



Museum Visitor Studies, Evaluation & Audience Research

Randi Korn & Associates, Inc.
118 East Del Ray Avenue
Alexandria, VA
22301

The Science Museum of Minnesota
Tissues of Life

Exhibition Summative Evaluation

TABLE OF CONTENTS

LIST OF TABLES	ii
SUMMARY AND DISCUSSION	iii
INTRODUCTION.....	1
Methodology	1
Data Analysis	2
Reporting Method	3
I. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS.....	4
Data Collection Conditions.....	4
Demographics	6
Overall Visitation Patterns.....	7
Visitation of Individual Exhibits.....	9
Behavior Patterns	11
II. PRINCIPAL FINDINGS: EXIT INTERVIEWS	15
Background Information about Interviewees.....	15
Visitors' Experiences in <i>Tissues of Life</i>	15
Use of Audio	17
<i>Tissues of Life</i> Main Message	20
APPENDICES	24

LIST OF TABLES

Table 1:	Data Collection Conditions	4
Table 2:	Visitor Start Location	4
Table 3:	How Visitors Exited <i>Tissues of Life</i>	5
Table 4:	Visitor Demographics.....	6
Table 5:	Group Composition of Visitors	6
Table 6:	Total Time Spent in <i>Tissues of Life</i>	7
Table 7:	Total Number of Exhibits Stopped at in <i>Tissues of Life</i>	8
Table 8:	Differences in Total Stops Made by Data Collection Day.....	8
Table 9:	Time Spent at Each Exhibit.....	9
Table 10:	Percentage of Visitors Stopping at Each Exhibit	10
Table 11:	Percentage of Visitors Exhibiting Behaviors in <i>Tissues of Life</i>	11
Table 12:	Differences in Behaviors by Age and Day	12
Table 13:	Differences in Audio Use by Age	13
Table 14:	Use of Audio at Specific Exhibits	13
Table 15:	Differences in Time Spent at the Introduction to Tissues: Jazz Band by Audio Use	14
Table 16:	Percentage of Visitors Doing Exhibit Activities	28
Table 17:	Percentage of Visitors Watching Others Do Exhibit Activities	28
Table 18:	Percentage of Visitors Coaching or Being Coached at Exhibit Activities	29
Table 19:	Percentage of Visitors Looking at Specimens.....	29
Table 20:	Percentage of Visitors Reading Exhibit Text	30
Table 21:	Percentage of Visitors Talking about Exhibit Content.....	31

SUMMARY AND DISCUSSION

This report presents the findings of a summative evaluation of the *Tissues of Life* exhibition, conducted by Randi Korn & Associates, Inc. (RK&A), for the Science Museum of Minnesota in St. Paul, Minnesota. *Tissues of Life* was funded by the National Institutes of Health.

Data collection took place at the Science Museum of Minnesota (SMM) in July and August 2004. The evaluation documents the impact and effectiveness of the exhibition, using timing and tracking observations and exit 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.

METHODOLOGY

Timing and Tracking Observations

The RK&A evaluator observed 132 walk-in visitors, ages 9 years and older and recorded the total time spent and the total stops made in the exhibition. Additionally, the evaluator collected data for each exhibit: the percentage of visitors stopping, the median time, and the frequency of select behaviors (based on the objectives of the exhibits).

Exit Interviews

RK&A conducted open-ended interviews with walk-in visitors, ages 9 years and older, immediately after their visit to *Tissues of Life*, with 60 visitor groups, comprised of 82 adults and 42 children.

OVERALL RESPONSE TO THE EXHIBITION

In terms of both the observation data and the interviews, *Tissues of Life* actively engaged visitors and provided them with a range of educational experiences. During the observations, each exhibit in *Tissues of Life* was used by four or more visitors—unlike other exhibitions RK&A has evaluated in which many exhibits are bypassed altogether by visitors (RK&A, 2000, 2002, 2004). In fact, a classic museum study found that 43 percent of exhibits were skipped entirely (Beer, 1987). *Tissues of Life* exhibits also held visitors' attention. All but one *Tissues* exhibit had a median time of more than 10 seconds. Again, in other RK&A studies it is common for many exhibits to hold visitors' attention for fewer than 10 seconds (Beer, 1987; RK&A, 2000, 2002, 2004). The behaviors observed in *Tissues of Life* further corroborate the high level of visitor engagement. More than one-half of visitors observed used exhibit activities, watched others use exhibit activities, looked at specimens, read exhibit text, and talked about exhibit content with their companions.

Interviewees praised *Tissues of Life* for being interactive and interesting. Additionally, the majority of interviewees found the exhibits informative and easy to use. When asked why the *Tissues of Life* exhibits appealed to them, interviewees noted that they readily connected

personally to the content of many exhibits. Some also lauded the authenticity of *Tissues of Life* for including exhibits with real specimens.

The most popular exhibits were the Scope-On-A-Rope interactive, the Body Slices specimens, and the Wounded Hand physical interactive with large prop. These exhibits attracted the most visitors in the observations and interviewees said they were their favorites. Visitors' immediately connected with these exhibits and credited the exhibits for giving them a new perspective. As interviewees noted, Scope-On-A-Rope provided magnified views of their own skin, the Body Slices allowed them to see inside a real human body, and the Wounded Hand's large size demonstrated how their skin heals.

VISITOR UNDERSTANDING OF MAIN MESSAGES

Interviewees readily connected *Tissues of Life* with the rest of the Human Body Gallery, noting that it, too, was about the human body and how it functions. When asked to discuss what tissues are and how they function, many interviewees accurately stated that tissues are made up of cells and could name different tissue types; one-half noted that different tissues play different roles in the body. The evaluator also asked interviewees what, if anything, new they discovered about tissues in the exhibition. Many noted that *Tissues of Life* reminded them of things they already knew about tissues. Such a response did not surprise RK&A, because a key reason many visitors attend museums is to reinforce their existing knowledge (Doering, 1999). Some other interviewees did mention learning what tissues look like or specific facts, such as that there are four tissue types. Based on interviewees' remarks, the exhibition's content worked well for those new to the topic and those familiar with tissues.

