

The Milwaukee Public Museum
Exploring Life on Earth
Summative Evaluation

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EXECUTIVE SUMMARY

This report presents findings from a comprehensive summative evaluation conducted by Randi Korn & Associates, Inc. (RK&A), of *Exploring Life on Earth*, a National Science Foundation-funded exhibition developed by the Milwaukee Public Museum (MPM). The evaluation documents the effectiveness of the exhibition and provides recommendations for remediation. Data were collected from May to August 2002 and include in-depth interviews, group discussions, timing and tracking observations, self-reported path identifications, and focused observations and interviews.

Only selected highlights of the study are included in this summary. Please consult the body of the report for a detailed account of the findings.

I. PRINCIPAL FINDINGS: IN-DEPTH INTERVIEWS

A total of 50 in-depth interviews were conducted: 26 with adults and 24 with children as they exited *Exploring Life on Earth*.

Exhibition as a Whole

- Though many interviewees identified aspects *Dioramas* and *Behind the Scenes* have in common (such as the display of specimens and fossils), most of them, especially children, did not readily see an explicit connection between the two exhibition areas.
- At the end of the interview, after having talked extensively about the two sides, most adults and many children said that the two areas show different aspects of scientists doing their work—in the field and in the lab.
- More than half of the adults and a couple of the children said they understood that the scientists and research shown in the various exhibits represent the work done at the Milwaukee Public Museum.

Dioramas

- Most interviewees were most impressed by the mechanized animals and lifelike qualities of objects in *Dioramas*.
- About half the adults and a few children said they especially liked the way *Dioramas* displayed the past and present in one location.
- Most interviewees did not name anything they disliked about *Dioramas*.
- Three-quarters of interviewees recognized that *Dioramas* showed the past and present in one location.

- About half the adults and children said *Dioramas* show that Earth has changed over time. Many also added that humans have impacted this change. Along those same lines, some interviewees said *Dioramas* show that it is important to care for the environment.
- About one-half of adults and several children said one of the main messages of *Dioramas* was to show scientists working in the field.
- Though no interviewees said *Dioramas* show biodiversity, several adults and a few children noted *Dioramas* show a reduction in plants and animals over time.

Behind the Scenes

- In *Behind the Scenes*, interviewees seemed especially interested in the opportunity to see real objects and artifacts. Virtually all the interviewees named tools, specimens, and fossils as their favorite features in that exhibition area.
- One-half of the adults and a few children said *Behind the Scenes* was too dense, overwhelming, and/or not interesting.
- About one-half of interviewees said that the main idea of the exhibits in *Behind the Scenes* was to show the scientists' work, with a few adults explicitly pointing out the division of the exhibits into the various fields of science. None of the interviewees talked specifically about the scientific process.
- Some interviewees said the main message of *Behind the Scenes* was simply "about animals," and some interviewees said they did not know the main message.

II. PRINCIPAL FINDINGS: TEACHER GROUP DISCUSSIONS

Discussion groups were held with two groups of a total of 16 Milwaukee school teachers.

Reactions to Exploring Life on Earth

- All teachers remarked positively about the exhibition's interactive elements, however, many commented that the presentation of the material was too dense for students to absorb during one visit.
- About one-half of the teachers reported seeing a relationship between *Dioramas* and *Behind the Scenes*, and believed their older students would as well. In contrast, about one-half did not see a connection, and did not believe their students would see one either.
- Teachers expressed mixed opinions about whether the exhibition's current title effectively conveyed its main idea; however, all agreed that the exhibition needed to be more clearly delineated and labeled.

Responses to the Exhibition Elements

- Teachers liked the design of the *Dioramas*, though they did not wholly agree that the “before and after” perspective was clear and appropriate for students.
- Teachers liked the Tree of Life, though almost all of them found it difficult to use. They discussed the need to better incorporate it into the exhibition.
- Teachers made few comments about *Behind the Scenes*. Though they liked the content of the area, they found the presentation unwelcoming and uninteresting.
- Teachers had mixed reactions to the Jeep. Though many teachers said the vehicle would attract students, they did not agree that the video would sufficiently capture student interest.

Connection of the Exhibition with Current Curriculum

- Overall, teachers agreed that the exhibition overlaps with current curriculum, including lessons about science, social studies, and Milwaukee. However, many emphasized that the exhibition was more appropriate for older students.

General Teacher Needs

- Teachers said that students need an orientation before visiting the exhibition, and suggested including exhibition lead-ins, an orientation film, and a designated orientation space.
- At least one-half of the teachers have Internet access and said they would prefer to receive information from the Museum online. The other one-half had various recommendations for receiving information, including using an existing information network.
- All the teachers agreed that they wanted access to information before visiting, as well as at the Museum. All teachers also noted that the material should be presented in a simple, easy-to-understand format.
- Teachers discussed a variety of barriers to visiting the Museum, including cost and time.

III. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

Observers timed and tracked 100 visitors, ages nine years and older, in both areas of *Exploring Life on Earth: Dioramas* and *Behind the Scenes*.

Comparison of Dioramas and Behind-the-Scenes Observations

- Visitors spent an average four minutes in the *Dioramas* and three minutes in *Behind the Scenes*. When the square footage of each exhibition area was compared, it was found that visitors moved more slowly through the *Dioramas* than through *Behind the Scenes*.
- When compared to Serrell's average "Sweep Rate Index" for diorama exhibitions, visitors in the *Dioramas* moved slower than visitors in exhibitions of similar size.
- When compared to Serrell's average "Sweep Rate Index" for non-diorama exhibitions, visitors in *Behind the Scenes* traveled much faster than visitors to exhibitions of similar size.
- A higher percentage of visitors used more than half of the *Dioramas* exhibits compared with *Behind the Scenes*. In other words, visitors used the *Dioramas* more thoroughly than did visitors in *Behind the Scenes*.
- When compared to Serrells' "Percentage Diligent Visitors," visitors stopped at more exhibits in the *Dioramas*, compared to exhibition areas of similar size.
- When compared to Serrells' "Percentage Diligent Visitors," visitors in *Behind the Scenes* stopped at fewer exhibits than did visitors to exhibition areas of similar size.
- Visitors looked at more panels in the *Dioramas* than did visitors in *Behind the Scenes*.

Dioramas Observations

- Each section of the *Dioramas* was visited by nearly all visitors (97 percent for Hell Creek Formation, 92 percent for Menomonee River, and 81 percent for Costa Rica). Visitors spent the most time in the Hell Creek Formation (median time of 1 minute 8 seconds).
- For individual exhibits, the most visitors stopped at the Hell Creek Formation Present diorama, followed by the Hell Creek Formation Past diorama (88 percent and 87 percent, respectively).
- The fewest visitors stopped at the Costa Rica Overview Section and the Adventure Starts Here panel (15 percent and 1 percent, respectively). No visitors stopped at Our Ever-changing World panel.

- Visitors spent the most time at the Hell Creek Formation Overview (38 seconds). Visitors spent the least time at the Jeep and the Adventure Starts Here panel (14 seconds and 3 seconds, respectively).
- While in *Dioramas*, more than one-third of visitors engaged in one to two exhibit-related social interactions with other visitors in their group (39 percent).
- All visitors looked at one or more dioramas (100 percent). Nearly three-quarters used one or more light buttons (72 percent).
- The elements used by the fewest visitors were the panels and touchable casts (each 48 percent).
- One-half of visitors did not spend any time using multimedia components (50 percent).

Behind the Scenes *Observations*

- The most visitors stopped at the Geology Lab and the Tree of Life (57 percent and 48 percent, respectively). They also spent the most time in the Geology Lab and the Tree of Life (median time of 56 seconds and 44 seconds, respectively).
- Of individual exhibits, the most visitors stopped at the Geology Lab preparing fossils area and the Tree of Life specimen case (each 35 percent).
- The fewest visitors stopped at the Tree of Life Morphology bench I, the Botany Lab bench, and the map of Museum staff research (7 percent, 7 percent, and 6 percent, respectively).
- Visitors spent the most time at the Geology Lab Exploring Microfossils bench (median time of 54 seconds). Visitors spent the least time at the Botany Lab bench (median time of 11 seconds).
- While in *Behind the Scenes*, more than one-third of visitors engaged in one to two exhibit-related social interactions with other visitors in their group (37 percent).
- About three-quarters of visitors looked at specimens (73 percent). Two-fifths looked at panels and used activities (42 percent and 41 percent).
- The behaviors exhibited by the fewest visitors were lifting and reading the PUGs (pull-up graphics) (8 percent and 5 percent, respectively).
- Nearly three-quarters of visitors did not spend any time using multimedia components (72 percent).

IV. PRINCIPAL FINDINGS: PATH IDENTIFICATION

A total of 100 drop-in visitors aged 16 years and older were interviewed and asked to draw on a map the path they took through the area of the Museum that included the *Exploring Life on Earth* exhibition.

- Nearly one-half of respondents reported first visiting the *Dioramas*, then walking through the butterflies exhibition area, and finally ending their experience by visiting *Behind the Scenes* (44 percent).
- Overall, few respondents—12 percent—walked directly from the *Dioramas* to *Behind the Scenes* or vice versa.

V. PRINCIPAL FINDINGS: FOCUSED OBSERVATIONS AND INTERVIEWS

RK&A conducted 10 focused observations and interviews at each of three exhibits: the Botany Lab, the Tree of Life, and the Geology Lab (Tracking Mass Extinctions and Earth’s Five Mass Extinctions).

Overall, interviewees described each exhibit as text-heavy and lacking activities. Many at the Botany Lab said they would have never stopped at this exhibit on their own because it “looked like a lot of reading and not many hands-on things to do.” Interviewees at the Tree of Life and the Geology Lab were attracted to the specimens displayed in these exhibits, but found the supporting panels and activities visually overwhelming.

Most interviewees said the graphics and text were dense, technical, and confusing. Few looked at the pull-up graphics, and those who did said they were awkward to use because of their weight, the small text font size, and surface glare. While interviewees liked the idea of multimedia, those in the Geology Lab were disappointed by the information that the Biodiversity and the Fossil Record multimedia provided. They did not understand the information, could not read the graph (either because of the small type size or because they did not know how to read graphs), and were frustrated by computer program’s lack of interactivity. Most interviewees had expected to use the multimedia to play a game or record fossil measurements or species counts to solve a problem, rather than simply read information or watch videos.

Interviewees said they enjoyed looking at specimens and interacting with “the real thing,” and they would welcome more opportunities to look at and touch specimens. Some visitors at the Botany Lab also appreciated that the plant taxonomy activity enabled them to “play the scientist” by using processes that mimicked how scientists identify plants. This sentiment was echoed by most interviewees at the other exhibits—that is, interviewees said they would like to use real scientists’ tools (e.g., microscopes, rulers) and engage in focused activities. For example, many interviewees in the Geology Lab said they would enjoy measuring fossils, and comparing different species in the drawers—activities that combine specimens and scientific tools. Once interviewees in the Botany Lab were made aware of the herbarium drawers, some suggested changing the activity so that it made more use of real specimens.

A few interviewees at the Botany Lab and a few others at the Geology Lab noticed that the exhibits discussed the scientific work taking place at the MPM. However, few were interested in learning more about those scientists' research areas.

DISCUSSION AND RECOMMENDATIONS

RK&A has prepared a discussion to highlight key findings from the comprehensive evaluation study. As a result of data analysis and in response to MPM's evaluation questions, these main issues surfaced:

- Visitors do not conceptually or physically experience the two areas that comprise *Exploring Life on Earth* as one exhibition.
- The *Dioramas* exhibition area performed more successfully than *Behind the Scenes*.
- Visitors grasped many of the main ideas of *Exploring Life on Earth*, but at a more superficial level than MPM intended.
- Visitors overwhelmingly demonstrated a preference for authentic media—artifacts, simulated environments, and specimens—over all other exhibit media, such as panels, computer touch screens, and pull-up graphics.
- Teachers said *Exploring Life on Earth* connects to their curriculum and seems valuable, but found much of it overwhelming; they stressed the need for orientation.

These issues are discussed in greater depth below.

Visitors do not conceptually or physically experience the two areas that comprise *Exploring Life on Earth* as one exhibition. The path identification data and in-depth interviews confirmed that visitors do not visit the *Dioramas* and *Behind the Scenes* consecutively and cannot readily articulate the relationship between the two exhibition areas. Rather than walking directly back and forth between the *Dioramas* and *Behind the Scenes*, nearly half of visitors moved through the area that includes *Exploring Life on Earth* by making a U-shaped path, visiting the butterflies exhibition in the middle of *Exploring Life on Earth*. Furthermore, most visitors (including teachers) could not accurately explain the connection between the two areas until *after* having talked in-depth about the two sides of the exhibition with the interviewer. Even then, only half of adults and a few children understood that the scientific research in the exhibition represents work done at MPM.

It is not surprising that so few visitors experienced *Exploring Life on Earth* as a whole. The exhibition's layout is problematic. A wide corridor separates *Dioramas* and *Behind the Scenes*; the butterflies exhibition takes prominence in the center of the two; and finally, regarding design, the two areas do not look alike. Confounding the physical separation of the exhibition areas is the lack of conceptual orientation. Conceptually, although the two areas present similar content, the thematic connection between the two—the fact that scientific research is being conducted by MPM staff, and other themes—is not made explicit for visitors. RK&A has found time and again that an exhibition's success depends on telling visitors the exhibition's thematic and organizational structure. In other words, visitors need to be told what an exhibition is about so they can think about the ideas and specimens in a particular context. For instance, in a study

conducted at the Newseum, RK&A found that more visitors who saw the orientation film, compared to those who did not, identified the Newseum's correct main idea.

In *Exploring Life on Earth*, two stand-alone text panels intend to orient visitors to the exhibition, but as observation data show, only one visitor read the Adventure Starts Here panel and no visitors read Our Ever Changing World panel. MPM visitors are not unique in bypassing stand-alone text panels. While many museums use stand-alone text panels to provide introductions, the lack of attention visitors give them is a general trend RK&A has observed at museums across the country. Nevertheless, the solution to the problem is not always as simple as including an orientation film (as it was at the Newseum). Whatever medium is used to orient visitors to *Exploring Life on Earth* must be appropriate to the exhibition's content, must work within (or overcome) the exhibition's physical limitations, and attract and hold visitors' attention.

Dioramas performed more successfully than Behind the Scenes. Observations show that visitors to *Exploring Life on Earth* spent significantly more time and attended to more exhibit elements in the *Dioramas* than in *Behind the Scenes*. Furthermore, when compared to a standardized criteria of exhibit effectiveness (developed by Beverly Serrell), the *Dioramas* performed significantly better (in terms of visitors' moving slowly through the exhibition and using it thoroughly) than other diorama exhibitions of similar size, while *Behind the Scenes* performed significantly worse than other non-diorama exhibitions of similar size. In corroboration with the observation findings, in-depth interview data show that virtually all visitors to the *Dioramas* took away at least a partially correct message—that the *Dioramas* show how Earth has changed over time or how scientists conduct their work—while one-half of the visitors to *Behind the Scenes* walked away with a partially accurate message—that the exhibits show the work of scientists (the messages visitors took from the exhibition area is discussed in more detail below).

In-depth interviews, focused observations and interviews, and teacher discussion groups help explain the difference in how visitors experienced the two exhibition areas. Overall, visitors said they enjoyed the *Dioramas* exhibition very much. In fact, most could not name anything they disliked, but quickly and enthusiastically responded to what they did like about the dioramas, including their realistic quality and their presentation of past and present. Moreover, though some visitors said they rushed by the dioramas, it is notable that visitors spent more time at these dioramas than visitors spend at dioramas in other museums. These longer-than-average visits may be attributed to the *Dioramas*' n-traditional strategy of using mechanized animals, light buttons, and other media that attracted and held the attention of visitors of all ages.

On the other hand, visitors and teachers voiced numerous complaints about *Behind the Scenes*. Interviewees' negative comments were particularly noteworthy to RK&A, because often museum visitors cannot articulate problematic aspects of an exhibition environment. Many said it was crowded, overwhelming, and not interesting-looking. In focused observations and interviews, visitors described the Botany Lab as "boring-looking," the interactive exhibits in the Tree of Life as visually too dense, and the Geology Lab graphics and text as "too busy." Moreover, even when visitors in the focused observations and interviews attempted to use these

exhibits as requested by the evaluator, they demonstrated great difficulty and frustration with many of them.

