



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 Remedial Evaluation  
Program Summative Evaluation  
Web Summative Evaluation**

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## EXECUTIVE SUMMARY

### METHODOLOGY

RK&A conducted 96 timing and tracking observations of visitors, 26 exit interviews with visitors, interviews with the Tissues Bioreactor Team and scientists who presented at the Demonstration Station, 17 telephone interviews with visitors who attended a Demonstration Station program, 27 telephone interviews with visitors who attended the *What is Life?* play, and 50 interviews with visitors about the *Tissues of Life* Web site. All data were collected in the summer and fall of 2003.

### EXHIBITION REMEDIAL EVALUATION

#### *Visitor Timing and Tracking Observations*

- Slightly more females (54 percent) than males (46 percent) were observed.
- 49 percent of visitors were visiting *Tissues of Life* as families.
- Visitors spent a median of 3 minutes in *Tissues of Life* and stopped at a median of 4 exhibits.
- Visitors were actively engaged in *Tissues of Life*: 68 percent looked at specimens, 65 percent did activities, 62 percent read exhibit text, 53 percent watched other visitors do activities, and 49 percent talked about exhibit content.
- Misuse/difficulty using exhibits was observed infrequently (15 percent).
- Visitors spent the most time at the Tissue Mysteries bench (median time of 2 minutes).
- The most visitors (53 percent) stopped at the Wounded Hand physical interactive/large prop.

#### *Visitor Exit Interviews*

- *Tissues of Life* interviewees tended to be repeat visitors who infrequently visit the SMM (two or fewer times in the past six months).
- Examining their own skin with the Scope-On-A-Rope and using large props at the Wounded Hand and Tissue Invaders appealed to many interviewees.
- Seeing real human tissue and looking inside the body were highlights for most interviewees.
- Low points for some interviewees were broken exhibits (e.g., the Flowcytometer).
- While many interviewees grasped that the exhibition was about how the human body functions, none used the term “tissues” as they described the exhibition’s main idea.
- Most interviewees grasped the connection between *Tissues of Life*, the *Cell Lab*, and the rest of the Human Body Gallery.

## PROGRAM SUMMATIVE EVALUATION

### *Demonstration Station Interviews*

- The Lab Crew participating in the Tissues Bioreactor Project described the program as a unique opportunity for teens, who expressed pride in conducting research and presenting their findings to visitors.
- The University of Minnesota scientists enjoyed interacting with visitors at the Demonstration Station. When asked what the SMM should do to support such presentations, the scientists praised the efforts of Museum staff: scheduling the presentation well in advance, taking care of Museum admission and parking fees, and helping them plan their activity with visitors in mind.
- In telephone interviews with visitors,\* which took place several weeks after their visit, all could describe in detail the demonstration they had attended. They praised the SMM for having these programs and noted that the demonstrations had positively impacted their visit.
- All the interviewees who attended the scientist demonstration or the craft activity said their children enjoyed the activities and the presenters' engaging demeanor. Interviewees who attended the Tissues Bioreactor Project demonstration had mixed responses, suggesting that the teens should modify their PowerPoint presentation for a lay audience.

### *What Is Life? Interviews*

- Nearly all visitors interviewed recalled the general presentation style of *What is Life?* and most remembered ideas and issues presented when interviewed by telephone several weeks after their visit.
- Most enjoyed the play's open-ended line of questioning and participatory nature; however, a few objected to its entertainment focus.
- Interviewees offered mixed opinions about the play's content. Some found it thought-provoking and balanced; others said it was too high-level for their children, vague, or off-putting.
- Most perceived the main message of *What Is Life?* as exploring what is living and nonliving.
- Many praised the SMM for presenting a play that asks questions and examines the nature of science. They said the play added richness to their museum experiences.
- None of the interviewees saw an explicit connection between *What Is Life?* and the *Tissues of Life* exhibition.

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\* Visitors were not told they would be interviewed about a demonstration to avoid cueing them to remember it and biasing the data.

## WEB SITE SUMMATIVE EVALUATION

- Many Web site users described its content as interesting and informative. However, most experienced design or technical difficulties that negatively impacted their experience: difficulty using navigation tools, long loading times, and having to download software.
- Non-users said their lack of interest in using the Internet or the subject hampered their use of the Web site.
- Slight differences between the responses of Web site users and non-users suggest that—in spite of technical difficulties—the Web site enhances the exhibition experience.
- Overall, both sets of interviewees suggested promoting the Web site in the exhibition to encourage visitors to use it and explicitly referencing the exhibition in the Web site to foster connections between the two.

## DISCUSSION

*Tissues of Life* offered visitors multifaceted experiences through the exhibition, Demonstration Station presentations, *What Is Life?* play, and a Web site. Overall, visitors who participated in the evaluation remarked positively about *Tissues of Life*. Many appreciated its unique offerings, such as seeing real human tissue, playing with large props, meeting scientists, participating in a play that discusses complex ideas, and using Web-based versions of exhibits they had visited at the SMM. RK&A noted that many visitors readily recalled their experiences at the demonstrations and the play—which speaks to the power of staffed programs.

Visitors tended to come away with personally relevant messages specific to each element of *Tissues of Life*. As such, the ideas and topics visitors learned varied, ranging from how the body functions, to the importance of hand washing, to questioning the nature of science.

While visitors appreciated the experiences *Tissues of Life* offered and described them as educational, some aspects proved problematic. Notably, few visitors used the term “tissues” as they talked about the main messages of the exhibition elements. All visitors had difficulty drawing connections between *What Is Life?* and the exhibition. Similarly, many visitors said the relationship between the exhibition and the Web site could be made more explicit. Many visitors also had design or technical difficulties using the Web site, limiting its effectiveness to convey information. Several visitors were displeased with *What Is Life?*—because they perceived a pro-evolution message in the play, said they felt the content was too vague, or disliked its irreverent tone. While not every element of *Tissues of Life* will likely work for all visitors, SMM staff may want to consider several ideas:

- In future demonstrations and the *What Is Life?* play, have the presenters state how the program is connected with the exhibition. For example, the actors in the play could ask the audience whether cells and tissues are alive.
- Consider developing a fun family “guide” that defines and describes tissues and can be used in the exhibition (e.g., tissue trading cards).