AUDIO

To meet the needs of visitors who are blind or visually impaired, as well as potentially to augment the experiences of sighted visitors, exhibit developers added audio descriptions to five exhibits: Introduction to Tissues: Jazz Bandstand, Model of Tissues, Introduction to Stem Cells, Tissue Invaders, and Wounded Hand. *Tissues of Life* is the first and only exhibition in the SMM to have such audio description. Not surprisingly, visitors with disabilities praised the audio description,¹ but sighted visitors were uncertain about how to respond to it. First, the majority of visitors did not use audio: 80 percent of visitors observed and 67 percent of interviewees were nonusers. Many of these interviewees said they noticed the audio but did not use it because they felt satisfied with the information the exhibit and associated text provided—that is, they saw no need for additional interpretation. Some interviewees did not notice the audio components while others did not pick them up because they were not certain of their function. It is worth noting that few science museums and centers have exhibits with audio description. If SMM visitors primarily visit such institutions they may not be accustomed to seeing audio components, and in fact, may not recognize them as such.

¹ Laurie Fink, PI for *Tissues of Life*, received positive feedback about the audio description from advisors who are blind or visually impaired.

Many interviewees who used the audio listened to it for a short time and expressed some disappointment with the experience. They assumed the audio would provide information over and above what was available by looking at the exhibit and reading exhibit text. Some interviewees also said the information would be best understood by an adult audience, but noted that many children were attracted to the audio's delivery mechanism—a telephone receiver. These findings were corroborated by a statistically significant finding from the observations—children were more likely to use audio than were adults. SMM may need to consider that audio will likely have an immediate appeal to children and use this natural behavior to promote audio as an interpretive tool for children who often do not take the time to read text.

The SMM should not be disheartened by the audio findings. The Museum should be commended for taking a first step in attempting to be accessible to visitors who are blind and visually impaired. The next step is to help sighted visitors understand the audio's purpose—so they can make an informed decision about whether they would like to use it to enhance their experience, which might happen naturally as more SMM exhibitions incorporate audio descriptions. However, the Museum may need to explicitly note the reason for the audio in the Museum brochure and encourage floor staff to explain and promote it.

Furthermore, visitors who are blind and visually impaired and sighted visitors will use the audio for different purposes. For sighted visitors, audio description might be most useful when the audio compliments the exhibit activity. For example, the observations showed that visitors who used audio at the Introduction to Tissues: Jazz Bandstand spent more time at this exhibit than did those not using the audio. One reason this audio component was successful for sighted visitors is because the experience of listening to the audio complements looking at and touching the materials representing the different tissue types. In contrast, the audio description at Tissue Invaders competes somewhat with using the interactive for sighted visitors who try to listen to the audio and do the activity at the same time. In the future, SMM may want to select the exhibits best suited to using the unique universal design capabilities of audio description.

REFERENCES CITED

Beer, Valerie. (1987). "Great Expectations: Do Museums Know What Visitors Are Doing?" *Curator: The Museum Journal*. Vol. 30, No. 3: 206-215.

Doering, Z. (1999). Strangers, Guests, or Clients? Visitor Experiences in Museums. *Curator*, 42.2: 74-87.

Randi Korn & Associates, Inc. (2000). "Visitor Experiences in Four Permanent Galleries at The Tech Museum of Innovation." Unpublished manuscript. San Jose, CA: The Tech Museum of Innovation.

Randi Korn & Associates, Inc. (2002). "*Exploring Life on Earth* Summative Evaluation." Unpublished manuscript. Milwaukee, WI: Milwaukee Public Museum.

Randi Korn & Associates, Inc. (2004). "*Strange Matter* Summative Evaluation." Unpublished manuscript. Pittsburgh, PA: Materials Research Society.

INTRODUCTION

This report, which presents the findings of a summative evaluation of the *Tissues of Life* exhibition, was conducted by Randi Korn & Associates, Inc. (RK&A), for the Science Museum of Minnesota (SMM). *Tissues of Life* was funded by the National Institutes of Health.

Data collection took place at the SMM in July and August 2004. The evaluation documents the exhibition's impact and effectiveness using timing and tracking observations and exit interviews. The evaluation's specific objectives were to determine:

- How much time visitors spend in the exhibition;
- How much time visitors spend at individual exhibits;
- The exhibits at which visitors stop;
- Differences between the time spent at the Jazz Band Introduction, Wounded Hand, Tissue Invaders, Stem Cell Introduction, and Tissue Model Puzzle by audio users and non-users;
- Percentage of visitors who use the audio and the demographic characteristics of those users;
- What ideas and information visitors take away from *Tissues of Life*, specifically whether they grasp the functions of tissues; and
- Differences in understanding the exhibition's main messages between visitors who use the audio description and those who do not.

METHODOLOGY

RK&A used two data collection strategies to assess visitors' experiences in *Tissues of Life*: timing and tracking observations and uncued exit interviews.

Timing and Tracking Observations

Visitors are often observed to provide an objective and quantitative account of how they behave and react to exhibition components. Observational data indicate how much time visitors spend within an exhibition and suggest the range of visitor behaviors.

All visitors nine years old and older were eligible to be unobtrusively observed in the exhibition. The evaluator selected visitors to observe using a continuous random sampling method. In accordance with this method, the observer stationed herself at the exhibition's entrance and observed the first eligible visitor to enter. The observer followed the selected visitor through the exhibition, recording the exhibits used, noted select behaviors—including using the audio, and indicated total time spent in the exhibition (see Appendix A for the observation form). When the visitor completed his or her visit, the observer returned to the entrance to await the next eligible visitor to enter the exhibition.

Exit Interviews

Open-ended 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. Open-ended interviews produce data rich in information because interviewees talk about their personal experiences.

Upon exiting the exhibition, visitors nine years old and older were eligible to be selected (following a continuous random sampling method, as described above) to answer several questions about their experiences (see Appendix B for the exit interview guide). 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' permission and transcribed to facilitate analysis.

