of the term "range." The results showed that although a majority of visitors could identify both South America and Asia from the continent outline alone, 28% of visitors could only identify one or both continents when viewing a map of the full hemisphere. Additionally, 10% were unable to identify a continent from any of the maps provided. Graphic representation of an animal range was better understood than the term "range" though a large percentage of the participants still did not understand the information. These findings suggest a need to revise maps in exhibit labels to improve visitor comprehension. Such changes would include showing at least a hemisphere-level view, specifically identifying or labeling countries, and replacing the term range with more accessible language.

BACKGROUND

American zoos seek to educate their visitors about environmental conservation issues through animal exhibition. Within these exhibitions, designers rely significantly on graphic maps and geographic terminology to communicate information to visitors. Additionally, because a map is only one part of a larger set of conservation messages, the map is often reduced to an outline or shape with a minimal amount of text. Creators of this signage often assume that visitors have a certain degree of geographic literacy to correctly interpret the information represented by these maps. The accuracy of this assumption, however, has been tested very little. One goal of this study was to test this assumption, to understand how well most zoo visitors are able to identify geographic locations on several versions of outline maps commonly used in zoo exhibits. A second goal was to assess whether visitors understand the concept

of animal "range" and the graphic representation commonly used to indicate range on a map. This term is frequently found on exhibit signs and/or is graphically represented through a shaded area on an outline map, as in Figure 1.

Although maps are commonly used to deliver information about the world or region to the general public, science educators have expressed concern that experience with information presented in visual-spatial ways, such as maps, is being neglected in American classrooms (Mathewson, 1999). Furthermore, a lack of such experience with maps may have negative effects, not only on the understanding of geographic information, but also on the acquisition of abstract concepts of spatial relationships (Uttal, 2000). In reviewing this literature, we became concerned that this spatial comprehension

deficit may be more widespread in the public than previously reported and that this lack of map comprehension was limiting the ability of zoo maps to convey conservation information in the zoo.

Little research has been done in museum or zoo settings to determine visitors' ability to correctly interpret the geographic information presented on maps. Assessment of the general public's geographic literacy has been performed by the National Geographic



Figure 1. Typical species identification label, including range map.

Society in 1988 and in 2002 (Leary, 1989; National Geographic Education Foundation, 2002). These studies have shown very low geographic literacy among young Americans (ages 18–24). On average, young Americans were only able to identify 6.9 out of 16 countries and global locations in 1988 and 7.3 out of 16 in 2002. Despite this, museums and zoos continue to use maps to present geographic information about wildlife and global conservation issues.

An earlier front-end study was conducted at the Prospect Park Zoo (Werntz and Fraser, 2002), which was concerned with visitor understanding of animal coloration as a survival strategy. Some unpublished data from that study gave the impression that some zoo visitors do not understand range maps on exhibit labels. To explore the supposition that some zoo guests have difficulty interpreting maps, a pilot study on map literacy was conducted at the Bronx Zoo by interviewing 40 visitors. Of the 40 visitors interviewed, the main finding was that almost half could not recognize the outline of South America. The results of this pilot study prompted the development of the present research, designed to more comprehensively assess adult zoo visitors' ability to identify a continent and country on an outline map, and explore their understanding of the terminology and graphic representation of animal range.

METHOD

To gain a clearer understanding of what graphic information is required to convey animal range information, we developed two measures. One set of evaluations concerned geographic literacy, and included determining how well zoo visitors recognized unlabeled continents either in isolated

outline or otherwise embedded in larger geographic contexts. We also measured visitors' ability to identify a specific country on the continent map. A second set of measures was about "range," namely, visitors' ability to define the term or locate it when displayed as a shaded area on a map.

Participants and Interviewers

Eighty-five visitors to the Bronx Zoo were surveyed by trained docents in March 2005. Participants were selected opportunistically by interviewers stationed at non-exhibit areas on zoo grounds. Demographic information was collected at the end of the survey, including age, level of schooling, gender, and group composition. The study participants included 45 men and 40 women, evenly distributed across age groups and closely approximating the average zoo visitor demographic profiles. (See Appendix for the standardized interview protocol). The interviewers were 14 adult docents from the Bronx Zoo who were trained to adhere to a standardized procedure in administering and scoring the surveys.

Map Reading

Each visitor was presented with the task of identifying on each of two sets of 11" x 17" cards first a continent, and if identified successfully, then a particular country on that continent. The first set contained outline maps of a "South American series" and the second contained maps of an "Asian series" (Figures 2 – 6). For the first series, the interviewee was shown a map of South America (Figure 2) and asked to name it. In each case the interviewer circled the continent with his or her finger to clarify which part of the map the visitor was to look at. If the visitor did not identify South America on the first card, he or she was shown the second card with the

added outlines of North and Central America (Western Hemisphere) (Figure 3). If the visitor was still unable to identify the continent, he or she was shown a final card depicting the world (Figure 4). If the visitor correctly identified South America on one of these cards, the interviewer pointed to the approximate center of Brazil on that map and asked the interviewee to name the country located there. If a continent was never identified, the researcher moved on to the next series of maps

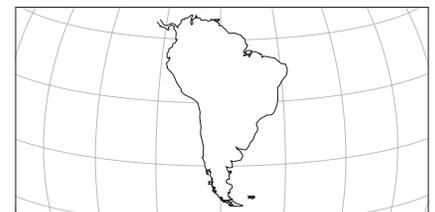


Figure 2. South America/Brazil Map 1 (Continent View)



Figure 3. South America/Brazil Map 2 (Hemisphere View). Interviewer circled the continent in question.

