Animal Secrets Exhibit
A Summative Evaluation Report

Prepared for

OMSI
OREGON MUSEUM OF SCIENCE AND INDUSTRY

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with the generous support of

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EXECUTIVE SUMMARY

Introduction

The Oregon Museum of Science and Industry (OMSI), with major funding from the National Science Foundation, developed the *Animal Secrets* exhibition for children ages 3–8 and their families. The exhibition seeks to provide families with an opportunity to discover nature from an animal's point of view as they explore immersive, naturalistic environments including a meadow, stream, woodland, cave, and naturalists' tent. Two 2,500-sq.-ft. versions of the exhibit were created—one for travel and one for permanent installation at OMSI. (See a detailed exhibit description in Appendix A.)

Early in the project the team identified a "big idea" to guide development of exhibit activities: "Visitors will develop a sense of wonder about nature by exploring the secret world of animals." In addition, the project had the following primary goals:

1. Offer young children rich opportunities to develop science process skills and gain an understanding of basic concepts in the natural sciences,
2. Raise the awareness of parents of young children about their role in their children's learning and development and the importance of playing an active role,
3. Provide parents of young children with the tools and techniques needed to encourage their children's interest in science,
4. Encourage families to explore the natural world.

Overview of Study

Dr. Lorrie Beaumont and her evaluation team conducted four separate studies of the exhibition, both the permanent version and the traveler, at OMSI and at the Austin Children's Museum (ACM) according to the following schedule:

Exhibit Version	Study Phase	Dates of Study
Traveling	Remedial (at OMSI)	3/31/06–4/1/06
Permanent	Remedial (at OMSI)	9/22/06–9/23/06
Traveling	Summative (at ACM)	11/3/06–11/4/06
Permanent	Summative (at OMSI)	1/25/07–1/26/07

This report discusses the summative studies of both the permanent version and the traveler.

Demographics

Respondents were families with children ages 0–8 who visited the Oregon Museum of Science and Industry or the Austin Children's Museum during the evaluators' site visits. Across the two summative studies data was collected either in person or via a follow-up online survey from well over 250 visitors. Because the team was interested in how Spanish speaking families and non-Spanish speaking families experienced the exhibit and used the English-Spanish labels, special

attention was paid to any Spanish speaking visitors in the exhibits during the site visits to be sure this audience was represented in the data.

Methods

Methods of data collection for both the permanent version and the traveler were relatively consistent. Exceptions are noted below. A critical review of the exhibit was conducted prior to collecting data from visitors. Evaluators used on-site specimen observations with follow-up interviews and online surveys administered approximately one month after the visit. Visitor reaction to and experience with labels in the exhibit were assessed through unobtrusive observation of label use in each of the major thematic areas.

At ACM special attention was given to label use since there were more Spanish speaking visitors. Thus, evaluators followed the unobtrusive observation by asking visitors to complete a short questionnaire. A survey of ACM staff was administered at the end of the exhibit's installation in Austin.

Key Findings

Overall Engagement

The Science Playground gallery at OMSI, where the permanent version of *Animal Secrets* was installed, targets 0–6 year olds and ACM targets approximately 0–8 year olds. Findings indicated that the exhibit was appealing across this broad age range. Adult visitors gave high ratings for how the exhibit compared to others they'd seen geared to their child's age. In addition, based on surveys with some of those same visitors a month after their visit, the ratings remained relatively high.

Big Idea

The messages that visitors took away from their experience in *Animal Secrets* indicated that most visitors had understood the intended big idea. These messages fell into several categories:

- Animals and how they live (this was the most frequent interpretation of the exhibit)
- Pretend play, what it is like to be an animal
- A sensory experience—tactile, being able to feel things in nature and get up close
- Empathizing with nature/animals: respecting, understanding and connecting to animals, nature/animals/forest/habitats
- Exploring—finding, searching, looking for what you don't normally see without really looking
- Discovery and interactivity

Meeting Project Goals

Goal 1: Offer young children rich opportunities to develop science process skills and gain an understanding of basic concepts in the natural sciences.

Developers sought to meet this goal by creating an immersive, naturalistic environment with developmentally appropriate activities and play materials. The goal was further supported by ancillary materials (a Teachers' Guide and a Family Guide) and the project Web site. The data from both sites (OMSI and ACM) revealed that children and adults gained an understanding of natural science concepts (e.g., animal behaviors, animal anatomy, habitats, how living things meet their needs for food, water, shelter, safety; interrelationships between living things) through dramatic play. The environment contributed to the richness of the dramatic play, and visitors saw the connections between thematic areas, particularly between the Woods and the Cave.

Developers also sought to create activities in which children could develop and use age-appropriate science process skills, specifically observing, comparing, asking questions, and investigating. The Cave encouraged many observations and we saw strong evidence of science process skills at the Naturalists' Tent.

Goal 2: Raise the awareness of parents of young children about their role in their children's learning and development and the importance of playing an active role.

Developers sought to meet this goal through the development of parent labels with information about how young children learn science and what parents can do to help. Similar information along with simple activities to do at home was also presented in a take-home Family Guide available at the exhibit and on the exhibit Web site. Results were disappointing. Although parents who did read the parent labels found the information useful, few parents overall attended to the parent labels, few Family Guides were picked up, and none of the visitors surveyed online indicated that they had explored the exhibit's Web site.

Goal 3: Provide parents of young children with the tools and techniques needed to encourage their children's interest in science.

With this goal in mind the exhibit team created intentional messages to parents about their role in their child's exploration and learning not only through parent labels but also through activity labels (which modeled techniques such as asking open-ended questions, demonstrating curiosity about nature, and providing nature vocabulary), exhibit design (e.g., components that are sized for adults and children to use together, costumes in sizes for children and adults, and "family-friendly" characteristics), and activities that would prove intriguing to both adults and children (e.g., examining nature specimens in the Naturalists' Lab). The exhibit team intended that as a result parents would interact with their children through play and conversation and that adults would assume a number of roles in this interaction including that of an observer, a supporter of play, or a play partner. The data across both the traveler and permanent exhibit evaluation studies consistently demonstrated that parents were in fact assuming the desired roles. Elements of the exhibit that helped parents support their child's experience included: labels, graphics and murals, the physical design and size of the exhibit (to fit both adult and child), and its inviting layout.

Overall, activities and activity labels were more effective than the parent labels in eliciting desired parent behaviors in the exhibit.

Goal 4: Encourage families to explore the natural world.

Exhibit developers sought to achieve this goal by modeling this behavior in exhibit activities and images, by promoting it in the Family Guide, and by providing pamphlets about regional nature centers in the exhibit itself and on the exhibit Web site. The hope was that as a result of their experience families would at least intend to explore a regional outdoor area or play more in the outdoors. Visitor groups responded quite positively when asked if their experience in the exhibit would likely cause them to visit a nature center or explore the outdoors. Those who responded negatively said it was because they were a family who already explored the outdoors. This was especially true of (OMSI) Portland visitors.

Label Use

Label types most often attended to were labels that identified animals or specimens in the exhibit. Parents also attended to labels that identified activity areas or to labels that posed a question or included a statement that visitors could investigate. Parents found the style and tone of labels friendly and accessible and especially liked those labels that provided clear orientation to the topic or guidance about the general idea of an area. They also appreciated the placement of labels within the exhibit and the brevity of text. In addition, we found that the images of animals were very useful to visitors. Response to bilingual labels was generally very positive at both sites. Spanish speakers used bilingual labels in several ways: to guide their children's activity at the exhibition, to build their children's vocabulary (both Spanish and English), and to help children practice their reading both in English and Spanish.

INTRODUCTION

The Oregon Museum of Science and Industry (OMSI), with major funding from the National Science Foundation, developed the *Animal Secrets* exhibition for children ages 3–8 and their families. The exhibition seeks to provide families with an opportunity to discover nature from an animal's point of view as they explore immersive, naturalistic environments including a meadow, stream, woodland, cave, and naturalists' tent. Two 2,500-sq.-ft. versions of the exhibit were created—one for travel and one for permanent installation at OMSI. (See a detailed exhibit description in Appendix A.)

The primary goals of the project were to:

- Offer young children rich opportunities to develop science process skills and gain an understanding of basic concepts in the natural sciences,
- Raise the awareness of parents of young children about their role in their children's learning and development and the importance of playing an active role,
- Provide parents of young children with the tools and techniques needed to encourage their children's interest in science,
- Encourage families to explore the natural world.

The museum contracted with Lorrie Beaumont Ed.D., Director of Evergreene Research and Evaluation, to conduct a series of evaluation studies of both the traveling and permanent versions of the exhibit. Each version of the exhibit went through a remedial study that focused on how well the individual components were working, whether the content messages were coming through clearly, and whether visitors were enjoying the exhibit. Beaumont and her evaluation team then followed the traveling exhibit to its first venue at the Austin Children's Museum (ACM) where they conducted a summative study to see how well the exhibit was meeting the team's original goals and how it was working for the Austin audience. Lastly, she and her team conducted a summative study of the permanent version at OMSI to determine how well the exhibit was meeting its intended goals and how it was working in the context of its installation in the Science Playground gallery. The four studies were conducted according to the schedule documented in Table 1.

Table 1
Evaluation Study Schedule

Exhibit Version	**Study Phase**	**Dates of Study**
Traveling	Remedial (at OMSI)	3/31/06–4/1/06
Permanent	Remedial (at OMSI)	9/22/06–9/23/06
Traveling	Summative (at ACM)	11/3/06–11/406
Permanent	Summative (at OMSI)	1/25/07–1/26/07

An extensive literature review (Gyllenhaal & Cheng, 2003) and front-end research informed the development of the project framework for measures of success. (See Appendix B.) That framework contributed to the development of more detailed topical frameworks that guided the

evaluation activities throughout the remedial and summative phases. This report focuses on the summative studies done of the traveling and permanent exhibits. Topical frameworks for these are included in Appendix C and D.

Respondents were families with children ages 0–8 who visited the Oregon Museum of Science and Industry or the Austin Children's Museum during the evaluators' site visits. Both weekdays and weekends were chosen by the exhibit and evaluation teams in order for the evaluators to observe a range of typical visitors to the two museums. Across the two summative studies data were collected either in person or via an online Internet follow-up survey from well over 250 visitors. The team was interested in how Spanish speaking families and non-Spanish speaking families experienced the exhibit and used the English-Spanish labels. Thus, special attention was paid to any Spanish speaking visitors in the exhibits during the site visits to be sure this audience was represented in the data.

SUMMATIVE EVALUATION OF TRAVELING EXHIBIT

Methods

Critical Review

Dr. Beaumont, the lead evaluator, and Cecilia Garibay, principal of The Garibay Group, began their site visit to the Austin Children's Museum by conducting a critical review of *Animal Secrets*. As the following quote explains, critical review gives the evaluation team a chance to both familiarize themselves with the exhibition as a whole and carefully study each exhibit component to identify areas that may need special focus during the data collection.

> *An evaluator's critical review is a critique informed by his or her professional experience of how visitors interact with museum environments…although it is not formal or systematic, critical review constitutes legitimate initial assessment. It can identify potential trouble spots and questions that need to be explored through systematic data collection (Raphling, 1995).*

The critical review focused on some of the unique aspects of the traveling version including:

- how changes to the exhibit and labels based on remedial evaluation recommendations affected the visitor experience
- how the setting affected the visitor experience

The layout of the exhibit at ACM presented some challenges for the evaluators. For example, visitors could enter the exhibit from the main hall or from an adjacent gallery that led to several other intriguing exhibits including a designated toddler gallery, a water play area, and a pretend diner. The adjacent gallery could potentially draw visitors out of the *Animal Secrets* exhibit before they explored the Meadow area. A second major challenge was that the museum was unable to accommodate the Naturalists' Tent on the first floor with the rest of the exhibit, so it was installed on the second floor in a gallery that also housed a butterfly exhibit. (See Figures 1 and 2.) This fit well with elements in the Naturalists' Tent that pertained to butterflies. For instance, there is a butterfly net, a poster showing the life cycle of a butterfly, a butterfly mosaic interactive, as well as butterfly specimens in the tent.

Figure 1: Naturalists' Tent at ACM

Figure 2: Butterfly Exhibit Adjacent to Naturalists' Tent at ACM

For a complete floor plan of the exhibit as it was installed in Austin see Appendix E.

Specimen Observations with Interviews

Specimen observations or descriptions are narrative descriptions of behavior or events that can be collected over a short period of time (Irwin and Bushnell, 1980). It is an unobtrusive style of observation in which the researcher observes and records data without interacting with the visitors. This method provided a detailed, sequential account of visitor behavior and of the context within which the behavior occurred.

Data collectors identified a group of visitors as they entered the exhibition and followed them in the gallery for up to 20 minutes. During each of these time samples, the data collector recorded details about the group's interactions and behaviors within each thematic area that they visited. In order to support and extend the specimen observation findings, short interviews were conducted with each group of respondents as they prepared to leave the exhibit or after 20 minutes, whichever came first. These interviews were an opportunity to gather brief demographic information, ask questions about the content messages of the exhibit, and find out what the group seemed to enjoy and what might have frustrated them. The protocol used for this method is included in Appendix F.

Follow-up Online Survey

Each respondent group that was interviewed was asked to consent to a follow-up survey approximately one month after their visit. They provided the interviewer with an e-mail address. In the first week of December respondents were contacted via e-mail and given a link to an online survey where they answered a few brief questions about their visit to *Animal Secrets* and ways in which that may have impacted their family's life since. This survey is included in Appendix G.

Unobtrusive Observations and Surveys

Although the use of labels was noted as part of specimen observations conducted by the evaluation team, Cecilia Garibay conducted unobtrusive observations and administered short questionnaires that focused specifically on better understanding how interpretive label strategies were working. In unobtrusive observations the researcher was able to see how visitors interacted as a group or on their own and how they responded to what they were seeing and doing.

For this part of the study Garibay selected specific areas of the exhibit to observe how visitors used labels as part of their interactions. Specific behaviors were coded (e.g., read out loud, parent uses to direct child's attention, child identifies Spanish vocabulary) for each label. This then allowed Garibay to note the relative frequency of various types of label use.

In addition to studying the use of the various label types, special attention was given to how families engaged with and used the bilingual labels, especially those families who spoke primarily Spanish or who were bilingual (Spanish/English). For those families who were more comfortable speaking Spanish, Garibay interviewed them in their native language.

Survey of ACM Staff

Key staff members at ACM were asked to respond to a brief survey near the end of the exhibit's rental. The survey was developed by ACM's director of education and thus was useful both internally as well as for the purposes of this study. The goal of this survey was to determine the exhibit's overall successes and challenges and to identify issues related to installation, interpretation, and visitor response unique to their audience. This survey is included in Appendix H.