DATA ANALYSIS

Quantitative Analysis

The observational data were quantitative, and were entered into a computer to be analyzed statistically using SPSS/PC+, a statistical package for personal computers. Frequency distributions were calculated for all categorical variables (e.g., gender, age group). To examine the relationship between two categorical variables (e.g., use of an exhibit and age group); cross-tabulation tables were computed to show the joint frequency distribution of the two variables, and the chi-square statistic (X^2) was used to test the significance of the relationship.

Summary statistics, including the mean (average), median (data point at which half the responses fall above and half fall below), and standard deviation (spread of scores: “±” in tables), were calculated for the time data² To compare the means of two or more groups, an analysis of variance (ANOVA) was performed. The level of significance was set at 0.05 because of the moderate 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 termed “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 really 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.

²For the most part, medians rather than means are reported in this document 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 time with exhibition components, a few 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.

Qualitative Analysis

The interview data are qualitative, meaning that results are descriptive, following from the conversational nature of the interviews. In analyzing the data, the evaluator studied responses for meaningful patterns and, as patterns and trends emerged, grouped similar responses. To illustrate interviewees' thoughts and ideas as fully as possible, verbatim quotations (edited for clarity) are included in this report.

METHOD OF REPORTING

The data in this report are both quantitative and qualitative. For the quantitative data, tables and graphs display the information. Percentages within tables may not always equal 100 owing to rounding. The findings within each topic are presented in descending order, starting with the most frequently occurring.

The interview data are presented in narrative. The interviewer's remarks appear in parentheses, and for visitor comments, an asterisk (*) signifies the start of a different speaker's comments. Trends and themes in the interview data are also presented from most- to least-frequently occurring.

Findings in each report are presented in two main sections:

- I. Timing and Tracking Observations
- II. Exit Interviews

I. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

The observers timed and tracked visitors in *Tissues of Life* for 14 days in July 2004, observing 132 walk-in museum visitors, ages nine years and older.

DATA COLLECTION CONDITIONS

The evaluator conducted the majority of observations on weekday afternoons during moderate visitation conditions (see Table 1).

Table 1
Data Collection Conditions
(*n* = 132)

Condition	%
Day	
Weekday	56.8
Weekend day	43.2
Time of Day	
PM	82.6
AM	17.4
Crowding Level	
Moderate	56.1
Few	40.9
Crowded	3.0

As shown in Table 2, about one-half of visitors entered *Tissues of Life* near the Body Hotel/Perception Theater and almost one-half entered near the Body Slices/Introduction to Tissues (51 percent and 49 percent, respectively).

Table 2
Visitor Start Location
(*n* = 132)

Location	%
Near Body Hotel/Perception Theater	50.8
Near Body Slices/Introduction to Tissues	49.2

For more than one-third of the visitors observed in *Tissues of Life*, other adults or children in their group initiated leaving the exhibition (40 percent) (see Table 3). Nearly all visitors left *Tissues of Life* to visit another part of the Human Body Gallery (90 percent).

Table 3
How Visitors Exited *Tissues of Life*
(n = 132)

Who Initiates Leaving <i>Tissues of Life</i>?	%
Other adult(s) or child(ren)	39.9
Selected visitor	32.5
Mutual	27.6
Visitor Leaves <i>Tissues of Life</i> for another Exhibition	%
Another part of Human Body Gallery	90.2
<i>Cell Lab</i>	9.1
Perception Theater	0.7

DEMOGRAPHICS

As indicated in Table 4, one-half of visitors were female and one-half were male (each 50 percent). More than one-third of visitors were between 25 and 44 years old (40 percent).

Table 4
Visitor Demographics
(*n* = 132)

Characteristic	%
Gender	
Female	50.0
Male	50.0
Age Group	
9 to 11 years	12.9
12 to 15 years	11.4
16 to 24 years	17.4
25 to 34 years	13.2
35 to 44 years	26.4
45 to 55 years	10.6
55 to 64 years	4.5
65 years or older	3.6

The majority of visitors were visiting the exhibition in groups of both adults and children (66 percent) (see Table 5).

Table 5
Group Composition of Visitors
(*n* = 131)

Group Composition	%
Multigenerational group	65.6
Adult-only groups	20.6
Alone	7.6
Child-only groups	6.1

OVERALL VISITATION PATTERNS

Total Time Spent in the Exhibition

As shown in Table 6, visitors spent a median of 7 minutes in *Tissues of Life*. The shortest time a visitor spent in the exhibition was 1 minute and the longest time was 52 minutes.

Table 6
Total Time Spent in *Tissues of Life*^{1/2/3}
(n = 132)

Median	Minimum	Maximum	Mean	±
7 minutes, 8 seconds	1 minute, 4 seconds	52 minutes, 1 second	9 minutes, 4 seconds	7 minutes, 31 seconds

¹Of the 132 visitors observed, 31 briefly left *Tissues of Life* and used other exhibits in the Human Body Gallery. The time these visitors spent outside *Tissues of Life* was subtracted from their total time.

²The observation protocol instructed data collectors to terminate a tracking if the visitor stopped at fewer than two exhibits in *Tissues of Life*.

³Because of their close proximity in location and similarity of content, eight exhibits that were funded by the National Science Foundation were included with *Tissues of Life* data.

Total Number of Exhibits Stopped At

Tissues of Life included 27 exhibits at which visitors could stop.³ For this evaluation, a “stop” was when a visitor stood for three seconds or longer in front of a component. If a visitor returned to a component at which s/he had previously stopped, this return was not counted as an additional stop, but the time spent was included in the total time spent at the component.

As presented in Table 7, visitors stopped at between 2 and 15 exhibits in *Tissues of Life*. Visitors stopped at a median of 6 exhibits (22 percent of available exhibits).