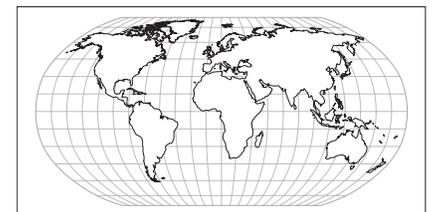


Figure 4. World Map. Used for both series of maps. Interviewer circled the continent in question.

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or questions. The second series used the same procedure for identifying Asia and China. The first card contained an outline map of Asia and Europe (Figure 5). The second card added Africa and Australia to that view (Figure 6). And the third card represented the world (Figure 4). All maps used a modified Goode projection with oceans removed.

Range

After the map-reading questions, the interview was concluded by asking

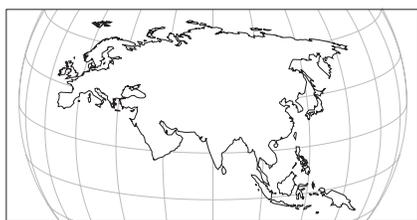


Figure 5. Asia/China Map 1 (Continent View).

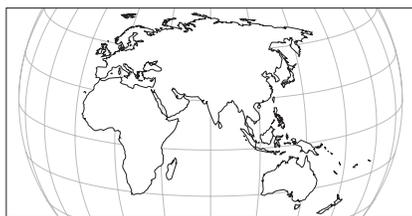


Figure 6. Asia/China Map 2 (Hemisphere View). Interviewer circled the continent in question.



Figure 7. Range Map used for interview.

one of two questions about “range.” Interviewers alternated between the two questions with consecutive interviewees. For one of these questions, 38 visitors were shown a new map of South America (Figure 7) containing a small, red shaded area, similar to the way in which animal ranges are illustrated in Bronx Zoo exhibits and scientific literature. Visitors were asked to “Look at the map of Brazil and suppose it is in front of an exhibit of Golden-headed Lion Tamarins. Can you tell me where exactly Golden-headed Lion Tamarins live?” For the other question, 43 visitors were not shown a map, but were asked, “If I say, ‘The range of Tamarins is Eastern Brazil,’ what does that mean?”

Due to procedural errors, data were discarded for two participants in the South American map series, for eleven participants in the Asia series, and for four participants answering the range question.

RESULTS

Map Reading

Results of map reading are illustrated in Tables 1 and 2. In all, 76 participants (92%) were able to correctly identify South America and 62 (84%) were able to correctly identify Asia. Seven participants (8%) were unable to identify South America by name and 12 participants (16%) were unable to identify Asia with the maps presented.

Analysis of the data based on how readily visitors were able to identify the maps of both continents was also performed to get a sense of the geographic literacy of the sample. Results of this analysis are illustrated in Table 3. From this, 45 visitors (63%) who were asked were able to identify both South America and Asia from

the outline of each continent alone (Map 1), showing strong geographic literacy. Seven visitors (10%) were unable to identify either continent on any of the maps shown. Between these two extremes, 20 visitors (28%) had difficulty identifying at least one of the continents by its outline alone, but were able to make a correct identification given greater context.

Range

Of the 38 visitors shown the map that graphically represented an animal range, 23 (61%) correctly identified, through words or by pointing on the map, that the colored area on the map represented where the exhibited animal can be found in the wild. The remaining participants were unable to attribute meaning to the shaded area. Responses to the question, “Looking at this map, where do Golden-headed Lion Tamarins live?” that were scored as incorrect included the following:

- “Maybe along the river?”
- “Don’t know – rainforest?”
- “Rainforest in Brazil”
- “Don’t know”
- Visitor points to someplace other than the red spot on the map, e.g., Western Brazil.

Of the 43 visitors asked to state the meaning of the word “range,” 24 (56%) correctly understood it to mean the place where the animals live, inhabit, or are found. We accepted statements that defined range as:

- “Tamarins inhabit Eastern Brazil”
- “That’s where Tamarins live”
- “That’s where you find them in the wild”
- “That’s where they are located”
- “That’s where the monkeys come from”
- “Where some things are found”.

Table 1. Identification of South America and Brazil

n=83	Continent Map	Hemisphere Map	World Map	Unable to Identify	Not Asked Country
S. America	55	21	0	7	
% of total	67%	25%	0%	8%	
Brazil	41	10	0	25	7
% of total	50%	12%	0%	30%	8%

Table 2. Identification of Asia and China

n=74	Continent Map	Hemisphere Map	World Map	Unable to Identify	Not Asked Country
Asia	59	3	0	12	
% of total	80%	4%	0%	16%	
China	47	3	0	12	12
% of total	64%	4%	0%	16%	16%

Table 3. Geographic Literacy (n=72)

Level of Maps on which Continents were Correctly Identified		
Both on Map 1	45	63%
One on Map 1; One on Map 2	13	18%
Both on Map 2	2	3%
One on Map 1; Couldn't identify the other	1	1%
One on Map 2; Couldn't identify the other	4	6%
Couldn't identify either	7	10%

The other 19 visitors (44%) either said they did not know what the sentence meant or incorrectly interpreted the term. Misinterpretations included association of the word with mountains, open spaces, forests, and as a measure of size.

There were no detectable effects of level of education, age group, or gender on

visitors' ability to identify continents (use of chi-square was inappropriate due to low expected frequencies).