These comments and experiences explain much about why visitors moved so quickly through *Behind the Scenes* and attended to so few exhibit elements. In most studies conducted by RK&A, having too many exhibit components in a particular space is overwhelming for visitors of any age. They have difficulty knowing which pieces of information are key, and respond by ignoring much of the information. One reason for this reaction may be intellectual fatigue caused by information overload.

Visitors grasped many of the main ideas of *Exploring Life on Earth*, but at a more superficial level than MPM intended. Visitors walked away from *Exploring Life on Earth* understanding at least some of its main messages, especially those messages from the *Dioramas*. However, very few visitors thoroughly grasped all the messages of *Exploring Life on Earth*. For instance, although many visitors understood that both the *Dioramas* and *Behind the Scenes* show scientists working, this understanding is very general. They did not discuss anything specific about scientific research or the scientific process. Furthermore, many visitors said the *Dioramas* show that Earth has changed over time, and many of the adults and a few children also said the *Dioramas* show how humans have had an impact on this change. However, very few connected these separate ideas into a coherent biodiversity message.

There are several ways to explain this lack of in-depth understanding among visitors. First of all, it is unrealistic to expect all visitors to grasp all the messages exactly as MPM intended. Making meaning naturally takes place when individuals encounter museum exhibitions. But visitors do not necessarily experience what the museum intends for them to experience—instead, they make meaning based on the way the new experiences fit into their worldview. One way to gauge and then integrate visitors' meaning making into an exhibition is to conduct thorough front-end and formative evaluations. Even then, however, it is up to the museum to set criteria to measure the effectiveness of the communication of their message—*what proportion* of the audience needs to understand *which parts* of the message for the exhibition to be considered a success? For instance, is it good enough that more than half of the visitors understood that *Exploring Life on Earth* shows scientists doing their work, but none learned about the scientific process? Does the fact that no visitors talked about biodiversity signal failure? While evaluators can measure the degree to which visitors understood specific messages, only the museum can establish the criteria of success.

It is still instructive to examine possible reasons why visitors did not grasp the messages more thoroughly. One explanation has already been discussed—the lack of a conceptual orientation. To reiterate, visitors need an organizational structure, or a framework, in which to place new information and experiences. Another explanation has also been discussed—the fact that visitors in *Behind the Scenes* were overwhelmed and thus, moved quickly through it. It is not surprising that visitors only superficially understood exhibits they skimmed. On the contrary, visitors were attentive to the *Dioramas* and gleaned some of its main ideas. However, the biodiversity message was too subtle for visitors to grasp and should be more explicitly stated in the orientation and within the exhibits themselves.

Visitors overwhelmingly demonstrated a preference for authentic media—artifacts, simulated environments, and specimens—over all other exhibit media, such as panels, computer touch screens, and pull-up graphics. *Exploring Life on Earth* contains a variety of media, but all the data indicate that visitors overwhelmingly preferred experiences that included the “real thing”—artifacts, tools, and the simulated scenes in the dioramas. For instance, in focused observations and interviews, most visitors said their favorite aspect of those exhibits was the opportunity to see the “real things,” such as the specimens in the Tree of Life and the fossils in the Geology Lab. In fact, some visitors wanted to interact with these “real objects” on a deeper level. Additionally, in *Behind the Scenes*, observations showed that three-quarters of visitors looked at specimens either in the open or in cases, and in interviews, most visitors said the specimens, tools, and fossils were their favorite part of the area. Visitors most enjoyed the realistic quality of the *Dioramas* as well. During the observations, nearly three-quarters of visitors used at least one light button. In the interviews and teacher discussion groups, many noted watching the animatronic animals move.

Though multimedia and computer touch screens comprised a large portion of the exhibit experiences, data show that these media were underutilized. For instance, half of visitors in *Dioramas* and three-quarters of those in *Behind the Scenes* did not use any multimedia. In interviews, visitors hardly ever mentioned the videos or computer touch screens. When prompted to talk about them, most visitors either said they did not use any or had no opinion about them. In the focused observations and interviews, all of the interviewees in the Geology Lab said they liked the idea of multimedia but were disappointed by the information provided by the Biodiversity and the Fossil Record multimedia. They did not understand the information and could not read the graph. Most of them expected and wanted to be able to use the multimedia to play a game, record fossil measurements or species counts to solve a problem—rather than simply read information or watch videos on the screen. Furthermore, teachers liked the idea of multimedia but said that they would not have time to use such resources. They suggested instead that the MPM provide copies of the information on the Internet or in a teachers’ guide.

Visitors tend to go to museums to have experiences they cannot have at home, on television, or in school. They want to see—and if possible touch and interact with the “real thing.” RK&A runs across this preference time and again, in all types of museums. This does not mean museums need to go back to the strategy of showing artifacts in static, behind-the-glass displays. But it does suggest that collections-based museums should try to design more exhibits and experiences that put primary emphasis on the objects—using collections as the point of reference from which to explore ideas, concepts, or theories.

Teachers said *Exploring Life on Earth* connects to their curriculum and seems valuable, but found much of it overwhelming—they stressed the need for orientation. Teachers enjoyed the exhibition and said it had many connections to the curriculum they teach. However, their concerns for students echoed those described thus far in this discussion. Teachers worried that their students would not see a connection between the two exhibition areas and that much of the exhibition would be too dense and overwhelming for them. They expressed the need to orient students to the exhibition, both at the Museum and at school (through simple pre-visit materials

prepared by MPM). Teachers also expressed concerns about not being able to find out what the MPM offers teachers. They suggested the Museum work more closely with science curriculum coordinators to disseminate information.

RECOMMENDATIONS FOR REMEDIATION

- Develop a strategy to unite the two areas of *Exploring Life on Earth*. The connection between the two sides needs to be explicit, intuitive, and concrete. This might best be done architecturally or through design (making the two sides *look* more alike). It might also be done by making the two sides match up thematically—for instance, refer to the three location scenarios represented in the *Dioramas* in the *Behind the Scenes* exhibits (for example, ask questions such as “What did scientists discover in Costa Rica and take back to the lab to study?”).
- Similarly, develop an orientation strategy to attract and hold visitors’ attention. The orientation should explicitly state what *Exploring Life on Earth* is about, and convey the main messages of *Dioramas* and *Behind the Scenes*.
- Consider ways to make this *Behind the Scenes* user-friendly. Eliminate some of the information-heavy and underutilized exhibit elements. Also, take advantage of and expand on what visitors *did* like about this area—particularly the “real things.” Emphasize exhibits that draw attention to specimens, and using scientific tools, such as microscopes.
- Create strategies to deter visitors’ using *Dioramas* as a corridor and to foster visitation between *Dioramas* and *Behind the Scenes*.
- Reconsider the exhibition’s learning objectives. Think about which messages are essential to convey and set criteria for success—for instance, determine how many visitors need to grasp particular messages for an exhibition to be successful.

INTRODUCTION

This report presents the findings from a comprehensive summative evaluation conducted by Randi Korn & Associates, Inc. (RK&A), of *Exploring Life on Earth*, an NSF-funded exhibition developed by the Milwaukee Public Museum (MPM). The evaluation documents the exhibition's effectiveness and provides recommendations for remediation. The study's objectives were to determine:

- How visitors identify the area entitled *Exploring Life on Earth*.
- What extent visitors understand that *Exploring Life on Earth* shows life on Earth has changed over time and continues to change; that changes in biodiversity result from natural or human-induced events, and that scientists use the scientific process to try to understand these changes, both in the field and behind-the-scenes in a museum.
- What understanding visitors gain about biodiversity.
- What extent the *Behind the Scenes* interactive exhibits communicate the scientific process (as unique to each field represented).
- Whether visitors understand the connection between *Dioramas* and *Behind the Scenes*, and if so, what connection they see.
- Whether visitors understand that the exhibition represents research conducted at MPM.
- Whether visitors understand that *Dioramas* shows a before and after scene.
- What extent visitors interact with and enjoy the various media associated with the *Dioramas* and *Behind the Scenes* exhibits.
- What extent the computer touch screen interactives fulfill visitors' expectations, interests, and needs.
- The most/least successful exhibition components, both in terms of attraction/holding time and conveyance of content.
- What path visitors take through *Exploring Life on Earth*. Whether a pattern emerges.
- How much time visitors spend in *Dioramas* and in *Behind the Scenes*.
- What extent the exhibition appeals to and is useful for middle-school teachers.

METHODOLOGY

Triangulation, or the use of mixed methods to study a single issue, was used in this evaluation. To be specific, five methodologies were used: in-depth interviews; group discussions; timing and tracking observations; self-reported path identifications; and focused observations and interviews. Each method reveals different aspects of the exhibition, thus providing a way to corroborate the findings and strengthen their validity. Data were collected from May to August 2002.

In-depth Interviews

Interviews encourage and motivate interviewees to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they constructed from an experience. In-depth interviews produce rich data because interviewees talk about their experiences from a personal perspective.

Visitors nine years of age and older who visited the exhibition were eligible to be interviewed. Following a continuous random sampling method, interviewers intercepted eligible visitors exiting the exhibition and invited them to participate in an interview. At the conclusion of each interview, the interviewer awaited the next eligible visitor to invite him or her to participate. A total of 50 in-depth interviews were conducted: 26 with adults and 24 with children.

Interviewees were asked a series of questions about their experiences in *Exploring Life on Earth* (see Appendix A for the interview guide). Interviews lasted from 5 to 15 minutes. The interview guide was intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful. All interviews were tape-recorded with participants' awareness and transcribed to facilitate analysis.

Group Discussions

Discussion groups are a qualitative research method in which a limited number of participants engage in roundtable discussions about topics presented by a facilitator. The MPM recruited 16 Milwaukee school teachers to participate in two discussion groups which were held on a weeknight in May at the MPM, and lasted for 90 minutes. Before the discussion groups, teachers spent approximately one-half hour touring *Exploring Life on Earth*. The conversations, which were facilitated by RK&A, were shaped by the discussion group script (see Appendix B). Throughout the conversation, participants were encouraged to be candid and frank in their responses. Conversations in both groups were tape-recorded with participants' knowledge, and transcriptions were produced to facilitate analysis.

Timing and Tracking Observations

Visitors are often observed in summative evaluations because observations provide an objective and quantitative account of how visitors behave and react to exhibition components. Observational data suggest the range of visitor behaviors occurring in an exhibition and indicate which components attract, as well as hold, visitors' attention.

All visitors nine years of age and older were eligible to be unobtrusively observed as they used the exhibits in each exhibition area. The observed individuals were selected following a continuous random sampling method. In accordance with this method, a trained observer was stationed at the each exhibition area entrance. The first eligible visitor to enter the exhibition area was followed through it. The observer recorded the exhibits at which he or she stopped, noted select behaviors at each exhibit, time spent at individual components, and the total time spent in the exhibition area (see Appendix C for the observation form for both exhibition areas). When the individual exited the exhibition area, the tracking was complete, and the observer returned to the entrance to await the next eligible visitor entering the exhibition area.

Observers conducted 100 timing and tracking observations in *Dioramas* and *Behind the Scenes*.

Path Identifications

Path identifications determine the order in which visitors move from exhibit to exhibit (or section by section) in an area of a museum. Following a continuous random sampling method described earlier, interviewers invited eligible visitors (16 years and older) to draw on a map the path they took through the area that included *Exploring Life on Earth*, the butterflies exhibition, and Sense of Wonder (see Appendix D for the path identification form).

A total of 100 drop-in visitors completed a path identification map.

Focused Observations and Interviews

Focused observations and interviews were conducted to understand in depth how visitors use exhibits, how they respond both cognitively and affectively to the exhibits' content and display techniques, and what they learned from the exhibits. The three exhibits included in the focused observations and interviews were Tree of Life, Botany Lab, and Geology Lab (Tracking Mass Extinctions and Earth's Five Mass Extinctions benches).

Following a continuous random sampling method described earlier, interviewers invited eligible visitors (nine years and older) to use a selected interactive exhibit, a recruitment method known as cued testing. Those agreeing to participate used the interactive exhibit while the data collector observed. When the visitor finished using the component, he or she participated in an open-ended interview (see Appendix E for the interview guides).

DATA ANALYSIS

In analyzing qualitative data, the evaluator studies responses for meaningful patterns. As patterns and trends emerge, similar responses are grouped together. Visitor quotations throughout this report exemplify the content gleaned from the data.

Quantitative data were analyzed using SPSS/PC+, a statistical package for personal computers. Frequency distributions were calculated for all categorical variables (e.g., gender, age group). Summary statistics, including the mean (average), standard deviation (spread of scores: “±” in tables), and median (data point at which half the responses fall above and half fall below) were calculated for time data, total number of stops, and total number of behaviors observed. To compare the mean times, stops, and behaviors of two visitor subsets (e.g., visitors in *Dioramas* and those in *Behind the Scenes*), ANOVA were computed.

The level of significance was set at 0.05 because of the small sample size. When the level of significance is set to $p = 0.05$, any relationship that exists at a probability (p -value) of ≤ 0.05 is “significant.” When a relationship has a p -value of 0.05, there is a 95 percent probability that the relationship being explored truly exists; that is, in 95 out of 100 cases, there really would be a relationship between the two variables (e.g., gender and preferences for visiting). Conversely, there is a 5 percent probability that the relationship does not exist; in other words, in 5 out of 100

cases, a relationship would appear purely by chance. Within the body of the report, only statistically significant results are discussed.

For the most part, medians rather than means are reported here because, as is typical, the number of components used and the time spent by visitors were distributed unevenly across the range. For example, whereas most visitors spent a relatively brief amount of time with exhibition components, a few visitors spent an unusually long time. When a distribution of scores is extremely asymmetrical (i.e., “lopsided”), the *mean* is strongly affected by the extreme scores and, consequently, falls further away from the distribution’s central area. In such cases, the *median* is the preferred measurement because it is not sensitive to the values of scores above and below it—only to the number of such scores.

METHOD OF REPORTING

The data presented in this report are both qualitative and quantitative. Following the qualitative tradition of data reporting, trends and themes within the interview and group discussion data are presented from most frequently to least frequently occurring. Verbatim quotations from the interviews and group discussions (edited for clarity) in this report illustrate respondents’ thoughts and ideas as fully as possible, to give the reader the flavor of visitor experiences. Within quotations, the interviewer’s questions appear in parentheses.

For the quantitative data, tables and figures are regularly used to display the information in an easily accessible manner. Percentages within tables may not always equal 100 owing to rounding. The findings within each topic are presented in descending order, starting with those most frequently occurring.

Findings from the study are presented in five main sections:

- I. In-depth Interviews
- II. Group Discussions with Teachers
- III. Timing and Tracking Observations
- IV. Path Identifications
- V. Focused Observations and Interviews

I. PRINCIPAL FINDINGS: IN-DEPTH INTERVIEWS

BACKGROUND INFORMATION

In-depth interviews were conducted with visitors as they exited the *Behind the Scenes* area of *Exploring Life on Earth*. Before beginning the interview, visitors were asked if they had visited the *Dioramas*. If they had not, they were not eligible to participate in the interview (all but two of the approached visitor groups had visited the *Dioramas*).

In all, 50 interviews were conducted: 26 with adults and 24 with children. The 26 adult interviews included 36 people—19 males and 17 females, ranging in age from 19 to 72 years, with a median age of 43 years. The 24 child interviews included 27 people—14 males and 13 females, ranging in age from 8 to 14 years, with a median age of 11 years. Of all the visitor groups that were approached and asked to participate in the study, 17 declined, making the refusal rate 23 percent, similar to the refusal rate when conducting interviews in other museums.

EXHIBITION AS A WHOLE

Connection Between the Two Areas of Exploring Life on Earth

Conceptually, interviewees did not experience the area entitled *Exploring Life on Earth* as one exhibition. Though many identified aspects *Dioramas* and *Behind the Scenes* have in common (such as the display of specimens and fossils), most of them, especially children, did not readily see an explicit connection between the two areas of the exhibition. It was not until the end of the interview, after having talked extensively about the two sides, that most adults and many children said that the two areas show the different aspects of scientists doing their work—in the field and in the lab.

In the beginning of the interview, about one-quarter of adults and one child recognized the connection between the two areas in *Exploring Life on Earth*: they said *Dioramas* show scientists in the field and *Behind the Scenes* shows scientists in the lab. Other interviewees either said they found no connection between the two areas, or they simply named various aspects the two sides have in common, such as displaying animals and fossils (see the quotation below).