Table 7
Total Number of Exhibits Stopped at in *Tissues of Life*^{1/2}
(n = 132)

Median	Minimum	Maximum	Mean	±
5.5	2.0	15.0	6.3	3.1

¹The observation protocol instructed data collectors to terminate a tracking if the visitor stopped at fewer than two exhibits in *Tissues of Life*.

²Because of their close proximity in location and similarity of content, eight exhibits that were funded by the National Science Foundation were included with *Tissues of Life* data.

When the total stops made in *Tissues of Life* were examined among demographic characteristics and data collection conditions, one statistically significant relationship emerged: weekday visitors stopped at more exhibits than did weekend visitors (see Table 8).

Table 8
Differences in Total Stops Made by Data Collection Day
(n = 132)

Day*	Mean Total Stops	±
Weekday	7.0	3.2
Weekend day	5.3	2.6

*p = 0.00

³Because of their close proximity in location and similarity of content, eight exhibits that were funded by the National Science Foundation were included with *Tissues of Life* data.

VISITATION OF INDIVIDUAL EXHIBITS

Time Spent at Each Exhibit

Visitors spent the most time at the Flowcytomter physical interactive (median time of 1 minute, 39 seconds) (see Table 9). Visitors also spent more than 1 minute at the Body Hotel microscope specimen, Scope-On-A-Rope physical interactive, Superhealers multimedia, and Protozoa microscope specimen. Visitors spent the least time at the Catch a Cold and Flowcytomter panels (median times of 17 seconds and 9 seconds, respectively).

Table 9
Time Spent at Each Exhibit

Exhibit	<i>n</i>	Median Time (Seconds)
Flowcytometer physical interactive	42	98.5
Body Hotel microscope specimen*	45	84.0
Scope-On-A-Rope physical interactive	54	80.0
Superhealers multimedia	21	78.0
Protozoa microscope specimen*	17	61.0
How to Use a Microscope bench*	22	60.0
Tissue Mysteries bench	23	57.0
Introduction to Stem Cells panel with audio	5	54.0
Stem Cell Discoveries panel with microscope specimen	31	53.0
Stem Cell Ethics video	16	48.5
Types Stem Cells panel	6	46.5
Good Cell, Bad Cell microscope specimen*	20	43.5
Model of Tissues physical interactive	14	40.5
Tissue Invaders physical interactive, large prop, and audio	40	38.5
Body Slices specimen	69	35.0
Dinner with a Paramecium microscope specimen*	23	33.0
Demonstration Station	16	31.0
Model of a Cell physical interactive*	32	31.0
Wounded Hand physical interactive with large prop	85	30.0
Sneezer physical interactive*	53	26.0
Introduction to Tissues: Jazz Band specimen	53	26.0
Wounded Hand panel, props, and audio	46	22.5
Invader Gallery panel	4	22.5
Skeleton specimen	22	19.5
Introduction to Tissues: Jazz Bandstand panel, props, and audio	49	18.0
Catch a Cold panel*	18	16.5
Flowcytometer panel	5	9.0

*Because of their close proximity in location and similarity of content, eight exhibits that were funded by the National Science Foundation were included with *Tissues of Life* data.

Stops Made at Each Exhibit

The most visitors stopped at the Wounded Hand physical interactive (64 percent), followed by the Body Slices specimen (52 percent) (see Table 10). The fewest visitors stopped at the Flowcytometer panel, Introduction to Stem Cells panel with audio, and the Invader Gallery panel (4 percent, 4 percent, and 3 percent, respectively).

Table 10
Percentage of Visitors Stopping at Each Exhibit
(n = 132)

Exhibit	%
Wounded Hand physical interactive with large prop	64.4
Body Slices specimen	52.3
Scope-On-A-Rope physical interactive	40.9
Sneezer physical interactive*	40.2
Introduction to Tissues: Jazz Band specimen	40.2
Introduction to Tissues: Jazz Bandstand panel, props, and audio	37.1
Wounded Hand panel, props, and audio	34.8
Body Hotel microscope specimen*	34.1
Flowcytometer physical interactive	31.8
Tissue Invaders physical interactive, large prop, and audio	30.3
Model of a Cell physical interactive*	24.2
Stem Cell Discoveries panel with microscope specimen	23.5
Tissue Mysteries bench	17.4
Dinner with a Paramecium microscope specimen*	17.4
Skeleton specimen	16.7
How to Use a Microscope bench*	16.7
Superhealers multimedia	15.9
Good Cell, Bad Cell microscope specimen*	15.2
Catch a Cold panel*	13.6
Protozoa microscope specimen*	12.9
Stem Cell Ethics video	12.1
Demonstration Station	12.1
Model of Tissues physical interactive	10.6
Types Stem Cells panel	4.5
Flowcytometer panel	3.8
Introduction to Stem Cells panel with audio	3.8
Invader Gallery panel	3.0

*Because of their close proximity in location and similarity of content, eight exhibits that were funded by the National Science Foundation were included with *Tissues of Life* data.

BEHAVIOR PATTERNS

Data collectors noted eight behaviors: doing exhibit activities, reading exhibit text, looking at specimens, talking about exhibit content, watching others use exhibit activities, coaching or being coached at exhibit activities, using audio, and watching video.

With the exception of audio use, which is described in detail in the section following the overall patterns discussion, see Appendix C for behaviors at each exhibit.

Overall Patterns

The most commonly observed behavior was doing exhibit activities (81 percent), followed by reading exhibit text (74 percent) (see Table 11). More than one-half of visitors looked at specimens, talked about exhibit content with their companions, and watched others use exhibit activities (69 percent, 69 percent, and 54 percent, respectively).

The least frequently observed behaviors were using audio (20 percent), watching video (3 percent), and noticing the banner (1 percent).

Table 11
Percentage of Visitors Exhibiting Behaviors in *Tissues of Life*
(*n* = 132)

Behavior	Number of Eligible Exhibits¹	%
Doing activity	10	81.1
Reading	18	73.5
Looking at specimens	3	69.0
Talking about content	20	69.0
Watching others use	7	54.4
Coaching/being coached	7	22.0
Using audio ²	5	19.7
Watching video	1	3.0
Noticing Cells Make Tissues banner	1	0.8

¹Number of eligible exhibits indicates exhibits that were designed to promote the behavior being studied.