Demographics

ACM Visitors on Site

We collected observation or interview data from a total of 91 visitors (43 were children). It is important to note that during our site visit the museum was not very busy, especially in the afternoons. Staff informed us that attendance numbers had been down recently. The average age of children in our data was 3 ½ years with slightly more girls than boys represented.

Cecilia Garibay surveyed 10 families specifically regarding their use and impressions of the various labels and text in the exhibit. In addition she tracked at least one family in each of the following areas to determine whether or not they attended to labels: the Stream, the Chipmunk Den, the Eagle's Nest, the Raccoon Log, and the Meadow.

ACM Visitors Surveyed Online

We initially collected 23 e-mail addresses from our visitors. Our sample was reduced to 16 respondents as seven of the original e-mails were either returned for incorrect addresses or respondents declined the invitation to participate. Out of those 16, seven visitors actually completed the survey.

ACM Staff Survey Respondents

Thirty members of the Austin staff were asked to complete their survey and 11 participated, a 37% response rate. Staff that participated included education, exhibit and marketing coordinators, and gallery educators.

Key Findings

Experience in Each Thematic Area

Average time spent in the main exhibition installed on the first floor (Woods, Cave, Meadow, and Stream) was approximately 8 minutes. Average time spent in the Naturalists' Tent (installed on the second floor) was approximately 5 minutes. The areas where visitors seemed to linger were the Raccoon Log, Eagle's Nest, and Chipmunk Den (all found in the Woods thematic area). In all three cases there was quite a bit of dramatic play, often including parents.

Most visitors we observed entered the exhibition from its designated entrance (*Animal Secrets* sign). However it should be noted that visitors could enter the exhibit from the main hall or from

an adjacent gallery. (See Figure 3.) This made it challenging for data collectors to "hang on" to visitors during their time in *Animal Secrets* as they often briefly explored and then moved into the adjacent galleries. In a few cases we noticed that they returned later; however, by then data collectors were engaged in an observation of a new visitor group.

Figure 3: First Floor Exhibit Layout at ACM

Given the challenges of the exhibit layout, we were interested to see what drew visitors in. At which interactive area did they begin their exploration? Of those that we tracked in the main gallery on the first floor:

- 43% began at the Discovery Tree (nearest to the gallery's main entrance)
- 11% began at Eagle's Nest
- 11% began at the Raccoon Log
- 11% began at the Meadow
- 11% began at the Cave
- 13% began at the Stream

The Meadow, the one thematic area that was unique to the traveling exhibit, was visited, but because of its placement at the end of the gallery many visitors missed it because they exited to the adjacent galleries before reaching the Meadow. It tended to be noticed most often when visitors entered from those adjacent galleries, since it was the first major area they saw.

Overall Experience in the Exhibition

Clearly visitors enjoyed the exhibit as ratings were high. Based on interviews with 17 visitors immediately after their experience in the exhibit, the average rating was 4.5 out of a possible 5 for how the exhibit compared to others they'd seen geared to their child's age. In addition, based on surveys with seven of those same visitors a month after their visit, the rating remained relatively high at 3.9 out of 5. Reasons given for the high ratings included the way the exhibit was laid out (*"It's chunky."*). In one of the few low ratings, the parent stated that their child (2-years old) was "*just too young for this*." They were in the Naturalists' Tent.

Separating the Naturalists' Tent from the rest of the exhibit revealed an interesting finding about parents' perceptions regarding their children's science learning. Many people that we interviewed in the main gallery on the first floor used words like *animal habitats, animal survival,* and *animal homes* to describe the science concepts their children were learning. The ones we interviewed upstairs in the Naturalists' Tent tended to use words such as *identification, measuring*, and *biology* to describe their children's learning. More of the science process skills were evident here where visiting families looked through microscopes, compared sizes of shells, and weighed or measured specimens.

As in the other phases of this exhibit's evaluation, we saw families move between the Chipmunk Den, Raccoon Log, and Eagle's Nest as though they were part of the same environment. There was not as strong a connection to the Meadow. This was likely due to its placement in the gallery.

Overall Messages

The messages that visitors took away from their experience in *Animal Secrets* fell into several categories (similar to the ones discovered in the remedial studies):

1. Animals and how they live (this was the most frequent interpretation of the exhibit)
2. Pretend play: what it is like to be an animal
3. Empathizing with nature/animals: respecting, understanding, and connecting to animals
4. Sensory experience: being able to touch and feel things in nature and get up close to them

Parent-child Interaction

We observed several parents, particularly in the Eagle's Nest, using the murals to facilitate their child's play. The adult, in many cases the mother, would take the role of the mother eagle and "feed" her baby eagle (child). Sometimes she would send the baby to search for food. The interaction was similar at the Raccoon Log where adults would take the role of the parent raccoon and either feed the baby raccoon (child) or send the baby raccoon to search for food.

When we asked parents if there was anything in the exhibit that helped them support their child's experience, they mentioned the following:

- Labels—"*told me how to play*"
- The graphics and murals—showed them what to do or how to initiate dramatic play
- The exhibit fits both parents and children—they can explore together
- Layout of the exhibit—it is inviting

Exploring the Natural World

Visitor groups that were interviewed at the Austin Children's Museum (N=17) responded quite positively when asked if their experience in the exhibit would likely cause them to visit a nature center or explore the outdoors. The average response was 3.75 (out of 5). Those who rated it low said it was because they were a family who already explored the outdoors.

The information about regional nature centers was not available to visitors in the exhibit. Staff at the museum stated that they didn't have room for the table in the Naturalists' Tent where they thought that information belonged so they did not include it. Teachers who brought field trips were given that information as part of their educator packet and visitors who went through a "gallery demo" were provided a handout; however it was not available to the "regular" visitor anywhere in the exhibit.

Audience Expectations

The visitors to the Austin Children's Museum were very fond of the permanent exhibits (mostly focused on physical science), which they described as "interactive." In fact, some told us that *Animal Secrets* was not interactive—at least not in their definition of the word. This suggests that the audience of this museum has specific expectations of the exhibits and the kind of exploration their children will do. They are somewhat dubious about exhibits with a different approach. They had a similar reaction to a traveling exhibit with a cultural theme, labeling it as less "interactive." Hopefully over time and as the museum continues to bring in new traveling exhibitions that take different approaches to "interactivity," visitors' definition of what the term means will be broadened.

Traveling Exhibit Issues

Staff Support

Overall the staff at ACM were pleased with the educational materials and manual provided by OMSI. They also developed new programs to add to the collection. The staff pointed out in their feedback that some of the environments created were not native to their area so they did some additional/supplemental programming to localize the material. For instance, they told us during our site visit that there are no chipmunks in Austin. They did however highlight the bats in the Cave since Austin is famous for the vast number of bats living under one of the city's main bridges.

Layout

As mentioned earlier, staff at ACM were unable to accommodate the entire exhibit environment in one gallery. Thus, they separated the Naturalists' Tent and installed it on the second floor in a nature gallery. It was also challenging to have openings into adjacent galleries in the middle of the exhibit, which caused the Meadow area to be overlooked or missed by many visitors. A strong immersive connection remained between the Stream, Woods, and Cave.

Marketing

Staff at ACM combined the materials provided by OMSI with ones they created themselves to be more regionally specific. The museum was able to partner with a local PBS station that produces a children's program "Big, Wide, World," to come into the museum and provide programming related to animals and nature. There was a large mobile hanging in the main entrance to the museum with images from the *Animal Secrets* exhibit. Staff informed us that these kinds of mobiles are created for each featured exhibit when it opens.

Recommendations

The following recommendations are based on our critical review/walk-through of the exhibit at Austin Children's Museum as well as our interview, observational, and survey data. Overall there were very few issues that needed addressing. Many of the previous revisions to the exhibit, implemented as a result of the remedial study, had already made for a better visitor experience.

- Whose Bones is still challenging for many visitors to figure out, even with adult support. We noted that several things were missing or inconsistent in the field guide leading to confusion. For instance only skulls are shown in the field guide, however there are other bones at "the scene" that are difficult to identify without more clues.

  - Make the clues in the field guide tactile or three-dimensional so they are easier to match. For example the picture of the rabbit fur in the field guide looks like tree bark. A sample of real rabbit fur would be easier to match to the fur in the activity.

  - Have more images and text that give clues about what happened and what to do in the activity. This will be challenging to portray in a sensitive and non-violent way.

  - Provide more direction about what the visitor is to do in this activity. The exhibit manual had great suggestions about how museum staff can facilitate this activity: "use a guided inquiry approach…to help them develop deductive reasoning skills." "Encourage visitors to first identify the bones and then discuss what might have happened to the rabbit." These are the kinds of ideas that could be used to provide more direction for the visitor. The activity cannot depend on staff facilitation to be understood. Other text could be taken from the "Questions for further learning" in the exhibit manual. For instance: "Look at the teeth in the skull?" or "What animal tracks do you see?"

- Some flashlights in the Cave do not point to things of interest. There may need to be more flashlights so that all of the hidden surprises can be discovered.

- The Meadow could benefit from a few more activities. We saw little dramatic play there. There needs to be more opportunities for discovery or the ones already there need to be brought out more. Visitors seemed to be missing the point of that area. The exhibit manual provided some useful "Questions for further learning" that could help enrich the play that

happens in this area. Some of the sounds in the Meadow pods are difficult to hear unless the gallery is very quiet.

- Build an Ant does not seem to get a lot of use or attention. Some visitors told us they did not understand what to do. It needs more direct signage with a few starting instructions.

- Make a Butterfly (in the Naturalists' Tent) gets very little use. The colors may not be inviting; they do not look like butterfly colors. Can there be pictures of butterflies nearby that show various color patterns?

SUMMATIVE EVALUATION OF PERMANENT EXHIBIT

Methods

Specimen Observations with Interviews

In this method, data collectors generally selected a group at the entrance to the Science Playground gallery and followed them unobtrusively in the exhibition for up to 20 minutes. Their choices of respondents were random. Once they were ready to begin a new round of observation they took the next family group that walked into the gallery. During each of these time samples, the data collector recorded details about the group's interactions and behaviors within each thematic area that they visited. In order to support and extend the specimen observation findings, short interviews were conducted with each group of respondents that consented as they left the exhibit or after 20 minutes, whichever came first. In the interviews, data collectors gathered brief demographic information and asked questions about the content message of the exhibit and their overall experience. The protocol used for this method is included in Appendix I.

From the remedial evaluation studies of *Animal Secrets* we knew that often visiting families would complete their visit within the 20 minutes that the data collector was observing them. Thus, in many cases we were able to fully document the visitor experience to the exhibit within our 20-minute time sample. In cases where the visitor stayed in the exhibit under two minutes we decided not to conduct a follow-up interview as we felt they had not had a sufficient enough experience in the exhibition to be able to answer questions.

Observations of Label Use

In the Austin study Cecilia Garibay focused on how families used the labels and text to support their experience in the exhibit. Her methods were replicated in this summative study of the permanent exhibition. Dr. Beaumont and her evaluation team observed six major areas: the Cave, Naturalists' Tent, Raccoon Log, Chipmunk Den, Eagle's Nest, and the Stream to determine the extent to which visitors used various types of labels as part of their interactions. The evaluation team remained in each area for approximately 30 minutes and was able to observe approximately 10–12 groups in each of the areas. Specific behaviors (i.e., glanced, read, or didn't attend) were coded for each type of label.

Follow-up Online Survey

Each respondent group that was interviewed was asked to consent to a follow-up survey approximately one month after their visit. They provided the interviewer with an e-mail address. In the first week of March respondents were contacted via e-mail and given a link to an online survey where they answered a few brief questions about their visit to *Animal Secrets* and ways in which that may have impacted their family's life since. The survey is included in Appendix J.

Additional Methods

This evaluation study followed a naturalistic methodology whereby methods could be adapted, added to, or even eliminated if they were not serving the purposes of this particular exhibit evaluation. Thus, for this phase of the study we introduced two new methods that had not been part of the original evaluation design. These additional methods further clarified and expanded on some of our findings.

Tracking Entrance Patterns

During our remedial site visit in November 2006 we observed many family groups enter the gallery, take a cursory look at *Animal Secrets*, and then head back into the familiar Science Playground area. This made our data collection extremely challenging. We had a hunch that the behavior of visitors had changed with the passage of time and as both adults and children became familiar with *Animal Secrets*. With this in mind, and given the fact that most of the visitors during the summative site visit were regular/repeat visitors, we were curious to see if that pattern had changed. So for one hour on the first day of the site visit Dr. Beaumont tracked the direction visitors went upon entering Science Playground. Did they go to the right, directly into *Animal Secrets*, or to the left, into Science Playground? In addition, she paid particular attention to who in the group initiated the direction, the child or the adult. Results are discussed later in the report.

Naturalistic Observations

Dr. Beaumont conducted several naturalistic observations of particular children that caught her attention because of their interesting behaviors in the exhibit. These "event samples" took place in a variety of locations in the exhibit. Dr. Beaumont would sit or stand out of view of the child and begin recording their behavior until it seemed to end. For example, she watched a six-year-old boy as he tried to negotiate, with another child he did not know, a way to acquire all of the acorns. These observations were useful in revealing how children thought about the exhibit and the complexity of their play.

Demographics

OMSI Visitors on Site

We collected observation or interview data from a total of 127 visitors (50 were children). The average age of children in our data was 3-years with equal numbers of girls and boys represented.

We tracked about 60 family groups to determine whether or not they attended to labels in each of the following areas (10 families per area): the Cave, the Stream, the Chipmunk Den, the Eagle's Nest, the Raccoon Log, and the Naturalists' Tent.

In addition, Dr. Beaumont tracked the entrance behavior of 27 family groups to determine how many went into *Animal Secrets* and how many went directly into Science Playground.

OMSI Visitors Surveyed Online

We initially collected 21 e-mail addresses from our visitors. Our sample was reduced to 18 respondents as three of the original e-mails were either returned for incorrect addresses or respondents declined the invitation to participate. Out of those 18, ten visitors actually completed the survey.

Key Findings

Appealing to a Broad Range of Ages

Although the exhibit was developed for 3–8-year olds, at OMSI *Animal Secrets* is installed in Science Playground, an early childhood gallery designed for 0–6-year olds. (See Figures 4 and 5.) Most of the family groups in our sample had children ranging from babies or toddlers to 4-year olds. That is a wide range developmentally and it can be difficult for a parent to find activities to engage children across that age range. The exhibit, however, does appeal to a broad age range. The following quotes demonstrate the ways in which parents saw the exhibit as appropriate to the needs of their children:

> *The older boy (5) loves make believe and really enjoys the chipmunk outfits and especially the cave and the hollow tree. The little one who is 19 months old just loves the mysteriousness of it all; he especially loves the hidden doors in the tree, opening them up and seeing what's hidden. (SU58)*
> *They like the fact that it is sized for them. (SU510)*

Figure 4: Exhibit Layout 1 OMSI

In our observation debriefs we noted how behaviors in *Animal Secrets* differed across age ranges: 0–2, 3–5, and 6–8. Overall, children in all the age ranges engaged in most of the activities but in different ways and at different levels of understanding. We frequently saw older siblings directing their younger siblings in an activity.