DISCUSSION

With regard to reading maps, a relatively large number of the participants (38% of those surveyed)

were unable to identify one or both continents by continent outline alone (i.e., on the first map). Embedding the continent outline within a hemispheric context increased comprehension, ensuring that noticeably more interviewees could make a correct identification. Displaying either continent within a world map, however,

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did not result in any further gain in recognition among those surveyed.

These data also show the variation in map reading literacy among Bronx Zoo visitors. While well over half of respondents demonstrated strong skills by identifying both continents on the first map, 10% of the sample were unable to identify either continent on any of the maps provided. As noted above, increasing map context to include the hemisphere view will aid many visitors' comprehension. However, we must also acknowledge that a segment of visitors require interpretation other than maps to obtain this information.

Visitors generally found it more difficult to identify Asia than South America. One reason might be that the Western Hemisphere map includes North America, which is commonly presented in television images with regional news. The responses of those incorrectly identifying South America suggested that without the larger geographical context of the Western Hemisphere, many visitors (19 people) confused South America with Africa. Seventeen of these visitors were able to correct their error once presented with the second map. However, this also may have been influenced by the fact that they were then aware that Africa was an incorrect response.

When reviewing the data from the Asian series of maps, we recognized the possibility that a sequence effect influenced these data. As the Asian series was always presented second, some visitors may have had a greater awareness that they were being asked to name a continent for the Asian series than they were for the South American series. However, allowing for this increased awareness of the interviewer's goal at the first card in the Asian series, the possible sequence

effect only appeared to aid a few visitors' comprehension. For future studies, the order in which series of maps are shown should be alternated in order to counter any such sequence effect.

The results presented in Tables 1 and 2 demonstrate that an individual's ability to identify a continent by its outline does not allow us to predict that he or she is aware of the location of a country within that outline. Even after correctly identifying the continent, a number of respondents were still unable to name the country when the examiner pointed to its geographic location within the continent. The latter failure occurred even though the countries (Brazil and China) are comparatively large and well-known. For example, although 92% of visitors were able to identify South America, a little more than half could also identify Brazil within that continent. We do not know what the success rate would have been for those who were unable to name the continent, had they been told the continent and given the opportunity to name the country. These success rates for identifying countries within continental maps suggest that supplemental information or alternate methods of presentation may be necessary for many visitors to comprehend this information.

The difference between identification ability for a continent and for a country may relate to the fact that these questions asked visitors to interpret two different types of information from a map. For the continent, visitors had to visually interpret the outline, while for the country, visitors had to identify the country spatially, based on its location within the continent. The results here show that understanding of these two types of information are different. There may be significant variation in individuals' ability to identify specific countries where animals are found

based on information presented in such unlabeled outline maps.

The findings regarding the term "range" and its corresponding graphic symbol further indicate the need to clarify exhibit labels. It is clear that we cannot assume most visitors will understand the use of this term in exhibit labels. With just over half of Bronx Zoo visitors correctly interpreting the term "range", we believe that zoo label writers should consider adopting simpler language descriptions to avoid confusion or misunderstanding by guests. Comparatively, it seems to be the case that the graphic representation of range on an exhibit label is somewhat easier for visitors to correctly interpret than is the word itself. Our results suggest, however, that a relatively large portion of zoo visitors do not readily understand the use of shaded areas to indicate animal habitat on graphic maps.

CONCLUSIONS

As a result of this study, we feel zoos should reexamine their presentation of key geographical information in exhibit maps and labels. We recommend that, at a minimum and wherever possible, graphic representations of animal habitats include at least the Eastern or Western Hemisphere to orient guests to the region being presented. If space is not a concern, it may be advisable to include a full world map, although that did not aid comprehension among our visitors. Furthermore, we recommend that the use of the term "range" be considered a scientific term requiring explanation or that alternative language be employed to explain the concept, such as in the modified range map in Figure 8.

Our recommendations are based on interviews with adult visitors to the Bronx Zoo and may not be



Figure 8. Illustration showing more clear representation of an animal's wild range.

representative of the American population. Further study at other institutions, with larger sample sizes, may provide more accurate understanding of the challenges involved in presenting graphic representations of where animals are found in the wild.

We believe that we have uncovered evidence of a deficit in visual-spatial interpretation of graphic information that poses a significant challenge to environmental educators working in the zoo exhibit community. If visitors to zoos cannot form a spatial understanding of where wildlife conservation issues are urgent from the graphic information presented in exhibit labels, their ability to understand the complexity of habitat loss, species scale relationships and other conservation education goals may also be limited.

Redressing this deficit through the design of clear and comprehensible graphics may increase conservation education at zoos and the usefulness of exhibit labels.

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Appendix: Interview Protocol (instrument - both versions (A/1. B/2)).

Map Range Study Ver. 1 (Updated Feb. 2005)

Interviewer _____ Loc _____ Date _____ S# _____

Hello. I work here at the zoo. We are trying to improve things here at the zoo for visitors. Would you mind looking at several pictures and answering a couple of questions, including about yourself? Good.

(For any answer involving "a map, " respond, "Can you name it?")