²These visitors used between one and three audio components (median use being one audio component).

When behaviors were examined by demographic characteristics and data collection conditions, three statistically significant relationships were found (see Table 12). Adults were more likely to look at specimens and read exhibit text than were children. Additionally, weekday visitors were more likely to read exhibit text than were weekend visitors.

Table 12
Differences in Behaviors by Age and Day
(n = 132)

Behavior	Adults %	Children %
Looking at Specimens ¹		
Looked at one or more	74.0	53.1
Did not look at any	26.0	46.9
Reading Exhibit Text ²		
Read one or more panels	79.0	56.3
Did not read any panels	21.0	43.8
Behavior	Weekday %	Weekend Day %
Reading Exhibit Text ³		
Read one or more panels	82.7	61.4
Did not read any panels	17.3	38.6

¹p = 0.03

²p = 0.01

³p = 0.01

Audio Use

After the remedial evaluation, audio was added to five exhibits—Jazz Band Introduction, Wounded Hand, Tissue Invaders, Stem Cell Introduction, and Tissue Model Puzzle. One objective was to examine audio users and nonusers. When audio use was compared among demographic characteristics, one statistically significant relationship emerged: children were more likely to use audio than were adults (see Table 13).

Table 13
Differences in Audio Use by Age
(*n* = 132)

Use of Audio*	Children %	Adults %
Used audio	37.5	14.0
Did not use audio	62.5	86.0

**p* = 0.00

As shown in Table 14, audio at the Introduction to Tissues: Jazz Bandstand and the Model of Tissues were used by the most visitors (each 29 percent). Visitors spent the most time using the audio at the Model of Tissues (median time of 18 seconds).

Table 14
Use of Audio at Specific Exhibits

Exhibit	Number of Visitors Stopping	Percentage Using Audio	Median Time Spent Using Audio (Seconds)
Introduction to Tissues: Jazz Bandstand	49	28.6	16.0
Model of Tissues	14	28.6	18.0
Introduction to Stem Cells	5	20.0	3.0
Tissue Invaders	40	17.5	12.0
Wounded Hand	46	10.9	8.0

When the time spent at each exhibit was compared between audio and nonaudio users, one statistically significant relationship was found: visitors who used the audio component at the Introduction to Tissues: Jazz Bandstand spent more time at this exhibit than those who did not use audio (see Table 15).

Table 15
Differences in Time Spent at the
Introduction to Tissues: Jazz Band by Audio Use
(n = 49)

Use of Audio*	Time Spent at Introduction to Tissues: Jazz Bandstand	
	Mean Time (Seconds)	± (Seconds)
Used audio	31.6	20.2
Did not use audio	19.3	13.9

*p = 0.02

II. PRINCIPAL FINDINGS: EXIT INTERVIEWS

RK&A and SMM staff trained by RK&A conducted open-ended interviews with visitors during the morning, afternoon, and evening hours in July and August 2004. Walk-in museum visitors, age nine years and older, were intercepted as they exited *Tissues of Life* and asked to participate in an interview.⁴ Of the 72 groups intercepted, 12 declined to participate in the study, making a 17 percent refusal rate—a typical rate for museum evaluations. A total of 60 visitor groups were interviewed.

BACKGROUND INFORMATION ABOUT INTERVIEWEES

Demographics

Data collectors interviewed 60 visitor groups, comprised of 124 individuals (82 adults and 42 children). Sixty-five percent of interviewees were female and 35 percent were male. The median age of adults was 36 years, and the median age of children was 11 years.

Prior Visits to SMM

Sixty-six percent of interviewees were repeat visitors to the SMM, and 34 percent were first-time visitors. Of the repeat visitors, most were infrequent visitors—74 percent had not visited the Museum in the past six months, while 26 percent had visited once or more in the same time period.

VISITORS' EXPERIENCES IN *TISSUES OF LIFE*

To understand how interviewees used and responded to *Tissues of Life*, data collectors asked them to identify the most interesting exhibit and which exhibits had confusing information and/or were frustrating to use.

Most Interesting Exhibits

Overall, interviewees praised the *Tissues of Life* exhibits for engaging their hands and minds. Their preference for the most interesting exhibits, however, varied. Many interviewees said the Scope-On-A-Rope was the most interesting exhibit because you could see yourself from a new and different perspective (see the first quotation below). Many interviewees said they found the Body Slices interesting because they provided a look inside a real human body (see the second quotation). Many interviewees said the Wounded Hand was interesting because of its scale and because they could connect to it personally (see the third quotation).

The girls really liked looking at their skin. (What was so interesting about looking at your skin?) * I think the scabs were cool, just how big everything [looked]. When you

⁴Although visitors were intercepted as they were exiting the *Tissues of Life*, many of them returned after the interview. The visitors' paths through the Human Body Gallery often took them in and out of *Tissues of Life* several times and the interviewers were unable to ascertain when the visitors were actually leaving *Tissues of Life*.

could see those little scabs and gross stuff in your belly button so big, I think that was really interesting.

(What was interesting about the body slices?) Just because of the way that they've preserved them, and that it's an actual slice of a body. You don't see that very often. I think it's interesting. Something like lung disease and the hemorrhage in the brain, just to see those things that look actually real instead of just [being] animated pictures. It's shocking and cool, very cool.

I liked the big hand [Wounded Hand], where it shows what happens if you bang your thumb, you get a splinter, or you get a blister. (What was so interesting about the Big Hand?) It just shows the different layers . . . it shows reality on a large scale. . . . That was cool.

Some interviewees said that the Sneezer was interesting and fun (see the first quotation below). Some interviewees said they enjoyed Tissue Mysteries because they appreciated seeing how doctors solve medical mysteries. A few interviewees referenced the following exhibits as interesting: Tissue Invaders, the Body Hotel, the stem cells exhibits, and the Introduction to Tissues: Jazz Band specimens. They said personal connections (see the second quotation) and authenticity (see the third quotation) made those exhibits interesting.