The youngest children seemed to engage in *Animal Secrets* as a sensory experience, doing such things as:

- Touching shells, fur, bark on the side of the Discovery Tree, bark on the Raccoon Log
- Listening to animal sounds coming from the Meadow pods or the Discovery Tree, sounds of water in the Cave
- Feeling water on their hands in the Stream
- Crawling through the exhibit, in and out of the Cave, into the Eagle's Nest or Chipmunk Den, all easily accessible to a crawler.

The 3–5 year olds engaged in:

- Pretend play, dressing in costumes
- Role play, being in a group of "chipmunks" (often children who did not know each other) in the Den discussing their strategies for gathering acorns
- Science process skills such as observation, investigation, comparison, measurement, and experimentation, most often in the Naturalists' Tent, sorting and categorizing specimens in Make a Collection. In some cases children were learning new skills they had not tried before.

  I don't think he had used a magnifying glass before or the computer. (01256)

The 6–8-year olds followed many of the same behaviors as the 3–5-year olds, but they also tended to be the group who most often used the computer kiosk: Paint a Butterfly and Animal Clues. This group spent a good deal of time in the Naturalists' Tent as well.

In our Internet survey we asked parents what it was about the activities in *Animal Secrets* that their children most enjoyed. Most of the responses focused on pretend play and the interactive nature of the exhibit.

> *[He] likes me to make animals talk, and is always drawn to the Cave and the Nest. (01257)*
> *Sitting in the Eagle's Nest, pretending to be an animal, exploring the Cave and pretending it's his. (012616)*
> *Hide and seek in the Cave. (012612)*

Layout in Science Playground (See Appendix K)

Many visitors entered the exhibit at one end, the Naturalists' Tent, which was nearest the entrance to Science Playground. Others were drawn in by the Cave at the back of the hall. From either of those entry points they moved in a non-linear fashion through the exhibit. Particularly, once they were in the Woods or near the Cave they moved back and forth in random ways between the various components. Their movement depended in large part on the "script" they were following in their play.

Figure 5: Exhibit Layout 2 OMSI

The only area we had difficulty observing in great detail was the Stream. Many visitors in our sample left *Animal Secrets* and went into the rest of Science Playground before they discovered the Stream (which was physically separated from the rest of the thematic areas). There seemed to be little understanding from visitors that the Stream was part of *Animal Secrets*. If we did see visitors at the Stream they often came to it from the Science Playground water table and then sometimes continued into the rest of *Animal Secrets*.

At OMSI, data collectors noted which of the major thematic areas and activities families explored. The percentage of family groups that visited selected areas or activities is shown in Table 2. We did not follow all groups for their entire visit; however we did follow most of them.

Table 2
Percentage of Groups Who Visited Thematic Areas or Activities

Exhibit area/activity	**% of groups observed that visited area/activity**
Naturalists' Tent	57%
The Woods	47%
The Cave	44%
Eagle's Nest	23%
Computer Kiosk	12%
The Stream	6%

We can surmise from this data that the Naturalists' Tent was visited by the largest percentage of our sample because it was often the first part of the exhibit they noticed, close to the entrance. In other cases, groups went directly to the Woods or the Cave. Those seemed to be the three attractors into the exhibit. (For the purposes of these observations, we considered the Eagle's Nest as an individual activity even though it is part of the thematic area called The Woods. When referring to the Woods in this table we included the Discovery Tree, Chipmunk Den, and Raccoon Log.)

The Naturalists' Tent has lots of opportunities for family groups to engage in nature study for long periods of time, with many natural specimens to look at, touch, and investigate deeply. Visitors were particularly engaged by the magnifying glasses, the balance scale, sorting shells, and examining bug specimens. The Computer Kiosk in the Naturalists' Tent did not see much activity. This is likely due to the fact that the sample we observed was very young, and the computer may not have been age-appropriate for them (under 2).

The Cave and Woods provided lots of opportunity for exploration and role play as "animals." We often saw "chipmunks" taking their acorns and hiding them in the Cave, or fox puppets joining their "friends" in the Cave. The Eagle's Nest seemed very inviting, especially to the adults who quickly assumed the role of the eagle parent feeding their young. Adults seemed to feel comfortable climbing into the Nest and sitting down to role play with their child.

We were disappointed, however, to see how few of our respondents went to the Stream. We believe this can be attributed to two things. First, many groups left the exhibit and went into Science Playground before noticing the Stream (which was at the opposite end of the hall from the entrance to the exhibit). Second, based on what we observed, the Stream does not seem to feel connected to the rest of *Animal Secrets* for visitors. Visitors often "stumbled" upon it when they were at the water table in Science Playground. Many times we observed children playing there, but, unfortunately, of the 34 groups we sampled, we saw little activity at the Stream.

Recommendations

The following recommendations are based on our final site visit to OMSI to view the permanent exhibit. Because we conducted such an extensive series of studies about this exhibit, each with its

own set of recommendations, we were left with very few to add at this stage. The team has continually improved the exhibit based on previous sets of recommendations.

- There were several requests for labels on the back of fur samples at the Naturalists' Lab. Visitors wanted to be able to identify them. This seemed really interesting to visitors and something they liked to talk to their children about.

- To help improve the cohesiveness of the environment, consider making the snack area (which separates the Cave from the Stream) into a "wooded picnic area" to fit thematically with the exhibit.

- Add slickers/rain coats and hats for the Stream so children can be more realistic naturalists—and keep themselves dry. If a naturalist or hydrologist were working at a stream in the Northwest, he/she probably wouldn't be wearing an apron!

- The Stream is located next to another water play area geared to younger children that focuses on physical science (moving water). Manipulatives move from one area to the other. Consider adding a wall between the two water areas to help separate the activities.

COMPARISON OF TRAVELING AND PERMANENT EXHIBITS

Overall Visitor Response

Visitor families clearly enjoyed themselves in this exhibition. One of the data collectors remarked that visitors she observed seemed so relaxed and happy. We commented that it might be the environmental feel of the "outdoors" that affected this. Across all of our studies of this exhibition (remedial and summative) we have been pleased to see that visitors do use the interactive components in the way the developers intended (Oregon Museum of Science and Industry, 2005). In the literature review written prior to the exhibit's development we recommended:

> *Children in particular respond with excitement to opportunities to put themselves in the environment and not just study it from afar. Efforts should be made to provide natural spaces that can be explored even if they are simulated, not just activity stations. (Gyllenhaal & Cheng, 2003, p.16)*

The exhibition's immersive naturalistic design allowed for that kind of exploration.

Physical Differences that Affected the Experience (Navigation and Flow)

Animal Secrets at Austin Children's Museum—Separated by Floors

At the Austin Children's Museum the layout of the exhibit generally worked well. There was the challenge of multiple exits out of the exhibit that tended to keep visitors from moving all the way through, particularly to the Meadow. In addition the Naturalists' Tent could not be accommodated in the first floor gallery, so it was installed apart from the rest of the exhibit on the second floor. ACM combined it with their butterfly exhibit, which included a small glassed-in butterfly garden and large pictures and charts about butterflies. This fit well with elements of the Naturalists' Tent that pertained to butterflies. For instance, there is a butterfly net and a butterfly mosaic interactive as well as butterfly specimens in the Tent. However, this separated the two major portions of the exhibit from each other and made it difficult for visitors to understand the impact of an immersive environment or the connection between the thematic areas. As mentioned earlier, many people that we interviewed in the main gallery on the first floor used words like *animal habitats, animal survival,* and *animal homes* to describe the science concepts their children were learning. The visitors we interviewed upstairs in the Naturalists' Tent used words such as *identification, measuring*, and *biology* to describe their learning.

Animal Secrets in Science Playground—Sharing a Gallery

The exhibit team was particularly interested in knowing the impact the new exhibit, *Animal Secrets,* was having on the early childhood gallery. *Animal Secrets* takes up approximately half of the Science Playground gallery, and its installation required the removal of several early childhood exhibit components that were part of the original Science Playground. Not surprisingly, when it was first installed in November 2006, many of the regular long-time visitors reacted negatively to having a new exhibit in this gallery. In part they were reacting to the necessary removal of a few

familiar exhibit components in the gallery, most specifically, the Grocery Store. As discussed earlier, we had a hunch that this attitude had changed given that time had passed and visitors had a chance to get to know *Animal Secrets*.

For one hour on the first day of her site visit Dr. Beaumont tracked families as they entered Science Playground to see which side of the gallery they went to (Science Playground versus *Animal Secrets*) and whether the direction they went was child-initiated or adult-initiated. Out of 27 family groups that entered during that hour, approximately 50% went in each direction. However what was most interesting is that of those that went into *Animal Secrets* nearly 100% were initiated by the child, and of those that went into Science Playground approximately 50% of the time it was adult initiated and 50% of the time the child initiated the direction. This data suggests that children are highly attracted to *Animal Secrets* and in the cases where adults initiated moving into Science Playground first, we posited that adults assumed that children would prefer what was familiar.

While most visitors we interviewed were quite positive about the change in Science Playground, some (approximately 34%) had a negative response to the installation of *Animal Secrets* in the gallery. It is important to mention that all of these respondents were members.

> *Everything in Science Playground is mostly toys. Animal Secrets is out of place. (012511)*
> *It uses up a whole lot of room! (012513)*
> *It's a little crowded. There's a lot going on in the area! (01261)*
> *I miss the houses and things for the boys to run through. (01267)*

Many of the respondents who were positive about *Animal Secrets* installation in Science Playground commented on its look and feel.

> *The leaves above their head make it seem separate from the rest of the gallery. (01251)*
> *It's kind of cool. The displays and backdrop are really nice! (01256)*
> *It draws them over here first. (012613)*

This is noteworthy since one of the team's intentions was that the environmental treatment would create the feel of an immersive naturalistic environment. This was certainly a challenge when putting it next to other exhibits in Science Playground that are brightly colored and have a playful and whimsical feel. In the following quote a parent makes an interesting comparison between the two sides of the gallery that has implications for the exhibit's ability to engage children across a wide age span.

> *It is easy to keep the children both together and occupied. In Science Playground they are harder to keep together, there is more energy and they are interested in different things, while in Animal Secrets they stay together. (01257)*

One of our respondents described *Animal Secrets* as "much calmer and more cohesive" than Science Playground and thus easier to keep her children interested in some of the same things at the same time.

We followed up with the OMSI visitors that said they had returned to the museum since we interviewed them in January and asked what brought them back. The results demonstrate what a good fit the *Animal Secrets* exhibit is to this audience's motivations for coming to OMSI. That is, their return visit is frequently child-initiated and they see it as an opportunity to play with their child. Survey responses are described in the table below.

Table 3
Visitor Reasons for Returning to *Animal Secrets*

Reason for returning to Animal Secrets	**Percentage of responses**
Good opportunity for me to play with my child	83.3%
Child requests visit	66.7%
Educational value	16.7%
Child is interested/curious about animals and nature	16.7%

OVERALL PROJECT FINDINGS

This section addresses how well the overall project communicated the "big idea" and achieved its primary goals. In addition, it describes how visitors (Spanish speaking and non-Spanish speaking) to the exhibit used the bilingual labels.

The Big Idea

Early in the project, the team identified a "big idea" to guide development of exhibit activities: "Visitors will develop a sense of wonder about nature by exploring the secret world of animals." The team wanted to know to what extent and in what ways visitors understood the big idea in the final exhibit.

The exhibit team agreed that if families had strong hold times and demonstrated the kinds of behaviors intended by the developers, it would mean visitors had understood and internalized the "big idea" of the exhibit. (See Measures of Success Framework in Appendix B.) There is strong evidence that both of these goals were met as described earlier in this report. Further, during the remedial and summative studies we asked families to tell us what they thought the exhibit was "about" in order to determine the messages they were taking away. For the most part the messages seemed to be consistent across all studies, although it seemed that more of the "animal's point of view" and "empathy for nature" messages were understood by visitors in the two summative studies (Austin, OMSI) as reflected in language parents used in their interview responses. Below is a summarized list of the main messages visitors expressed.

- Animals and how they live (this was the most frequent interpretation of the exhibit)
- Pretend play, what it is like to be an animal
- A sensory experience—tactile, being able to feel things in nature and get up close
- Empathizing with nature/animals: respecting, understanding, and connecting to animals, nature/animals/forest/habitats
- Exploring—finding, searching, looking for what you don't normally see without really looking
- Discovery and interactivity

The exhibit team also agreed that long hold times would be one of the indicators that children had captured the big idea of the exhibit. Data from the study at OMSI shown in Figure 6 compares the number of children with the amount of time spent in the exhibit. Time spent ranged across the sample of 50 children in family groups we observed from 2 minutes to more than 20 minutes. Approximately 25% of the sample stayed 20 minutes or more.

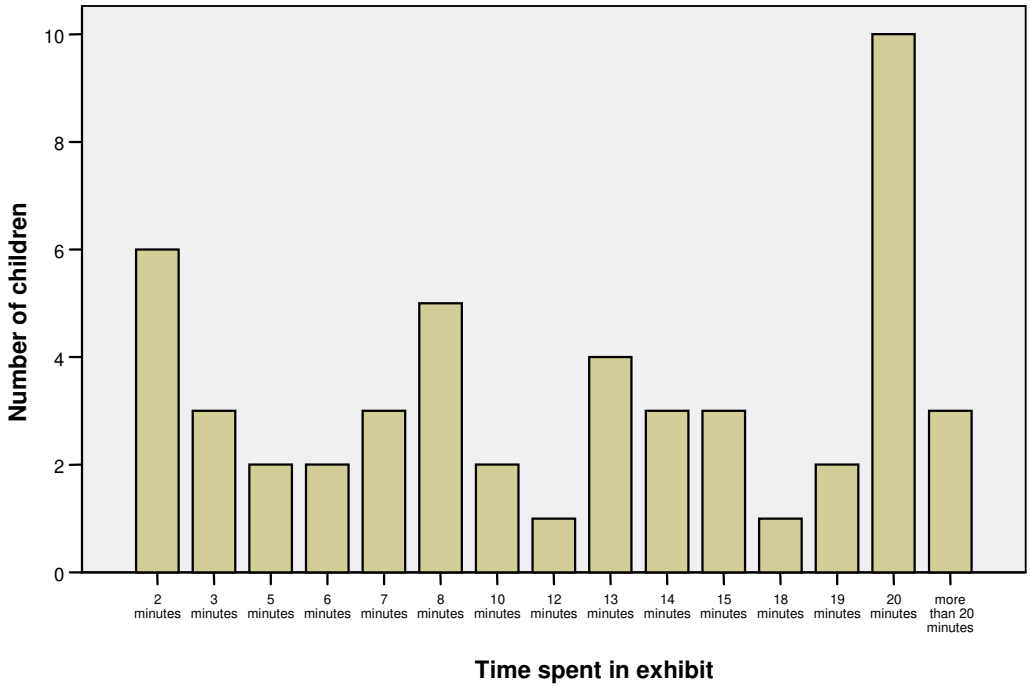

Figure 6: Time Spent in Exhibit by Number of Children

We also compared repeat visitors and first-time visitors at OMSI in terms of average time spent in the exhibit (see Table 4). Although the number of first-time visitors was low, repeat visitors in this study spent more time (14 minutes) in the exhibit than those who were visiting for the first time (10 minutes).