- Promote the Web site in the exhibition. If possible, consider using the *Tissues of Life* temporary tattoos distributed at the state fair, or develop a similar hand stamp.
- To reinforce connections between the exhibition and the Web site, include a virtual exhibition on the Web site that enables visitors to find an exhibit and then connect with the related features and links.
- One reason some visitors may have responded negatively to *What is Life?* is that they did not know what to expect from the play. Describe and appropriately publicize the play.
- Consider revising *What Is Life?* so visitors provide examples of what is life, what is not life, and reasons for their classifications. Provide visitors with a forum for discussing their criteria for life and for the actors to describe those of scientists. Additionally, provide time at the end of the program for visitors to discuss their objections to the ideas the play presented.

## INTRODUCTION

This report presents the findings of remedial and summative evaluations of *Tissues of Life*, conducted by Randi Korn & Associates, Inc. (RK&A), for the Science Museum of Minnesota (SMM), in Saint Paul, MN. RK&A simultaneously conducted a remedial evaluation of the *Tissues of Life* exhibition and summative evaluations of its associated elements: the Web site with the same name, presentations at the Demonstration Station, and the *What is Life?* play. The National Institutes of Health funded all *Tissues of Life* elements.

Data collection took place in July through October 2003. The evaluation documents the scope of the impact and effectiveness of *Tissues of Life* exhibition, Web site, and programs. The evaluation's 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;
- The frequency of select behaviors;
- Visitors' perceived connections between the *Tissues of Life* exhibition, the *Cell Lab* (an adjacent and content-related exhibition), and other exhibits in the Human Body Gallery;
- Comparison of *Tissues of Life* to other exhibitions at the SMM;
- Visitors' responses to and understanding of the *Tissues of Life* exhibition, demonstrations, and *What is Life?* play;
- Presenters' experiences interacting with visitors at the Demonstration Station;
- What impact the demonstrations had on visitors' experiences in the Museum;
- Whether visitors reflected on the demonstrations and continued to think about the demonstrations a few weeks after their visit;
- Whether visitors reflected on the play and continued to think about issues raised in the play a few weeks after their visit;
- Whether visitors connect issues raised in the play with the content of the *Tissues of Life* exhibition;
- Web site users' responses to the exhibition's companion *Tissues of Life* Web site;
- Non-users' barriers to using the Web site;
- Whether using the *Tissues of Life* Web site deepened visitors' understanding of the exhibition by comparing responses of Web site users and non-users;
- Ways in which the *Tissues of Life* Web site can extend the exhibition experience; and
- Suggestions for improving all *Tissues of Life* elements.

## METHODOLOGY

RK&A employed three data collection strategies to assess visitors' experiences in *Tissues of Life*: timing and tracking observations, uncued exit interviews, and telephone interviews. Additionally, to understand presenters' experiences at the Demonstration Station, evaluators conducted face-to-face interviews with them.



### *Visitor 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 in an exhibition and suggest the range of visitor behaviors.

All visitors nine years of age and older were eligible to be unobtrusively observed in the exhibition. The observed visitors were selected following a continuous random sampling method. In accordance with this method, the observer was stationed at the entrance of the exhibition, and observed the first eligible visitor to enter. The observer followed the selected visitor through the exhibition, recording the exhibits used, select behaviors, and total time spent in the exhibition (see Appendix A for the observation form). Upon completing a visit, the observer returned to the entrance to await the next eligible visitor to enter the exhibition.

### *Visitor 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 of age 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 give interviewees the opportunity to discuss what was meaningful. All interviews were tape-recorded with participants' permission and transcribed to facilitate analysis.

### *Presenter Interviews*

RK&A conducted open-ended, face-to-face interviews at the SMM with scientists from the University of Minnesota and the Tissues Bioreactor Team (teens employed as part of the Lab Crew in the *Cell Lab*) after their presentations at the Demonstration Station.

Again, the interview guides were open-ended to encourage the presenters to talk about their personal experiences (see Appendix C presenter interview guides). All interviews were tape-recorded with participants' permission and transcribed to facilitate analysis.

### *Visitor Telephone Interviews*

RK&A conducted post-visit telephone interviews with visitors for three programmatic elements: Demonstration Station presentations, the *What is Life?* play, and the *Tissues of Life* Web site.

For the presentations at the Demonstration Station, the evaluator collected telephone numbers by systematically intercepting visitors exiting the Human Body Gallery. The evaluator noted which visitors attended the presentations and when they exited the area, asked them to participate in a

telephone interview about the Museum. Visitors were not told they would be interviewed about the Demonstration Station presentation to avoid cueing them to remember their experiences and biasing the data. Interviews about the Demonstration Station presentations took place four to six weeks after those visits (see Appendix D for the visitor Demonstration Station interview guide).

For *What is Life?*, the evaluator intercepted visitors as they entered the theater and asked them to participate in a telephone interview about the play. Because of the program's nature and the layout of the theater, telling the visitor the focus of the interview was unavoidable. Interviews about *What is Life?* took place four to six weeks after those visits (see Appendix E for the *What is Life?* interview guide).

For the Web site, the evaluator systematically intercepted visitors as they exited *Tissues of Life*. The evaluator asked the visitor to participate in a telephone interview about the Web site, and, upon agreeing, was given a card with the Web site URL. Interviews about the Web site took place two to four weeks after those visits. One-half of interviewees had used the Web site and the other one-half had not (see Appendix F for the Web-site interview guide).

Only visitors 18 years of age and older were approached for a telephone interview. The telephone interview guide was open-ended to allow individuals to express what they found meaningful about their visit. All interviews were tape-recorded with participants' permission and transcribed to facilitate analysis.

## DATA ANALYSIS

### *Quantitative Analysis*

The observational data were quantitative, and the evaluator entered them 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). 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 data.<sup>1</sup>

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<sup>1</sup> For 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 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.

## *Qualitative Analysis*

Visitors, Web site users, and presenters' responses to interview questions were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns. As patterns and trends emerged, similar responses were grouped together. Each grouping was assigned a name or category that conveys the meaning of the data, and quotations are used to illustrate interviewees' thoughts and ideas as fully as possible.

## METHOD OF REPORTING

The data in this report are both quantitative and qualitative. For the quantitative data, tables and graphs are used to 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. Interviewees' verbatim quotations (edited for clarity) are included for the exit and telephone interviews. Within quotations, asterisks (\*) are used when more than one speaker is quoted. The interviewer's remarks appear in parentheses. Trends and themes in the interview data are also presented from most to least frequently occurring.

Findings in each report are presented in five main sections:

- I. Timing and Tracking Observations
- II. Exit Interviews
- III. Demonstration Station Interviews
- IV. *What Is Life?* Interviews
- V. Web site Interviews

## I. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

The observer timed and tracked visitors in *Tissues of Life* and the *Cell Lab*<sup>2</sup> for 10 days in July 2003, observing 100 drop-in museum visitors, ages nine years and older.<sup>3</sup> Of 100 visitors observed, 52 percent visited both *Tissues of Life* and the *Cell Lab*, 44 percent visited only *Tissues of Life*, and 4 percent visited only the *Cell Lab* (see Table 1).