[The two sides of the exhibition have] bones and fossils and animals and turtles [in common]. *Child*

By the end of the interview, after having talked in-depth about the two sides of the exhibition with the evaluator, three-quarters of adults and one-half of the children recognized the correct connection (see the first quotation). Most adults described it as scientists working “in the field and the lab,” (see the second quotation) and many children said both sides show the work that scientists do (see the third and fourth quotations).

[The connection] becomes apparent now that we’ve had this conversation. You can correlate that . . . [in *Dioramas*], this is how they work, and these are some of the tools

they are using to work with and things they've found [on the *Behind the Scenes* side]. Now that we've had this conversation, it's obvious. *Adult*

[The connection between the two sides has] very much to do with the research idea. There's actually field research going on, and the [Museum] is showing the collection they ended up with because of the research. [It's also about] ongoing research the [Museum] can do in the lab as well as in the field. *Adult*

The dioramas show scientists and people looking for stuff and digging it up. And [the *Behind the Scenes* area] shows what they might have found. *Child*

[The two sides of the hall are] about scientists. (What about scientists?) That scientists study things. How to uncover bones. Then you learn to watch and you want to be a scientist. *Child*

Representation of MPM Scientists in the Exhibition

More than half of the adults and a couple of the children understood that the scientists and research shown in the various exhibits represents the work done at the Milwaukee Public Museum. Those who did not realize this found it very interesting once told so by the interviewer told them.

Over one-half of the adults and a couple of the children recognized that the scientists and research shown in *Exploring Life on Earth* represents the work of scientists at the Milwaukee Public Museum. They based this knowledge on specific exhibit components, such as the overview multimedia and the map of staff research in *Behind the Scenes* (see the first quotation). Interviewees who did not realize the presence of MPM scientists in the exhibition were surprised (see the second quotation) and very interested when the interviewer told them. Several children who said they wanted to be scientists when they grew up, exclaimed, "cool," upon hearing that MPM scientists' work was represented in the exhibition.

I figured that out. I didn't do any real reading, but I did look at the map over there that marked the different areas where [MPM scientists] have done studies. *Adult*

I didn't realize that [the scientists in the exhibition] worked at the Museum. I thought it was just showing [scientists] because it is fun for people. I didn't think they actually work in the Museum. *Child*

DIORAMAS

Overall Opinion

Most interviewees said they were most impressed by the mechanized animals and lifelike qualities in *Dioramas*. Additionally, many of the adults and a few children said they especially liked the presentation of the past and present in one location. Most named nothing they disliked.

When asked what visitors liked best about *Dioramas*, more than one-half of adults and children named the scenes' motion and realistic quality (see the first and second quotations below). These interviewees cited the light buttons, the attention to detail, the way some of the animals in the scenes moved unexpectedly, and the realistic quality of the mannequins. About one-half of adults and one-fifth of children said what they liked best about *Dioramas* was the presentation of the past and the present because it clearly conveyed change over time (see the third quotation).

I like the small moving animals, the butterflies. The little touches of things moving mechanically made it seem quite real There was just a lot of detail that made [*Dioramas*] very interesting. *Adult*

[What I liked best about *Dioramas* was] that they were motorized. They actually had some movement. (Why did you like that?) It made some of the things a little more realistic than just standing still. It gives you an idea of how the dinosaurs might have moved, how they might have done stuff. *Child*

I liked the before and now part of the diorama. So all in one diorama, instead of walking to this one, seeing before and after, you can compare them together. I thought that was neat. At first, when you walk up there, you don't quite make it out. And as you got closer and read about it, this was 65 million years ago, and this is now. *Adult*

Most could not name anything about *Dioramas* they disliked. However, about one-quarter of adults and a few children said *Dioramas* contained too much information and they had hurried past it.

Main Messages

About half the adults and children said *Dioramas* show that Earth has changed over time. Many also added that humans have impacted this change. Along those lines, some interviewees said *Dioramas* show that it is important to care for our environment. Though no interviewees said *Dioramas* show biodiversity, several adults and a few children noted *Dioramas* show a reduction in plants and animals over time. Additionally, about one-half of adults and several children said one of *Dioramas*' main messages was to show scientists working in the field.

Almost three-quarters of adults and children recognized that each diorama shows a past and present scene of one location. In fact, more than one-half of adults and slightly less than one-half of children said the main message of *Dioramas* was to show that Earth has changed over time (see the first three quotations). Many of these adults and a few of these children went on to explain that *Dioramas* show how humans have impacted this change (see the fourth quotation). Similarly, about one-quarter of adults and a few children said *Dioramas* promote conservation—taking care of our environment (see the fifth and sixth quotations).

[The diorama] helps to demonstrate the vast expanse of time in forming the Earth's crust. . . . To think on that time scale. *Adult*

[The division of the past and the presentation shows] what it was in the past in the same place . . . so you realize the differences that have changed over the past years. *Child*

[The *Dioramas* show] the way things change over thousands of millions of years. *Child*

[The *Dioramas* show] what we did, how we changed the environment to make it like a city. Like people changed [it] by deforesting and destroying the environment. It shows how bad we are by changing everything. We changed the environments into cities.
Child

[The *Dioramas* show] to keep things preserved the way they used to be. [Changes] affect how things used to be, like animals' and people's general health. *Adult*

I think that in terms of educating the public, [*Dioramas* shows] our generation came up with the whole ecology idea and the impact on man. Can we be better stewards?
Definitely. *Adult*

Additionally, about one-half of adults and several children said one of the main messages of *Dioramas* was to show scientists working in the field (see the two quotations below)—they used words like “discovering,” and “research,” though they did not specifically say the scientists were studying change.

[The *Dioramas* show] what people's jobs are, because they show people digging up stuff. Here they show people at swampy places. They try to find different stuff, kind of like the Audubon Center. *Child*

[The *Dioramas* show] what goes on out in the field of research. It breaks it down on a more elementary level [so] kids can understand—like the process of how things get to the museum. *Adult*

No visitors used the term biodiversity when discussing the *Dioramas*. However, several adults and a few children said that *Dioramas* show how various species of plants and/or animals have been reduced or become extinct as a result of changes in the natural environment (see the two quotations below).

[The *Dioramas* show that the] environment changed a lot You never really see an elk in Wisconsin anymore unless it's on a game farm. Or some of the birds you never see. You don't see half the birds you used to. I would say that three-quarters of the birds of Wisconsin don't [exist] anymore. *Adult*

It is showing different time periods of the same place. It shows how the world has been changing through time. It seems there are less trees. Less animals. More people. *Child*

BEHIND THE SCENES

Overall Opinion

In *Behind the Scenes*, interviewees seemed especially interested in the opportunity to see real objects and artifacts. Virtually all the interviewees named tools, specimens, and fossils as their favorite features in that the exhibition area. When asked what they liked least, one-half of the adults and a few children said the area was too dense, overwhelming, and/or not interesting.

When asked what visitors liked best about *Behind the Scenes*, nearly all the adults and children named some specific object or artifact—such as the tools (see the first two quotations), specimens (see the second and third quotation), or geologic samples (see the fourth quotation). These interviewees expressed an enthusiasm for seeing the “real thing.”

The stuff is real. Like the tools, it explains what the tools are and what they are used for.
Adult

[I liked] the raptor skeleton. Liked the tools that they use to dig up the dinosaur bones. I liked the animals that are stuffed because they look so real. *Child*

Quite frankly I thought the most interesting part was just to look at the insects to see how large some of the insects are, like the walking stick. . . . [I liked] looking at the specimens themselves as opposed to finding out the mechanics of them. *Adult*

[I liked] the rocks. . . . If you looked at them in specific detail, you could see them in the woods and cut them up and they would have crystal stuff in them. *Child*

When asked what they liked least, one-half the adults and a few children said the area was too dense and overwhelming. Some interviewees said they rushed through because it lacked interesting-looking exhibits (see the two quotations below).

We just kind of walked through that [area] and didn't really look. (Was there anything that caught your eye?) No. (Was there anything you found interesting?) No. *Adult*

We didn't really go through [*Behind the Scenes*]. Everything is in glass. It's got a shorter ceiling. It just looks too compact and everything. *I got just one look in from the outside. There's nothing I really saw of interest [in that area]. *Adults*

Main Messages

About one-half of interviewees said that the main idea of the exhibits in *Behind the Scenes* was to show scientists' work, with a few adults explicitly pointing out the division of the exhibits into the various fields of science. None of the interviewees talked specifically about the scientific process. Some interviewees said the main message was simply “about animals,” and some interviewees said they did not know the main message.

More than one-half of adults and slightly less than one-half of children said the main idea of the exhibits in *Behind the Scenes* was to show scientists work (see the first two quotations), though none said it showed scientists studying change. A few adult visitors said the exhibits were divided into the various fields of science—naming geology and botany, for example, and pointing to the overhanging signs in the exhibition (see the third quotation). None of the visitors talked specifically about the scientific process.

[*Behind the Scenes*] shows that people take care of wildlife and nature. People study it. [It] might even encourage somebody to go for a career in it because they'd be like, "Wow, I didn't even know people did that." *Adult*

To show kids what jobs they could do and how hard it is. (What kind of jobs?) To do stuff about nature. *Child*

I think it is trying to give an introduction to each of the different areas of science. I think a lot of people don't understand what a geologist does or what an ecologist does. *Adult*

About one-quarter of children and several adults said the main message of *Behind the Scenes* was to display and teach about various animals. They referred to all the specimens on display.

About one-quarter of children and several adults said they did not know *Behind the Scenes*' main message. These tended to be visitors who rushed through the exhibition.

II. PRINCIPAL FINDINGS: TEACHER GROUP DISCUSSIONS

BACKGROUND INFORMATION

As shown in Table 1, about two-thirds of the 16 participants in the discussion groups were female (10 teachers), and about one-third were male (6 teachers). Teachers were between the ages of 36 and 53 years, with a median age of 45 years.

Table 1
Gender and Age of Teacher Discussion Group Participants

Characteristic	Group 1 (n=9)	Group 2* (n=7)
Gender		
Female	4	6
Male	5	1
Age		
under 45	2	2
45 and older	7	4

*One participant in Group 2 did not report his/her age.

The majority of participants taught middle or high school science classes (9 teachers and 10 teachers, respectively) (see Table 2). Fourteen teachers worked with mainstream students, followed by 13 teachers who taught special education students. Thirteen teachers worked in public schools.

Table 2
Teaching Characteristics

Characteristic	Group 1 (n=9)	Group 2 (n=7)
Grades		
Elementary	3	1
Middle	2	5
High	2	-
All	2	1
Subjects		
Science	6	4
All	3	2
Social Studies	-	1
Students*		
Gifted	5	5
Mainstream	8	6
Special education	7	6
School		
Public	8	5
Parochial	-	1
Independent	-	1
Outreach Programs	1	-

*Participants reported teaching a range of students, therefore the total exceeds *n*.

Participants in both groups reported a high interest in science (see Table 3). Teachers in both groups rated student interest in science slightly lower than their interest in science.

Table 3
Interest in Science

7-Point Rating Scale: Not interested (1) / Very interested (7)	Group 1		Group 2	
	Mean	±	Mean	±
Teacher interest in science	6.56	1.01	7.00	0.00
Student interest in science	4.78	1.64	5.40	1.14

Both groups rated their comfort level of teaching science relatively high (see Table 4).

Table 4
Comfort Level Teaching Science

7-Point Rating Scale: Not very comfortable (1) / Very comfortable (7)	Group 1		Group 2	
	Mean	±	Mean	±
Comfort teaching science	6.33	1.32	6.57	0.79

Twelve of 16 teachers in the discussion groups have been involved with the Milwaukee Public Museum for more than three years (see Table 5). Additionally, 15 teachers have taken their students on a field trip to the Museum.

Table 5
Involvement with Milwaukee Public Museum

Characteristic	Group 1 (n=9)	Group 2 (n=7)
Years involved with MPM		
Never	1	2
Less than 1 year	1	-
1 to 2 years	-	-
3 years or more	7	5
Last time took a field trip to MPM		
Never	-	1
Within the past 3 months	2	3
Within the past 6 months	1	2
More than 6 months ago	6	1

REACTIONS TO *EXPLORING LIFE ON EARTH*

Overall Reactions to Presentation

All of the teachers remarked positively about the exhibition's interactive elements, however many commented that the material was too dense for students to absorb during a single visit. Several teachers remarked that the exhibition accommodated the needs of students with disabilities, though a few said the labels were difficult to see. Additionally, one teacher suggested incorporating more Spanish into the exhibits, and another mentioned broken exhibits that needed attention.

Both groups made positive comments about *Exploring Life on Earth*, specifically praising the exhibition's interactive nature (see the first quotation below). However, many teachers noted that their students would not be able to absorb the amount of material presented in the exhibition (see the second quotation). A few others disagreed, stating that *Exploring Life on Earth* did not present too much material to process during a single field trip (see the third quotation).

I have certainly wandered around this Museum a lot and this particular exhibit is truly set up for an education in science where you could take kids to really involve them or immerse them in different levels of it. While the other exhibits are very interesting, this one seems like it's meant to really [be] interact[ed] with. *It's really something you should interact with. *Yes. And these displays were not what I expected in a museum. When you go to a museum, things just are standing there. These all had some sort of movement or interaction. There was a bird that was fluttering its wings and things like that. You just don't see that, and so it is more than just an exhibit, more than just a museum visit.

It takes a lot of time to really look at one exhibit. And if you come here on a field trip with students, it would be next to impossible to get through all of this.

(How feasible do you think it would be to have a focused visit about this [exhibition]?) I think it's very feasible. This might be an obvious choice for such a thing or a mini trip when you figure you're not going to see the whole museum. You can come and see one area.

A few teachers in both groups commented that the exhibition addressed the needs of students with visual and hearing disabilities and those who use wheelchairs. Additionally, several teachers praised the use of Spanish in videos (see the quotation below).

I was happy to see closed captioning on the videos and the ones where the native speakers were in Spanish—it was left in Spanish and the captioning was in English. We have a fair [number] of Spanish-speaking students at our school.

Teachers made a few suggestions for improving the exhibition's overall presentation. A few participants commented that the lighting and small print made the labels difficult to read (see the first quotation below). One teacher wanted more exhibition elements translated into Spanish,

and another emphasized the importance of properly functioning video screens and buttons (see the second and third quotations).

Some of the kids [have] bad eyesight—some of it was [in] pretty small print [considering] how fast you're going to have to go through something like this because the next person in line wants to read it. . . . *Yeah I [would recommend making the labels] more reader-friendly, especially with the lighting—[perhaps install] a larger screen, poster, or information board.

I saw some of the bilingual [video] tapes. I [also saw] some of the personnel files—maybe some of those could be translated.

One thing that drove me crazy . . . is when you touch a screen and it doesn't work. When you push a button [and] it doesn't work. I've been to this Museum and I've been to other museums where I came year after year and the same button didn't work. Don't have buttons then. If you aren't going to keep them up and fix them, don't have them, because it really angers kids—it angers me right now.

Overall Reactions to Exhibition Content

Many teachers thought the exhibition content was most appropriate for students in fourth grade and older. About one-half of the teachers reported seeing a relationship between *Dioramas* and *Behind the Scenes*, and believed their older students would also. In contrast, about one-half said they did not see a connection, and did not believe their students would see one either. Teachers had mixed opinions about whether the current title of the exhibition effectively conveyed its main idea; however, all agreed that the exhibition needed to be more clearly delineated and labeled.

Appropriateness of Content for Students

Teachers agreed that the exhibition presented material too advanced for younger students (see the quotation below). Many teachers stated that younger students would require additional interpretation or instruction to use the exhibits.

When I was thinking about bringing kids here, I thought fourth or fifth [grade] would be the earliest that I would bring a class, and [students] would need to be teacher led. Even though the exhibits are really good, kids don't have any context. I would say seventh grade would be as early as I would let it be kid directed, and that would be with some prep. . . . *They wouldn't understand what the dioramas are, the career connection, what are the people doing, [and] how the three dioramas . . . are connected to each other.

Responses to Presentation of the Main Ideas

None of the teachers asked how *Dioramas*, *Tree of Life*, and *Behind the Scenes* were connected, could articulate the relationship among them. About one-half of the teachers saw a connection between *Dioramas* and *Behind the Scenes*, though many initially had difficulty doing so (see the

first quotation below). Those teachers who understood the connection indicated they felt that students' understanding of the relationship would vary by grade (see the second quotation). Additionally, many teachers remarked that they did not see a relationship and did not believe that their students would either (see the third quotation).