Table 4
Time in Exhibit: Repeat vs. First-time Visitor

Repeat?	**Avg. time**	**N**
No	10.0000	6
Yes	14.2188	32
Total Average = 13.5526		Total N = 38

Project goals

Goal 1: Offer young children rich opportunities to develop science process skills and gain an understanding of basic concepts in the natural sciences.

Developers sought to meet this goal by creating an immersive, naturalistic environment with developmentally appropriate activities and play materials. The goal was further supported by ancillary materials (a Teachers' Guide and a Family Guide) and the project Web site.

Animal Secrets was designed to foster playful discovery and exploration by children and their adult caregivers. Play is an appropriate way for younger children to learn early science concepts (Chaille, 1997; Forman, 1987). Play materials throughout the exhibit included costumes for dressing up like animals; animal puppets; toy animals for dramatic play; collections of shells, rocks, and other natural specimens to sort, compare, and investigate; and tools to measure, weigh, and observe natural artifacts more closely. The exhibit's environment was immersive and naturalistic and used realistic murals, life-sized images of animals, realistic models, and real specimens.

The data from both sites (OMSI and ACM) revealed that children and adults gained an understanding of natural science concepts (e.g., animal behaviors; animal anatomy; habitats; how living things meet their needs for food, water, shelter, and safety; and interrelationships between living things) through dramatic play. (See Figures 7 and 8.) The environment contributed to the richness of dramatic play, and visitors saw the connections between thematic areas, particularly between the Woods and the Cave. We regularly observed children in chipmunk costumes crawling into the Cave, trying to climb the Discovery Tree (although this was not an intended goal for the tree), or children with eagle puppets "flying" across the exhibit to find fish to feed their baby eagle. Chipmunks in the den gathered and sometimes hoarded acorns. We often saw parents putting on puppet shows with the raccoons at the Raccoon Log using the mural as the inspiration for their script.

Figure 7: Mother-daughter Chipmunks

Figure 8: Father-daughter Eagles

Developers also sought to create activities in which children could develop and use age-appropriate science process skills, specifically: observing, comparing, asking questions, and investigating. The Cave encouraged many observations—both intended and unintended. In the Cave, children used flashlights to find hidden wonders on the cave walls. One father told us that

his two-year old kept returning to the Cave just to take another look at a "bee" she had spied on the wall. (He didn't know why she was so intrigued.) Sometimes children in groups used the Cave to test out an echo (i.e., scream) to hear how loud it would sound.

In the Naturalists' Tent in particular we saw strong evidence of science process skills. We saw families engaged for long periods examining the specimens, comparing their weight and length, or looking at them under the magnifying glass. (See Figure 9.)

Figure 9: Families at the Naturalists' Tent

Even very young children were motivated to try out their observation skills with science tools. One three-year-old girl wanted to examine the shells from Make a Collection more closely, so she placed them all into a fold in her shirt and carried them across the room to an area where a magnifying glass hung near a display of butterfly specimens. She put the shells on the floor, reached up for the magnifying glass, and stood on her tiptoes to look through it at the pile of shells. They were too far from the magnifying glass to be seen clearly, but she knew what she wanted to do.

Young visitors were also engaged at Make a Collection in sorting and classifying the various rocks and shells. Parents took the opportunity at interactives such as Whose Tracks and Animal Skulls to read labels and discuss these components with their children. The computer kiosk particularly attracted older siblings who enjoyed the Paint a Butterfly activity (which focused on observing symmetry) most of all.

When we did observe children at the Stream we noticed that the play was rich and varied. Children used the toy animals to make up stories about the animals' lives, how they ate, what they hunted,

etc. This was consistent with behavior at the Austin Children's Museum site as well, even though in the traveling exhibit the Stream has a clear resin "stream" instead of real water. This did not seem to deter children's imaginations in terms of their play with the animals. It seemed they were using the Stream area as more of an animal habitat than a water play area. In the remedial study of the traveling exhibit we had also found that even without water, the Stream was very engaging and popular with children.

In our follow-up online survey we asked parents which specific exhibit activities their children remembered visiting. Activities that were most memorable appear below in this list followed by the percentage of survey respondents that named them (Austin and OMSI combined):

1. The Cave (88.2%)
2. Chipmunk Den (76.5%)
3. Eagle's Nest (70.6%)
4. Animals at the Stream, Discovery Tree, Raccoon Log, and Puppets (58.8%)
5. Butterfly Specimens (52.9%)
6. Naturalists' Lab—scale, specimens, magnifying glass, etc. (47.1%)
7. Whose Tracks, Discovery Tree Puzzle (41.2%)
8. Naturalists' Tent (29.4%)
9. Animal Skulls (23.5%)
10. Whose Bones (17.6%)
11. Make a Collection (5.9%)

We should note that we only included the exhibit activities that were common to the permanent and traveling exhibits. Thus activities in the Meadow (which was only in the traveling version) are not included in this list. Most remarkable in this list is the high percentage of visitors who listed Animals at the Stream. Almost 60% of the survey respondents (n=17) indicated that this was an area their child remembered visiting. While we were unable to observe many visitors at the Stream (especially at OMSI) due to limitations of time and methods, these survey numbers indicate that this was in fact a very popular area.

Goal 2: Raise the awareness of parents of young children about their role in their children's learning and development and the importance of playing an active role.

Developers sought to meet this goal through the development of parent labels (see Figure 10) with information about how young children learn science and what parents can do to help. Similar information along with simple activities to do at home was also presented in a take-home Family Guide available at the exhibit and on the exhibit Web site.

There were five parent labels in the exhibit—one in each thematic area—positioned in locations where children would likely be engaged for longer periods in order to increase the likelihood that parents would have time to read them. Based on formative evaluation, the labels were edited to shorten copy (average length: 41 words). Despite this, few parents read these labels.

Figure 10: Parent Panel

Across the two sites only 17% of respondents attended to parent labels. When questioned about it, several respondents commented that they were too long to read in the context of needing to pay attention to their child—there was just too much activity competing for parents' attention. As one respondent commented, "*When you have little ones you have to go for something quick and at eye-level.*" The few respondents who did read part or all of a parent label, however, commented that the information provided was very useful. In comparing the three parent labels in the figure below, the one attended to most was the "Let's Pretend" (pictured above) text, followed by the "Let's Play" text. The "Let's Go Outside" label was not attended to by any of the respondents in our data set.

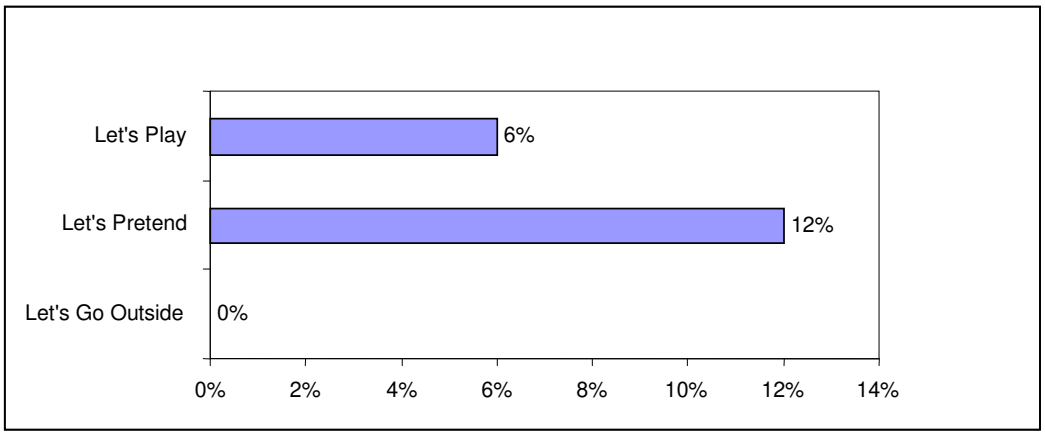

Figure 11: *Animal Secrets* Parent Label Use

Observational data indicated that this difference in attention to parent labels can be attributed to several factors. For example, the "Let's Pretend" label was located near the Chipmunk Den, where parents often stood very near the label while their children engaged in play at the tree. At the Stream area, on the other hand, parents tended to stand farther away from the label and tended to notice it less often. At the Naturalists' Tent, the main focus of the activity was inside the tent and no parents we observed seemed to notice the parent label located just outside the tent. Thus, in general, areas that engaged visitors for longer periods (e.g., Chipmunk Den) were also ones where parents tended to read labels more often. That is in part because they simply spent more time there and engaged in more depth with what they were doing. This was discussed in our literature review:

> *Parents sometimes read labels in greater depth while they are waiting for their children to complete their interactions with the exhibit. This type of use seems to start as a way of "killing time." Parents at least sample the text from the labels they otherwise would have ignored, and keep reading as if it engages their interest. In this case, a well written label may win over some readers who otherwise might not have pursued more information about the exhibit. (Gyllenhaal & Cheng, 2003)*

Perhaps the parent labels in *Animal Secrets* looked longer because of the bilingual copy. In addition, since they were not as directly related to exhibit activities as some of the other labels were (e.g., invitation labels, identification labels), perhaps they did not directly relate to roles that parents typically play in exhibits, such as learning enhancer, explainer, or vocabulary supplier as identified in Dockser's work on parental roles in museums (Dockser, 1989).

We also tracked use of the Family Guides during our site visit to OMSI. We counted the number of Family Guides as well as pamphlets with information on regional nature centers available in the exhibit at the beginning of each day and then tracked how many were taken. Results were disappointing. Over the course of the two-day site visit (Thursday and Friday), 16 (out of 46) Family Guides were picked up and 9 pamphlets (out of 46). Staff explained that since the majority of the visitors were repeat visitors or even members, they were less likely to pick up that information. In our follow-up, online survey we asked both ACM and OMSI visitors whether they had picked up a Family Guide. One hundred percent said "No," they hadn't. They were then asked

to respond to a variety of possible reasons why they did not pick up the Family Guide and 100% chose "I did not notice any Family Guides." During our site visit to the Austin Children's Museum we noted that the Family Guide, as well as the information about regional nature centers, was not available for visitors, so we were unable to determine the frequency of their use or whether or not these made a difference in the experience. At ACM, teachers who brought field trips were given that information as part of their educator packet and visitors who went through a "gallery demo" were provided a handout. However, these were not available to the "regular" visitor anywhere in the exhibit that we noticed.

In our post-visit survey we asked OMSI visitors if they had been to the *Animal Secrets* Web site and what they thought about it. Unfortunately 100% of our sample of 10 said that they had not visited the Web site.

Goal 3: Provide parents of young children with tools and techniques needed to encourage their children's interest in science.

With this goal in mind the exhibit team created intentional messages to parents about their role in their child's exploration and learning not only through activity labels (which modeled useful techniques such as using open-ended questions, demonstrating curiosity about nature, and providing nature vocabulary) but also through exhibit design (e.g., components that are sized for adults and children to use together, costumes in sizes for children and adults) and activities that would prove intriguing to both adults and children (e.g., examining nature specimens in the Naturalists' Lab). The exhibit team intended that as a result parents would interact with their children through play and conversation, and that the adults would assume a number of roles in this interaction including that of an observer, a supporter of the play, or a play partner. The exhibit team used the characteristics of "family-friendly" exhibits as identified by the PISEC researchers to guide the development of exhibit components and foster parent-child interactions. According to the PISEC study (Borun & Dristas, 1997) "family-friendly" exhibits should be:
1) multi-outcome, 2) multi-user, 3) multi-sided, 4) accessible to both children and adults,
5) served by easily readable text, and 6) relevant to visitor's existing knowledge or experience.

The data across both the traveler and permanent exhibit evaluation studies consistently demonstrated that parents were in fact assuming the desired roles. Some of the parental behaviors we observed are listed below:

- Encouraging imaginary play
- Participating in pretend play/role play, e.g., "growling like a fox"
- Providing information, asking questions, making suggestions
- Following the child's lead
- Modeling how to use or do something (e.g., puppet, balance scale, sorting shells, using flashlights in the Cave)
- Observing their child's play

At OMSI we watched as a father "climbed" the Discovery Tree to show his 2-year-old daughter where the bird sound was coming from. While the tree was not intended to be climbed, this father seemed to forget himself in an effort to demonstrate the realistic elements in nature (birds are

perched high in trees, out of harm's way). At ACM, we watched a mother sitting in the Eagle's Nest for 20–30 minutes playing out the role of the mother eagle, feeding her son/baby eagle and then sending him out to hunt for more fish. He usually went straight to the Stream, a seemingly intuitive act on the part of this child. Children and adults alike regularly crawled in and out of the smaller opening to the Cave. These are just a few examples of how adults let themselves become part of the play.

We asked parents in our interviews if there was anything that helped them in their abilities to interact with their child in the exhibit. Parents mentioned the following key aspects of the exhibit design that affected their interaction and ability to play with their child, "key" because all of these aspects were intentionally designed by the exhibit team.

- Feeling as if they were being invited to participate
- Having exhibit components that "fit" them (e.g., Eagle's Nest, tunnel out of Cave)
  Everything is low to the ground, comfortable for me to sit and kneel next to— carpeted and feels clean (012616)
- Knowing what their role should be
- Feeling as though the exhibit was not just for "my child but it's for me too."
  Adult [chipmunk] vests were a great idea. (012617)

Goal 4: Encourage families to explore the natural world.

Exhibit developers sought to achieve this goal by modeling this behavior in exhibit activities and images, by promoting it in the Family Guide, and by providing pamphlets about regional nature centers in the exhibit itself and on the exhibit Web site. The hope was that as a result of their experience families would at least intend to explore a regional outdoor area or play more in the outdoors. That was a difficult goal to assess. At the end of the interviews during the site visit to OMSI we asked visitors if experiencing the exhibit would have an effect on their interest in nature and the outdoors. The data below shows that more people said it would have a positive effect on their interest in the outdoors. Those who said it wouldn't increase their interest stated that it was because they already had a high interest and were very active in the outdoors.