**Table 1**  
**Exhibitions Visited**  
(*n* = 100)

<b>Exhibition</b>	<b>Total (%)</b>
Both <i>Tissues of Life</i> and <i>Cell Lab</i>	52.0
<i>Tissues of Life</i> only	44.0
<i>Cell Lab</i> only	4.0

This report presents data for the 96 visitors who visited *Tissues of Life*. RK&A prepared a separate report for the National Science Foundation on the *Cell Lab*.

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<sup>2</sup> The *Cell Lab* includes all the cell biology exhibits and benches in the Human Body Gallery.

<sup>3</sup> The observations of the two exhibitions were combined for two main reasons: (1) to account for the close proximity of *Tissues of Life* and the *Cell Lab* and (2) to accurately reflect visitors' experiences—in which they tend to ignore the boundaries between related exhibitions.

DATA COLLECTION CONDITIONS

The evaluator conducted the majority of observations on weekday afternoons during moderate visitation conditions (see Table 2).

**Table 2**  
**Data Collection Conditions**  
*(n = 96)*

<b>Condition</b>	<i>Tissues of Life</i> <b>(%)</b>
<b>Day</b>	
Weekday	59.4
Weekend day	40.6
<b>Time of Day</b>	
PM	74.0
AM	26.0
<b>Crowding Level</b>	
Moderate	53.1
Few	41.7
Crowded	5.2

As shown in Table 3, almost three-quarters of visitors entered *Tissues of Life* near the Body Slices/Introduction to Tissues (73 percent), and about one-quarter of visitors entered near the Body Hotel/Perception Theater (27 percent).

**Table 3**  
**Visitor Start Location**  
*(n = 96)*

<b>Location</b>	<i>Tissues of Life</i> <b>(%)</b>
Near Body Slices/Introduction to Tissues	72.9
Near Body Hotel/Perception Theater	27.1

Upon exiting *Tissues of Life*, most visitors went to *Cell Lab* exhibits (54 percent) (see Table 4). About an equal number went to other parts of the Human Body Gallery (22 percent) or left that area of the Museum altogether (21 percent).

**Table 4**  
**Where Visitors Went After Leaving *Tissues of Life***  
**(n = 96)**

<b>Location</b>	<i>Tissues of Life</i> (%)
<i>Cell Lab</i>	54.2
Other part of Human Body Gallery	21.9
Leaves Human Body Gallery	20.8
Perception Theater	3.1

DEMOGRAPHICS

As indicated in Table 5, more than one-half of visitors were female (54 percent) and less than one-half were male (46 percent). More than one-third of visitors were between 25 and 44 years old (38 percent).

**Table 5**  
**Visitor Demographics**  
*(n = 96)*

<b>Characteristic</b>	<i>Tissues of Life</i> <b>(%)</b>
<b>Gender</b>	
Female	54.2
Male	45.8
<b>Age Group</b>	
9 to 11	13.5
12 to 15	20.8
16 to 24	4.2
25 to 44	37.5
45 to 64	12.5
65 years or older	11.5

The majority of visitors were visiting the exhibition in groups of both adults and children (49 percent) (see Table 6).

**Table 6**  
**Group Composition of Visitors**  
*(n = 96)*

<b>Group Composition</b>	<i>Tissues of Life</i> <b>(%)</b>
Multigenerational group	49.0
Adult-only groups	24.0
Alone	14.5
Child-only groups	12.5

OVERALL VISITATION PATTERNS

*Total Time Spent in the Exhibition*

As shown in Table 7, visitors spent a median of almost 3 minutes in *Tissues of Life*. The shortest time a visitor spent in the exhibition was 6 seconds and the longest time was about 26 minutes.

**Table 7**  
**Total Time Spent in *Tissues of Life***  
**(n = 96)**

Median	Minimum	Maximum	Mean	±
2 minutes, 44 seconds	6 seconds	25 minutes, 50 seconds	4 minutes, 9 seconds	4 minutes, 48 seconds

*Total Number of Exhibits Stopped At*

*Tissues of Life* included 20 exhibits at which visitors could stop. **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 8, visitors stopped at between 1 and 13 exhibits in *Tissues of Life*. Visitors stopped at a median of 4 exhibits.

**Table 8**  
**Total Number of Exhibits Stopped at in *Tissues of Life***  
**(n = 96)**

Median	Minimum	Maximum	Mean	±
4.0	1.0	13.0	4.5	2.4



## OVERALL BEHAVIOR PATTERNS

The most commonly observed behavior was looking at specimens (68 percent), followed by doing exhibit activities (65 percent) (see Table 9). More than one-half of visitors read exhibit text (62 percent) and watched others use exhibit activities (53 percent). Nearly one-half of visitors talked aloud about exhibit content to their companions (49 percent).

The least frequently observed behaviors were misuse of or difficulty using exhibits (15 percent), followed by staff interactions (3 percent).

**Table 9**  
**Percentage of Visitors that Exhibited Behaviors in *Tissues of Life***  
**(*n* = 96)**

<b>Behavior</b>	<b><i>Tissues of Life</i></b> <b>(%)</b>
Looked at specimens	67.7
Did activity	64.6
Read	61.5
Watched others use	53.1
Talked about content	49.0
Coached/was coached	29.2
Misused/had difficulty using	14.6
Interacted with Staff	3.1

## VISITATION OF INDIVIDUAL EXHIBITS

### *Time Spent at Each Exhibit*

As shown in Table 10, visitors spent the most time at the Tissue Mysteries bench (median time of nearly 2 minutes). Visitors also spent more than one minute at the Scope-On-A-Rope interactive, Stem Cell Ethics video, and Flowcytometer interactive.

The two exhibits at which visitors spent the least time were Wounded Hand panel with props (median time of 17 seconds) and the Flowcytometer panel (median time 16 seconds).