When you're first walking into it, [the exhibition] is so much like a hallway, that I didn't immediately see the connections from one side to the other. . . . So it took me a while to get the idea that I was looking at something 100 years . . . before and after.

I teach middle school and I don't think they would have a problem [making the connection between the two aspects of the exhibition]. [However,] for elementary school [students], especially the lower elementary grades, I don't see them making that connection.

I didn't just know that they're all connected. They [the students] would think that you have all different exhibits here. They're all totally disconnected and not related in any way at all.

Responses to Exhibition Title

Teachers indicated that the exhibition needed a descriptive title that introduces the connection between *Dioramas* and *Behind the Scenes* and indicates content (see the first quotation below). None of the teachers said they saw the title while visiting the exhibition. A few approved of the present title, *Exploring Life on Earth* (see the second quotation). However, a few said the title would not intrigue their students, and made suggestions for alternative titles (see the third and fourth quotations).

When you come into here [there must be an] effective comment about context—what I know from being here is you can learn about life in the past and life today and how things have changed. . . . [Indicate] the things that kids learn about here.

I think it's a nice title, but you're really doing a comparison and then exploring that comparison. They'll pick that up in 'Exploring Life on Earth.'

'Exploring Life on Earth'—it's not kid oriented. If it focuses on kids, then the language needs to be more kid engaging. And 'Exploring'—the instant you said it I just saw it on a textbook cover.

Science starts with a question. So that's [been] said before and that really fits what this [exhibition] is. This is a place not just to answer questions—this is the place to get questions going. So it could be, 'Questions About Life On Earth.'

RESPONSES TO EXHIBITION ELEMENTS

Dioramas

Teachers liked the *Dioramas*' design, though they did not wholly agree that the “before and after” perspective was clear and appropriate for students. Several teachers suggested reducing the amount of information presented in the exhibition area.

Teachers commented that *Dioramas*' interactive components and realistic figures would attract students to the exhibition hall (see the first quotation below). Many teachers understood the “before and after” perspective of *Dioramas*, though a few had difficulty seeing this relationship (see the second quotation below). Overall, teachers agreed that students would understand *Dioramas*, although one teacher noted that the idea of “before and after” scenes would not sustain student interest. Additionally, a few teachers said they were confused by the “before and after” perspective of the presentation, as well as the sequence of the three dioramas (see the third quotation).

I thought the dioramas were really attractive—eye pleasing. . . . I thought the lighting changes were all always a high point of the exhibit.

I wasn't sure if I was starting at the right place or not—I just felt that the older [diorama] should have been first. I wasn't sure if we were supposed to start [at] this end and go that way . . . or the other [way]. I didn't realize at first that it was divided because my attention was on the modern-day [side]. Then, as I was walking past the exhibit, I [thought], ‘Oh wait a minute you know here's the gray line and the dinosaurs,’ and then I put it together, but at first I didn't think of it that way.

Once they figure out a pattern, there's nothing new [for the students]. . . . The kids [will think], ‘Well that's the same as that, and that's the same as that’ [and] swoosh by. So the pattern doesn't engage them the way it does adults.

While teachers agreed that *Dioramas* was appropriate for students, several suggested ways to tailor it for younger visitors. Several others discussed the density of information presented, and recommended organizing big ideas with bulleted sections and less text. Another suggested spreading the dioramas around the exhibition space to thin the information concentration. One teacher recommended engaging students in a game to encourage reading (see the quotation below), and another suggested allowing students to walk in the dioramas or having carts with artifacts available for exploration.

There's a lot of reading. I think if you did something [like] a question search-and-find, maybe that would prompt them more to try to figure out the answer.

Tree of Life

Teachers liked the Tree of Life, though almost all of them found it difficult to use. They discussed the need to better incorporate it into the exhibition, and suggested reorganizing the material to facilitate use.

Though teachers liked the idea of the exhibit and seeing the specimens, almost all of the teachers found the Tree of Life confusing, difficult to use, or too busy (see the first quotation below). However, one teacher praised the exhibit and said students would appreciate it too (see the second quotation).

I started out here with the Tree of Life, and I found that confusing. I was trying to connect the center diagram with all the specimens around it and I couldn't figure it out. They're not directly connected. The numbers don't go with the specimens and it took me a long time to find the numbers on the wheel.

I really liked it because that's a lot like we lay out our court at school. We have a big wall that we do. To see it with a real specimen—I think my kids would really relate well to that.

Teachers discussed different strategies to organize the information in the Tree of Life and ways to connect it to the other exhibits. Most agreed that it needed to give information on the specimens, and a few suggested incorporating some of the plants and animals displayed into *Dioramas* and *Behind the Scenes* (see the quotation below).

[The exhibit would be better] if these animals or plants [had] a number that . . . located [them] within the tree. *I was thinking the same thing. Then [indicate] . . . they're over here in this diorama. Each kid could be an animal and if they start out with the Tree of Life, [they learn] who are they, where they belong on that tree and then they could go back over to the diorama and find if there's an animal that would be similar.

Behind the Scenes

Teachers made few comments about *Behind the Scenes*. Though they liked the content of the exhibition area, they found the presentation unwelcoming and uninteresting. A few teachers suggested creating a game to encourage students to visit the exhibition area, as well as guide them through the material.

Behind the Scenes was not a peak experience for teachers and very few offered comments about the exhibit. Many remarked that the exhibition area's overall appearance did not appeal to them (see the first quotation below). However, some teachers commented favorably about the exhibition area's content (see the second quotation). Finally, a few teachers discussed creating a game, such as "Who Wants To Be The Leader?" to guide students through the exhibition area.

If you were to ask me what this was the first time when I walked in, I would have [said] offices of some sort. Once I [was] over there and looking around and observing the rest

of it, then I could see it's a display but it doesn't have the same sort of grab [that the dioramas do].

I liked the fact that they showed the tools that the scientists used. I think it's important that the kids see that because you always encourage the kids to use these tools but to actually see that the scientists really do use them and this is what they use them for [is good].

Jeep

Finally, teachers had mixed reactions to the Jeep. Though many teachers said the vehicle would attract students, they did not agree that the video would sufficiently capture their interest. One teacher recommended redesigning the vehicle to teach students about packing for fieldwork.

Several teachers said they thought students would be attracted to the Jeep. However, teachers did not reach consensus about the video played from the Jeep. Some reacted favorably to the video, while others said that students would not enjoy the presentation. One teacher suggested using the vehicle to display the gear that scientists take into the field (see the quotation below).

It would be fun if they could unpack it and take a look at what you would need while you were out there [in the field]. They could make it a little bit less complicated to just give them an idea [of what scientists in the field use] because a lot of these kids went camping in fifth grade, but they wouldn't know what they would need [in the field].

CONNECTION OF THE EXHIBITION WITH CURRENT CURRICULUM

Overall, teachers agreed that the exhibition overlaps with the current curriculum, including lessons about science, social studies, and Milwaukee. However, many emphasized that the exhibition was more appropriate for older students. A small number of teachers had suggestions to help mesh visitor experience with the curriculum, including providing specialized tours and Web-based supplemental materials.

Teachers indicated they thought the exhibition overlaps with the curriculum, though many stressed the importance of having visits correspond with relevant lesson plans. Additionally, several teachers said they would only encourage students in the third grade and older to visit.

Almost all of the teachers said the exhibition teaches students of all ages about possible careers in science. Additionally, many teachers said they felt that the sections devoted to Milwaukee would encourage students to learn about their state (see the first two quotations below). Several teachers remarked that the exhibition corresponds well with science lessons, including geology, taxonomy, animal biology, and other fields of scientific research. One teacher commented that the exhibition could help students understand biodiversity (see the third quotation). Finally, a couple of teachers remarked that the exhibition could blend well with social studies lessons.

The curriculum includes ecology in the middle school and also there's a section on Wisconsin itself. All this ties in just lovely with what I teach.

I was thinking the content really works well in the middle schools. You could take field trips right out to the Menomonee Valley doing biodiversity counts or you could be taking some water samples. . . . To me the information is right on [target] for what one does in the school.

Biodiversity—I see that throughout. You can see the differences in the plant life on one side and then on the right side. You see it's just dead and destitute and it's just not as cool. I think that that's a big thing that kids need to see. Why do we want biodiversity? Why do we worry about this? . . . Start with the beetle that got eaten by this that did [that]. . . . Kids don't see those connections.

Teachers had many suggestions for ways to connect the exhibition with school curriculum. One suggested creating tours to reflect current classroom lessons, and another recommended creating a Website that generates tests based upon current curriculum and exhibition content. Several other teachers suggested strategies to engage students, such as role-playing and scavenger hunts (see the first quotation below).

I'd [create] scenarios—like a simulation for them to step into another world and start acting out the parts. Have something that they have to go get, look for, and do.

GENERAL TEACHER NEEDS

Suggestions for Improving the Student Experience

Teachers said that the students need an orientation before visiting the exhibition, and suggested including exhibition lead-ins, an orientation film, and a designated orientation space. Several preferred having the Museum generate a plan, while a few others wanted specific information about the content, staff interaction with the students, and electronic guides. Additionally, teachers discussed strategies they could use to help guide the student experience.

The teachers agreed that student groups would require an introduction to the exhibition's main idea (see the first quotation below). Several offered suggestions for exhibition elements to introduce the content (see the second and third quotations), and a few suggested showing a film to orient students (see the fourth quotation). A few others recommended creating an orientation area for the exhibition where exhibits or programs could introduce exhibition concepts to students.

[The students need] some kind of lead-in or just an explanation of what you're doing [and] what the display's about.

With the lead in you could even have something that's easy as: 'What is the connection?' Just [provide] a question at the beginning so that [the students] know that they can look for something.

If you put questions over there that said: 'Go across the hall and see what you can find out and then come back and look.' . . . *That's a good idea. Just to have that section be, not just the place where you get the answers, but also where a question gets started, or where you find you have to go back to the lab to get the answer. Some of the stuff happens there, but some of it happens in the lab.

A little theater . . . could start out [with] a film to get you oriented to this [and you] wouldn't have to worry about the sound problems and all those things.

Many teachers agreed that the Museum should provide plans that direct student groups to the most pertinent aspects of the exhibition. A couple of teachers added that they would like information about the exhibition's content, especially the names of the animals in the Tree of Life exhibit (see the first quotation below). Both groups commented that having Museum staff interact with students would add relevancy to the exhibition experience (see the second quotation).

I [would prefer] handouts or a package to give teachers beforehand so they know, 'let's start in this area.' Then maybe have a question board out as you move to the next area that actually leads them into it. Ask some sort of question and then [students] go through [the exhibition] and they make the connection with the previous part. . . . Have a pack that you can give to the teachers that they come through with. Have questions down at the [students'] level but they don't necessarily need to be able to do all the reading. They can just do observations and they'll pull something out that way.

I was just struck again by how these people are really here in Milwaukee. . . . Could I have one of those people as a speaker? . . . [They would understand that] that real people do this [research]. This is not somebody they just fabricated over there.

A few teachers suggested teaching strategies to engage students visiting the exhibition (see the first and second quotations below). Additionally, one suggested using technology to guide students through the exhibition (see the third quotation).

So for the older kids, [I suggest] doing the jigsaw. Assigning them to different parts and then bringing it all back together in the classroom would work with that amount of reading. But if you don't divide them, it's not going to get done.

I like the idea of bringing them in first and have some sort of preliminary program. Then divide the school group up into manageable portions. . . . [Use] a station concept.

The technology is changing [and there are] these little MP3 players . . . [so information does not] have to be sequential anymore. The kids could have some kind of a hand-held device that says, 'OK you're interested in more on butterflies. Where [should] you go?

And then tap here.’ And it brings up a map and says, ‘OK go up to the third floor and go to here’ . . . Or an audio thing where if you want to do this, then you enter 22 you know and then you run off and do this kind of thing.

Suggestions to Improve Information Exchange

At least one-half of the teachers have Internet access and said they would prefer to receive information from the Museum online. The other half had various recommendations to receive information, including using an existing information network. All agreed that they wanted access to information before visiting, as well as at the Museum. All teachers also noted that the material should be presented in a simple, easy-to-understand format. Some teachers wanted in-service programs and access to Museum staff. Teachers in one group also seemed interested in distance learning.

At least one-half of the teachers had access to the Internet at school, and many agreed that they would prefer to receive information from the Museum online. A few recommended using existing information networks designed specifically for science teachers (e.g., working with a school district’s science coordinator). Teachers agreed that information about the exhibition should be available while planning a visit, as well as at the Museum on the day of the field trip.

Teachers had various opinions about the best way to make teachers aware of the exhibition. For example, a few preferred to receive postcards. Another advocated having a Museum Open House and using unique invitations (see the first quotation below). However, all teachers emphasized that the advertising should clearly explain what the exhibition is about and the benefits of visiting it (see the second quotation).

[I like the] backpack—if you made a paper one and put it in the mail which opened up—you could put stuff in it, send it to key teachers in the Milwaukee public schools or surrounding area. Then invite them here to an opening where this thing is explained.

It has to be simple. . . . Something that shows them a positive benefit [and that they] can use easily and effectively. [Provide an] introductory presentation for instructors and [one] introductory presentation for a student researcher, [and one for] a student in a class.

Some teachers suggested marketing the exhibition as part of an in-service program for teachers (see the quotation below). Some indicated they thought having Museum staff either at teachers’ meetings or as facilitators at a private exhibition showing would encourage teachers to plan field trips to the exhibition. Additionally, distance learning was introduced in one group, and was well received by the other teachers.

Sell it as a real program, not as a thing that you’re just walking through. . . . When you’re trying to sell it to the schools, show it as real enhancement to what they have going in the curriculums already. And show how they can fit in with this.

Barriers to Visiting

Teachers discussed a variety of barriers to visiting the Museum, including cost and time.

Finally, teachers mentioned barriers to visiting that did not relate to exhibition presentation or content. These included cost of the trip, having enough time to visit the specified areas of the Museum, and having enough time to plan the field trip. Additionally, a few commented that the free days offered by the Museum are not optimal for student trips (see the quotation below)

Mondays are the days that most people come because it's free to residents, but then you have so many people here that you just really don't get a real good sense of what's here.

III. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

DATA COLLECTION CONDITIONS

Observers timed and tracked visitors in *Dioramas* and *Behind the Scenes* for five days in June 2002. Data collection occurred on weekdays and weekend days. A total of 100 drop-in visitors, ages nine years and older were observed in each exhibition area. As Table 6 shows, about one-half of the observations were conducted on a weekday (58 percent and 50 percent), and one-half were conducted during the weekend (42 percent and 50 percent). About three-quarters of the observations in each exhibition area were conducted when few visitors were present (77 percent and 73 percent).

Table 6
Data Collection Conditions
(*n* = 100 for each exhibition area)

Condition	<i>Dioramas</i> %	<i>Behind the Scenes</i> %
Day		
Weekday	58.0	50.0
Weekend	42.0	50.0
Level of Crowding		
Few visitors	77.0	73.0
Moderate	23.0	27.0
Crowded	0.0	0.0

VISITOR DEMOGRAPHICS

As Table 7 shows, in each exhibition area more than one-half of the visitors were female (57 percent in *Dioramas* and 52 percent in *Behind the Scenes*) and less than one-half were male (43 percent in *Dioramas* and 48 percent in *Behind the Scenes*). Most visitors in each exhibition ranged in age from 25 to 44 years (58 percent in *Dioramas* and 44 percent in *Behind the Scenes*).

Table 7
Demographics of Visitors Observed
(n = 100 for each exhibition)

Characteristic	<i>Dioramas</i> %	<i>Behind the Scenes</i> %
Gender		
Female	57.0	52.0
Male	43.0	48.0
Age Group		
9 to 12 years of age	6.0	7.0
13 to 15	3.0	10.0
16 to 18	3.0	7.0
19 to 24	8.0	14.0
25 to 34	28.0	22.0
35 to 44	30.0	22.0
45 to 54	8.0	8.0
55 to 54	11.0	7.0
65 years or older	3.0	3.0

As Table 8 shows, nearly two-thirds of visitors in *Dioramas* and one-third of visitors in *Behind the Scenes* were in groups of adults and children (62 percent and 32 percent, respectively). More than one-quarter of visitors in each exhibition area were in groups comprised only of adults (each 28 percent). Only one visitor in *Dioramas* was in a children-only group, while 19 percent of visitors in *Behind the Scenes* were in such groups.