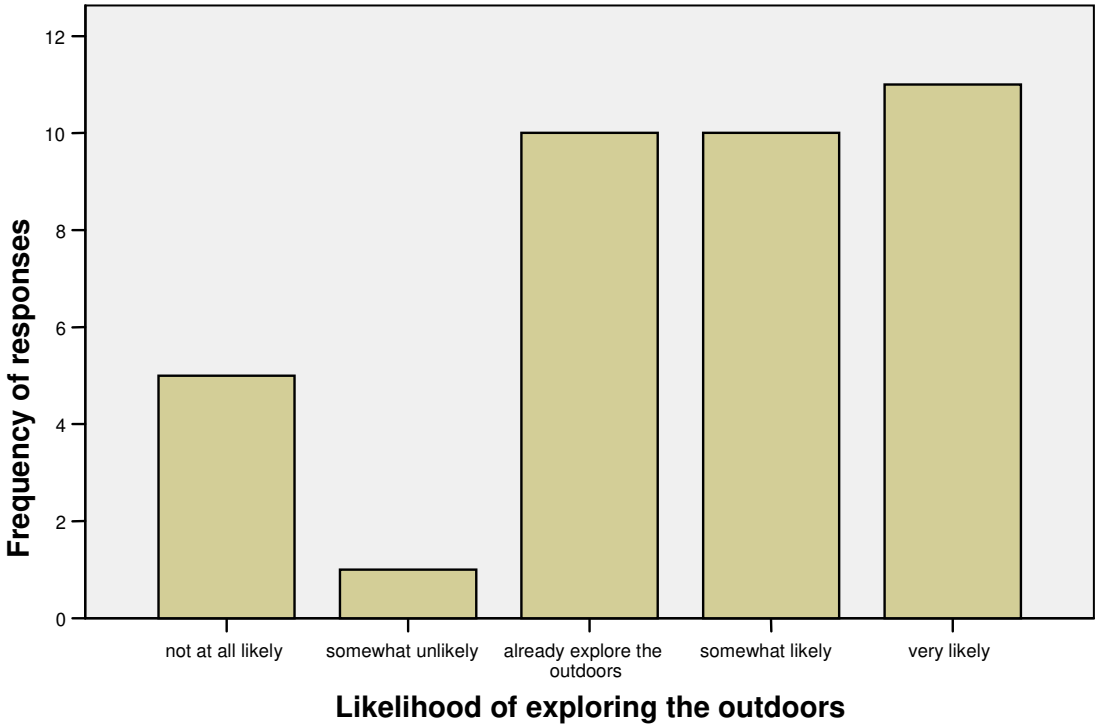

Figure 12: Likelihood of Exploring the Outdoors after Visiting the Exhibit

In the post-visit Internet survey we asked visitors in what ways they thought the exhibit had impacted their family's experiences in nature. Responses were very encouraging in regards to the exhibit's impact.

> *My daughter remembers the animals from the exhibit and now looks for them when we're out in the woods. (SU131)*
>
> *We have been more observant of animal tracks. We like to pretend we know what animal sounds are when we hike. (SU132)*
>
> *I was raised in a very rural setting so I love to tell them stories of my childhood, and it all connects because of the exhibit. (SU135)*
>
> *I think [the exhibit] has made them more aware of things in nature, like birds singing, squirrels, etc. (SU137)*

Labels

The *Animal Secrets* exhibition used a number of different types of labels and text to support the visitor experience, beyond the more traditional exhibit labels (Identification or Title). They are shown in Figures 13–18, followed by a brief description of their purpose:

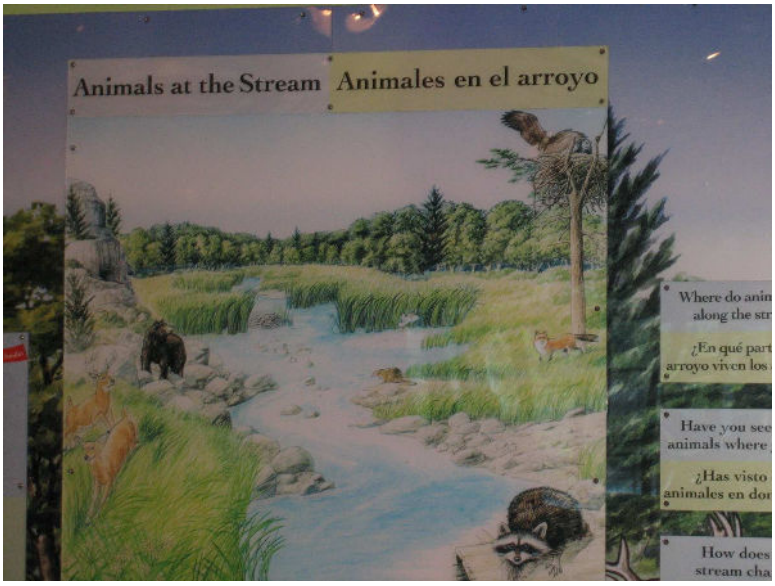

Figure 13: Title 1—Briefly identifies the main idea or subject of an activity.

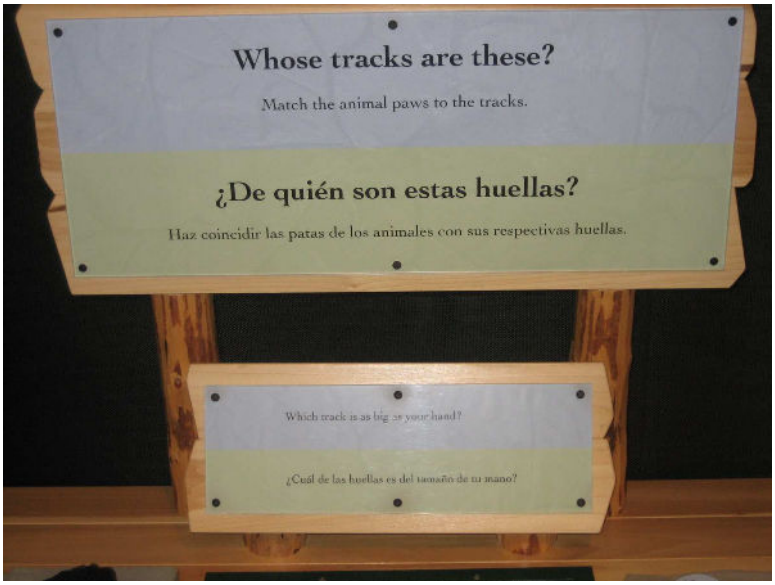

Figure 14: Title 2—Overall question or statement designed to be answered or investigated through the activity, an invitation.

Figure 15: Body 1—Cues visitor to specific activity to carry out.

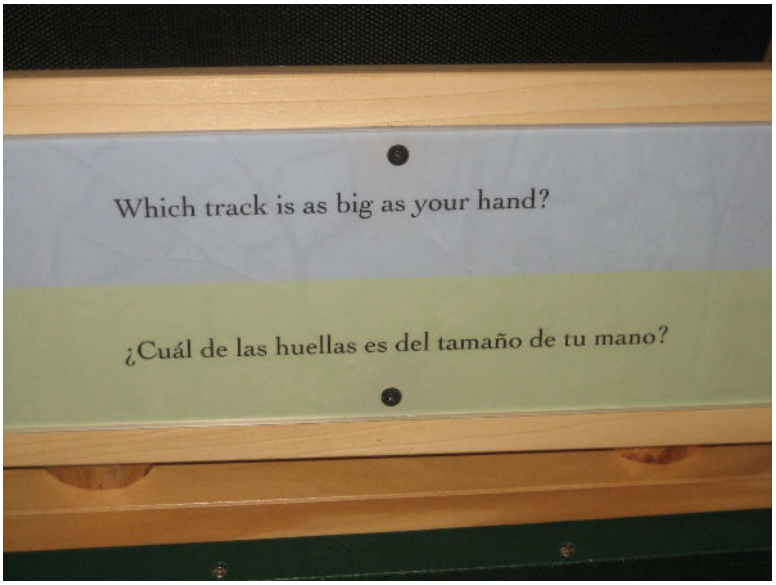

Figure 16: Body 2—Provides more detailed directions, natural science content, and relevance to visitor's life experiences.

Figure 17: Parent Panel—Information directed to parents regarding how children learn science and how parents can support them.

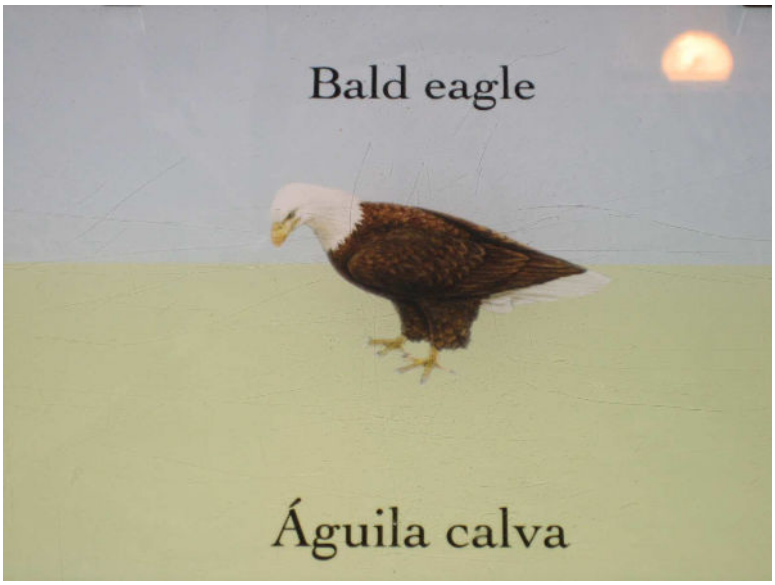

Figure 18: Identification Label—Identifies animals shown in illustrations, specimens, etc.

We collected data about label use in each of our evaluation studies. The remedial findings were used to improve the writing or placement of the labels. Findings we report below synthesize the summative studies of both the permanent exhibition at OMSI and the traveling version at the Austin Children's Museum.

Label Use

Label types most often attended to were "Identification," "Title 1," "Title 2," and some "Body 2" labels (see Figure 19). Identification labels may have been used the most because they directly support one role that parents typically play in exhibits, that of "vocabulary supplier" (e.g., "What's this?" "It's a praying mantis."). Beyond identification labels, parents particularly attended to ones that identified the activity area or topic or to those labels that posed a question or included a statement that visitors could investigate.

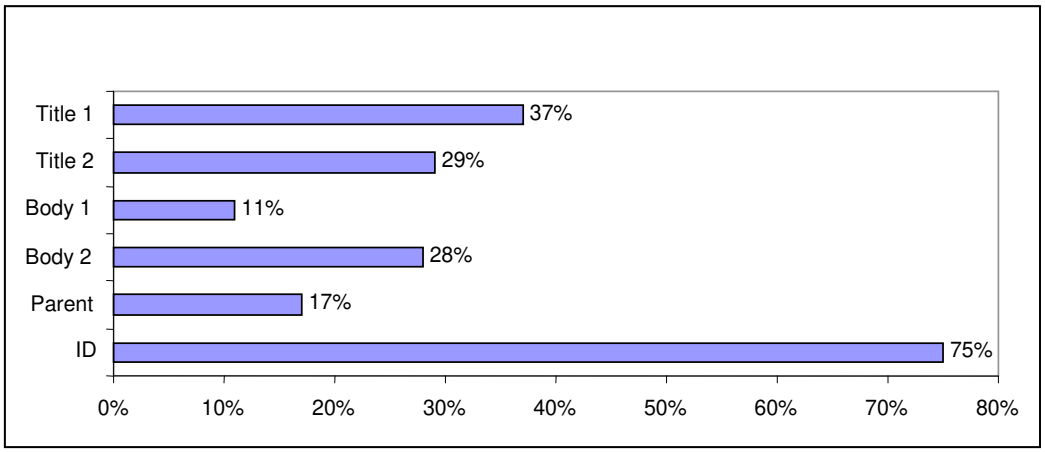

Figure 19: *Animal Secrets* Label Use by Label Type

While "Title 2" labels were used less often than "Title 1" labels, parents often commented on the usefulness of "Title 2" information, such as "*Be an eagle*" or "*Get ready for winter—like a chipmunk*." These seemed especially successful with parents because they provided cues that helped parents facilitate their children's experiences in the exhibition. Parents clearly used labels to guide their children's interactions. We consistently observed parents use labels to direct children's attention, convey key information (e.g., what eagles do or eat), and engage in conversation.

When comparing label use by exhibition area, those most attended to include the Raccoon Log (91%), Chipmunk Den (84%), and Stream (70%), followed by the Naturalists' Tent area (66%). (See Figure 20.) In large part, these areas seemed to get the most use because of three reasons: a) label placement relative to where activity took place, b) number of labels available in that area, and c) the relative amount of time families seemed to spend in some of these areas (we observed long stay times at all three of these areas).

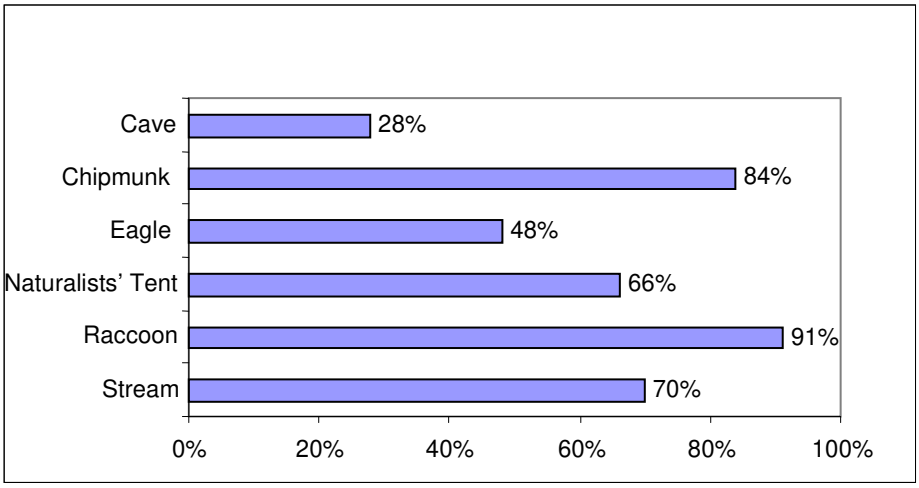

Figure 20: *Animal Secrets* Label Use by Area

Since only the traveling version of *Animal Secrets* included the Meadow area, that information appears below in Figure 21.