**Table 10**  
**Median Time Visitors Spent at *Tissues of Life* Exhibits**  
**(*n* = 96)**

<b>Exhibit Name</b>	<b>Number of Visitors that Stopped</b>	<b>Median Time (Seconds)</b>
Tissue Mysteries bench	17	110.0
Scope-On-A-Rope physical interactive	39	83.0
Stem Cell Ethics video	10	80.0
Flowcytometer physical interactive	16	72.0
Demonstration Station	6	55.5
Superhealers multimedia	13	55.0
Stem Cell Discoveries panel with microscope specimen	16	50.5
Body Slices specimen	39	37.0
Wounded Hand physical interactive with large prop*	43	30.0
Introduction to Stem Cells panel	5	30.0
Tissue Invaders physical interactive with large prop	24	29.5
Skeleton specimen	20	26.5
Introduction to Tissues—Jazz Band specimen	42	24.0
Invader Gallery panel	5	24.0
Types of Stem Cells panel	1	24.0
Wounded Hand panel with props	33	17.0
Flowcytometer panel	3	16.0

\*The Wounded Hand interactive was broken for 19 of the observations, so *n* = 81.

### *Stops Made at Each Exhibit*

Visitors could stop at 17 exhibits.<sup>4</sup> As shown in Table 11, the greatest number of visitors stopped at the Wounded Hand interactive (53 percent), followed by the Introduction to Tissues—Jazz Band specimen (44 percent), Body Slices specimen (41 percent), and Scope-On-A-Rope (41 percent).

The fewest visitors stopped at the Flowcytometer panel (3 percent) and Types of Stem Cells panel (1 percent).

**Table 11**  
**Percentage of Visitors that Stopped at *Tissues of Life* Exhibits**  
**(*n* = 96)**

<b>Exhibit Name</b>	<b>Percent Stopped</b>
Wounded Hand physical interactive with large prop*	53.1
Introduction to Tissues—Jazz Band specimen	44.0
Body Slices specimen	40.6
Scope-On-A-Rope physical interactive	40.6
Wounded Hand panel with props	34.4
Tissue Invaders physical interactive with large prop	25.0
Skeleton specimen	20.8
Tissue Mysteries bench	17.7
Flowcytometer physical interactive	16.7
Stem Cell Discoveries panel with microscope specimen	16.7
Superhealers multimedia	13.5
Stem Cell Ethics video	10.4
Demonstration Station	6.3
Introduction to Stem Cells panel	5.2
Invader Gallery panel	5.2
Flowcytometer panel	3.1
Types of Stem Cells panel	1.0

\*The Wounded Hand interactive was broken for 19 of the observations, so *n* = 81.

<sup>4</sup> For this evaluation, a “stop” was defined as a visitor standing for three seconds or longer in front of an exhibit.

## *Behaviors at Each Exhibit*

### Behaviors at Interactives, Multimedia, and Tissue Mysteries Bench

The observer noted seven behaviors at interactives, multimedia, and the Tissue Mysteries bench: doing the activity, watching others do the activity, coaching or being coached at the activity, reading, talking about exhibit content, interacting with staff, and misuse or having difficulty using the activity.

As presented in Table 12, visitors displayed the most behaviors at the interactive exhibits (most frequently observed behaviors are highlighted in the table).

- More than one-half of visitors that stopped at the Flowcytometer did the exhibit activity, watched others use it, read exhibit text, and/or talked about exhibit content (the numbers are highlighted in the table).
- More than one-half of visitors that stopped at Scope-On-A-Rope did the activity, watched others use it, and/or talked about its content.
- More than one-half of visitors that stopped at the Wounded Hand did the activity, watched others use it, and/or read exhibit text.
- More than one-half of visitors that stopped at Tissue Invaders did the activity and/or watched others use it.

More than one-half of visitors that stopped at Tissue Mysteries bench did the activity and talked about exhibit content. One reason few visitors watched others use it or coached each other at it may be the bench's design. It is semi-enclosed so it would be difficult for visitors to watch others use it. The lab companion computer, which provides instructions, potentially decreases the need for visitors to coach each other while using it.

More than one-half of visitors that stopped at Superhealers did the activity.

**Table 12**  
**Behaviors Observed at Each Interactive and Multimedia Exhibit**

Exhibit	Number of Visitors that Stopped	Number of Visitors that Displayed Each Behavior						
		Did	Watched	Coached	Read	Talked	Interacted with Staff	Misused
Flowcytometer physical interactive	16	13	8	2	10	8	0	4
Scope-On-A-Rope physical interactive	39	30	29	11	9	21	1	0
Wounded Hand physical interactive with large prop <sup>1</sup>	43	29	22	13	28	13	0	2
Tissue Invaders physical interactive with large prop <sup>2</sup>	24	14	14	2	5	7	1	2
Tissue Mysteries bench <sup>3</sup>	17	14	6	7	6	9	0	4
Superhealers multimedia <sup>4</sup>	13	9	5	1	4	4	0	4

<sup>1</sup>The Wounded Hand interactive was broken for 19 of the observations.

<sup>2</sup>At Tissue Invaders, 12 used the rabies virus, 8 used the rhinovirus, 7 used the tetanus virus, 7 used the pertussis virus, and 6 used the human papilloma virus. For a detailed list of where each microbe was placed, see Appendix G.

<sup>3</sup>At Tissue Mysteries, 11 looked at specimens, 9 looked at the computer, and 5 tried to solve a case. In terms of which case they examined, 8 visitors used the Case of the Sore Leg, 3 used the Case of the Petite Boy, and 2 used the Case of the Overweight Problems.

<sup>4</sup>At Superhealers, 6 visitors used the Healing Game, 4 used Take the Challenge, and 2 used Healing Overview. One visitor completed Healing Game and one completed Take the Challenge; none completed Healing Overview.

## Behaviors at Specimen Exhibits

The observer noted three behaviors at exhibits with specimens: looking at specimens, reading, and talking about content (see Table 13). Body Slices was the most engaging specimen activity for visitors—more than one-half of visitors that stopped at it looked at specimens, read exhibit text, and/or talked about exhibit content with their companions (numbers highlighted in table).

More than one-half of visitors that stopped at Stem Cell Discoveries looked at specimens under the microscope and read exhibit text. More than one-half of visitors that stopped at the Introduction to Tissues—Jazz Band specimen and the Skeleton looked at specimens.

**Table 13**  
**Behaviors Observed at Each Specimen Exhibit**

<b>Exhibit</b>	<b>Number of Visitors that Stopped</b>	<b>Number of Visitors that Displayed Each Behavior</b>		
		<b>Looked</b>	<b>Read</b>	<b>Talked</b>
Body Slices specimen <sup>1</sup>	39	36	20	19
Stem Cell Discoveries microscope specimen <sup>2</sup>	16	12	8	2
Introduction to Tissues—Jazz Band specimen	42	41	16	13
Skeleton specimen	20	15	9	8

<sup>1</sup>At Body Slices, 10 visitors used a magnifying class and 9 used the information cards.

<sup>2</sup>At Stem Cell Discoveries, 7 visitors used two microscopes and 5 used one microscope; 5 used two flip panels and 2 used one flip panel; 7 read four or fewer columns and 1 read all five columns.