My favorite is the sneeze. (Why is that?) It's just interesting how far a sneeze goes, how it can really contaminate a lot. * I liked the sneeze too. It's fun to get it to sneeze on somebody else.

[The Body Hotel] was really neat. (What was interesting about that?) Well, I've had head lice, and just knew that was really gross.

We liked the body parts. They were interesting because, what made it so interesting was the fact that it was real . . . the fact that you could see inside the organs and stuff.

Confusion and Frustration

The majority of interviewees said they found the *Tissues of Life* exhibits informative and easy to use (see the quotation below).

There was nothing really confusing. That's not to say that I always understood everything, but that problem probably resided within me. There wasn't anything that was presented poorly so that it created a lack of understanding. [The exhibits] were relatively clear.

Most interviewees who experienced confusion explained they had limited time to use the exhibits (see the first quotation, next page). A few interviewees said that the crowded exhibit space led to frustration (see the second quotation). Others were confused by what they were seeing. For example, an interviewee said that the Body Slices were difficult to interpret because they were not clearly labeled (see the third quotation).

I really can't spend a long time here in the Museum. We thought maybe a few hours would be enough time, but some of these activities take 20-30 minutes. You start adding all of those up, I want to do them, but can't because we're on a timeframe. (Would you say you found these confusing or more frustrating?) Not confusing, but there just seems to be an overwhelming amount of information and you really need to spend a lot of time . . . I look at [an exhibit] and think, 'do I want to sit down for 20 or 30 minutes or should we go to another floor we haven't seen yet?'

What was the most frustrating thing in these hands-on areas is that usually the one you want to do, somebody else is there. *Yeah. * And you wait and wait and then leave.

It was confusing actually looking at the [body] slices, actually seeing what's what. Where's the kidney? And where's the liver? Is this the stomach? And so on. If it was labeled or something, that would make it much easier.

USE OF AUDIO

Data collectors asked interviewees whether they used any of the devices that "looked like telephone receivers." Those who used the audio devices were asked their opinion of the format and content. Those who did not use the audio were asked what prevented them from doing so.

Of the 124 visitors interviewed, 67 percent did not use audio and 33 percent did. There were no significant gender, age, or visitation differences between audio users and nonusers.

Audio Users

Behaviors at the Audio Components

Over one-third of interviewees using an audio component used the one at the Introduction to Tissues: Jazz Bandstand. Over one-quarter used audio at the Tissue Invaders, a couple interviewees used audio at the Wounded Hand, while one interviewee used audio at the Introduction to Stem Cells.⁵

Many audio users said that they listened briefly before hanging up the device. These interviewees said they picked up the telephones to see what would happen and/or to determine the target audience of the audio program. They then hung up after quickly determining that because they could see and read, they could get the same information visually that was provided in the audio (see the two quotations below).

I picked [the telephone] up for just a few minutes and I thought, what, what's the purpose? I mean why not be able to read? Or is [the telephone] for people that can't read? There again, I kind of lose my patience . . . and I put it down. Maybe I listened for 10 seconds tops. . . I just kind of put it down because he was reading to me.

⁵ One-third of interviewees were not asked which audio component they used.

I thought [the telephones] were saying what was obvious, so if I was blind, it was interesting, but I don't think they were adding anything. I never listened to the whole thing through . . . it didn't tell me anything that I couldn't readily see. So because it was the same information, I hung up.

A few interviewees said that they were not sure how to use the audio components (see the quotations below).

I tried using a couple [of telephones], I couldn't really figure out how to use them. . . . I didn't know if I was supposed to wait.

I wasn't sure when it was looping and the next area started and I had to listen for an extra 10 seconds to make sure that I wasn't missing out on something.

Content Presentation and Length

Two-thirds of audio users made negative comments about the audio content. Some said they found the information presented too complex or thought it more appropriate for adults than children (see the first and second quotations below). Several said the information and/or delivery of the information was boring (see the third quotation). A few said the audio was too long (see the fourth quotation).

(Why did you only listen for about 5 seconds?) It started talking over my head . . . it just didn't capture my attention right away and I was impatient.

(How did the length of the audio work for you?) They were probably a very appropriate length for me but not for a seven-year-old. . . I thought the information was great for me. (And for your seven-year-old?) I don't know. I think he's more into just picking up the phone.

I think they were kind of boring . . . There was nothing new . . . I thought the voice was kind of boring and droning on.

[The audio] lasted a really long time. I just kind of listened . . . put it back down and walked away.

One-third of interviewees who used an audio component were satisfied with the experience (see the first quotation below). They said the content was easy to understand and the length was appropriate (see second and third quotations).

(What did you think about [the audio]?) It was neat. I liked it. We liked hearing about the stuff. Because you get to see it and hear it at the same time. I like that. . . (How did the information work for you?) It was in-between. I mean it wasn't too much or too little.

(How difficult or easy was the audio information to follow?) I thought was very easy. To get the four different tissues, we learned what the four different tissues are and that was very easy. . . I thought it was nice how it was duplicated in different areas. The four different tissues, you could read about them in another area to kind of reinforce it.

I think [the telephones] are great. I like them. I liked listening and I thought they were good. [The length] was fine. [The information] was good.

Audio Nonusers

Eighty-five percent of audio nonusers noticed the telephones but elected not to use them. The evaluator asked these interviewees to provide some reasons for their decisions to not use the audio components.

Many audio nonusers said that they prefer visual media or felt satisfied with the information provided by the physical exhibit and associated text (see the first two quotations below). Similarly, some assumed the audio was for visitors who wanted more information (see the third quotation).

I guess for me, I'd just as soon read the information. This way I can read the part that I'm interested in and skip over the parts that I'm not so interested [in].

I noticed [the audio components] were there, I just felt there was too much to look at and so to sit there and listen to something when I could read, scan through it real quick reading or whatever, and get the gist of it.