Section SAB

1. *(Show picture SAB-1) (Circle S.A. with finger) Can you tell me what this picture is of?* _____

Correct. *(Point to approximate center of Brazil) Can you tell me what country is here?* _____

If wrong in 1:

2. *(Show picture SAB-2) (Circle S.A. with finger) No, but now can you tell me?* _____

Correct. *(Point to approximate center of Brazil) Can you tell me what country is here?* _____

If wrong in 2:

3. *(Show picture SAB-3) (Circle S.A. with finger) No, Now can you tell me?* _____

Correct. *(Point to center of Brazil) Can you tell what country is here?* _____

Section AC

1. *(Show picture AC-1) (Circle Asia with finger) Can you tell me what this is a picture of?* _____

Correct. *(Point to the center of China) Can you tell me what country is here?* _____

If wrong in 1:

2. *(Show picture AC-2) (Circle Asia with finger) No, but now can you tell me?* _____

Correct. *(Point to the center of China) Can you tell me what country is here?* _____

If wrong in 2:

3. *(Show picture AC-3) (Circle Asia) No, now can you tell me?* _____

Correct. *(Point to the center of China) Can you tell me what country is here?* _____

(If none were correct, state: "People find these maps difficult")

Section A

(Show map SAB-4) Look at the map of Brazil and suppose it is in front of an exhibit (a cage) of Golden-headed Lion Tamarins. Can you tell me where exactly Golden-headed Lion Tamarins live? _____

Section C. We are almost finished. I just have several questions about yourself.

1. **What year were you born?** _____

2. **Would you please indicate your level of schooling?**

Below HS Graduate

HS Graduate

Some College

College Degree

3. **Who joined you, if anyone, in your visit to the zoo today?**

Alone _____ Children _____ Adults _____ Children & Adults _____

Male _____ Female _____

Thank you for your help.

Notes: _____

Interviewers alternated between Section A as listed above, and Section B as follows:

If I say, "The range of Tamarins is Eastern Brazil" what does that mean? _____

Are We There Yet? Conversations about Best Practices in Science Exhibition Development

Reviewed by Beth Redmond-Jones

What are “best practices” in exhibitions? Is it the act of creating the best science exhibition? Is it having the best exhibition development, evaluation and design process? Is it a process of looking at what has and hasn’t worked and how we can learn from what has gone on before? Or, is it taking a chance, taking a risk, not letting a checklist of exhibit do’s and don’ts guide the process?

The Exploratorium, with funding from the National Science Foundation’s Informal Science Education (ISE) program, brought together a group of well-respected exhibition developers, designers, big picture thinkers, evaluators, project managers, and educators to discuss the exhibition process. This group of “mentors, masters and whiz kids” (p. vi) convened in 2003 at the Exploratorium in San Francisco, California to explore this notion of best practices and the exhibition development process. The results were stimulating conversations, intriguing debates, and “some of the field’s sacred cows being tipped, just a bit.” (p. vi).

Are We There Yet? consists of three parts—*The Conversations*, *Twelve Noteworthy Science Exhibitions*, and *In the Vernacular*.

Part One: The Conversations highlights the conversations and debates about best practices and innovation through a series of articles by professionals with different expertise. It begins by identifying the characteristics of good exhibition development but states that there is no tried-and-true formula for exhibition success. These characteristics are:

- meaningful involvement with scientists, educators and others;

- positive collaborations, including team planning, design, and development;
- evaluation (front-end, formative, summative, remedial);
- careful prototyping;
- focusing on visitors and designing for meaningful interactivity;
- excellent design of exhibits and space;
- clear goals and objectives;
- ample time and money;
- effective project management;
- ongoing maintenance and upgrading; and
- institutional support.

The visitor outcomes that these practices tend to promote include:

- memorable experiences;
- ongoing conversation and inquiry;
- wonder and excitement;
- personal relevance and meaning-making;
- accessible and comprehensible content; and
- a comfortable and engaging environment (p. 2).

But this part of the book brings more to the reader than a list of characteristics. It brings the inspiring discussions, thoughts, and opinions, which usually occur in the bars during museum conferences, to the forefront of exhibition literature. The articles discuss different perspectives on best practices, goals and objectives, teams, time and money, project management, interactivity, evaluation, new technology, and finally, the ideas—the stories that these exhibitions bring to life. It brings the tools we, as exhibit professionals, should all consider as we strive to create memorable exhibit experiences and

which, we hope, will be considered best practices in years to come.

As I read the articles, I found myself agreeing with one concept from one author, then agreeing with a counter-concept from the next author. New ideas were floating to the top and old concepts were being brought into a new light. My process of exhibition development was challenged—and that is a good thing. We should not let our exhibit process be driven by a checklist, but should embrace the tangents, the opportunities, the challenges, the new ideas and the risks. That’s what makes for best practices.

Lastly, one feature of this section that I truly relish is how the articles flow from one to another and all relate to each other. There is a continuity that is not seen in most edited collections. As I read each article from start to finish, and from one to the next, concepts and ideas were reiterated, refuted, and questioned to create a dialog in my mind, almost to the point of feeling as if I was sitting in a room with all the authors listening to their “conversations”. I commend all the authors and editors on creating this response in a reader.

Part Two: Twelve Noteworthy Science Exhibitions

This part of the book discusses twelve significant science exhibitions identified multiple times by exhibit professionals who participated in a questionnaire prior to the 2003 Best Practices in Science Exhibition Development conference (p. 44). The exhibitions encompass a wide range of disciplines and a variety of organizations, not just “science” museums. Each description tries to

Book Review

provide parallel information including museum, title, date opened, time to develop, budget, main participants, exhibition description, background, walkthrough, development process and challenges (including evaluation), and outcomes and lessons learned, while interspersed with photographs and quotes about the exhibition. An accompanying CD-ROM in the back of the book contains additional images, walkthroughs and/or videos of the exhibitions.