Behaviors at Panels

The observer recorded two behaviors at panels: reading and talking about content (see Table 14). More than on-half of visitors who stopped at the Wounded Hand panel read it. All five of the visitors that stopped at the Introduction to Stem Cells read the panel. Of the few visitors who stopped at Invader Gallery, Flowcytometer, and Types of Stem Cells panels most read text and talked about the panels' content (numbers are highlighted in the table).

**Table 14**  
**Behaviors Observed at Each Panel**

<b>Exhibit</b>	<b>Number of Visitors that Stopped</b>	<b>Number of Visitors that Displayed Each Behavior</b>	
		<b>Read</b>	<b>Talk</b>
Wounded Hand panel with props <sup>2</sup>	33	28	11
Invader Gallery panel	5	4	3
Introduction to Stem Cells panel	5	5	1
Flowcytometer panel	3	3	2
Types Stem Cells panel	1	1	1

<sup>1</sup>At Introduction to Stem Cells, 4 visitors used the flipbook.

<sup>2</sup>At Wounded Hand, 12 visitors read both panel and prop copy, 8 only read panel copy, and 8 only read prop copy.

### Behaviors at the Demonstration Station

The evaluator noted four behaviors at the Demonstration Station: doing activities (either using resources or participating in a program), watching others do activities, talking about exhibit content, and interacting with staff.

As shown in Table 15, most of the visitors that stopped at the Demonstration Station did activities (number highlighted in the table).

**Table 15**  
**Behaviors Observed at the Demonstration Station**

<b>Exhibit</b>	<b>Number of Visitors that Stopped</b>	<b>Number of Visitors that Displayed Each Behavior</b>			
		<b>Did</b>	<b>Watched</b>	<b>Talked</b>	<b>Interacted with Staff</b>
Demonstration Station	6	4*	3	2	1

\*Of the 4 visitors who did an activity at the Demonstration Station, 2 looked at books, 1 participated in a volunteer program, and 1 participated in a demonstration.



Behaviors at the Stem Cell Ethics Video

The Stem Cell Ethics video enabled visitors to listen to different perspectives about stem cell research. All ten visitors who stopped at the Stem Cell Ethics video watched at least one video; eight of them watched the patient video (see Table 16). None watched the embryological stem cell researcher video.

A few visitors who stopped at the Stem Cell Ethics video read the comment book (4 of the 10).

**Table 16**  
**Behaviors Observed at the Stem Cell Ethics Video**  
*(n = 10)*

<b>Exhibit Name</b>	<b>Number That Exhibited Behavior</b>
Watched one or more videos*	10
Watched entire patient video (3)	
Watched part of patient video (5)	
Watched entire adult stem cell researcher video (2)	
Watched part of adult stem cell researcher video (2)	
Watched entire politician video (2)	
Watched part of politician video (2)	
Watched entire doctor video (1)	
Watched part of doctor video (3)	
Watched entire theologian video (3)	
Watched part of theologian video (0)	
Watched entire ethicist video (0)	
Watched part of ethicist video (2)	
Watched entire embryological stem cell researcher video (0)	
Watched part of embryological stem cell researcher video (0)	
Read Stem Cell Ethics video comment book	4
Talked about content at Stem Cell Ethics video	2
Misused or had difficulty using the Stem Cell Ethics video	1
Wrote a comment in the Stem Cell Ethics comment book	0

\*The number in parenthesis indicates the number of visitors that either watched the entire video or part of the video.

## II. PRINCIPAL FINDINGS: VISITOR EXIT INTERVIEWS

The evaluator conducted open-ended interviews with visitors as they exited *Tissues of Life* at the SMM. RK&A designed the interview guide to explore:

- Visitors' responses to and understanding of the *Tissues of Life* exhibition;
- Connections between *Tissues of Life*, the *Cell Lab* (an adjacent and content-related exhibition), and the other exhibits in the Human Body Gallery;
- Comparison of *Tissues of Life* to other exhibitions at the SMM; and
- Suggestions for improving *Tissues of Life*.

RK&A conducted interviews in July and August 2003. Drop-in museum visitors, ages nine years and older, were intercepted as they exited the Human Body Gallery and asked to participate in an interview. Of the 51 visitor groups intercepted, 11 declined to participate in the study, making a 21 percent refusal rate—a typical rate for museum evaluations.

A total of 40 visitor groups were interviewed—20 had visited only *Tissues of Life*, 14 had visited only the *Cell Lab*, and 6 had visited both *Tissues of Life* and the *Cell Lab*.<sup>5,6</sup>

This report presents data for the 26 visitor groups that visited *Tissues of Life*, but also provides some data for the *Cell Lab* as context and draws comparisons between the two exhibitions where appropriate.<sup>7</sup>

### BACKGROUND INFORMATION ABOUT INTERVIEWEES

#### *Demographics*

The evaluator interviewed 26 visitor groups, comprised of 54 individuals (30 adults and 24 children). Fifty-six percent of interviewees were female and 44 percent were male. The median age of adults was 34 years, and the median age of children was 11 years.

#### *Prior Visits to SMM*

Seventy-four percent of interviewees were repeat visitors to the SMM, and 26 percent were first-time visitors. Of the repeat visitors, 62 percent had visited twice or less in the last six months and 38 percent had visited three times or more.

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<sup>5</sup> The interviews of the two exhibitions were combined for three main reasons: (1) to account for the close proximity of *Tissues of Life* and the *Cell Lab*, (2) to accurately reflect visitors' experiences—in which they tend to ignore the boundaries between related exhibitions, and (3) to examine whether visitors drew connections between cells and tissues.

<sup>6</sup> The data collector initially randomly intercepted visitors as they exited the Human Body Gallery; however, when few visitors who used the *Cell Lab* were intercepted and agreed to participate, the data collector began intercepting visitors as they exited the *Cell Lab*.

<sup>7</sup> RK&A prepared a separate report for the National Science Foundation about the *Cell Lab*.

## VISITATION TO *TISSUES OF LIFE* AND *CELL LAB*

For context, interviewees were asked whether they visited *Tissues of Life*, the *Cell Lab*, or both. The evaluator pointed to the exhibitions, rather than referencing them by name.

As stated earlier, 20 of the 26 visitor groups interviewed about *Tissues of Life* had not visited the *Cell Lab*. Six had visited both *Tissues of Life* and the *Cell Lab*.