That's why the phones would be good because it explains things . . . if people are interested in something they'll stand and listen to more.

Other nonusers talked about characteristics of their visit or conditions in the exhibit space that made them not want to use the audio. For example, some provided social reasons for not using the audio components (see the first quotation below). Similarly, some said that time factored into their decision to bypass the audio components (see the second quotation). A few interviewees did not use the audio because of crowding and hygiene concerns (see the third and fourth quotations).

Well, we were together and although I noticed [the telephone receivers] and I wanted to do it, I didn't because [my friend] wouldn't be able to hear at the same time I did. As opposed to you pressing a button, and then it starts talking to you, then it is ok. You can see if you like it or whatever and [my friend] can hear it too.

It has nothing to do with the mechanics of the phones. It's just the time constraints. I'm really just stopping at places and looking and if I have to move on, I do that.

There was somebody standing there when I was ready to use it [the telephone] so I kept going.

I saw [the telephone receiver] but I didn't use it. And I don't know why. It's just, well, I started to, but I didn't get too close because of all the kids handling it. I'm a teacher, and after looking at those things on my body in [the Body Hotel], I wasn't about to put the phone anywhere near my face.

The remaining 15 percent of audio nonusers either did not notice the audio components or were not certain of the telephone receivers' purpose (see the two quotations below).

(Did you notice the telephone receivers?) I didn't notice until you just said that. I don't think it really has a big sign on it or tells you what you're going to be able to hear. I don't know, for something that's new . . . maybe you need to have a larger sign or something that draws your attention to it, so that you would actually want to pick up the phone and use it. It's the same with the other exhibits. As you walk through, something that catches your eye is going to make you stop.

(Did you notice [the telephone receivers] were there?) I noticed they were there, but I didn't use them. I didn't know what they were for.

TISSUES OF LIFE MAIN MESSAGE

Themes

Interviewers asked interviewees to describe the main ideas of the *Tissues of Life* exhibits.⁶ To make sure the data collectors did not bias visitors, they pointed to the exhibits but did not call them by name when asking the question.⁷

The majority of interviewees said the exhibition was about the human body. Many explained further that the exhibition was about the workings of the human body (see the first quotation below). Some included the word "cell" in their description of the exhibit's theme (see the second quotation. Four visitors used the word "tissue" to describe what the exhibit was about (see the third quotation).

(Off the top of your head, what would you say the exhibits in this area are about?)
Basically, I would say they are about the human body and how it functions, how the parts work together.

⁶ Few interviewees used the audio. As such, RK&A was unable to determine differences between audio users and nonusers in their understanding of the main message.

⁷ Some interviewees were not clear which exhibits were included in the *Tissues of Life* area. Throughout the interviews, some interviewees referenced other areas/experiences (e.g., the Cell Lab, the Perception Theater, the eye exhibits). Although the interviewer directed the visitors to the *Tissues* exhibits, the interviewees did not discuss the area as distinct.

It's about the body. (Would you agree with that or is there anything you want to add?) * I thought it was a little minute[r] than that. I thought the body, but I also thought cells . . . really small parts of the body.

The body, well in terms of what the whole exhibit's about, I would say body * how it works, how it all goes together and the things that people are doing to help make it better. (Is there anything you want to add?) ** I guess if I had to sum it up, it's all about tissues.

*Information Visitors Learned about Tissues*⁸

Data collectors asked interviewees what, if anything, new about tissues they had learned from the exhibits, as well as to describe what a tissue is and what it does.

New Discoveries

Beyond the overall theme of the *Tissues of Life* exhibits, interviewees were asked to talk about anything new they discovered about tissues. Many interviewees said that they knew about tissues before they came into the Museum and *Tissues of Life* reinforced their knowledge (see the two quotations below).

I'm probably not the best to ask because I'm in the medical profession so I know a lot about tissues. It may not have added to my knowledge, but I thought it was interesting.

I didn't really learn anything new, but I thought it was kind of cool because last year in biology class we learned about tissues. I recognized some of the things that they were talking about. So that was pretty cool, I actually knew what they were talking about.

Some interviewees discovered what tissues look like (see the two quotations below). Some provided specific examples of facts they learned from the exhibits. For example, some interviewees discovered that there are four types of tissues. One discovered that researchers are using adult stem cells in addition to embryonic stem cells. Another discovered "what different people felt about stem cell use and research." Some interviewees said that they did not discover anything new about tissues during their Museum visit.

The pancreas, it looks like grass or something. I thought it was interesting. *To see what they actually really look like, I never would have thought about the pancreas being so fibrous before I saw that.

(What would you say you discovered new today about tissues?) What they look like, I mean I've never seen real human tissue outside of school. *Yeah.

⁸ Some interviewees had difficulty with this section because they said they felt they were being tested. This led interviewees to recall what they knew about tissues from other sources (for example, school), as opposed to what they discovered from the *Tissues of Life* exhibits. The interviewers attempted to put the interviewees at ease by telling them that this was not a test. Interviewers also asked interviewees to focus their comments on what they discovered in the exhibit. However, many interviewees explained that they were calling on prior knowledge and experiences to answer questions about tissues.

What is a Tissue?

Interviewers asked the interviewees, “Can you tell me what a tissue is?” Many interviewees responded structurally, stating that tissues are made up of cells (see the first quotation below). Additionally, many interviewees listed tissue types including: skin/epithelial tissue, muscle tissue, and nervous tissue (see the second and third quotations).

Well, when I think of tissue, I think of cells and that’s what makes us. Cells.

A tissue is made up of a group of related cells. (And what are cells?) They vary, there are different type of cells that make up different types of tissues. There are muscle cells, there’s nervous tissue . . . skin tissue.

There are different kinds of tissues. There’s muscle tissue, skin, organ tissue, and stuff. It’s important to know how they differ.

Some interviewees did not answer the question asking what a tissue is, despite prompting by the interviewer. A few interviewees provided scientifically inaccurate (see the first quotation below) or incomplete responses (see the second quotation).