Table 8
Group Composition of Visitors Observed
(n = 100 for each exhibition)

Group Composition	<i>Dioramas</i> %	<i>Behind the Scenes</i> %
Adults and children	62.0	32.0
All adults	28.0	28.0
Alone	9.0	21.0
All children	1.0	19.0

COMPARISON OF *DIORAMAS* AND *BEHIND THE SCENES* OBSERVATIONS

Comparison of Average Total Time

One way to examine the visitor experience in an exhibition is to record how much time people spend within it. Visitors spent an average of four minutes in *Dioramas* and three minutes in *Behind the Scenes* (see Table 9).¹ When the total times of the two exhibition areas were compared statistically, the relationship was highly significant. That is, the fact that visitors spent more time in the *Dioramas* than in *Behind the Scenes* was not due to chance.

Table 9
Total Time Spent in *Dioramas* and *Behind the Scenes*
(*n* = 100 for each exhibition)

	<i>Dioramas</i>		<i>Behind the Scenes</i>	
	Mean	±	Mean	±
Total time*	4 min., 14 sec	3 min., 6 sec.	2 min., 53 sec.	3 min., 1 sec.

**p* = 0.00

To further compare the two exhibition areas, RK&A used Serrell’s “Sweep Rate Index” (SRI).² The SRI is calculated by dividing the exhibition’s square footage³ by the average total time spent in the exhibition.⁴ The lower the SRI, the more time visitors spent per square foot of space. *Dioramas* SRI is 515 square feet per minute and *Behind the Scenes* SRI is 757 square feet per minute. This means that visitors are moving slower through the *Dioramas* than they are through *Behind the Scenes*.

***Dioramas* SRI is lower than Serrell’s average SRI for diorama exhibitions,⁵ meaning visitors in *Dioramas* are moving slower than visitors in exhibitions of similar size (See Appendix, Chart 1). Visitors in *Behind the Scenes* are traveling much faster than visitors to exhibitions of similar size.**

¹ RK&A usually reports medians rather than means for time data, because time data not are evenly distributed. However, means are reported in this section to conform with the Serrell Sweep Rate Index model. A nonparametric test was used to analyze the significance of the two exhibitions’ time data.

² Serrell, B. (1998). *Paying Attention: Visitors and Museum Exhibitions*. Washington, DC, American Association of Museums.

³ *Dioramas* is 2,180 square feet and *Behind the Scenes* is also 2,180 square feet.

⁴ The average total times were used in the SRI calculation in accordance with Serrell’s methods. Throughout the rest of the report, the median times are reported, as the median is standard for time data that is unevenly distributed across its range.

⁵ Serrell reports an average SRI of 638.5 (±236.7) for diorama exhibitions and an average SRI of 244.3 (±104.8) for small (<3,900 square feet) nondiorama exhibitions.

Comparison of Total Stops

A second method of gauging the visitor experience in an exhibition is to count the stops visitors make. **For the purposes of this study, a “stop” is defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which he or she had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.**

Visitors made an average of six stops in *Dioramas* and four stops in *Behind the Scenes* (see Table 10). When the average total stops of the two exhibition areas were compared statistically, the relationship was highly significant. That is, the fact that visitors stopped at more exhibits in *Dioramas* than did visitors in *Behind the Scenes* was not due to chance.

Table 10
Total Stops in *Dioramas* and *Behind the Scenes*
(*n* = 100 for each exhibition)

	<i>Dioramas</i>		<i>Behind the Scenes</i>	
	Mean	±	Mean	±
Total stops*	5.59	1.92	3.78	3.05

**p* = 0.00

To further compare the two exhibitions, RK&A used Serrell’s “Percentage Diligent Visitor Index” (%DV).⁶ The %DV is obtained by calculating the percentage of visitors who stopped at more than half of the exhibits. The higher the %DV, the more thoroughly the exhibition was used. The %DV for *Dioramas* is 36 percent, and the %DV for *Behind the Scenes* is 4 percent. This means that visitors used *Dioramas* more thoroughly than did visitors in *Behind the Scenes*.

***Dioramas* %DV is higher than Serrell’s average %DV for diorama exhibitions,⁷ which means visitors stopped at more exhibits in *Dioramas*, compared with exhibitions of similar size (See Appendix, Chart 2). Visitors in *Behind the Scenes* stopped at fewer exhibits than did visitors to exhibitions of similar size.**

⁶ Serrell, B. (1998). *Paying Attention: Visitors and Museum Exhibitions*. Washington, D.C., American Association of Museums.

⁷ Serrell reports an average %DV of 23.3 percent (±19.8) for diorama exhibitions, and an average %DV of 29.7 percent (±22.8) for small (<3,900 square feet) nondiorama exhibitions.

Comparison of Behaviors

A third way to examine the visitor experience is to compare visitors' behaviors in the two exhibitions. Three behaviors were analyzed statistically: total number of social interactions, total number of panels looked at, and amount of time spent using multimedia. Differences in the format of the exhibits in *Dioramas* and *Behind the Scenes* precluded comparing other behaviors.

There was a statistically significant difference between the two exhibition areas for one behavior. As shown in Table 11, visitors in *Dioramas* looked at a mean of three panels, while those in *Behind the Scenes* looked at a mean of two. When the average number of panels looked at in the two exhibitions was compared statistically, the relationship was significant. That is, the fact that visitors looked at more panels in *Dioramas* than did visitors in *Behind the Scenes* was not due to chance.

Table 11
Differences in Behaviors Between the Two Exhibitions

	<i>Dioramas</i>				<i>Behind the Scenes</i>			
	<i>n</i>	Median Usage	Mean Usage	±	<i>n</i>	Median Usage	Mean Usage	±
Number of times looked at panels*	48	2.5	2.9	1.7	42	2.0	2.1	1.7

**p* = 0.03

DIORAMAS OBSERVATIONS

Background Information

Most of the observations were begun at the Hell Creek Formation end of *Dioramas* (84 percent) (see Table 12).

Table 12
Section of *Dioramas* at which Visitors Were Intercepted
(n = 100)

Section	%
Hell Creek Formation end of <i>Dioramas</i>	84.0
Costa Rica end of <i>Dioramas</i>	16.0

As Table 13 shows, at the conclusion of the observations, 61 percent of visitors went to the live butterflies exhibition upon leaving *Dioramas*.

Table 13
Exhibition Visitors Visited After Leaving *Dioramas*
(n = 100)

Exhibition	%
Live butterflies	61.0
<i>Behind the Scenes</i>	16.0
<i>Sense of Wonder</i>	13.0
<i>Streets of Old Milwaukee</i>	5.0
None	3.0
PBW butterfly exhibits	2.0

General Visitation Patterns

Observers recorded the total time visitors spent in *Dioramas* and the total number of stops⁸ visitors made. The percentage of visitors that stopped in each section of *Dioramas* and the amount of time they spent there were also calculated.

Total Time and Total Stops

Visitors spent a median of 3 minutes, 30 seconds in *Dioramas* (see Table 14). They stopped at a median of six exhibits.

Table 14
Total Time and Stops in the *Dioramas*
(n = 100)

	Median	Mean	±	Minimum	Maximum
Total time	3 min., 30 sec.	4 min., 14 sec.	3 min., 6 sec.	30 sec.	32 min., 40 sec.
Total stops	6.0	5.59	1.92	1.0	10.0

Visitation of Each Section

As Table 15 shows, each section of *Dioramas* was visited by nearly all visitors (97 percent for Hell Creek Formation, 92 percent for Menomonee River, and 81 percent for Costa Rica). Visitors spent the most time in the Hell Creek Formation (median time of 1 minute, 8 seconds), followed closely by the Menomonee River (median time of 1 minute, 7 seconds). Visitors spent the least amount of time in Costa Rica (median time of 51 seconds).

Table 15
Stops Made and Time Spent in Each Section of *Dioramas*
(n = 100)

Section	%	Median Time (Seconds)
Hell Creek Formation	97.0	68.0
Menomonee River	92.0	67.0
Costa Rica	81.0	51.0

⁸ For this study, a “stop” was defined as using or looking at an exhibit for three seconds or longer. This definition is consistent with the museum literature.

Stops and Time Spent at Each Dioramas Exhibit

In terms of individual exhibits, the most visitors stopped at the Hell Creek Formation Present diorama, followed by the Hell Creek Formation Past diorama (88 percent and 87 percent, respectively) (see Table 16). The fewest visitors stopped at the Costa Rica Overview section and the Adventure Starts Here panel (15 percent and 1 percent, respectively). No visitors stopped at Our Ever-changing World panel.

Table 16
Percentage of Visitors that Stopped at Each *Dioramas* Exhibit
(*n* = 100)

Exhibit Name	%
Hell Creek Formation Present diorama	88.0
Hell Creek Formation Past diorama	87.0
Menomonee River Valley Present diorama	83.0
Costa Rica Tropical Dry Forest Present diorama	78.0
Menomonee River Valley Past diorama	70.0
Costa Rica Tropical Dry Forest Past diorama	55.0
Menomonee River Valley Overview	33.0
Hell Creek Formation Overview	29.0
Jeep	20.0
Costa Rica Tropical Dry Forest Overview	15.0
Adventure Starts Here panel	1.0
Our Ever-changing World panel	0.0

As Table 17 presents, visitors spent the most time at the Hell Creek Formation Overview (38 seconds). Other than Our Ever-changing World panel, that no visitors spent any time viewing, visitors spent the least time at the Jeep and the Adventure Starts Here panel (14 seconds and 3 seconds, respectively).

Table 17
Median Time Spent at Each *Dioramas* Exhibit

Exhibit Name	<i>n</i>	Median Time (Seconds)
Hell Creek Formation Overview	29	38.0
Menomonee River Valley Overview	33	32.0
Hell Creek Formation Past diorama	87	31.0
Menomonee River Valley Present diorama	83	31.0
Costa Rica Tropical Dry Forest Overview	15	30.5
Costa Rica Tropical Dry Forest Past diorama	55	30.0
Hell Creek Formation Present diorama	88	28.0
Costa Rica Tropical Dry Forest Present diorama	78	28.0
Menomonee River Valley Past diorama	70	26.5
Jeep	20	14.0
Adventure Starts Here panel	1	3.0
Our Ever-changing World panel	0	0.0

General Behavior Patterns in Dioramas

In addition to recording stops visitors made and time spent at exhibits, observers also noted several behaviors: social interactions, use of exhibit elements (e.g., panels, touchable casts, multimedia), and time spent at multimedia components.

Social Interactions

While in *Dioramas*, more than one-third of visitors engaged in one to two exhibit-related social interactions⁹ with other visitors in their group (39 percent) (see Table 18). More than one-quarter did not socially interact (28 percent). Another one-quarter had three or more exhibit-related social interactions (24 percent).

Table 18
Total Number of Social Interactions in the *Dioramas*
(*n* = 100)

Number of Social Interactions	%
1-2	39.0
0	28.0
3 or more	24.0
Not applicable (visiting alone)	9.0

⁹ Exhibit-related social interactions were defined as two or more visitors using an exhibit together, talking about an exhibit, pointing to exhibit elements, etc. When visitors talked about non-exhibit topics, disciplined children, or misused exhibits, these occurrences were not recorded as “social interactions.”

As Table 19 presents, the most social interactions took place at the Menomonee River Valley Present diorama (36 interactions). For each diorama, the most social interactions took place as visitors looked at the diorama. In all the dioramas but Costa Rica Present, the light buttons elicited the second greatest number of social interactions.

Table 19
Social Interactions in Each Dioramas Exhibit

Section	Social Interactions Observed <i>n</i>
Menomonee River Valley Present diorama Diorama (16)/Rat light button (15)	36
Hell Creek Formation Past diorama Diorama (22)/ <i>Gypsonictops</i> light button (8)	33
Hell Creek Formation Present diorama Diorama (23)/Dinosaur bone light button (4)	30
Menomonee River Valley Past diorama Diorama (14)/Turtle light button (6)	20
Costa Rica Tropical Dry Forest Past diorama Diorama (11)/Agoutis light button (4)	16
Costa Rica Tropical Dry Forest Present diorama Diorama (14)	14
Hell Creek Formation Overview	11
Jeep	5
Menomonee River Valley Overview	4
Costa Rica Tropical Dry Forest Overview	1

Summary of Behaviors

All of the exhibit elements were used by at least one-half of visitors. Every visitor looked at one or more dioramas (see Table 20). Nearly three-quarters of visitors used one or more light buttons (72 percent). The panels and touchable casts were used by the fewest visitors (each 48 percent).

Table 20
Summary of Behaviors in the *Dioramas*
(*n* = 100)

Behavior	% of Visitors	Median Usage	Mean Usage	±	Minimum Usage	Maximum Usage
Looked at dioramas	100.0	5.0	4.4	1.6	1.0	6.0
Used light buttons	72.0	2.0	2.4	1.5	1.0	6.0
Looked at specimens	52.0	2.0	2.2	1.3	1.0	5.0
Used multimedia	50.0	2.0	1.8	0.9	1.0	5.0
Looked at panels	48.0	2.5	2.9	1.7	1.0	8.0
Touched casts	48.0	4.0	4.2	3.0	1.0	11.0

- Of all the dioramas, the Hell Creek Formation Present diorama was looked at by the most visitors (99 percent).
- Of all the light buttons, the agoutis light button (Costa Rica Past diorama) was used by the most visitors (47 percent).
- Of all the cases with specimens, the acacia model case (Costa Rica Present diorama) was looked at by the most visitors (24 percent).
- Of all the multimedia components, the Hell Creek Formation Overview multimedia was used by the most visitors (79 percent).
- Of all the panels, Menomonee River 1,000 Years Ago was looked at by the most visitors (30 percent).
- Of all the touchable casts, the *Gysonictops* skull (Hell Creek Formation Past) was touched by the most visitors (31 percent).

The specific behaviors at each element in *Dioramas* are discussed later in this report.

Time Spent Using Multimedia Components

One-half of visitors did not spend any time using multimedia components (50 percent) (see Table 21). Twenty-six percent of visitors spent 25 percent of their time in *Dioramas* using multimedia components. Twenty-four percent of visitors spent more than 25 percent of their total time in the exhibition using multimedia components.

Table 21
Percent of Time Spent at Multimedia in *Dioramas*
(*n* = 100)

Amount of Time Spent at Multimedia	% of Visitors
Did not spend any time	50.0
Up to 25% of the total time in <i>Dioramas</i>	26.0
25% to 50% of the total time in <i>Dioramas</i>	12.0
More than 50% of the total time in <i>Dioramas</i>	12.0

As Table 22 shows, the 50 visitors who used multimedia components spent a median of 59 seconds doing so.

Table 22
Total Time Spent Using Multimedia in *Dioramas* (*n* = 50)

Median	Mean	±	Minimum	Maximum
59 sec.	2 min., 1 sec.	2 min., 37 sec.	1 sec.	10 min., 8 sec.

The most visitors used the Menomonee River Valley Overview multimedia (25 visitors) (see Table 23). While the fewest visitors used the Hell Creek Formation Present multimedia, they spent the most time there (median time of 1 minute, 4 seconds). Visitors spent the least time at the Costa Rica Present multimedia (median time of 25 seconds).

Table 23
Median Time Spent at Each *Dioramas* Multimedia Component

Component	Number of Visitors Using Component	Median Time (Seconds)
Hell Creek Formation Present multimedia	9	74.0
Menomonee River Valley Present multimedia	11	45.0
Hell Creek Formation Overview multimedia	23	44.0
Costa Rica Tropical Dry Forest Overview multimedia	11	42.0
Menomonee River Valley Overview multimedia	25	35.0
Costa Rica Tropical Dry Forest Present multimedia	11	25.0

All of the visitors who used the Menomonee River Valley Overview multimedia and the Costa Rica Overview multimedia spent the majority of their time at each Overview exhibit using the multimedia (see Table 24). The same is true for nearly all visitors who used the Hell Creek Formation Overview multimedia.