Interviewees who had not visited the *Cell Lab* bypassed it for a variety of reasons. Many said they did not have a reason for not visiting the *Cell Lab*—they simply had not made their way to it yet. Several indicated that the *Cell Lab* looked too advanced for their children, who were under eight years old. Conversely, a few adult groups said they did not visit because it looked as if it were for children. A few other interviewees each said they did not have time to commit to the *Cell Lab*, they had used it on a previous visit, or they planned to use it later in the day.

## VISITORS' EXPERIENCES IN *TISSUES OF LIFE*

To understand how interviewees used and responded to *Tissues of Life*, they were asked to identify the exhibits that were the most and least fun to use. They were also asked which exhibits presented the most and least interesting information.

### *Most and Least Fun Exhibits*

Overall, interviewees praised the *Tissues of Life* exhibits for engaging their hands and minds (see the first quotation below). Their preferences for the most fun exhibits, however, varied. Some identified the Scope-On-A-Rope as the most fun to use. They were intrigued to see their scars, individual hairs, and magnified skin (see the second quotation). Several named the Wounded Hand, enjoying its large size, the “gross” activity of “picking the scab,” and seeing inside a fingernail (see the third quotation). A few liked the Tissue Invaders because of its oversized props and the matching activity.

We like everything [in this area]. (Any exhibit in particular?) Just the interactive nature of them makes them the funnest [*sic*]—stuff that [my daughter] can get her hands on. She . . . enjoys that part of it, and it makes it fun to learn. [Male, 41 years]

[I liked] that one with the microscope you put on your skin. (Why was that the most fun?) You could see your scabs and stuff, because you don't usually get to see them that close up. \*Yeah, even for an adult it was neat to see your pores and arm hairs. [Male, 10 years; Male, 59 years]

I like the big hand. (Why do you think you liked the big hand?) \*It's just fun to lift up the parts and see what it actually looks like [on the] inside. \*\*And the blister thing. (What about the blister?) It was soft and you could mush on it. \*And pick the scab, yeah, that was funny. [Female, 12 years; Female 12 years]

In general, interviewees said exhibits that were the least fun because they were not functioning properly or not interactive. Several said they did not enjoy using the Flowcytometer because “it didn’t work right—you could never catch the balls.” A few complained in general about broken exhibits. One interviewee each named the Stem Cell Ethics video and Stem Cell Discoveries panel as least fun because they weren’t interactive. As one interviewee stated, “All you do is watch the video—there’s nothing to do there.” Another interviewee did not like the Superhealers multimedia because “it tells you the answer before you can guess,” referring to the roll-over feature in the Healing Game.

### *Most and Least Interesting Exhibits*

In terms of the *Tissues of Life* exhibit with the most interesting information, many interviewees named the Body Slices specimen. They were amazed to see real human tissue and to look inside the human body (see the two quotations below). A few others had the same reason for being intrigued by the Introduction to Tissues—Jazz Band specimen. Two interviewees appreciated the information in the Stem Cell Ethics video because it helped them “understand the issues and make up our own minds [on them].” One interviewee was surprised to learn at the Demonstration Station that “you have to wash your hands really well to get all the germs off your hands.” Another interviewee was fascinated to see the real human tissue at the Tissue Mysteries bench. A third was intrigued by the Superhealers multimedia because of the “multiple agents and steps just to heal a cut.”

I just thought the sliced human body parts were most fascinating. (What did you find interesting about it?) You’ve got a whole . . . section of the body, all the parts—to see how they fit together, work together. It was more fascinating to me . . . [to] see inside the [whole] body rather than little pieces of it. . . . You see into the body—how it all works when it’s in the body not dissected. [Male, 73 years]

(Which one of the exhibits had the most interesting information?) The body slices. (Why was that?) That’s really what you look like inside you. So, it’s not every day [that] you can see the real stuff not like a model. It’s especially interesting [to see] what’s inside you. [Male, 16 years]

Although most interviewees said the exhibits they had visited were interesting, a few wanted additional interpretation to help them understand the Wounded Hand and the Skeleton (see the quotation below). One interviewee was uninterested in the Body Slices specimen because she was “squeamish.”

(Which exhibit had the least interesting information?) \*The big hand [Wounded Hand], because . . . they show you the nail all opened up, but they don’t tell you what you’re looking at. (Okay, what about for you?) \*\*The least interesting was that skeleton. Is that a really human skeleton? (Yes. Why was that least interesting?) Because it’s just to show you the skeleton, but doesn’t give you why it’s in here. Is it just to show you the bones? [Female 20 years; Male 22 years]

## COMPARISON TO OTHER MUSEUM EXHIBITIONS

The evaluator asked interviewees to compare *Tissues of Life* with other exhibitions in the Museum in terms of how engaging it was and how interesting they found its information.

Many interviewees rated *Tissues of Life* to be of similar high quality as other exhibitions in the Museum (see the first quotation below). Several said they preferred other exhibitions, because they are more interested in topics such as physics, mechanical engineering, or dinosaurs. In contrast, a few were more captivated by *Tissues of Life* than other parts of the Museum, because they had an interest in human biology (see the second quotation). One parent noted that the Wounded Hand is her son's favorite exhibit and is always the first one they visit at the Museum.

(In terms of your enjoyment, how did these exhibits compare with the rest of the Museum?) Very favorably—they're good exhibits. It's a good museum. (Anything, in particular, make it a good museum?) Hands-on, fun activities. Educational. Always learn something new here. (What about the information presented in this exhibition, how does it compare?) I thought favorably. They're the same. . . . They're all very good, very interesting. [Male, 42 years]

(In terms of your enjoyment, how did these exhibits compare with the rest of the museum?) I like this one the most I think. (Why do you think that is?) Body things are more real. It's more like related to you. (You sort of already touch upon this, but how did the information presented in this exhibition compare to others?) Yeah, it's more interesting to me, but I've always been interested in biology, more so than, say, weather or physics. It [the whole Museum] is fun, so I'm just more personally interested in this topic. [Male, 22 years]

## MAIN MESSAGE OF *TISSUES OF LIFE*

The observer asked interviewees to describe what the *Tissues of Life* exhibition intended to convey to visitors. To make sure the evaluator did not bias visitors, she pointed to the *Tissues of Life* exhibition but did not call it by name when asking the question.

Many said the exhibition explained how the human body functions (see the first quotation below). Several said the exhibition was simply about seeing inside the human body but did not speak of how the different parts function (see the second quotation). Several others said the exhibition was about "cells" and "how cells work." When asked to define "cells," all of these interviewees could state that "cells are the basic unit of life." A few interviewees were unsure of the main message, but when further prompted said it was about "biology." One interviewee did not perceive any cohesive, overall message.