The exhibitions discussed are:

- *Wolves and Humans: Coexistence, Competition and Conflict*, Science Museum of Minnesota;
- *Traveling the Pacific*, The Field Museum;
- *Psychology: Understanding Ourselves, Understanding Each Other*, American Psychological Association and Ontario Science Centre;
- *Darkened Waters: Profile of an Oil Spill*, Pratt Museum;
- *Whodunit? The Science of Solving Crime*, Fort Worth Museum of Science and History;
- *Engineer It!*, Oregon Museum of Science and Industry;
- *Memory*, Exploratorium;
- *Congo Gorilla Forest*, Wildlife Conservation Society, Bronx Zoo;
- *Frogs*, Exploratorium;
- *Sounds from the Vaults*, The Field Museum;
- *Sound Lab*, Experience Music Project; AND
- *Jellies: Living Art*, Monterey Bay Aquarium

After reading all twelve of the exhibition narratives, I concluded that each process was unique. Different variables—ideas, team members, visitor needs, institutional needs, results of evaluation and/or prototyping, project management tools, permanent vs. traveling exhibition, budget—impacted the end result, ultimately achieving an exemplary exhibition. But, as Kathleen McLean

and Catherine McEver state in their introduction to this section, “upon closer inspection, however, there are some aspects common to all of the exhibitions described here:

- they were all developed by teams of people;
- they all had clearly articulated and ambitious goals from the start;
- they all strove for solid science content and reflected the contributions of scientists and scholars;
- they all employed some form of visitor research and evaluation that helped shape the exhibition content and design;
- they all contained interactive elements;
- their team members were particularly passionate about the material;
- the development processes were marked by some sort of creative tension; and
- they were all new types or styles of exhibition not usually developed by the originating institution.

Further commonalities, as well as clues to characteristics of good practice—multigenerational appeal, attitude-changing-content, empowerment, and personal engagement—may be found in each of the exhibition narratives (p. 45).

The information about each of the twelve exhibitions provides an opportunity for any exhibit professional, regardless of how long he or she has been in the field, to learn something. It’s an opportunity to glean an understanding of why a specific exhibition is considered a best practice, to review an archive of a successful project and process, and to look at who in the field is creating memorable work, how they got there, and insights that they share about the exhibition process.

Part Three: In the Vernacular

Have you ever sat in a room with a “team” for a brainstorming session and the creativity and the flow of ideas never really seems to happen? Maybe it’s too

early in the morning and not everyone has had enough coffee. Or maybe it’s too late in the day and everyone is brain dead. Or maybe the “team” members have too much on their mind and are thinking about all the emails they should be answering instead of participating in yet another brainstorming session. Well, if you have been faced with such a situation (or even if you haven’t), never fear, Kathleen McLean, Catherine McEver and the participants of the *2003 Best Practices in Science Exhibition Development* conference have, in a few pages, provided us with the tools to break out of the box and be creative once again.

First, are *30 Weed Seeds: Ideas for Innovation*, ideas, questions, and thoughts to mull over, that will help “seed” creativity once again. Or try giving your team *Free Passes* at the beginning of the exhibition process—give them the okay to take a risk and to be innovative. Review the *Creativity Killers* poster to remind yourself and your team what can kill the creative process. *MuZine* provides a look at off-beat exhibit ideas, how we view ourselves and our visitors, among other things. The section ends with *Comments from Non-visitors* to help us remember all those individuals whom we have yet to bring into exhibitions or who have a view of science museums as places only for scientists, and not for them.

THE BOOK

McLean, Kathleen and Catherine McEver, editors, (2004). *Are We There Yet? Conversations about Best Practices in Science Exhibition Development*, San Francisco, CA: Exploratorium. ISBN: 0-943451-58-2 (pbk, CD ROM) USD \$40.00

THE REVIEWER

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Museums and the Public Understanding of Science Conversations

Reviewed by George E. Hein

This volume contains essays from a 2002 conference, “Museums, Media, and the Public Understanding of Research—An International Working Conference,” at the Science Museum of Minnesota, edited and published so that this “special gathering . . . should not end up as a scattered collection of memories (p. xiii).” It’s difficult to capture the spirit of a working conference in a collection of essays, and often nearly impossible to persuade participants to provide written texts. The book gives some sense of the breadth and intensity of the discussions, as well as providing a rich and diverse collection of papers on a central issue for science museums.

Public Understanding of (Science) Research (PUR) is a recently developed subset of the more general concept of Public Understanding of Science (PUS). It was promoted and supported by a special funding initiative within the National Science Foundation Education Directorate under the guidance of Hyman Field. The conference, as well as this publication, received NSF support. Field has argued that “The results of many [current] studies and experiments will undoubtedly have profound impacts on the lives of citizens . . . Yet few people know what research is being conducted, much less understand why it is being done and what the potential implications may be.” He urged the field of informal public education to address this shortcoming (Field and Powell, 2001). The broader topic, has,

of course, long been a primary mission for science museums and science centers. The 19th century science and natural history museums covered current science, including for example, developments in harnessing power, new materials, exotic species from across the globe and the novel notion of evolution. However, as Neil Chambers points out, the Director of the British Museum of Natural History, William Fowler, decided to separate the research collections from the public displays. Most of the world’s natural history museums, generally the institutions with the largest in-house research programs and collections, followed that model. It requires a reversal of established habit for science museums to open their research directly to the general public.