Table 24
Percent of Time Spent at Each *Dioramas* Multimedia Component

Component	Number of Visitors Using Component	Number of Visitors Spending 50% or More of Their Time Using Multimedia
Menomonee River Valley Overview multimedia	25	25
Hell Creek Formation Overview multimedia	23	21
Costa Rica Overview multimedia	11	11
Costa Rica Present multimedia	11	9
Hell Creek Formation Present multimedia	9	6
Menomonee River Valley Present multimedia	11	6

Behaviors at Specific Dioramas Exhibits

Observers noted whether visitors used each exhibit element (e.g., bone lights, panels, touchable casts) for each diorama. Each of the 10 tables in this section of the report displays the data for one exhibit, beginning with the Hell Creek Formation Present diorama and ending with the Jeep.

Hell Creek Formation

As Table 25 presents, every visitor who stopped at the Hell Creek Formation Present diorama looked at the diorama. One-third used the dinosaur bone light (34 percent). The fewest number of visitors used the multimedia (10 percent).

Table 25
What Visitors Did at the Hell Creek Formation Present Diorama
(n = 88)

Behavior	%
Looked at Hell Creek Formation Present diorama	100.0
Looked back and forth (59.1)	
Looked briefly (21.6)	
Looked back and forth and below (14.8)	
Looked below only (4.5)	
Used dinosaur bone light button	34.1
Successfully (86.7)	
Unsuccessfully (13.3)	
Looked at K/T rock case	25.0
Touched mammal skull cast	21.6
Looked at Montana Today panel	20.5
Touched <i>Dromaeosaurus</i> foot cast	19.3
Used Hell Creek Formation Present multimedia	10.2
Used both (66.7)	
Used Join the Research (22.2)	
Used Meet the Field Crew (11.1)	

Nearly all of the visitors who stopped at the Hell Creek Formation Overview section used the multimedia (90 percent) (see Table 26).

Table 26
What Visitors Did at the Hell Creek Formation Overview
(n = 29)

Behavior	%
Used Hell Creek Formation Overview multimedia	89.7
Watched part of video (50.0)	
Used multiple parts (23.1)	
Watched entire video (11.5)	
Used Field Notebook (7.8)	
Used Explorer's Report (3.8)	
Used Diorama Map (3.8)	
Looked at Hell Creek Formation 65 Million Years Ago and Today panel	13.8

As Table 27 shows, nearly all of the visitors who stopped at the Hell Creek Formation Past diorama looked at the diorama (97 percent). Forty-two percent used the *Gypsonictops* light button. The fewest number of visitors touched the leaf cast or looked at the leaf model case (9 percent and 8 percent, respectively).

Table 27
What Visitors Did at the Hell Creek Formation Past Diorama
(n = 87)

Behavior	%
Looked at Hell Creek Formation Past diorama	96.6
Looked back and forth (61.9)	
Looked briefly (27.4)	
Looked back and forth and below (9.5)	
Looked below only (1.2)	
Used <i>Gypsonictops</i> light button	42.5
Successfully (83.8)	
Unsuccessfully (16.2)	
Looked at meteorite case	35.6
Touched <i>Gypsonictops</i> skull cast	31.0
Looked at 65 Million Years Age panel	28.7
Touched <i>Dromaeosaurus</i> claw cast	25.3
Touched leaf cast	9.2
Looked at leaf model case	8.0

Menomonee River Valley

Nearly all of the visitors who stopped at the Menomonee River Present diorama looked at the diorama (94 percent) (see Table 28). Nearly one-half used the rat light button (46 percent). The fewest number of visitors looked at the Valley of Opportunity panel (8 percent).

Table 28
What Visitors Did at the Menomonee River Present Diorama
(n = 83)

Behavior	%
Looked at Menomonee River Present diorama	94.0
Looked back and forth (52.6)	
Looked back and forth and below (28.2)	
Looked briefly (15.2)	
Looked below only (3.8)	
Used rat light button	45.8
Successfully (81.6)	
Unsuccessfully (18.4)	
Looked at Menomonee River Valley Today panel	21.7
Touched native species cast	16.9
Touched invading species cast	16.9
Looked at The Purple Plague case	14.5
Used Hell Creek Formation Present multimedia	14.5
Used both (50.0)	
Used Meet the Field Crew (41.7)	
Used Join the Research (8.3)	
Looked at Valley of Opportunity panel	8.4

Nearly all of the visitors who stopped at the Menomonee River Overview used the multimedia (91 percent) (see Table 29).

Table 29
What Visitors Did at the Menomonee River Overview
(n = 33)

Behavior	%
Used Menomonee Overview multimedia	90.9
Watched part of video (53.3)	
Used multiple parts (20.0)	
Watched entire video (13.3)	
Used Diorama Map (10.0)	
Used Explorer's Report (3.3)	
Used Field Notebook (0.0)	
Looked at the Menomonee River 1,000 Years Ago panel	15.2

As Table 30 shows, nearly all of the visitors who stopped at the Menomonee River Valley Past diorama looked at the diorama (97 percent). Forty-three percent used the turtle button. The fewest visitors looked at the Humans in the Valley panel or touched the human artifact cast (10 percent and 9 percent, respectively).

Table 30
What Visitors Did at the Menomonee River Past Diorama
(n = 70)

Behavior	%
Looked at Menomonee River Past diorama	97.1
Looked back and forth (54.4)	
Looked briefly (17.7)	
Looked back and forth and below (23.5)	
Looked below only (4.4)	
Used turtle button	42.9
Successfully (86.7)	
Unsuccessfully (13.3)	
Looked at Menomonee River 1,000 Years Ago and Today panel	30.0
Touched animal cast	28.6
Looked at bottle gentian model case	20.0
Looked at Humans in the Valley panel	10.0
Touched human artifact cast	8.6

Costa Rica Tropical Dry Forest

Nearly all of the visitors who stopped at the Costa Rica Present diorama looked at the diorama (94 percent) (see Table 31). More than one-quarter touched the guanacaste tree cast (27 percent). The fewest number of visitors used the multimedia (13 percent).

Table 31
What Visitors Did at the Costa Rica Present Diorama
(n = 78)

Behavior	%
Looked at Costa Rica Present diorama	93.6
Looked back and forth (72.6)	
Looked briefly (19.2)	
Looked back and forth and below (6.8)	
Looked below only (1.4)	
Touched under the guanacaste tree cast	26.9
Looked at acacia model case	24.4
Used pocket mouse button	20.5
Successfully (87.5)	
Unsuccessfully (12.5)	
Looked at Costa Rica Today panel	20.5
Used Costa Rica Present multimedia	12.8
Used both (50.0)	
Used Meet the Field Crew (30.0)	
Used Join the Research (20.0)	

As Table 32 shows, nearly all of the visitors who stopped at the Costa Rica Overview used the multimedia (93 percent).

Table 32
What Visitors Did at the Costa Rica Overview
(n = 15)

Behavior	%
Used Costa Rica Overview multimedia	93.3
Watched part of video (60.0)	
Used multiple parts (13.3)	
Watched entire video (6.7)	
Used Diorama Map (6.7)	
Used Explorer's Report (0.0)	
Used Field Notebook (13.3)	
Looked at Tropical Dry Forest 500 Years Ago and Today panel	20.0

Nearly all of the visitors who stopped at the Costa Rica Past diorama looked at the diorama itself (91 percent) (see Table 33). Nearly one-half used the *Agoutis* light button and looked at the butterfly case (47 percent and 44 percent, respectively). The fewest visitors looked at the What is Tropical Dry Forest? panel (7 percent).

Table 33
What Visitors Did at the Costa Rica Past Diorama
(n = 55)

Behavior	%
Looked at Costa Rica Past diorama	90.9
Looked back and forth (64.0)	
Looked briefly (26.0)	
Looked back and forth and below (8.0)	
Looked below only (2.0)	
Used <i>Agoutis</i> light button	47.3
Successfully (72.4)	
Unsuccessfully (27.6)	
Looked at the butterfly case	43.6
Touched the <i>Agoutis</i> skull cast	34.5
Looked at 500 Years Ago panel	20.0
Touched forest floor cast	12.7
Looked at What is Tropical Dry Forest? panel	7.3

As Table 34 shows, nearly all of the visitors who stopped at the Jeep looked at the jeep (97 percent). Few watched part of the video, and no one watched the entire video (3 percent and 0 percent, respectively).

Table 34
What Visitors Did at the Jeep
(n = 20)

Behavior	%
Looked at jeep	97.0
Watched part of video	3.0
Watched entire video	0.0

BEHIND THE SCENES OBSERVATIONS

Background Information

As Table 35 shows, about one-half of the observations were begun at the shared entryway between the PBW butterfly exhibits and *Behind the Scenes* (49 percent).

Table 35
Section of *Behind the Scenes* at which Visitors Were Intercepted
(n = 100)

Section	%
PBW butterfly exhibits exit	49.0
<i>Behind the Scenes</i> main entrance	26.0
<i>Behind the Scenes</i> second entrance	25.0

At the conclusion of the observations, 44 percent of visitors went to *Sense of Wonder* after leaving *Behind the Scenes* (44 percent) (see Table 36).

Table 36
Exhibition Visitors Visit After Leaving *Behind the Scenes*
(n = 100)

Exhibition	%
<i>Sense of Wonder</i>	44.0
Live Butterflies	14.0
PBW Butterfly exhibits	12.0
None	11.0
Display case by stairwell	8.0
<i>Dioramas</i>	7.0
Jeep	4.0

General Visitation Patterns

Observers recorded the time visitors spent in *Behind the Scenes* and the number of stops¹⁰ they made. The percentage of visitors that stopped in each section of the exhibition and the amount of time they spent there were also calculated.

Total Time and Total Stops

Visitors spent a median of 1 minute and 4 seconds in *Behind the Scenes* (see Table 37). They stopped at a median of three exhibits.

Table 37
Total Time and Stops in *Behind the Scenes*
(*n* = 100)

	Median	Mean	±	Minimum	Maximum
Total time	1 min. 4 sec.	2 min. 53 sec.	3 min. 1 sec.	15 sec.	12 min. 48 sec.
Total stops	3.0	3.78	3.05	1.0	17.0

¹⁰ For this study, a “stop” was defined as using or looking at an exhibit for three seconds or longer. This definition is consistent with the museum literature.

Visitation of Each Section

As Table 38 shows, the most visitors stopped at the Geology Lab and the Tree of Life (57 percent and 48 percent, respectively). They also spent the most time in the Geology Lab and the Tree of Life (median time of 56 seconds and 44 seconds, respectively). The fewest visitors stopped at the Botany Lab (7 percent). They also spent the least time in the Botany Lab (median time of 11 seconds).

Table 38
Stops Made in Each Section of *Behind the Scenes*
(n = 100)

Section	%	Median Time (Seconds)
Geology Lab	57.0	56.0
Tree of Life	48.0	44.5
<i>Behind the Scenes</i> Introduction	41.0	28.0
Zoology Lab	28.0	19.0
Biogeography Lab*	19.0	16.0
Ecology Lab*	17.0	39.0
Botany Lab*	7.0	11.0

*The Biogeography Lab, Ecology Lab, and Botany Lab sections each consist of a single exhibit. All other sections include multiple exhibits.

Stops and Time Spent at Each Behind the Scenes Exhibit

In terms of individual exhibits, the most visitors stopped at the Geology Lab Preparing Fossils area and the Tree of Life specimen case (each 35 percent) (see Table 39). The fewest visitors stopped at the Tree of Life morphology bench I, the Botany Lab bench, and the map of Museum staff research (7 percent, 7 percent, and 6 percent, respectively).

Table 39
Percentage of Visitors that Stopped at Each *Behind the Scenes* Exhibit
(*n* = 100)

Exhibit Name	%
Preparing Fossils area (Geology Lab)	35.0
Specimen case (Tree of Life)	35.0
A Place for Science case	25.0
Image of SE Wisconsin from Space	22.0
Exploring Microfossils bench (Geology Lab)	20.0
A Place for Collections case	19.0
Milwaukee's Deep Tunnel Project bench (Geology Lab)	19.0
Biogeography Lab bench	19.0
Fish Taxonomy bench (Zoology Lab)	19.0
Ecology Lab bench	17.0
DNA bench I (Tree of Life)	16.0
DNA bench II (Tree of Life)	16.0
Five Kingdoms section (Tree of Life)	16.0
Snake Taxonomy bench (Zoology Lab)	14.0
From Montana to the Museum area (Geology Lab)	12.0
Tracking Mass Extinctions bench (Geology Lab)	12.0
Morphology bench II (Tree of Life)	12.0
Behind the Scenes Overview multimedia	11.0
What is a Curator? case	10.0
Earth's Five Mass Extinctions bench (Geology Lab)	9.0
Morphology bench I (Tree of Life)	7.0
Botany Lab bench	7.0
Map of MPM Staff Research	6.0

As Table 40 presents, visitors spent the most time at the Geology Lab Exploring Microfossils bench (median time of 54 seconds). Visitors spent the least time at the Botany Lab bench (median time of 11 seconds).

Table 40
Median Time Spent at Each *Behind the Scenes* Exhibit

Exhibit Name	<i>n</i>	Median Time (sec)
Exploring Microfossils bench (Geology Lab)	20	54.0
Ecology Lab bench	17	39.0
Earth’s Five Mass Extinctions bench (Geology Lab)	9	38.0
Specimen case (Tree of Life)	35	37.0
Milwaukee’s Deep Tunnel Project bench (Geology Lab)	19	36.0
Five Kingdoms section (Tree of Life)	16	33.5
Preparing Fossils area (Geology Lab)	35	33.0
Image of SE Wisconsin from Space	22	27.0
Fish Taxonomy bench (Zoology Lab)	19	27.0
Snake Taxonomy bench (Zoology Lab)	14	25.5
Behind the Scenes Overview multimedia	11	24.0
From Montana to the Museum area (Geology Lab)	12	23.5
A Place for Science case	25	23.0
Morphology bench II (Tree of Life)	12	22.0
Tracking Mass Extinctions bench (Geology Lab)	12	19.5
Morphology bench I (Tree of Life)	7	17.0
Biogeography Lab bench	19	16.0
What is a Curator? case	10	15.5
Map of MPM Staff Research	6	15.0
DNA bench II (Tree of Life)	16	13.5
A Place for Collections case	19	13.0
DNA bench I (Tree of Life)	16	13.0
Botany Lab bench	7	11.0

General Behavior Patterns in Behind the Scenes

In addition to recording stops visitors made and time spent at exhibits, observers also noted several behaviors: social interactions, use of individual exhibit elements (e.g., panels, specimens, multimedia), and time spent at multimedia components.

Social Interactions

While in *Behind the Scenes*, more than one-third of visitors engaged in one to two exhibit-related social interactions¹¹ with other visitors in their group (37 percent) (see Table 41). More than one-quarter did not socially interact (29 percent).

Table 41
Social Interactions in *Behind the Scenes*
(n = 100)

Number of Social Interactions	%
1-2	37.0
0	29.0
Not applicable (visiting alone)	21.0
3 or more	13.0

¹¹ Exhibit-related social interactions were defined as two or more visitors using an exhibit together, talking about an exhibit, pointing to exhibit elements, etc. When visitors talked about non-exhibit topics, disciplined children, or misused exhibits, these occurrences were not recorded as social interactions.

As Table 42 presents, the most social interactions took place in the Geology Lab (41 interactions). In five of the seven sections, specimens elicited many social interactions. In the Ecology Lab, the multimedia—specifically the Snake Game—promoted the most social interactions at that exhibit. Activities in the Zoology Lab, Botany Lab, and Geology Lab also fostered social interactions.

Table 42
Social Interactions in Each *Behind the Scenes* Section

Section	Social Interactions Observed <i>n</i>
Geology Lab Touchable shells (8)/Image of SE Wisconsin (7)/Microscopes (7)	41
Tree of Life Specimen wall (11)	19
<i>Behind the Scenes</i> Introduction A Place for Collections specimens (7)	17
Zoology Lab Snake taxonomy activity (5)/Fish collection specimens (5)	15
Ecology Lab Ecology multimedia (9)	9
Biogeography Lab Beetle specimens (6)	6
Botany Lab Plant taxonomy activity (2)	2

Summary of Behaviors

As Table 43 presents, about three-quarters of visitors looked at specimens (73 percent). Forty-two percent looked at panels and 41 percent used activities. The behaviors exhibited by the fewest visitors were lifting and reading the pull-up graphics (PUGS) (8 percent and 5 percent, respectively).