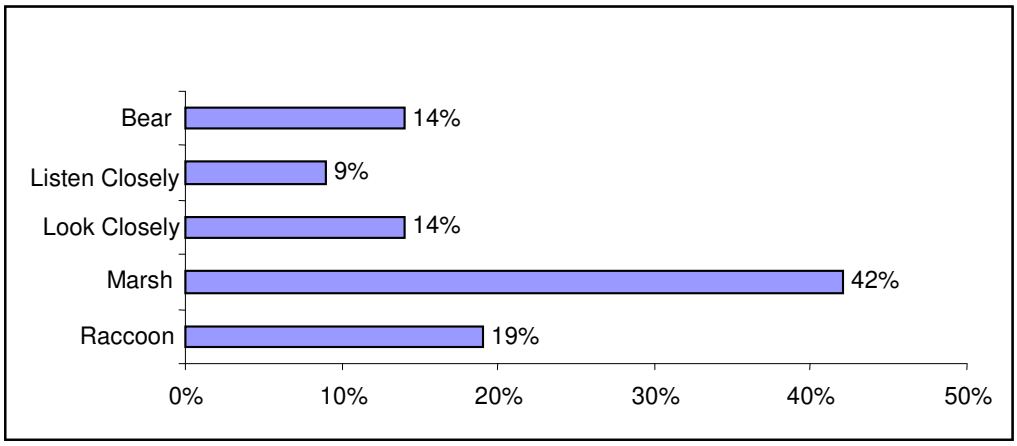

Figure 21: *Animal Secrets* Meadow Area Label Use

Style and Tone

Parents found the style and tone of labels friendly and accessible and especially liked those labels that provided clear orientation to the topic or guidance about the general idea of that area. As one respondent commented:

> *[The text] helps me understand what they are supposed to do—what they are looking at. [It] helps me recognize the animals. (01269)*

They also appreciated the brevity of the text (easy to read at a glance) and its approach, which some parents indicated was "*easy enough*" to read directly to children.

> *They were short and easy to read. (01254)*
> *They were short and succinct. (01256)*

We found that many of the images of animals were very useful to visitors. Both parents and children used the images to quickly identify specific animals. Beyond the identification aspects, parents indicated that they used the images to orient them to the general "idea" of the component (e.g., this area is about raccoons). Those labels that illustrated specific animals involved in some specific activity, such as getting food, were also useful to parents as they helped provide visual cues about some of the main ideas to convey to their children.

> *I noticed the pictures. (012510)*
> *The pictures helped. (012612)*

Finally, the interview data revealed that parents noticed and appreciated the label placement.

> *Placement is often in the area where the children are playing and at a child's eye level. (01255)*
> *The fact that they are where I'm watching the kids and I want to do something, I read them—they are nicely positioned. (01257)*

Behaviors Supported by Labels

Labels, in general, supported visitor engagement in various ways. Primarily, they helped to:

- Direct attention to specific units or features (e.g., looking at butterfly specimens, examining tracks)
- Identify specific objects or specimens (e.g., tracks, fur specimens)
- Encourage visitors to engage in specific behavior (e.g., measure yourself)

Labels that posed questions were especially useful in helping caregivers understand ways they could support their children's behavior. While not all parents actually used the questions directly, many commented in interviews that these helped them understand how they might engage their children. As one parent commented, "they [question labels] gave you an idea of what kinds of things you could ask." Another parent said this:

I liked how questions were asked; this helps adults with interaction, asking children a question instead of telling them information [is good]. (01251)

Bilingual Labels

All labels in the *Animal Secrets* exhibit were written in both English and Spanish and were generally well received by visitors. While this study used purposive sampling and survey responses are not statistically generalizable, response ratings do help us see trends in the data. As shown below, at the Austin site, 83% of respondents rated bilingual labels for *Animal Secrets* as either "important" or "very important."

Table 5
Importance of Bilingual Labels to Visitors (ACM)

Rating	Percent
Not at all important	8%
Somewhat important	8%
Important	29%
Very Important	54%

At OMSI, the ratings were slightly lower as seen in Table 7, with 70% rating the inclusion of bilingual labels as either "important" or "very important." The sample size, however, was small, so caution should be used in interpreting results. It is likely, however, that the difference between the Austin and OMSI ratings may be explained by the population visiting each site. In Austin, there was a higher rate of first and second generation Latinos, some who were bilingual or English dominant and others who were primarily Spanish speakers.

Table 6
Importance of Bilingual Labels to Visitors (OMSI)

Rating	Percent
Not at all important	0%
Somewhat important	30%
Important	40%
Very Important	30%

A number of parents commented that given the large Latino population, bilingual labels were important.

[There are] an increasing number of non-English speaking immigrants or visitors. (SU153)

Others often seemed to wonder out loud why this was even a question, noting that of course this was both acceptable and appropriate. One parent, for example, commented that he lived in San Francisco and was used to seeing many people from diverse backgrounds. He noted that as an Asian American, he tried to maintain a few of the customs his grandparents had passed down and he felt that language was one of those. Additionally, parents of Latino heritage we spoke with,

while either fully bilingual or primarily English speaking, appreciated the labels because they provided opportunities for their children to be exposed to Spanish.

> *It enhances young children's exposure to a second language with the assistance of adults. (SU151)*

While response to bilingual labels was generally very positive at both sites, we did note that a few visitors lamented the need for bilingual labels, stating that they wished they were not necessary. Most of these respondents stated that they felt having bilingual labels was a "disservice" or commented that, ultimately, everyone needed to learn to speak English.

Spanish speakers used bilingual labels in several ways:

- To guide their children's activity at the exhibition,
- To build their children's vocabulary (both Spanish and English), especially animal names,
- To help children practice their reading both in English and Spanish.

English speakers whose children were learning Spanish also used the Spanish language labels as a way of building their children's vocabulary or for building their own vocabulary.

> *I liked the Spanish [because] my daughter is learning Spanish. (01267)*
> *The kids were interested in the Spanish words and letters. (01254)*

At least one visiting family recognized the importance of making the exhibit experience more accessible to Latino visitors.

> *Our school has many children who speak Spanish. Although those children are learning English, often times their parents are not. It makes their experience at OMSI more valuable when they are able to read in their native language. (SU156)*

LESSONS LEARNED

This section includes reflections by evaluators and other key team members on selected aspects of the project.

Fostering Parent-Child Interaction

> *Schauble's (2002) work suggests that a major challenge in shaping parent-child interactions is to first decide on the desired level and type of parental involvement, and then design to achieve those goals. (Gyllenhaal & Cheng, 2003, p. 16)*

This exhibit was very intentionally designed for parent-child interaction. The exhibit team's goal for the role of parents in the *Animal Secrets* exhibit was the following:

> *Parents will play multiple roles in this exhibit: observer, supporter of play, and play partner (OMSI, 2005).*

Aspects of exhibit design in *Animal Secrets* that contributed to this included:

- An attractive environment that is inviting to both adults and children, for instance there is a sign in the Eagle's Nest that says "Parents—there's room for you."
- Costumes are sized for both adults and children.
- Parents can quickly identify a role for themselves; they figure out what to do with little direction necessary. Labels with cues, prompts, and suggestions helped those parents who needed a little extra support in their role.
- Many materials are open-ended and science tools are familiar.
- Activities are compelling for children and adults.

Promoting Development of Science Process Skills in Young Children

The activities at the Naturalists' Tent were particularly good at promoting science process skills such as observing, comparing and measuring, communicating and asking questions, investigating, and finding patterns. Science tools (magnifiers, balance scale, etc.) were familiar and both children and adults could easily use them. Especially interesting were the real specimens from nature such as shells, rocks, fur, wood, etc. that families could investigate up close.

Impact of Immersive, Naturalistic Environment on Behaviors

The exhibit was designed with great attention to environmental detail in order to bring the outdoors indoors. Murals and backdrops depicting realistic nature scenes, special lighting effects, nature

sounds (the chirp of a bird or frog, the sound of trickling water), and natural textures, such as those found in the Cave, the Discovery Tree, the Stream, and the Raccoon Log, added to this realistic feel. All of these design features created a feeling of being out in nature and this clearly contributed to the animal role play we observed across thematic areas.

Communicating with Parents in an Early Childhood Exhibit

One of the challenges of the exhibit was designing appropriate ways of communicating messages to parents and other adult caregivers about their developing child and the importance of their role in that development. The team used activity labels to model behaviors, such as open-ended questioning or expressing curiosity about nature, that parents can use to support young children's science learning. They also developed special graphic panels "For Parents" that explicitly addressed how young children learn science and what parents can do to help. This evaluation study has raised an important question about the effectiveness of labels that are targeted specifically to the adult caregiver in the family group, since the "For Parent" panels were rarely read by parents. One lesson is that it may be difficult for parents to attend to "meta" messages with all of the roles they have to play during a museum visit. In addition it may be best to model and embody parent messages in the activities themselves. In the study, activity labels were more likely to be read than parent labels, perhaps because they were more directly relevant to the child's/parent's needs in the exhibit. Thus it would be useful to conduct further research into the use of parent labels in exhibits. For example, a study might look at repeat visitors to see if the use of parent labels changes as parents become more familiar with how to "navigate" an exhibit.

Another challenge was the distribution of take-home materials. There is a need for more evaluation of the effectiveness of take-home guides and brochures. Many exhibits include them, but exhibit developers need to better understand the factors that contribute to their success (i.e., they are stocked in the exhibit, taken by visitors, and used after the visit).

REFERENCES

Borun, M. & Dristas, J. (1997). Developing family-friendly exhibits. *Curator*, 40(3), 178–196.

Chaille, C. and Lory Britain. (1997). *The young child as scientist: a constructivist approach to early childhood science education*. New York: Harper Collins Publishers.

Dockser, L.S. (1989). *Mothers in children's museums: A neglected dynamic.* Unpublished doctoral dissertation, University of Pennsylvania, Philadelphia, PA.

Forman, G. & D.S. Kuschner. (1987). *The child's construction of knowledge: Piaget for teaching children.* Washington, D.C.: National Association of Young Children.

Gyllenhaal, E. and Cheng, B. (2003). *Animal Secrets Literature Review*. Unpublished Manuscript. Oregon Museum of Science and Industry. Portland, OR.

Irwin, D.M., and Bushnell, N.M. (1980). *Observational strategies for child study*. New York: Harcourt Brace Jovanovich College Publishers.

Oregon Museum of Science and Industry (2005). *Animal Secrets Exhibit Descriptions and Learning Objectives.* Portland OR: Author.

Raphling, B. (1995). *The evaluation process used to develop a new way-finding system for the Adler Planetarium & Astronomy Museum*. Unpublished manuscript. Adler Planetarium, Chicago, IL.

Schauble, L. et al. (2002). Supporting science learning in museums. In G. Leinhardt, K. Crowley, & K. Knutson (Eds.), *Learning conversations in museums* (pp. 425–451). Mahwah, NJ: Lawrence Erlbaum.

Appendix A: Exhibit Description

Animal Secrets Exhibit Overview

Where does a chipmunk sleep? What does an eagle feed its young? How do mother bats find their babies in a dark cave? In ***Animal Secrets*** children will find the answers to these questions and more as they explore the hidden habitats and secret lives of forest animals. Through dramatic play and multi-sensory, hands-on activities, children will discover nature from an animal's point of view as they explore immersive, naturalistic environments, including a stream, woodland, meadow, cave, and naturalists' tent.

Animal Secrets is designed for young children (ages 3–8) and their families or caregivers. In the exhibit, children can develop science process skills and discover natural science concepts through play and exploration. Parents and caregivers can also learn ways to foster their children's interest in science. Exhibit activities encourage family interaction and text panels are bilingual (Spanish/English).

Young children are natural scientists, curious about the world around them. ***Animal Secrets*** was designed to encourage this curiosity and foster a sense of wonder about nature. The exhibits in ***Animal Secrets*** provide opportunities for children to develop important science skills, including observing, comparing and measuring, communicating and asking questions, investigating, and finding patterns.

Traveling Exhibition

There are five major thematic areas in ***Animal Secrets***: *The Stream, The Woods, The Meadow, The Cave, and The Naturalists' Tent.*

THE STREAM
Explore a stream habitat and the animals that live there in this highly realistic tabletop stream environment. Large, colorful murals support imaginative play and provide clues to the animals, their homes, and their behaviors.

Animals at the Stream
Create your own stories about the animals that live in and along a stream in this multi-sensory, open-ended activity. Discover caves, nests, dens, and other animal homes in the tabletop stream environment or build your own homes for the toy animals using twigs and sticks.

THE WOODS
Realistic trees and bushes, colorful murals, and natural sounds help create a "woodland clearing," where you can discover animal homes in a larger-than-life tree, crawl into a chipmunk's den, investigate a raccoon's log, or curl up in an eagle's nest.

Discovery Tree
Discover the hidden habitats of forest animals as you explore this larger-than-life oak tree. See how different animals use the tree for food and shelter. Look up in the branches to see a squirrel climbing. Open a door in the tree's trunk to discover a nest of woodpecker chicks, while the father woodpecker searches for insects nearby. Open another door to find the intricate pattern that bark beetle larvae have eaten into the tree. Peek into a rabbit's cozy nest in the tree's roots where baby rabbits are sleeping. Lift a patch of leaf litter to find salamanders, beetles, pill bugs, centipedes, and a toad's den.

Discovery Tree Puzzle
Assemble a large puzzle based on the Discovery Tree. The top layer of the puzzle shows the exterior of the tree. Remove the pieces to see some of the animals hidden in the branches, trunk, and roots—just as in the real Discovery Tree. Put the pieces back to hide the animals once again.

Chipmunk Den
Put on a chipmunk costume and crawl through the roots of the Discovery Tree to find a larger-than-life chipmunk den. Get a chipmunk's eye view of the underground world as you discover a diorama of a chipmunk in its nest. Gather acorns for the winter and then curl up in your cozy den—large enough for adults and children to enjoy.

Raccoon Log and Puppets
Help a raccoon puppet family find food and explore their world—but watch out for the hungry red fox! The raccoon log is large enough for children and adults, and it sits near several "pools" where young raccoons can practice their fishing skills. Search the area for hidden raccoon foods, including fish, frogs, and berries. A detailed mural creates a rich environment and provides clues to real raccoon behaviors.

Eagle's Nest
Explore the secret world of an eagle's nest and act out eagle behaviors, including building a nest, finding food, and caring for eaglets, with a family of eagle puppets. A background mural provides clues about the natural behaviors of eagles, shows a real eagle's nest, and depicts an adult eagle feeding fish to its young.