In the past 50 years, both the pace and sophistication of current research in science and technology outside the research museums, has made it less accessible to the general public. Also, most modern science centers are not themselves major natural science research centers: they illustrate the science created by others. Simple mechanical analogies, relatively easy to understand and amenable to modeling as exhibits, are increasingly inadequate to explain current atomic theory and energy concepts on the one hand, or social structures and cultural interactions on the other. At the same time, argues John Durant, science has become integrated with other aspects of society, rather than viewed as a

discipline apart, and can be roughly divided into “finished science” (topics on which scientists mostly agree and the results rather than the current research predominate) and “unfinished science” (current work, characterized by uncertainty) (p. 55). Each type presents different challenges for museums. It is the latter that provides the content for PUR activities and exhibitions.

How do informal science institutions grapple with including PUR? The essays provide critical analyses of some of the leading examples at major museums—in London, the Dana Center and Wellcome Wing at the Museum of Science and the Darwin Center at the Natural History Museum; the live presentations at the Current Science & Technology Center in Boston’s Museum of Science; and the Forum des Sciences program at la Cité in Paris. These initiatives can serve as examples both of what has been done and what problems museums face as they implement PUR. Some authors suggest that these grand and costly efforts may not serve as useful models for smaller informal science institutions. Don Pohlman’s case study of the development of a Minnesota exhibition on a current archeological site also illustrates some of the challenges in bringing current research into the museum. He concludes, “In the end, what worked in the exhibit worked not because the research was still fresh but because we managed to connect it to the lives of our audience” (pp. 274–5).

Book Review

This need to connect with the audience is repeated throughout the essays in exhortations to engage visitors actively through a range of approaches: discussion groups, guided tours of research areas, scientist presentations to small groups, appropriate written materials, or media presentations. A section of seven essays discusses “What Museums Can Learn from Media Public Understanding of Research Initiatives”. Among others, Cornelia Dean, former science editor of the *New York Times* (“More copies of the *New York Times* are sold on Tuesdays, the day *Science Times* comes out, than on any other day of the week”) and Nancy Linde, a producer of the PBS *Nova* series (“widely recognized as the flagship television science news program in the United States”), discuss the challenges of presenting science (not necessarily current research) to the public. Ms. Linde expresses a key issue most succinctly in terms that will resonate for museum exhibition developers, “There are three critically important elements in creating the perfect *Nova*: • story, • story, • and story” (p. 312).

Graham Farmelo points out that “Everywhere monologue is out and dialogue is in” (p. 59), and others share this view. Unfortunately, dialogue, even when media substitutes in part for direct human dialogue, is labor intensive and thus expensive. It requires rethinking by museum staff whose traditional goal was to develop exhibitions that could stand on their own without much human involvement. The call for PUR is one more factor (costly interactive exhibitions have been another) in the direction of increasing staff engagement with visitors. Just how informal science institutions,

always short on funds for staff to interact with the public, will manage these added fiscal burdens is a problem recognized by several writers, although, not surprisingly, none has simple answers.

Who is the audience for PUR and what do they want and need to know about current research? Several essays introduce this question. The desire of scientists and informal science institutions to inform and engage the public in dialogue on science and on current research may well exceed the public’s interest. Several authors point out that we are certain that public understanding of science (and of research) is crucial for society’s well being, but that truism within the profession may not be known—or accepted if it is known—by the populace at large. It is also essential for continued public support of science, especially now, as Graham Farmelo says, “that the Cold War is over, so that there is no readily identifiable ‘bad guy’ whom we must outdo” (p.19). But surveys show a general public indifference, and, increasingly, public distrust of science and its importance, especially in contrast to faith-based (or occult based) beliefs. No author addresses the important and exceedingly difficult question of how informal science institutions might successfully counter firmly held beliefs in such concepts as a biblically literal 4,000 year-old earth or intelligent design. A strong chapter by Martin Storksdieck and John Falk outlines the essential role of visitor studies in efforts to introduce PUR (the argument can be applied more generally to all museum educational efforts) and urges museums to formulate realistic expectations for outcomes of various types of exposure

to PUR activities. Other writers also stress the need for museums’ understanding of the public as well as setting clear goals in order to launch successful PUR programs.

Inevitably a collection of papers from a conference, even a focused one devoted to a limited topic, provides breadth but little depth. Readers can come to understand the major issues and get snapshots of current work, but those who are seriously interested need not only to consult the references but also contact the authors. Fortunately, all are listed with email addresses and there is an extensive bibliography on topics relevant to PUR. The editors are to be commended for bringing the conference proceedings to the attention of the wider professional field besides the 76 individuals who gathered “in St. Paul for an extended weekend in late September 2002” (p. 337).

Field, H., & Powell, P. (2001). Public understanding of science versus public understanding of research. *Public Understanding of Science*, 10, 421–426.

THE BOOK

Chittenden, David, Graham Farmelo & Bruce V. Lewenstein (2004). *Creating Connections: Museums and the Public Understanding of Current Research*. Walnut Creek, CA: AltaMira Press. 400 pages. ISBN 0-7591-0475-1 (cloth, US\$80.00), 0-7591-0476-X (paper, US\$34.95).

THE REVIEWER

George E. Hein, Professor Emeritus at Lesley University has written widely on museum subjects, including *Learning in the Museum*.

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VSA Thanks Sponsors

The Visitor Studies Association would like to thank the following organizations and individuals for their generous support of this year's conference.

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Counting Visitors or Making Visitors Count? Research for Changing Practice

**19th Annual Visitor Studies Association Conference
Grand Rapids, Michigan
July 25–29**

CALL FOR PROGRAM PROPOSALS

The Visitor Studies Association is today's premier professional organization focusing on all facets of the visitor experience in museums, zoos, nature centers, visitor centers, historic sites, parks and other informal learning environments. For nearly two decades our conferences have been at the forefront of the field, providing tools and inspiration to better understand, attract, educate and serve visitors.