What is a body tissue? I guess I would respond with it’s what makes up our body that’s not fluid.

(In your words, what is body tissue?) I don’t know, the body’s protection. It’s what our barrier is for our important organs. . . It’s just our outer layer, kind of like a protection. I think of it that way.

What do Tissues do?

Interviewees were further prompted to describe some of the functions of tissues. Approximately one-half of interviewees did not provide a response to this question, despite prompting by the interviewer. Of those who responded, many interviewees said that different tissues have different jobs, including protection, connecting, secretion, absorption, and assisting in healing (see the first and second quotations below). A few interviewees highlighted the function of only one tissue type without referencing other tissue types (see the third quotation).

The epithelial tissue is able to secrete things and also able to absorb things. It actually passes between the layers which is fascinating. . . (Can you think of anything else?) Tissues connect things. *And they help you feel and touch.

(What does body tissue do?) What type of tissue? [Laughs] Certain tissues take away infection, like when you get invaded by germs. The skin protects. Connective tissue connects. Red and white blood cells have their jobs. Tissues do all of that. It does different things depending on what it’s designed for.

Tissues? When you ask about tissues I'm thinking of skin tissue for some reason. I'm just thinking it protects your body. (What would you say tissues do?) Just that, protect your body.

APPENDICES

APPENDICES A and B removed for proprietary reasons.

APPENDIX C
Behaviors at Each Exhibit

Table 16
Percentage of Visitors Doing Exhibit Activities

Exhibit	<i>n</i>	% Did Activity
Wounded Hand physical interactive with large prop	85	84.7
Tissue Mysteries bench	23	82.6
Demonstration Station**	16	81.3*
Scope-On-A-Rope physical interactive	54	77.8
Stem Cell Discoveries panel with microscope specimen	31	71.0
Flowcytometer physical interactive	42	66.7
Superhealers multimedia	21	61.9
Introduction to Tissues: Jazz Bandstand panel, props, and audio	49	61.2
Model of Tissues physical interactive	14	50.0*
Tissue Invaders physical interactive, large prop, and audio	40	47.5

*Readers should note the small sample size for these exhibits when considering the percentages reported.

**Most visitors (75.0%) used the resources at the Demonstration Station; that is, they used it when it was unstaffed.

Table 17
Percentage of Visitors Watching Others Do Exhibit Activities

Exhibit	<i>n</i>	% Watched
Scope-On-A-Rope physical interactive	54	66.7
Model of Tissues physical interactive	14	50.0*
Tissue Invaders physical interactive, large prop, and audio	40	50.0
Flowcytometer physical interactive	42	38.1
Superhealers multimedia	21	38.1
Tissue Mysteries bench	23	34.8
Wounded Hand physical interactive with large prop	85	30.6
Demonstration Station	16	18.8*

*Readers should note the small sample size for these exhibits when considering the percentages reported.

Table 18
Percentage of Visitors Coaching or Being Coached at Exhibit Activities

Exhibit	<i>n</i>	% Coached
Flowcytometer physical interactive	42	26.2
Model of Tissues physical interactive	14	21.4*
Scope-On-A-Rope physical interactive	54	14.8
Superhealers multimedia	21	14.3
Wounded Hand physical interactive with large prop	85	11.8
Tissue Invaders physical interactive, large prop, and audio	40	7.5
Tissue Mysteries bench	23	0.0

*Readers should note the small sample size for this exhibit when considering the percentages reported.

Table 19
Percentage of Visitors Looking at Specimens

Exhibit	<i>n</i>	% Looked at Specimens
Body Slices specimen	69	97.1
Skeleton specimen	22	95.5
Introduction to Tissues: Jazz Band specimen	53	92.5

Table 20
Percentage of Visitors Reading Exhibit Text

Exhibit	<i>n</i>	% Read Text
Invader Gallery panel	4	100.0*
Types Stem Cells panel	6	83.3*
Flowcytometer panel	5	80.0*
Introduction to Stem Cells panel with audio	5	80.0*
Wounded Hand panel, props, and audio	46	69.6
Stem Cell Discoveries panel with microscope specimen	31	67.7
Flowcytometer physical interactive	42	64.3
Body Slices specimen	69	50.7
Introduction to Tissues: Jazz Bandstand panel, props, and audio	49	49.0
Introduction to Tissues: Jazz Band specimen	53	47.2
Tissue Mysteries bench	23	43.5
Superhealers multimedia	21	42.9
Skeleton specimen	22	36.4
Tissue Invaders physical interactive, large prop, and audio	40	32.5
Stem Cell Ethics video comment book	16	18.8*
Model of Tissues physical interactive	14	14.3*
Scope-On-A-Rope physical interactive	54	9.3

*Readers should note the small sample size for these exhibits when considering the percentages reported.

Table 21
Percentage of Visitors Talking about Exhibit Content

Exhibit	<i>n</i>	% Talked about Content
Body Slices specimen	69	55.1
Scope-On-A-Rope physical interactive	54	50.0
Invader Gallery panel	4	50.0*
Superhealers multimedia	21	42.9
Flowcytometer panel	5	40.0*
Wounded Hand physical interactive with large prop	85	38.8
Introduction to Tissues: Jazz Band specimen	53	37.7
Flowcytometer physical interactive	42	35.7
Types Stem Cells panel	6	33.3*
Demonstration Station	16	31.3*
Tissue Mysteries bench	23	30.4
Wounded Hand panel, props, and audio	46	23.9
Skeleton specimen	22	22.7
Stem Cell Discoveries panel with microscope specimen	31	22.6
Tissue Invaders physical interactive, large prop, and audio	40	22.5
Introduction to Stem Cells panel with audio	5	20.0*
Introduction to Tissues: Jazz Bandstand panel, props, and audio	49	14.3
Model of Tissues physical interactive	14	14.3*
Stem Cell Ethics video	16	12.5

*Readers should note the small sample size for these exhibits when considering the percentages reported.