THE MEADOW
Large murals, clumps of meadow grasses, marshy ground, and natural sounds let you experience life in a meadow.

Follow the Tracks
Follow four winding sets of animal tracks through the meadow to find life-size images of the animals that made them (a chipmunk, raccoon, deer, and bear). Use measuring tapes to compare your size to that of a life-size bear and raccoon. Are you bigger than a raccoon? Smaller than a bear?

Meadow Sounds
Use your listening skills to try to find three animals hidden in the meadow—a frog, a goldfinch, and a mallard duck. Follow their calls and discover their hidden habitats.

Make a Butterfly
Use multicolored mosaic tiles to create your own butterfly wing patterns on two larger-than-life butterflies.

THE CAVE
Experience the cool breezes and secret passageways of a woodland cave. Use flashlights and all your senses to search for animals in the cave. Along the way you'll also find sparkling geodes and other hidden surprises.

Cave Explorer
Become a cave explorer and find animals hidden in the cave. Activate your senses of sight, hearing, and touch to learn more about cave life, including a mother fox and her pups, an owl, a raccoon, and a colony of little brown bats.

See in the Dark
Search for eerie salamanders, fish, crickets, and spiders that live in the deepest part of the cave. How many can you find?

Whose Bones?
Outside the cave on a rocky ledge, you'll find clues—bones, tracks, and fur—to an animal whodunit. Use the clues, a magnifier, and a field guide to figure out what you think might have happened.

Build an Ant
Just outside the cave you can put together a three-dimensional, larger-than-life ant! Work as a team to put the pieces together and learn about ant anatomy.

THE NATURALISTS' TENT
You're the naturalist as you use science tools to explore nature in this canvas naturalists' tent, outfitted with real field equipment that makes it seem as if the naturalist has just stepped out for a minute.

The Naturalist's Desk
Pick up information about local nature parks and programs.

Naturalists' Lab
At three activity stations you can use different science tools to examine and compare real specimens, including insects, fur, wood, and shells.

> **Balance Scale**
> Choose specimens and use the balance scale to compare them. How many small shells does it take to balance one large shell?
>
> **Magnifiers and Light Table**
> Use the light table and magnifiers to examine and compare different specimens. Which ones let light through? Which ones don't? Then compare the magnifying power of two different hand lenses.
>
> **Measuring Tools**
> Use a ruler or a measuring tape to compare the size of different specimens. What's the biggest specimen you can find? The smallest?

Animal Skulls
Examine, compare, and contrast the characteristics of five different animal skulls—a chipmunk, bald eagle, raccoon, black bear, and white-tailed deer. Use the clues provided and your own observations to guess which skull belongs to which animal.

Make a Collection
Put together your own museum collection! Choose from a variety of fascinating and beautiful natural artifacts, including rocks and shells. Organize your collection and place the artifacts in a special display case for others to view.

Whose Tracks?
The naturalist has made casts of six different animal tracks—a beaver, raccoon, bear, fox, deer, and eagle. Can you match the paw-like puzzle pieces to the tracks to figure out which animal made which track?

Butterfly Specimens
Use a magnifier to examine a stunning collection of real butterflies, which illustrate the infinite variety of wing patterns. Look through a Wentzscope to discover the intricate details in a butterfly wing.

Permanent Exhibition

There are four major thematic areas in ***Animal Secrets***: *The Stream, The Woods, The Cave, and The Naturalists' Tent.*

THE STREAM
Explore a stream habitat and the animals that live there in this highly realistic tabletop stream environment, complete with running water. Large, colorful murals support imaginative play and provide clues to the animals, their homes, and their behaviors.

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Create your own stories about the animals that live in and along a stream in this multi-sensory, open-ended activity. Discover caves, nests, dens, and other animal homes in the tabletop stream environment or build your own homes for the toy animals using twigs and sticks.

THE WOODS
Realistic trees and bushes, colorful murals, and natural sounds help create a "woodland clearing," where you can discover animal homes in a larger-than-life tree, crawl into a chipmunk's den, investigate a raccoon's log, or curl up in an eagle's nest.

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Tree-Root Tunnel
Explore another underground passageway as you crawl through the roots of a giant tree.

Raccoon Log and Puppets
Help a raccoon puppet family find food and explore their world—but watch out for the hungry red fox! The raccoon log is large enough for children and adults, and it sits near several "pools" where young raccoons can practice their fishing skills. Search the area for hidden raccoon foods,

including fish, frogs, and berries. A detailed mural creates a rich environment and provides clues to real raccoon behaviors.

Eagle's Nest
Explore the secret world of an eagle's nest and act out eagle behaviors, including building a nest, finding food, and caring for eaglets, with a family of eagle puppets. A background mural provides clues about the natural behaviors of eagles, shows a real eagle's nest, and depicts an adult eagle feeding fish to its young.

THE CAVE
Experience the cool breezes and secret passageways of a woodland cave. Use flashlights and all your senses to search for animals in the cave. Along the way you'll also find sparkling geodes and other hidden surprises.

Cave Explorer
Become a cave explorer and find animals hidden in the cave. Activate your senses of sight, hearing, and touch to learn more about cave life, including a mother fox and her pups, an owl, a raccoon, and a colony of little brown bats.

See in the Dark
Search for eerie salamanders, fish, crickets, and spiders that live in the deepest part of the cave. How many can you find?

Whose Bones?
Outside the cave on a rocky ledge, you'll find clues—bones, tracks, and fur—to an animal whodunit. Use the clues, a magnifier, and a field guide to figure out what you think might have happened.

THE NATURALISTS' TENT
You're the naturalist as you use science tools to explore nature in this canvas naturalists' tent, outfitted with real field equipment that makes it seem as if the naturalist has just stepped out for a minute.

The Naturalist's Desk

> **Computer Kiosk**
> The kiosk offers a variety of information and activities for parents and children. In Explore the Exhibit, you'll find information about ways that parents and other caregivers can encourage their children's learning and play in the exhibit. This material is based on information found in the Take-Home Family Guide and the exhibit panels "For Parents." In Activities, you'll find two interactive games to explore: "Animal Clues" and "Paint a Butterfly." In "Animal Clues," you can use your observation and comparison skills to discover what kinds of sounds and tracks different animals make. In "Paint a Butterfly," you can paint a butterfly to match a real butterfly or create a pattern of your own. In Explore Nature, you will find information about local nature parks and programs, so you

can continue exploring nature outdoors. Traveling Exhibit tells you where the traveling version of *Animal Secrets* is headed.

Brochure Rack
Pick up information about local nature parks and programs.

Naturalist's Diary and Magnified Specimens
Discover how a naturalist makes and records her observations. View real specimens up close just as a naturalist would. What observations do you have?

Naturalists' Lab
At three activity stations you can use different science tools to examine and compare real specimens, including insects, fur, wood, and shells.

Balance Scale
Choose specimens and use the balance scale to compare them. How many small shells does it take to balance one large shell?

Magnifiers and Light Table
Use the light table and magnifiers to examine and compare different specimens. Which ones let light through? Which ones don't? Then compare the magnifying power of two different hand lenses.

Measuring Tools
Use a ruler or a measuring tape to compare the size of different specimens. What's the biggest specimen you can find? The smallest?

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Make a Collection
Put together your own museum collection! Choose from a variety of fascinating and beautiful natural artifacts, including rocks and shells. Organize your collection and place the artifacts in a special display case for others to view.

Whose Tracks?
The naturalist has made casts of six different animal tracks—a beaver, raccoon, bear, fox, deer, and eagle. Can you match the paw-like puzzle pieces to the tracks to figure out which animal made which track?

For additional details, visit the Animal Secrets Web site at www.animalsecrets.org.

Appendix B: Measures of Success Framework

Project Goals	Project Objectives	Behavioral Measures	Exhibit Characteristics
1. Offer young children rich opportunities to develop science process skills and gain an understanding of basic concepts in the natural sciences (life, Earth, and ecology).	• Children and adults will explore "the secret world of animals" through play, primarily: ▪ exploratory play to acquire information and ▪ dramatic play (as naturalists and as animals) to develop science process skills and empathy for nature. This play will commonly reflect age-appropriate science process skills such as observing, asking questions, comparing, measuring, investigating, and experimenting. (Eisenberg 2000, referenced in Chalufour and Worth, "Discovering Nature with Young Children," 2003) • Children will demonstrate a "sense of wonder" about nature. • Children will exhibit age-appropriate understanding of the content.	• The majority of children will demonstrate relevant play behavior as identified for each activity. • The majority of children will demonstrate excitement for nature (by stating an exclamation such as "wow," "whoa," or "cool," or by squealing with interest or delight in a higher voice or higher volume). • The majority of children will demonstrate age-appropriate understanding of the content. Overall, we agree that if children have strong hold times at the activities while exhibiting and repeating the desired behaviors and if children demonstrate excitement for nature, they have captured the big idea of the exhibit (developing a "sense of wonder" about nature).	Immersive, naturalistic environment • Environmental details • Rich sensory environment (natural textures, lighting, sounds) • Realistic murals • Life-size animals • Real nature specimens Support for play • Activity variety and choice • Costumes and props for dramatic play • Manipulatives • Space for gross motor activity Presentation of concepts/knowledge • No abstract concepts • Links to folk knowledge and personal experience • Opportunities to learn concepts within a hierarchy Easy orientation/navigation • Well-defined areas for different activities (regions to travel to and explore) • Safe boundaries; good sight lines • A piazza (central area) that connects everything or a large, central landmark Promise of information • "Mystery, complexity, coherence, legibility" • Hidden worlds
2. Raise the awareness of parents of young children about their role in their children's learning and development and the importance of playing an active role.	• Parents will read "For Parents" graphic panels and pick up take-home Family Guides in order to gain an understanding of the importance of play in science learning for 3 to 8 year olds and what parents can do to support that play.	• Almost half of adults using a component will read a "For Parents" panel. • Almost half of adults will take home Family Guides.	Type and label guidelines for parent panels: • Contrast • Comfort • Consistency • Clear function • Convey main message • Brevity Family Guides supplied in exhibit (easy to find and carry)

Project Goals	Project Objectives	Behavioral Measures	Exhibit Characteristics
3. Provide parents of young children with the tools and techniques needed to encourage their children's interest in science.	• Parents will play multiple roles in the exhibit: observers, supporters of play, and play partners. • Children and adults will talk about the exhibit with each other.	• The majority of encounters with components will elicit adult-child interaction in which the adult supports play or plays. • The majority of groups with more than one person will talk about the activity amongst themselves.	Family-friendly exhibits • Accessible to children and adults • Relevant (in this case, highlight animal behaviors children would recognize like eating, home building, caregiving) • Readable • Multi-user • Multi-sided • Multi-outcome • Multi-modal Activities that engage adults and children and that model techniques for encouraging children's interest in science (posing questions to explore, using science tools, narrating dramatic play) Exhibit copy that models techniques for encouraging young children's science learning (e.g., asking open-ended questions, expressing curiosity about nature)
4. Encourage families to explore the natural world.	• Families will intend to explore a regional outdoor area after visiting this exhibit.	• Almost half of families intend to explore the outdoors "more often." • Almost half of families will take information on local nature centers. • Almost half of children will say exploring the outdoors is fun.	Images in exhibit that show families exploring and enjoying nature together Brochures for local nature centers (with programs for young children) readily available in exhibit Opportunities for representatives from local nature centers to give demonstrations in exhibit

Appendix C: Traveler Topical Framework

Overall Topics

Experience in each thematic area

In what ways do visitors use the interactive components?
What works well in terms of navigation, usability, age-appropriateness, and developer's goals for each component?
What does not seem to work well? Why? For instance, is there a problem with manipulatives moving out of or between appropriate areas?
In which of the thematic areas are visitors spending the longest amount of time? What might we attribute this to?
In which of the thematic areas are visitors spending less time? What might we attribute this to?

Overall experience in the exhibition

To what extent is the immersive, naturalistic environment impacting what visitors do in terms of the project's goals: children will develop science process skills and gain an understanding of basic science concepts through play?
How do visitors move through the exhibition?
To what extent and in what ways do visitors enjoy what they did/saw?
How does the experience of 3–5-year olds compare to that of 6–8-year olds?
What science process skills are children demonstrating (observing, investigating, comparing, measuring, and experimenting) and at which areas of the exhibit do particular skills seem to be demonstrated (e.g., measuring at Nat Table)?

Overall messages

What messages are visitors walking away with?
What is it about the exhibit that best communicates the messages: the labels, the activities, etc?
What kinds of questions do visitors have?
To what extent are visitors getting the Big Idea, "a sense of wonder about nature"?

Parent-child interaction

What types of parent-child interaction do the components support?
What aspects of the exhibition are contributing to parent-child interaction, for instance label text, parent panels, the Family Guide, or general layout and design?
To what extent are parents leaving the exhibition with an increased awareness about their role in their children's learning and development, and the importance of playing an active role?
To what extent and in what ways are the Family Guide and parent panels contributing to that awareness?

Labels and text

To what extent have label changes increased attention to and usefulness of the labels?
In what ways and to what extent do visitors use the different types of labels (e.g., family and parent labels)? Are there specific types of labels that seem to be used more frequently than others?
What are the various ways that labels support visitor engagement? What is the nature of those interactions?
What, if any, differences are there between use with 3–5-year olds and use with 6–8-year olds in their usage of graphic text?
In what ways and to what extent do families use the bilingual labels? How do bilingual labels seem to support or hinder interactions?
What, if any, differences are there in the use of bilingual labels between English dominant speakers and Spanish dominant speakers?
What is the response to bilingual labels by Spanish speaking visitors and what are the reasons for that response?
What is the response of bilingual labels by English speaking visitors and what are the reasons for that response?

Exploring the natural world

What level of interest in nature centers do parents bring to the *Animal Secrets* exhibition?
To what extent and in what ways does the exhibition affect their level of interest in nature centers?
How do families respond to information about regional nature centers?

Traveling Exhibit Issues

Staff support

To what extent were there issues for the host museum in terms of receiving and setting up the exhibit?
How was the exhibit manual (in its draft form) useful to staff in terms of ease of use, thoroughness, and providing what the staff needed?
To what extent is the host museum staff satisfied with the exhibit in terms of interpreting, planning programming, and visitor response?

Layout

How does the layout differ from the one at OMSI? What impact, if any, does that have on the visitor experience?
To what extent does the placement between two galleries, with no walls to separate, impact the visitor experience and flow through *Animal Secrets*?
To what extent is the exhibit's immersiveness retained in its layout at the host museum?

Marketing

Did the staff use the materials produced by OMSI, their own, or a combination of both?
To what extent was the museum able to find sponsors or funders for this exhibit? Which ones?
What kinds of advertisement or press coverage did the exhibit receive?
To what extent was the host museum able to connect with local nature centers? If they were able to, what kinds of nature centers were they? Did they form any cooperative partnerships?