Table 43
Summary of Behaviors in *Behind the Scenes*
(n = 100)

Behavior	% of Visitors	Median Usage	Mean Usage	±	Minimum Usage	Maximum Usage
Looked at specimens	73.0	2.0	3.4	2.9	1.0	13.0
Looked at panels	42.0	2.0	2.1	1.7	1.0	11.0
Used activities	41.0	3.0	4.1	3.5	1.0	14.0
Used multimedia	28.0	2.0	3.1	2.2	1.0	9.0
Only lifted PUGs	8.0	1.0	1.5	0.7	1.0	3.0
Read PUGs	5.0	6.0	5.6	2.6	2.0	8.0

- Of all the specimens, those in the A Place for Collections, A Place for Science, and What is a Curator? cases were looked at by the most visitors—every visitor that stopped at these cases looked at the specimens.
- Of all the panels, the Milwaukee’s Deep Tunnel Project back panel (Geology Lab) was looked at by the most visitors (84 percent).
- Of all the activities, the microscopes (Geology Lab) were used by the most visitors (95 percent).
- Of all the multimedia components, the Five Kingdoms was used by the most visitors (37 percent).
- Of all the PUGs, the whale question was read by the most visitors (25 percent).

The specific behaviors for each element in the *Behind the Scenes* exhibition are presented later in this report.

Time Spent Using Multimedia Components

Nearly three-quarters of visitors did not spend any time using multimedia components (72 percent) (see Table 44). Fourteen percent of visitors used multimedia components for up to 25 percent of their time in *Behind the Scenes*.

Table 44
Percent of Time Spent at Multimedia in *Behind the Scenes*
(n = 100)

Amount of Time Spent at Multimedia	% of Visitors
Did not spend any time	72.0
Up to 25 % of the total time in <i>Behind the Scenes</i>	14.0
25% to 50% of the total time in <i>Behind the Scenes</i>	5.0
More than 50% of the total time in <i>Behind the Scenes</i>	9.0

As Table 45 shows, the 28 visitors who used multimedia components spent a median of 28 seconds doing so.

Table 45
Time Spent Using Multimedia in *Behind the Scenes*
(n = 28)

Median	Mean	±	Minimum	Maximum
28 sec.	1 min., 33 sec.	2 min., 12 sec.	3 sec.	9 min., 10 sec.

As Table 46 presents, the most visitors used the *Behind the Scenes* Overview multimedia (11 visitors). Four visitors used the ecology multimedia, doing so for the longest median time—3 minutes 12 seconds. Visitors spent the least time at the biogeography multimedia (median time of 7 seconds).

Table 46
Median Time Spent at Each *Behind the Scenes* Multimedia Component

Component	Number of Visitors Using Component	Median Time (Seconds)
Ecology multimedia	4	192.0
Milwaukee: Below the Surface multimedia	2	69.0
Five Kingdoms multimedia	9	32.0
<i>Behind the Scenes</i> Overview multimedia	11	24.0
Biodiversity and the Fossil Record multimedia	3	17.0
Molecular Laboratory multimedia	6	17.0
Biogeography multimedia	4	7.0

All of the visitors who used the *Behind the Scenes* Overview, Molecular Laboratory, Biogeography, Ecology, and Biodiversity and the Fossil Record multimedia components spent the majority of their time at each exhibit using the multimedia (see Table 47).

Table 47
Percent of Time Spent at Each *Behind the Scenes* Multimedia Component

Component	Number of Visitors Using Component	Number of Visitors Spending 50% or More of Their Time Within Each Section Using Multimedia
<i>Behind the Scenes</i> Overview multimedia	11	11
Molecular Laboratory multimedia	6	6
Five Kingdoms multimedia	9	5
Biogeography multimedia	4	4
Ecology multimedia	4	4
Biodiversity and the Fossil Record multimedia	3	3
Milwaukee: Below the Surface multimedia	2	1

Behaviors at Specific Behind the Scenes Exhibits

Observers noted whether visitors used each exhibit element (e.g., panels, activities, PUGs). Each of 10 tables in this section of the report displays the data for one exhibit, beginning with the *Behind the Scenes Overview* and ending with the Tree of Life morphology benches.

Behind the Scenes Overview

As Table 48 shows, all 19 visitors that stopped at A Place for Collections and all 25 visitors that stopped at A Place for Science cases looked at specimens. Of the 11 visitors who stopped at the *Behind the Scenes* multimedia, four watched the entire Introduction video and three watched part of the video.

Table 48
What Visitors Did in the *Behind the Scenes Overview*

Behavior	<i>n</i>
A Place for Collections case (total <i>n</i> = 19)	
Looked at specimens	19
Looked at case labels	1
Looked at large panel	0
A Place for Science case (total <i>n</i> = 25)	
Looked at specimens	25
Looked at large panel	2
Looked at case labels	2
<i>Behind the Scenes</i> multimedia (total <i>n</i> = 11)	
Watched Introduction entire/partial	4 / 3
Sat on crates	3
Watched Geology Department entire/partial	2 / 1
Watched History Department entire/partial	2 / 0
Watched Vertebrate Zoology Department entire/partial	0 / 3
Watched Anthropology Department entire/partial	0 / 2
Watched Botany Department entire/partial	0 / 2
Watched Meet the Staff entire/partial	0 / 0
Watched Invertebrate Zoology Department entire/partial	0 / 0
From Montana to the Museum area (total <i>n</i> = 12)	
Looked at <i>Dromaeosaurus</i> specimen, panel, etc.	9
Looked at “A Piece of Earth’s History” panel and specimen	7

Geology Lab

Eight of the 12 visitors who stopped at the Tracking Mass Extinctions bench looked at the back panel (see Table 49). Seven of the nine visitors who stopped at the Earth's Five Mass Extinctions bench looked at the back panel and six looked at specimens with flip lids.

Table 49
What Visitors Did in the Geology Lab:
Tracking Mass Extinctions and Earth's Five Mass Extinctions Benches

Behavior	<i>n</i>
Tracking Mass Extinctions bench (total <i>n</i> = 12)	
Looked at "Tracking Mass Extinctions" back panel	8
Looked at coral case	5
Sat on stool	3
Used Meet the Curators multimedia	3
Used Join the Research multimedia	2
Looked at journal reprints/specimens case	1
Read Rodney Watkins Personnel File PUG	1
Read Patricia Burke Personnel File PUG	1
Looked at specimen drawers	0
Earth's Five Mass Extinctions bench (total <i>n</i> = 9)	
Looked at Earth's Five Mass Extinctions back panel	7
Looked at specimens with flip lids	6
Sat on stool	4
Looked at scientist's tools and specimens case	0

As Table 50 shows, 19 of the visitors who stopped at the Exploring Microfossils bench used the microscopes. Sixteen visitors who stopped at the Milwaukee’s Deep Tunnel Project looked at the back panel and 11 looked at the table top text.

Table 50
What Visitors Did in the Geology Lab:
Exploring Microfossils and Milwaukee’s Deep Tunnel Project Benches

Behavior	<i>n</i>
Exploring Microfossils bench (total <i>n</i> = 20)	
Used microscopes	19
Used microscope key	17
Used Join the Research multimedia	2
Used Meet the Curators multimedia	1
Looked at core sample and timelines	1
Looked at Exploring Microfossils back panel	1
Sat on stool	1
Read or lifted Paul Mayer Personnel File PUG	0
Milwaukee’s Deep Tunnel Project (total <i>n</i> = 19)	
Looked at Milwaukee’s Deep Tunnel Project back panel	16
Looked at table top text	11
Sat on stool	4
Looked at scientists’ tools and specimens case	1

Twenty-four of the visitors who stopped at the preparing fossils area looked at or touched the shells in medium (see Table 51). No one read or lifted the PUG.

Table 51
What Visitors Did in the Geology Lab: Preparing Fossils Area

Behavior (total <i>n</i> = 35)	<i>n</i>
Looked at or touched shells	24
Looked at acid bath case	12
Looked at Back rock case	11
Looked at Rock saw case	10
Looked at How Do Geologists Prepare Fossils text/video	9
Looked at Rock splitter case	9
Looked at “Fossils: Evidence of Past Life” case	7
Touched rock specimens	7
Read or lifted Peter Sheehan Personnel File PUG	0

Biogeography Lab

As Table 52 presents, 12 of the visitors who stopped at the Biogeography Lab looked at the beetles. Nine looked at the back panel. No one used either one of the PUGs.

Table 52
What Visitors Did in the Biogeography Lab

Behavior (total <i>n</i> = 19)	<i>n</i>
Looked at beetle specimens	12
Looked at What Lives Where and Why? back panel	9
Sat on stool	2
Looked at Earth & Life Evolve Together back panel	2
Used Meet the Curators multimedia	2
Used Join the Research multimedia	2
Read or lifted Gary Noonan Personnel File PUG	0
Read or lifted ground beetles PUG	0

Ecology Lab

As Table 53 shows, seven of the visitors who stopped at the Ecology Lab looked at the ecology case. No one looked at the scientific tools and specimens case, used only the “What is a Butler’s Garter Snake?” portion of the multimedia, used only the “What is an Ecologist?” portion of the multimedia, or used either one of the PUGs.

Table 53
What Visitors Did in the Ecology Lab

Behavior (total <i>n</i> = 17)	<i>n</i>
Looked at ecology case	7
Used only Snake Game multimedia	4
Looked at Organisms and Their Environment back panel	3
Sat on stool	2
Used multiple parts of the Ecology multimedia	2
Looked at turtle/butterfly/shrimp case	2
Looked at The Growth of Milwaukee back panel	1
Looked at scientific tools and specimens case	0
Used only What is a Butler’s Garter Snake? multimedia	0
Used only What is an Ecologist? multimedia	0
Read or lifted Gary Casper Personnel File PUG	0
Read or lifted Butler’s garter snake PUG	0

Botany Lab

As Table 54 shows, four of the visitors who stopped at the Botany Lab looked at the back panel. No one used either one of the PUGs.

Table 54
What Visitors Did in the Botany Lab

Behavior (total $n = 7$)	n
Looked at “Identifying Plants” back panel	4
Used plant taxonomy activity	3
Lifted plant taxonomy activity answer flip panel	3
Looked at herbarium case	2
Sat on stool	1
Looked at specimen drawers	1
Read or lifted Neil Luebke Personnel File PUG	0
Read or lifted Kevin Lyman Personnel File PUG	0

Zoology Lab

As Table 55 shows, eight of the visitors who stopped at the Snake Taxonomy bench used the activity. Fourteen of the visitors who stopped at the Fish Taxonomy bench looked at the fish collection case.

Table 55
What Visitors Did in the Zoology Lab

Behavior	<i>n</i>
Snake Taxonomy Bench (total <i>n</i> = 14)	
Used snake taxonomy activity	8
Lifted snake taxonomy activity answer flip panel	6
Looked at amphibian and reptile collections case	6
Looked at Snake Taxonomy back panel	4
Looked at scientific tools and specimens case	3
Sat on stool	1
Only lifted Robert Henderson Personnel File PUG	1
Only lifted Treeboas Snake File PUG	1
Fish Taxonomy Bench (total <i>n</i> = 19)	
Looked at fish collection case	14
Sat on stool	5
Used multiple part of the fish taxonomy activity	4
Only pushed fish taxonomy activity button	2
Looked at scientific tools and specimens case	2
Only lifted fish taxonomy answer flip panel	1
Looked at Fish Taxonomy back panel	0
Read or lifted Randall Moore Personnel File PUG	0
Read or lifted sweepers PUG	0

Tree of Life

As Table 56 shows, 19 of the visitors who stopped at the Specimen Wall looked at specimens. No one looked at the “Going, Going, Gone?” panel. Nine of the visitors who stopped at the Five Kingdoms area turned the animal drums. No one used the Follow a Branch and Future Trees portions of the multimedia.

Table 56
What Visitors Did at the Tree of Life:
Specimen Wall and Five Kingdoms Sections

Behavior	<i>n</i>
Specimen Wall (total <i>n</i> = 35)	
Looked at specimens	19
Vocalized amazement	6
Identified animals	3
Multiple behaviors	2
Looked at Tree of Life large panel	2
Looked at Reading the Tree of Life small panel	1
Looked at Our Unexplored Planet panel	1
Looked at Going, Going, Gone? panel	0
Five Kingdoms Area (total <i>n</i> = 16)	
Turned animal drums	9
Read whale question PUG	4
Watched part of What Is the Tree of Life? video multimedia	4
Read salad question PUG	3
Read alligators question PUG	3
Looked at Five Kingdoms specimen case	2
Watched entire What Is the Tree of Life? video multimedia	2
Used Building the Tree of Life multimedia	2
Read lilies question PUG	2
Sat on stool	1
Only lifted salad question PUG	1
Used Follow a Branch multimedia	0
Used Future Trees multimedia	0

Four of the visitors who stopped at the DNA bench section I looked at One Way to Build a Tree: DNA back panel and another four used the Meet the Curators portion of the multimedia. Five of the visitors who stopped at the DNA bench section II pushed the first button of the quillworts systematics activity and four looked at the Revealing Family Secrets back panel. No one looked at the quillworts systematics activity screen.

Table 57
What Visitors Did at the Tree of Life: DNA Benches

Behavior	<i>n</i>
DNA Bench Section I (total <i>n</i> =16)	
Looked at One Way to Build the Tree: DNA back panel	4
Used Meet the Curators multimedia	4
Used Join the Research multimedia	3
Only lifted Sara Hoot Personnel File PUG	3
Only lifted quillworts PUG	3
Only lifted Carl Taylor Personnel File PUG	2
Sat on stool	0
DNA Bench Section II (total <i>n</i> =16)	
Pushed button one of quillworts systematics activity	5
Looked at Revealing Family Secrets back panel	4
Pushed button two of quillworts systematics activity	3
Read quillworts systematics activity answer flip panel	2
Sat on stool	0
Looked at quillworts systematics activity screen	0

As Table 58, four of the visitors who stopped at the Morphology bench section I looked at the One Way to Build a Tree: Morphology back panel. No one used the PUG. Of the twelve visitors who stopped at the Morphology bench section II, four pushed either the first or second buttons. No one looked at the systematic activity screen.

Table 58
What Visitors Did at the Tree of Life: Morphology Benches

Behavior	<i>n</i>
Morphology Bench Section I (total <i>n</i> = 7)	
Looked at One Way to Build the Tree: Morphology back panel	4
Used fish systematics activity steps 1 and 2	3
Only lifted bearded eel blemy Fish File PUG	1
Sat on stool	0
Read or lifted Randy Mooi Personnel File PUG	0
Morphology Bench Section II (total <i>n</i> = 12)	
Pushed button one of fish systematics activity steps three to five	4
Pushed button two of fish systematics activity steps three to five	4
Read fish systematics activity answer flip panel	3
Looked at What is a 'cleared and stained' specimen back panel	1
Sat on stool	0
Looked at fish systematics activity screen	0

IV. PRINCIPAL FINDINGS: PATH IDENTIFICATION

DATA COLLECTION CONDITIONS

Data collectors interviewed visitors for four days in June 2002. Data collection occurred on weekdays and weekend days. A total of 100 drop-in visitors, ages 16 years and older, were interviewed and asked to draw on a map the path they took through the *Exploring Life on Earth* exhibition. Of the 102 visitors approached, two declined to participate, for a low refusal rate of 2 percent.

As Table 59 shows, more than one-half of the path identification data was collected during a weekend and less than one-half on a weekday (56 percent and 44 percent, respectively).

Table 59
Data Collection Schedule
(*n* = 100 for each exhibition)

Day	%
Weekend	56.0
Weekday	44.0

VISITOR DEMOGRAPHICS

As Table 60 shows, more than one-half of the respondents were female and less than one-half were male (57 percent and 43 percent, respectively). Most respondents ranged in age from 25 to 44 years (56 percent). The median age was 36 years.

Table 60
Demographics of Path Identification Respondents
(n = 100)

Characteristic	%
Gender	
Female	57.0
Male	43.0
Age Group	
16 to 18	9.0
19 to 24	6.0
25 to 34	25.0
35 to 44	31.0
45 to 54	11.0
55 to 64	9.0
65 years or older	9.0

As Table 61 shows, more than one-half of respondents were in groups comprised of adults and children (56 percent). One-third were in groups comprised only of adults (34 percent). Ten percent were visiting *Exploring Life on Earth* alone.

Table 61
Group Composition of Path Identification Respondents
(n = 100)

Group Composition	%
Adults and children	56.0
All adults	34.0
Alone	10.0

OVERALL PATH THROUGH *EXPLORING LIFE ON EARTH*

Exploring Life on Earth consists of three main exhibition areas: *Dioramas*, the butterflies exhibition (includes the live butterflies and PBW butterfly exhibits), and *Behind the Scenes* (includes the Tree of Life, labs, and *Behind the Scenes* Overview).