The theme for the 19th Annual Visitor Studies Association Conference is **Making Visitors Count: Research for Changing Practice**. The conference will explore how research and evaluation are used in informal learning environments to enhance the visitor experience. Proposals that illustrate the many and diverse ways in which research has been used to inform design, education, outreach, policy or big ideas in the world of informal learning will help advance VSA's mission.

Because **visitor studies is a multidisciplinary field**, we welcome submissions from the wide range of fields that study informal learning experiences. These include psychology, interaction design, sociology, cognitive science, architecture, evaluation, policy, and education.

Because **visitor studies are useful to a broad spectrum of practitioners**, we invite submissions from all of those who use the results. These include evaluators, educators, interpreters, exhibit designers and developers, marketing professionals, planners, academics, consultants and directors who believe that in today's challenging environment, innovative interdisciplinary integration is a key to success.

Because **visitor studies is a growing field**, we especially welcome submissions from early career professionals and graduate students. In addition to submitting proposals for standard session formats, newcomers to visitor studies can take part in special "work in progress" sessions and get feedback on their work from others in the field.

In short, we encourage sessions that communicate across disciplinary boundaries to inform the broader field of visitor studies.

Some ideas for topics for sessions might include:

- Studies that establish evidence for learning in informal settings
- Practitioner sessions that pose research questions to the visitor studies field
- Studies that explore how people behave in public spaces with the goal of enhancing the visitor experience in informal learning environments
- Best practices and innovative approaches used to design and evaluate visitor services, programs and exhibitions
- How research has been used to create richer and more meaningful environments and experiences
- How to apply research tools to attract new visitors and build loyalty
- Innovative approaches to designing evaluation instruments and conducting visitor studies
- Utilizing findings and theory in the design and prototyping of exhibition elements
- Innovative methods and uses of technology
- Working with internal constituencies for in house evaluation

Deadline for Submission: January 30, 2006

For submission guidelines, go to www.visitorstudies.org

If you have questions or require additional information, please email Program Chairs Kevin Crowley & Karen Knutson, University of Pittsburgh Center for Learning in Out-of-School Environments, at: upclose@pitt.edu.

Visitor Studies Association Conference 2006

CALL FOR WORKSHOP PROPOSALS

The 2006 Visitor Studies Association Conference is inviting proposals for workshops. The Visitor Studies Association seeks workshop leaders from a broad range of fields and professions: psychology, sociology, education, museum practice, tourism and leisure studies, interpretation, cognitive science, architecture, design, statistics, marketing research methods and other facets of visitor experience.

Pre-conference workshops provide a major opportunity for professional development and have been attended by students, evaluators, exhibit and program designers and museum directors alike. The workshops are targeting the field of visitor studies as it applies to museums, libraries, zoos, aquariums, nature centers, interpretive centers, and other areas that provide engaging and educational experiences for all audiences.

Workshops can be half-day, full-day or two-day sessions that are lively, interactive, and offer participants the opportunity to broaden their knowledge and skills in studying or enhancing the experiences of visitors in a wide range of institutions. Suitable topics include but are not limited to: new and “tried and true” methodologies used in exhibit and program evaluation, statistical analysis, front-end, formative and summative studies, questionnaire design, interviewing techniques, label writing, evaluating web-based activities, surveying on the web, market research, using research findings to inform practice, cultural diversity, responding to RFPs, or working with external consultants. All workshops should provide participants with background information (e.g. a literature review) and should address, where appropriate, ethical considerations and be sensitive to diverse audiences.

The workshop leader will receive 50% of their workshop's registration income (less expenses), and one complimentary conference registration.

VSA will utilize an all-electronic proposal submission and review process for this conference. For general information about the Visitor Studies Association Conference 2006, visit www.visitorstudies.org or email info@visitorstudies.org.

Deadline for Submission: December 22, 2005

For submission guidelines, go to www.visitorstudies.org

Workshop Chairs: Martin Storksdieck & Cheryl Kessler, Institute for Learning Innovation, and Jane Hetrick, Connor Prairie. If you have questions or require additional information, please e-mail storksdieck@ilinet.org.

VSA News

Review of the VSA Nominating and Election Process

The VSA Board has asked long-time VSA member Beverly Serrell to review and report on the past and present nominating and election procedures used by VSA. At the 2005 annual conference in Philadelphia, she read this report at the business meeting:

Progress Report to the Board, August 2005

by Beverly Serrell

I have been reviewing notes from VSToday and Board Meetings on the history of the nomination-election process. I have received copies of notes relevant to the changes made in the process, and I have read feedback from members about the changes. I have reviewed the election ballots from the 2005 election.

I will be getting feedback from participants in the process (e.g., members of the Board Development Committee, newly elected members of the Board) as well as talking to “elders” in VSA about their views on the past and present process.

I will address Harris Shettel and others' concerns and questions:

Is the nomination process being done correctly? How do participants in the nomination process feel about it? Should the new system be retained or modified?

In my review and report, I will be focusing on the overall questions of why the nomination-election processes were changed and whether the changes have led to the desired results. I expect to have the report finished by the VSA Board meeting at the AAM meeting in Boston 2006.