Appendix D: Permanent Topical Framework

Overall experience in the exhibition

In what ways do visitors use the interactive components?
What works well in terms of navigation, usability, age-appropriateness, and developer's goals for each component?
What does not seem to work well? Why? For instance, is there a problem with manipulatives moving out of or between appropriate areas?
To what extent are visitors experiencing connections between the thematic areas? For instance, might a child move between the discovery tree in costume to the cave and crawl through in character?
How do visitors move through the exhibition?

Offering young children rich opportunities in science learning

In which of the thematic areas are visitors spending the longest amount of time? What might we attribute this to?
In which of the thematic areas are visitors spending less time? What might we attribute this to?
In what ways is the placement of *Animal Secrets* in Science Playground impacting the visitor experience?
To what extent are visitors moving back and forth between *Animal Secrets* and other parts of Science Playground vs. moving through *Animal Secrets* as one more cohesive experience?
To what extent is the placement of *Animal Secrets* in Science Playground affecting the visitor experience of being in an immersive naturalistic outdoor environment?
To what extent are interactives/ manipulatives moving between *Animal Secrets* and other exhibits in Science Playground?
What kinds of play are children engaging in as they explore the exhibition?
How do the experiences of 0–2, 3–5, and 6–8-year olds compare?
To what extent are children demonstrating age-appropriate understanding of the content?
What science process skills are children demonstrating (observing, investigating, comparing, measuring, and experimenting)?
What are the primary messages visitors are taking away?
To what extent are visitors getting the Big Idea, "a sense of wonder about nature"?

Raising the awareness of parents of young children

Are there specific types of labels that seem to be used more frequently than others?
In what ways and to what extent do visitors use the different types of labels? How do they seem to affect interactions at the exhibition?
At what ages do we notice children using the text to enhance their experience?
In what ways and to what extent do families use the bilingual labels?
How is the placement of labels working in terms of the visitor experience?
To what extent are parents picking up the Family Guide and either reading it or taking it home to read?

To what extent are parents leaving the exhibition with an increased awareness about their role in their children's learning and development and the importance of playing an active role?
To what extent and in what ways are the Family Guide and parent panels contributing to that awareness?

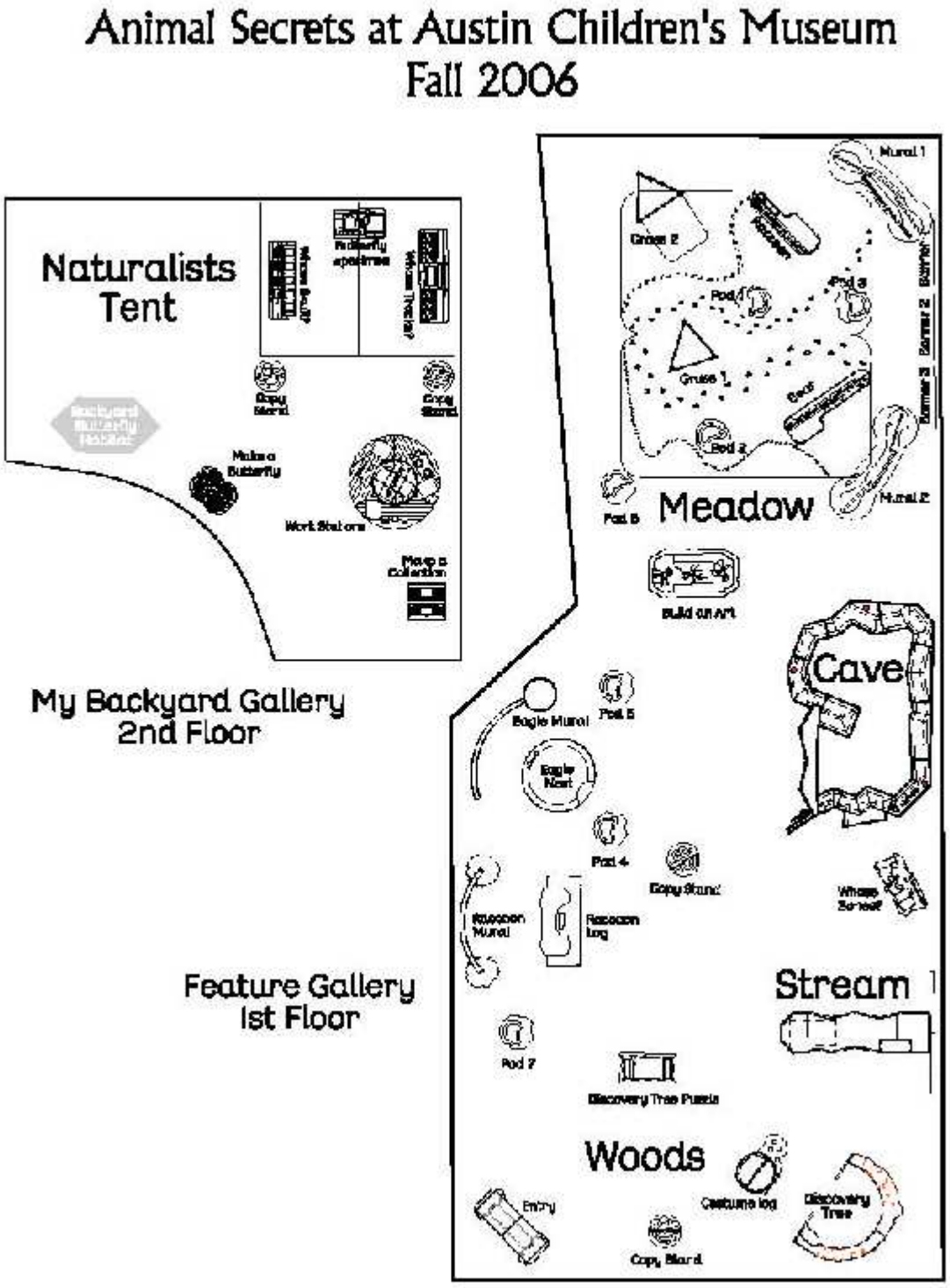
Providing parents of young children with tools and techniques to encourage their children's interest in science

What types of parent-child interaction do the components support?
In what specific ways are parents interacting with their children in the exhibit?
What aspects of the exhibition are contributing to parent-child interaction, for instance label text, parent panels, the Family Guide, or general layout and design?

Encouraging families to explore the natural world

To what extent and in what ways does the exhibition affect their level of interest in nature centers and being in the outdoors? Do most visitors interact with the computer kiosk?
To what extent are families reading the information about regional nature centers? How do they respond to it?
To what extent do families say they explored the outdoors more often after visiting *Animal Secrets* than they had before their visit?

Appendix E: Traveler Floor Plan



Appendix F: Traveler Evaluation Instruments

Observation/Interview Protocol

Date: _____ Area of entry: _____

Description of Group: _____

(Below estimate ages of individuals and observed ethnicity)

AM: _____

AF: _____

CM: _____

CF: _____

Time group entered exhibit: _____
Time group exited exhibit: _____

Duration of observation and reason for ending: _____

Record a running record of visitor experience in the exhibit for up to 20 minutes or until group leaves. Whenever possible note times that they changed to a new area, activity or behavior. Use other side of the page as necessary.

FOLLOW UP INTERVIEW

Hi, my name is _____ and I am working at Austin Children's Museum today to help the team that designed this exhibit know whether or not it is successful, and what improvements it might need. I have been observing you in the exhibit and would like to ask you just a few questions before you move on.

1. Is this your first visit to ACM? YES/NO
2. To this exhibit? YES/NO
3. What did you think the Animal Secrets exhibit was about?
4. What area or activity did you and/or your child like best?
5. Was there anything you didn't enjoy? YES/NO What was it?
6. What could we do to make that activity better for you and your child? What could be added or changed?

7. What kind of science concepts do you think your children are learning in this exhibit?

8. Was there anything in this exhibit that helped you as the parent to experience the exhibit with your child?

9. Did you notice the labels/signs? What would you say is the value of the labels in this exhibit?

10. (If they noticed labels and saw value in them ask): Do you typically read labels and signs in an exhibit? What was it about these labels/and signs that made you pay attention?

11. Did you notice that the labels were bilingual? Yes / No

12. What was your general reaction to the bilingual labels? [open-ended]

13. In your opinion, how important do you think it is that this exhibit includes bilingual labels?

☐ Not at all important ☐ Somewhat important ☐ Important ☐ Very Important

14. Have you been to any nature centers in the area before your visit here today? YES/NO Which ones?

13. As a result of your experience here today how likely are you to visit a nature center or explore the outdoors? (1 not at all likely, 5 very likely)

1 2 3 4 5

14. How would you rate this exhibit experience for your child compared to others you've seen geared to his/her age? (1 low, 5 high)

1 2 3 4 5

**** We would like to contact you via e-mail in about one month to follow up with you about your experience here today. Can you provide us with an e-mail address where we could reach you? The survey will be accessible to you on line and will be completely anonymous.

Appendix G: (Austin) Online Visitor Survey

Have you visited the Austin Children's Museum since we met you therein November? YES NO

If YES, how many times have you visited?

1 time 2 times 3 times 4 or more times

If you did return since November, did your child spend time at the Animal Secrets exhibit? YES NO

What do you and/or your child remember about the Animal Secrets exhibit?

What was your child's favorite area or activity?

Below is a list of all of the activities in the Animal Secrets exhibit. Please check all of the ones that you or your child remember visiting. (List not included in this report)

While visiting the Animal Secrets exhibit did you pick up a take home Family Guide, located at the entrance to the exhibit? YES NO

In what ways was this Guide useful to you?

If you did not pick up a Family Guide check all reasons that apply to you.
__ I did not notice any Family Guides.
__ The Family Guides were not available.
__ I have read the Family Guide on a previous visit.
__ I was not interested.

How would you rate the Animal Secrets exhibit compared to others you have seen geared to your child's age? (Lowest to highest)
__ One of the worst I have seen
__ Nothing special
__ Equal to others I have seen
__ Quite good
__ One of the best I have seen

Since your November visit to the exhibit how much have you explored the outdoors with your child?
1__ Less than usual
2__ About the same as usual
3__ More than usual

Appendix H: Staff Survey (Austin Children's Museum)

Compared with other exhibits, feature or permanent, in-house or rented, that you've observed here or at other museums:

1. To what degree did visitors seem interested in or excited about the topic and ideas in the exhibit? Low Medium High
2. How well did the activities engage children? Low Medium High
3. How well did the activities engage the adults in interaction with children? Low Medium High
4. What ages of children seemed to respond best to the exhibit activities?
5. Which area/component/activity worked best?
6. Which area/component/activity needs the most improvement?
7. What was the audience response to the bilingual labels?
8. What challenges/victories were there in staffing/interpreting the exhibit?
9. Any additional comments?

Appendix I: Permanent Evaluation Instruments

Observation/Interview Protocol

Date: _____ Area of entry: _____

Description of Group: _____

(Below estimate ages of individuals and, if possible, observed ethnicity)

AM: _____ AF: _____

CM: _____ CF: _____

Time group entered exhibit: _____

Time group exited exhibit: _____

Duration of observation and reason for ending _____

Record a running record of visitor experience in theme area for up to 20 minutes or until group leaves. Whenever possible note times that they changed to a new area, activity or behavior. Use other side of the page as necessary.

FOLLOW UP INTERVIEW

Hi, my name is _____ and I am working at OMSI today to help the team that designed this exhibit know whether or not it is successful, and what improvements it might need. I have been observing you in the exhibit and would like to ask you just a few questions before you move on.

Is this your first visit to OMSI? YES/NO

To this exhibit? YES/NO

If they have visited before ask: How many times in the last 12 months have you visited OMSI?

1-3 4-6 7-9 10-12 more than 12 times

Are you a member? YES/NO

What do you think the Animal Secrets exhibit is about?

What area or activity did you and/or your child like best?

What kinds of things did your child do in the exhibit?

Was there anything you or your child didn't enjoy? YES/NO
What was it?

What could we do to make that activity better for you and your child? What could be added/changed?

If you have any under the age of 3, how did he/she enjoy the exhibit? What kinds of things did he/she do?

What do you think about the placement of *Animal Secrets* in Science Playground?

Was there anything in this exhibit that helped you as the parent to experience the exhibit with your child?

Did you notice the labels/signs? What would you say is the value of the labels in this exhibit?

(If they noticed labels and saw value in them ask): Do you typically read labels and signs in an exhibit? What was it about these labels/and signs that made you pay attention?

(If the age of the child seems appropriate ask): Did your child read any of the labels or text? To what extent did that help them in their experience?

Did you happen to notice or read any of the "Parent Panels" (point to one)? YES/NO

Were those valuable or useful to you in any way? Please explain:

As a result of your experience here today how likely are you to visit a nature center or explore the outdoors? (1 not at all likely, 5 very likely)
1 2 3 4 5

How would you rate this exhibit experience for your child compared to others you've seen geared to his/her age? (1 low, 5 high)

1 2 3 4 5

Appendix J: Online Visitor Survey (OMSI)

Have you returned to the Animal Secrets exhibit at OMSI since we met you there in January?
YES NO

If YES, how many times have you visited?

1 time 2 times 3 times 4 or more times

Please tell us what brings you back?
__ Child requests visit
__ Educational value
__ Good opportunity for me to play with my child
__ Child is interested/curious about animals and nature
__ Other (please specify)

Below is a list of all of the activities in the Animal Secrets exhibit. Please check all of the ones that you or your child remember visiting. (List not included in this report)

What is it about those activities that he or she enjoyed?

While visiting the Animal Secrets exhibit did you pick up a take home family guide, located near the computer kiosk? YES NO

If YES, what did you think of the Family Guide?

To what extent and in what ways did you find the Guide useful or fun for your family?

If you did not pick up a family guide check all reasons that apply to you.
__ I did not notice any Family Guides
__ The Family Guides were not available
__ I have read the Family Guide on a previous visit
__ I was not interested

Have you had the opportunity to visit the exhibit's web site: www.animalsecrets.org?
YES/NO

If YES, which links did you or your child investigate?
__ Explore the Exhibit
__ Activities
__ Explore Nature
__Resources
__ Traveling exhibit information
__ Donors

How would you rate the Animal Secrets exhibit compared to others you have seen geared to your child's age?
__ One of the worst I have seen
__ Nothing special
__ Equal to others I have seen
__ Quite good
__ One of the best I have seen

In what ways, if any, has the exhibit had an impact on your family's experiences in nature?

In your opinion, how important do you think it is that this exhibit includes bilingual labels?
__ Not at all important
__ Somewhat important
__ Important
__ Very important

Appendix K: Permanent Floor Plan