Humans are understandable. [When] you see inside [our bodies] and it's all very logical. . . . There's the stomach and [it's] attached to the bowels. . . . There's the heart it's kind of in the center of things. . . . When you get to see it in here [the *Tissues of Life* exhibition], it just makes things real understandable and very graphic. (Can you say a

little more about that?) You get to see the real thing and that's really helpful . . . so you [learn] what's inside people and what makes us work. Makes us tick. How all the different parts work together to make a person and what each part does. [Female, 47 years]

(What do you think these exhibits are trying to get across to visitors?) To help educate people about the human body—the different parts—and to get a chance to see a brain. Those kinds of things for kids are kind of cool. (Anything in particular about the different parts of the human body?) No, just exposing kids to what our bodies look like inside. [Female, 40 years]

None of the interviewees used the term “tissues” as they talked about the exhibition’s main idea. As noted earlier, a few used and were able to define “cells.” One interviewee, who is a scientist, used the term “organs,” and defined them as “the major systems in your body” and gave the example that the “heart is part of the circulatory system.”

#### CONNECTION BETWEEN *TISSUES OF LIFE* AND THE *CELL LAB*

The evaluator asked interviewees what connection, if any, there was between the *Tissues of Life* and *Cell Lab* exhibitions. Again, to make sure the evaluator did not bias visitors, she pointed to the *Tissues of Life* exhibition but did not call it by name. Because many interviewees had not visited the *Cell Lab*, the evaluator pointed to the exhibition and explained that it is a hands-on lab in which visitors can do activities related to cells.

Most interviewees simply reiterated the message they had gleaned from *Tissues of Life*, stating that the two exhibitions were about the “human body” or “how the human body works.” A few said the two exhibitions provide two views of the body—one that is microscopic and one that is macroscopic (see the quotation below).

I think they [the two exhibitions] are probably trying to get across learning more about both the visible and the invisible parts of the body [and] understanding that both are important. (And what in particular helped you to know that?) Because here [in the *Cell Lab*], you look in the microscopes . . . at some of the cells. We know [cells] are small—you can't see them—whereas all the other elements over here are really looking at the visible aspect of the body. [Male, 32 years]

#### CONNECTION BETWEEN *TISSUES OF LIFE* AND THE HUMAN BODY GALLERY

The interviewer asked interviewees what connection, if any, there was among *Tissues of Life*, the *Cell Lab*, and the other exhibits in the Human Body Gallery. The evaluator pointed to *Tissues of Life* and the *Cell Lab* but referred to the Human Body Gallery by name.

Most interviewees grasped that the *Tissues of Life*, the *Cell Lab*, and the other exhibits in the Human Body Gallery showed a progression—from small parts to the larger whole. They used

different words to describe this relationship. Some said the exhibitions explained the human body from “micro to macro” perspectives (see the first three quotations below). A few, with science education backgrounds, said the exhibitions showed that the human body is made up of systems, which are made up of organs, which are made up of cells (see the fourth quotation).

How the whole human body works. Its parts [and] how the small parts fit with the bigger parts—the muscles, the bones, [how] they fit [into] the whole thing. . . . You have a lot of little parts to make up the whole thing. And you get the sense of the interdependence—how everything relies on each other. [Male, 73 years]

The [other parts of the] Human Body Gallery show you more the outside and that shows you more of the inside. (How so?) That shows you, like, what we look like on the outside—the diversity of people—but then this [*Tissues of Life*] shows you the skin and then that [*Cell Lab*] breaks the skin down into its parts. [Female, 57 years]

Those [other part of the Human Body Gallery] dealt with some of the major organ systems in the human body. Those [*Tissues of Life*] dealt with some of the basics of organs. And those dealt with the individual cells. It’s just a reductionist approach, I guess. (A reductionist approach?) Yeah, that deals . . . with the organ systems, but that [part] deals with how different cells in different organs interact with each other. This is just dealing [with how] all the individual cells are able to function. [Male, 42 years]

This [the *Cell Lab*] is close-up, that [the rest of the Human Body Gallery] is far away. (Close-up and far away?) This part, you’re looking [at] more microscopic [items]—[in] that range. This is more larger scale. . . . Stuff you can see with your own eyes, like a brain. [Female, 34 years]

In contrast, five interviewees did not glean that the Human Body Gallery is organized in a hierarchical arrangement from cells to systems. Three thought the unifying message was about health, explaining how the body works so that researchers and every day people can take steps to prevent and treat diseases (see the quotation below). Two proposed that the Human Body Gallery was simply about “how the body works.”

They’re related to how the human body works—like the chromosomes talked about diseases and cancer, how researchers can use that information probably to help people who have those diseases or might be at risk. . . . It’s also about how wounds heal and things you can do to make sure your cuts heal properly. . . . So it’s like an owner’s manual to your own body. [Female, 40 years]

### III. PRINCIPAL FINDINGS: DEMONSTRATION STATION INTERVIEWS

RK&A interviewed three audiences about the Demonstration Station in the *Tissues of Life* exhibition. Two of the audiences were Demonstration Station presenters: the Tissues Team (the teens employed in the Lab Crew working on the Tissues Bioreactor Project), and scientists from the University of Minnesota; and the third was comprised of visitors who participated in one of three Demonstration Station programs.

RK&A designed the interview guides to explore:

- Presenters' experiences interacting with visitors at the Demonstration Station;
- Visitors' responses to and understanding of the demonstrations;
- What impact the demonstrations had on visitors' experiences in the Museum;
- Whether visitors reflected on the demonstrations and, a few weeks after their visit, continued to think about the demonstrations; and
- Suggestions for improving the demonstrations.

#### TISSUES BIOREACTOR PROJECT LAB CREW INTERVIEWS

RK&A interviewed Sara Fruehling, the *Cell Lab* Program Manager, and three Lab Crew members of the Tissues Team at the SMM in July 2003.

##### *Background Information about the Tissues Bioreactor Project*

In 2002, Dr. Sara Fruehling, the *Cell Lab* Program Manager, began the Tissues Bioreactor Project with a subset of Lab Crew participants. She designed the Tissues Bioreactor Project to take advantage of the lab resources in the *Cell Lab* by conducting small-scale scientific research so that interested Lab Crew could extend their science experiences beyond the lab benches.

The goals of the Tissues Bioreactor Project are to teach team members how to grow cells in culture and then to have them talk to visitors about their research. Dr. Fruehling also has a meta-goal—to introduce the public to an area of medical research and demonstrate the accessibility of current scientific research.