As Table 62 presents, nearly one-half of respondents reported first visiting *Dioramas*, then walking through the butterflies exhibition, and finally ending their experience by visiting *Behind the Scenes* (44 percent). Overall, few respondents—12 percent—walked from the *Dioramas* to *Behind the Scenes* or vice versa (noted with an asterisk in the table).

Table 62
Overall Path through *Exploring Life on Earth*
(n = 100)

Path	%
<i>Dioramas</i> → butterflies exhibition → <i>Behind the Scenes</i>	44.0
Butterflies exhibition only	13.0
<i>Dioramas</i> → butterflies exhibition	9.0
Butterflies exhibition → <i>Behind the Scenes</i>	7.0
Butterflies exhibition → <i>Behind the Scenes</i> → <i>Dioramas</i> *	7.0
<i>Dioramas</i> only	6.0
<i>Dioramas</i> → <i>Behind the Scenes</i> *	5.0
<i>Behind the Scenes</i> → butterflies exhibition → <i>Dioramas</i>	5.0
Butterflies exhibition → <i>Dioramas</i>	4.0

*Denotes the path designers intended visitors to follow.

VISITATION OF SUBSECTIONS

In addition to drawing their overall path through the *Exploring Life on Earth* exhibition, respondents were asked which 10 subsections they visited: Hell Creek Formation dioramas, Menomonee River Valley dioramas, Costa Rica Tropical Dry Forest dioramas, live butterflies, PBW butterfly exhibits, Tree of Life, Biology Labs (includes Zoology and Botany Labs), Behind the Scenes Overview, Geology Lab (includes Biogeography Lab and Ecology Lab), and Sense of Wonder.

As Table 63 shows, respondents reported visiting between one and nine subsections. One-third visited eight to nine subsections (32 percent). The median number of subsections visited was six.

Table 63
Number of Exhibition Subsections Visited
(n = 100)

Number of Subsections Visited	%
1	13.0
2-3	10.0
4-5	20.0
6-7	25.0
8-9	32.0

Of all the subsections, the live butterflies was visited by the most respondents, followed by the Hell Creek Formation dioramas (87 percent and 80 percent, respectively) (see Table 64). The fewest respondents reported visiting Sense of Wonder (1 percent).

Table 64
Exhibition Subsections Visited
(n = 100)

Subsection	%
Live butterflies	87.0
Hell Creek Formation dioramas	80.0
Menomenee River dioramas	77.0
Costa Rica dioramas	74.0
PBW butterflies exhibits	62.0
Tree of Life	56.0
Behind the Scenes	48.0
Geology Lab	42.0
Biology Labs	40.0
Sense of Wonder	1.0

V. PRINCIPAL FINDINGS: FOCUSED OBSERVATIONS AND INTERVIEWS

To understand how visitors respond to specific exhibits, RK&A conducted focused observations and interviews. This is a cued-testing strategy, in which visitors were asked to use a particular exhibit, were observed as they used it, and then, afterwards, interviewed about their experiences. Based on the timing and tracking observations and questions posed by MPM staff, three exhibits were chosen for focused study: the Botany Lab, the Tree of Life, and the Geology Lab (Tracking Mass Extinctions and Earth's Five Mass Extinctions).

BOTANY LAB

Ten visitor groups, comprising 20 visitors—14 adults and 6 children—were observed and interviewed at the Botany Lab. Thirteen participants were female and seven were male. Children ranged in age from 9 to 12 years, with the median age being 10 years, and adults ranged in age from 21 to 45 years, with the median age being 36 years.

Of the twenty visitors, four had seen *Exploring Life on Earth* on a previous visit. None had used the Botany Lab before the evaluation.

Overall Visitor Response

All of the interviewees said when they initially approached the Botany Lab, they thought it “looked like a lot of reading and not many hands-on things to do.” They noted that they would never have stopped at this exhibit without being asked to do so by the interviewer, and many said they had not noticed the exhibit because it is “tucked away in a corner” and “looks boring.”

Nearly all interviewees said their favorite aspect of the Botany Lab was the real specimens because they enjoyed seeing the “real thing.” A few suggested including live plants or specimens rather than the plant model.

Interviewees had mixed opinions about the plant taxonomy activity. Some praised the simplicity of the activity and the low-tech quality of the exhibit. Parents, in particular, liked that they could use the activity as a group—unlike multimedia with a single monitor and controls. However, parents noted that if they had not been participating in the study, their children would not have been as attentive in following each step of the dichotomous key. Parents were frustrated that their children often quickly move from one exhibit to another, rather than engaging in one activity. Other interviewees said the activity was confusing and complained that the end result was not worth the effort they had spent figuring out how to use it. A few found the activity esoteric, saying “So, what? Who cares about identifying this plant that I’ve never heard of before?”

Operational Functioning

As interviewees approached the Botany Lab, nearly all asked the interviewer, “What do I do?” During the interview, interviewees said the graphics on the back panel and the tabletop were

confusing and made it difficult to know how to begin the activity. As one interviewee stated, “I didn’t know where to look. There are a lot of pictures and stuff to read.”

Most interviewees read the back panel—parents read it aloud to their children—and then began using the numbered steps on the tabletop. A few interviewees did not read the back panel and instead immediately began using the tabletop text. Interviewees appreciated the numbered steps, stating that they made the activity easy to follow. Nearly all used the dichotomous key with ease, answering the questions and making observations, until they reached the step asking whether the leaves of the plant were greater or less than three centimeters long. None of the interviewees realized that the black-and-white checkerboard strip next to the plant was a centimeter ruler. One-half of the interviewees guessed that the leaves were greater than three centimeters long, and the other one-half guessed that the leaves were less than three centimeters long. All interviewees lifted the answer flip panel—because visitors had guessed at the leaf measurements, one-half incorrectly identified the plant. Those who correctly identified the plant were pleased that they “got the right answer.” Those who did not indicated they were embarrassed and somewhat displeased with their experience. When the ruler was pointed out to interviewees, most said that it did not look like a typical ruler. They suggested including a ruler and a specimen that visitors could actually handle to take a measurement.

After completing the plant taxonomy activity, only one interviewee opened the herbarium drawer. All the others either did not read that portion of the answer flip panel or did not see the herbarium drawers. Once the drawers were pointed out to them, most opened each drawer and talked about the appearance of the dried specimens. They asked questions such as, “Why are all the plants flat?” “Why can’t you preserve the color [of the plants]?”

Most interviewees lifted and glanced at the PUGs, but none read the information on them. Some complained that the PUGs were too awkward to use (e.g., too heavy, hard to see because of the glare, hard to read the small font used). Others said the graphical layout of the PUGs was “boring looking” and “a lot to read and not much to look at.” A few found the content uninteresting, as one interviewee stated, “Why should I care about their [the scientists’] work? I don’t know these people, so it’s hard for me to care.”

Conveying Content

Nearly all of the interviewees said the main idea of the Botany Lab was to show “how scientists identify plants.” Most gleaned the message from the activity. In fact, some liked that the exhibit enabled them to “play the scientist” by using processes that mimicked how scientists identify plants. Others indicated that the exhibit’s title should emphasize the challenge aspect of the activity because “everybody likes a challenge.” A few said the activity’s premise was artificial, as one explained, “These two scientists don’t need my help identifying this plant. They know the answer.”

A few also noticed that the scientists featured in the Botany Lab work at the MPM. However, interviewees were not sure what these scientists do at the Museum and were not interested in learning more about them. Two interviewees did not think the Botany Lab had a main idea. They said, “it’s just an activity to do.”

TREE OF LIFE

Ten visitor groups, comprising 24 visitors—16 adults and 8 children—were observed and interviewed at the Tree of Life. Thirteen participants were male and eleven were female. Children ranged in age from 5 to 17 years of age, with the median age being 8 years. Adults ranged in age from 23 to 62 years, with the median age being 35 years.

Of the 24 visitors, three had seen *Exploring Life on Earth* on a previous visit. None had looked at the Tree of Life prior to the evaluation.

Overall Visitor Response

All interviewees said the specimen wall was their favorite aspect of the Tree of Life. They were immediately drawn to it, expressing amazement about the variety of organisms displayed, trying to identify the animals, and asking questions such as, “What kind of animal is that?” and “Are those real animals?” Many complained that the height of the wall and the exhibits below it prevented them from getting a close look at the specimens. Many were also frustrated that they could not find any information about the names, geographic distribution, or natural history of the animals.

All interviewees said the exhibits below the specimen wall—the Five Kingdoms and Building the Tree benches—were visually too dense. As one interviewee stated, “it’s too much to look at, read, and process [for] the few minutes you have to spend with it.” When asked about the layout of all the exhibits under the specimen wall, none of the interviewees understood that there were three distinct exhibits. For them, the exhibits were not visually differentiated, which made the area uninviting to them.

Most visitors looked at elements in the Five Kingdoms, saying they thought the multimedia or text might provide information about the specimen wall and were disappointed that it did not. A few had also hoped it would be more interactive rather than just informational. Two watched part of the Five Kingdoms video and, while they found it somewhat interesting, said it was too long to watch standing up. Three used Follow a Branch—the two adults enjoyed it but the child found it “boring” since he expected a game. Two also used three of the question PUGs (salad, whale, and alligator). They were intrigued by the questions and enjoyed reading those PUGs. One interviewee read the Animal Drum, stating that she liked the “fun facts, like there are more species of fleas than primates.”

Few interviewees engaged with the Building the Tree benches. Many children purposelessly pushed the buttons or flipped through screens on the Molecular Laboratory multimedia. Some parents tried using the morphology bench but either they or their children did not find it compelling. Most adults glanced at the benches but did not use the activities because they seemed “complicated.” A few lifted the PUGs but none read them, describing them as “heavy” and “hard to read” because of the small font.

Operational Functioning

All of the interviewees who used the Five Kingdoms multimedia said it was easy to navigate. They could start the program they had selected and return to the main page. A few suggested tilting the monitor and providing seating to motivate more visitors to use it. None of the interviewees purposefully used the Molecular Laboratory, so no one commented on its operational functioning.

None of the interviewees understood how to use the diagram in the specimen wall. Many asked the interviewer to explain how the diagram was connected with the specimens, thinking that there was a one-to-one relationship between the organisms listed in the diagram and those displayed the wall. They did not understand what the numbers in the diagram referred to, and when the interviewer showed them the Animal Drums, some suggested making that connection more explicit to visitors. They also did not understand the color-coding in the diagram, even after they had looked at the Animal Drums.

None of the interviewees used the One Way of Building the Tree: DNA activity. A few interviewees tried using the One Way of Building the Morphology: Morphology activity—saying they were drawn to it because of the fish models encased in the tabletop. Some began the activity on the wrong end of the bench, but quickly reoriented themselves and began reading the first step. Once interviewees understood that the activity steps were numbered, they began using the activity as designers intended. However, no one completed the activity. Some adults and children complained that the steps were tedious, while others said the steps were confusing because the exhibit did not provide enough information for them to answer the questions. A few stopped using the activity because they found the premise uninteresting, as one stated, “I’m not sure why it’s important to identify this fish. It seems like a silly exercise.” One interviewee said he would have preferred if there were “more to do” at the bench. For example, he wanted to use “a scanning electron microscope and other scientific tools.”

Conveying Content

All interviewees said the Tree of Life was trying to show visitors that there is “a great variety of life on earth and that all life is connected.” Most adults and children 10 years of age and older said they were already familiar with this concept before visiting the exhibit. One parent of a six year-old said the exhibit was “a nice way to introduce” the tree of life concept. However, with the exception of the question PUGs and the Animal Drum, most parents said they thought the information provided in the Tree of Life was too advanced for their elementary-school-aged children. One man said, “I really liked looking at [Follow the Branch] but my son wasn’t interested. He’s just learning that there is a tree of life, so this is way above him.”

When asked to identify aspects of the exhibit that best convey the tree of life idea, nearly all said the specimen wall. A few said they thought visitors would need to know something about the variety of life before seeing the exhibit to understand the concept. They said they did not think the exhibit was intended to explicitly teach visitors about the tree of life, but rather, to tap into their prior knowledge.

Most of the interviewees who used elements in the Five Kingdoms understood that this exhibit's the main idea was to show that there are "five main types of living things." Several were surprised by this exhibit, because they recalled learning that there were three kingdoms—animals, plants, and fungi—not five. One interviewee asked, "When did that change? I've never heard of most of these kingdoms," and suggested addressing this issue in the exhibit.

No one understood what the Building the Tree of Life benches were trying to convey. Interviewees had no idea how scientists developed the tree of life and, in fact, it was unclear from their responses whether they realized that the tree is a construct that changes as scientific knowledge about life on earth changes.

GEOLOGY LAB (TRACKING MASS EXTINCTIONS AND EARTH'S FIVE MASS EXTINCTIONS)

Ten visitor groups, comprising 20 visitors—16 adults and 4 children—were observed and interviewed at the Geology Lab (Tracking Mass Extinctions and Earth's Five Mass Extinctions benches). Ten participants were female and 10 were male. Children ranged in age from 7 to 12 years old, with the median age being 10 years. Adults ranged in age from 18 to 49 years, with the median age being 27 years.

Of the 20 visitors, two had seen *Exploring Life on Earth* on a previous visit. None had used the Tracking Mass Extinctions or Earth's Five Mass Extinctions benches prior to the evaluation.

Overall Visitor Response

All interviewees said they enjoyed looking at fossils. Some were impressed with the large coral fossil, others liked those with the flip lids, and a few liked the small fossils in the pull-out drawers. In fact, the fossils were interviewees' favorite aspect of the benches. However, they wanted to interact with the fossils—touch them, measure them, sort them—rather than just look. They were not interested in the journal reprints and case of scientist's tools. As one interviewee stated, "I'm not sure why I should look at those things. The fossils are interesting on their own. The other stuff isn't unless you're a scientist."

Nearly all interviewees said the benches had too many graphics and text, characterizing them as "too busy." Many said when they approached the benches, they did not know what to do first at the benches because there was so much to look at and read. Once interviewees used the benches, most were disappointed that there was little else to do at the benches other than read. Many also said the overall design of the benches was unattractive, disparaging the color choices and "cartoon-like" graphics. In contrast, one interviewee liked the look of the benches.

About one-half of interviewees used the Biodiversity and the Fossil Record multimedia. Most said they were dissatisfied with the software for being informational rather than interactive. A few liked the profiles in Meet the Curators. Two interviewees knew scientists being featured. The other one-half that did not use the multimedia said they were not interested in computer-based experiences.

A few interviewees lifted the PUGs. None read them, stating that the information about scientists was uninteresting or complaining that the PUGs were awkward to use because of their weight, small font size, and glare.

Operational Functioning

All the interviewees who used the Biodiversity and the Fossil Record multimedia said they were easy to navigate. They could select different profiles in the Meet the Curators and return to the main page. They also said the audio was an appropriate volume.

However, all the interviewees who used the Join the Research activity said it was confusing. They had difficulty reading the text either because they did not know how to read graphs or because the font in the graph was too small. They did not understand what the graph was trying to convey and were frustrated that they could not stop the data analysis and graphing once it started, so many left in the middle of the tabulations. They did not know that the specimens in the pull-out drawers were connected to the multimedia and did not notice the color-coding on the drawers. Once they were told about the connection, they suggested changing the multimedia into a real activity in which visitors could count the specimens in the drawers, enter data, create their own graph, and compare it to the scientist's graph.

Most interviewees commented that the language used throughout the panels and multimedia was too technical—even for some who had studied geology in college. A few interviewees who looked at the graph on the Earth's Five Mass extinctions were not sure how to decipher it; others said it was easy to understand.

Conveying Content

When asked to describe the main ideas of the benches, most interviewees said “fossils and how scientists study fossils.” A few said “mass extinctions,” noting that they had studied this topic in college. When asked to elaborate on the topic, they responded that mass extinctions have “happened in the past and may happen again.” A few others did not know what the benches were trying to convey.

Several interviewees also grasped that the benches featured work of MPM scientists. Those who did not watch the profiles or lift the PUGs did not realize that the benches were trying to demonstrate behind-the-scenes work at the museum. None said they thought the benches conveyed a particular environment, especially not a lab or behind the scenes at the museum.

APPENDICES

Removed for proprietary reasons