All VSA members are encouraged to share their thoughts or questions about the slate vs. individual election process by contacting Beverly Serrell before February 1, 2006. Her email address is bserrell@aol.com

**American Association of Museums
Committee on Audience Research and Evaluation (CARE)**

**Call for Proposals for the
2006 CARE Roundtable of Ideas: Current Trends in Visitor Studies**

**To be held at the 2006 AAM Annual Meeting in the Sheraton Boston Hotel, 39 Dalton Street Boston, MA 02199
Saturday, April 29, 2006 from 12:15 p.m. to 1:45 p.m.**

Purpose

The Roundtable venue allows for a rich, one-on-one exchange between new and experienced practitioners not possible in the larger session format. The mission of this event is to:

- showcase audience research and evaluation work currently being undertaken in and for museums.
- encourage museums of all sizes and types to engage in audience research and evaluation.
- present information on the related areas of museum audiences and museum programs and exhibitions, to encourage museum professionals to seek generalizations, trends, and principles that can guide efforts to improve practice.
- feature studies and programming responding to community or contemporary issues, programming beyond the walls of the museum, innovative museum/community partnerships, and the use of technology to reach new audiences.

Presenters

Museum staff, consultants, museum studies faculty, and students who are members of CARE and registered for the AAM Annual Meeting are eligible to participate. CARE encourages students and professionals who have done work on visitor studies, audience research and exhibit or program evaluation to share their methods and findings with their colleagues.

Tabletop Presentation

Each presenter will prepare a poster or other form of display, handouts, and other materials as relevant. Displays will be on view concurrently during the 90-minute session. Visitors to the session will be invited to walk from display to display, read the posters and other materials, and interact with the presenters. Presenters must be knowledgeable about the study and available throughout the session for discussion.

Current Trends 2006: Audience Research and Evaluations

Presenters are encouraged to submit an abstract and a 5-8 page paper describing the evaluation project for publication in Current Trends 2006: Audience Research and Evaluation. Accepted presenters will receive submission guidelines and contact information for this publication.

Scholarships/Fellowships are Available

CARE is offering two Scholarships/Fellowships to the 2006 Annual Meeting. Awards are \$1,000 each and are intended to support conference attendance of individuals who are interested or active in the field of audience research and evaluation. Fellowships will be awarded to students or professionals who are CARE members and who have never before attended an AAM Annual Meeting. Preference will be given to applicants who are presenting in either a panel or poster type session (both session types are equally weighted). Please contact Keni Sturgeon at Keni-Sturgeon@brown.edu for more information.

Application Deadline: February 1, 2006

If you would like to participate in the CARE Roundtable please email Wendy Meluch for an electronic copy of the application form: wendy@visitorstudies.com

Fax/phone: 415.897.4051

Post: Wendy Meluch, CARE Roundtable Co-Chair

We're about Belonging

VSA invites you to become a member today. Join us, and take advantage of up to the minute information, opportunities for growth and the value of belonging to the organization that is about the visitor.



Visitor Studies Association

MEMBERSHIP BENEFITS INCLUDE:

Visitor Studies Today – VST published 3 times per year, is the premier publication of the Association which contains peer-reviewed articles and announcements of interest to VSA members.

E-Newsletter – For members only, our bi-monthly e-news contains reports of VSA programs and services, exciting opportunities for VSA involvement, and updates and announcements from other organizations that focus on visitors, museums, and informal learning.

Vote – All members in good standing are entitled to a vote on the board membership and any other matters which come to the full membership for vote.

Conference and Workshop Discounts – Percentage discounts for conference activities and training opportunities.

Membership Directory – A complete directory of all current VSA members.

Choice of Printed Recognition – Supporting, Sustaining and Patron members can choose how they'd like to be recognized for their support from a menu of options.

Board Reception – Supporting, Sustaining and Patron members are also invited to join the VSA board of directors at an irresistible reception. This is an exclusive opportunity to network with some of the most interesting, engaging, and progressive people in the profession and to receive recognition for your support.

VSE at VSA – A Very Special Event for Sustaining and Patron members will showcase one of the most outstanding attractions at the annual conference location. This is an exciting opportunity to interact with other invited special guests in a unique and memorable setting.

Customized Event – We honor our Patron level members with an exclusive recognition event. VSA will treat you to a wonderful and memorable experience, tailored just for you.

VISITOR STUDIES ASSOCIATION MEMBERSHIP CATEGORIES:

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FULL	\$100	✓	✓	✓	✓	✓	✓				
SUPPORTING	\$250	✓	✓	✓	✓	✓	✓	✓	✓		
SUSTAINING	\$500	✓	✓	✓	✓	✓	✓	✓	✓	✓	
PATRON	\$1000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
STUDENT/RETIRED*	\$30	✓	✓	✓	✓	✓	✓				
INSTITUTIONAL**	\$300	✓	✓	✓	✓	✓	✓				

* Student membership requires evidence of current and active enrollment in a degree granting program.

** Institutional members receive benefits for up to 4 people in one organization.

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Skyline, Downtown Grand Rapids

Photo by Brian Kelly



Van Andel Museum Center of the Public Museum of Grand Rapids

We hope to see you
next July in
Grand Rapids, Michigan
for the
Visitor Studies Association
annual conference.
For further information,
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We look forward to hearing from you!

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Visitor Studies Today is a peer-reviewed international journal that publishes high-quality articles focusing on visitor research, visitor studies, evaluation studies and other subjects related to museums and out-of-school learning environments. It is published by the Visitor Studies Association.

The *Visitor Studies Association* promotes understanding visitors as a tool to enhance the experience of the visitor in informal learning environments, such as aquariums, museums, historic sites, nature centers, parks, science centers, zoos, art galleries and similar institutions.

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