The Tissues Bioreactor Project is particularly appealing to Dr. Fruehling because it combines her expertise in scientific research and devotion to mentoring Lab Crew participants. One aspect of Dr. Fruehling's job that has been frustrating is her lack of time to develop science-based projects. To address this issue, Dr. Fruehling hired an assistant (a graduate of the Lab Crew program) to handle scheduling and lab operations and enabling her to devote additional time to the Tissues Bioreactor Project.

The Tissues Team was created from existing Lab Crew members—teens who work in the *Cell Lab*. In the fall of 2002, of the 10 Lab Crew, 6 chose to participate. Because of school time commitments, two had to drop out of the Tissues Team. In summer 2003, the core Tissues Team



was comprised of four female Lab Crew members—three of whom were interviewed. Additional Lab Crew were recruited in the fall of 2003 to participate in the Tissues Team.

### *Experiences of the Tissue Team*

RK&A asked the four Lab Crew participating in the Tissues Bioreactor Project to explain the project. The Lab Crew described conducting research on the Internet, setting up the experiment, and developing a PowerPoint presentation to use in their Demonstration Station presentation for visitors (see the first quotation below). They also described their experiment's hypothesis (see the second quotation).

We are working with cell cultures. . . . We had to take care of the cells, feed them, and maintain their life. . . . We have a PowerPoint demonstration [about the Tissues Bioreactor Project]. It talks about some of the information we and [the *Cell Lab* Program Manager] have gathered. We went on the Internet and looked up some information about the cell structure and functions. . . . We'll talk to people who come in [and tell them] about our line of work. We have an inverted microscope, and we show them the cells that are alive or ones that have died already. [Female, 17 years]

(Can you explain some of the science concepts that you've been learning for the Bioreactor Project?) I still have to read up on it a little more. But it's a [device that creates a] low gravity [environment], so it's kind of like being in space. And we're trying to see, if the cells [grow differently] . . . on a regular Petri dish or [if they] are different in a low gravity space environment. (So is the research question will they grow differently?) Yeah, will they grow differently? The *Cell Lab* Program Manager has read up on different things and thinks [they] will grow differently. In the bioreactor they'll grow 3-D instead of flat. (What kinds of cells are you using?) Mouse mammary cells. [Female, 18 years]

Although the Tissues Team was just beginning their work on the Bioreactor Project, they said that it was a unique opportunity (see the first quotation below). As such, they were proud to share their work with visitors (see the second quotation).

Most 17- or 18-year-olds don't have the experience to work with a bioreactor or work with agar to make the culture's Petri dish plates. They don't have the opportunity to do that, but I have [working in the Tissues Team]. [Female, 18 years]

It makes me feel kind of good to talk with people about what we've been doing [in the Tissues Team.] (Why is that?) To show people how to use a micropipette, and a lot of adults haven't used one, they're like, 'Wow, you're just in high school and doing all this stuff.' [Female, 17 years].

## SCIENTIST INTERVIEWS

RK&A interviewed four graduate students from the University of Minnesota and two of their professors in July 2003 following their program at the Demonstration Station. The four graduate student scientists (hereafter, called “scientists”) engaged visitors at the Demonstration Station while their professors observed and provided guidance. This was the first time these scientists had presented at the Demonstration Station.

### *Background Information about Scientists’ Presentation*

Two scientists conducted the glow germ activity. In this activity, a substance invisible in natural light—representing bacteria—was applied to visitors’ hands through casual contact, such as a handshake or touching the tabletop. Visitors then placed their hands inside a box with a black light, making the “bacteria” glow and become visible. After washing their hands, visitors used the black light box again to see if they removed all the “bacteria.”

One scientist informally talked with visitors about her molecular research, using a DNA model, computer program, and felt protein model. Another fielded general questions and welcomed visitors as they approached the Demonstration station. The two professors stood to the side and watched as their students interacted with visitors.

All of the scientists handed out University of Minnesota pencils, bandannas, magnets, and other paraphernalia. They encouraged children to attend the University and to study the biosciences.

### *Scientists’ Experiences*

Overall, the scientists enjoyed interacting with visitors in the informal setting of the Demonstration Station. In particular, the Station’s design promoted close interactions among visitors (see the first quotation below). The scientists said they thought the simple glow germ activity worked well for the diverse ages the Museum serves, since it is hands-on, delivers a basic public health message, and ties in with the *Tissue of Life* exhibition (see the second quotation). A few were concerned that parents shied away from the demonstration, but they were unsure whether it was the content or the crowding that deterred them (see the third quotation). The evaluator, too, noted that parents stood back and watched as their children interacted with the scientists.

The [Demonstration Station] is one of the best setups we’ve ever had [in a public venue]. (What about it made it the best?) Because it’s a tool that you can more easily engage people in conversations. . . . There’s plenty of space for visitors to walk up, the tabletop isn’t too high so we’re right there with the visitors. . . . There’s seating so if you want to show something to kids they don’t have to stand. It worked really well for us.

\*The glow germ is something very easy [to do]. When we . . . are at these events where we have a wide range of ages, that’s something we have to consider. We’ve had little toddlers and older brothers and sisters. It’s a very simple public health message . . . and the whole thing about the Science Museum is hands-on learning. So, this [the glow germ

activity] is something for them to do and it [connects with] stuff in the exhibit. . . . \*\*The hand washing [activity] seemed to work really well, especially with the little kids. They really got into it. \*\*\*It was an experiment for us. We had never done that sort of thing. (And would you do it again?) Oh, yeah. It was easy to do with the crowd. Kids seemed to get it and thought it was fun, so we'd do it again.

What I noticed about this one over the other [public program] we've done is that it was mostly kids. It wasn't the grownups. (When you presented here at the Museum?) At the Science Museum [and] in other venues, too. I was surprised at the grownups. This was a kid thing, not for them, and they were more hesitant. . . . I don't know if it was just the crowd today or what. \*I think it's the glow germ [activity]. Adults know they should wash their hands. Plus, the kids really wanted the [University of Minnesota] stuff so that was the draw.

The scientists were asked what impact their presentation had on visitors. All aspired to promote general positive attitudes toward science and the University of Minnesota. They also said they hoped that visitors would be more diligent in their handwashing. One wished that girls would come away with the idea that they can pursue science, as three of the graduate students were females.

While the scientists said they hoped visitors got something out of their interaction with them, they suggested that they also benefited. They enjoyed seeing the excited reactions of children (see the quotation below). The professors were proud of their students for working well with the children, keeping their attention, and conveying some simple science concepts.

\*The kids were great. Seeing their reactions to things that they thought were gross. [I would] describe this is how you would get germs and they [would say,] 'Eewww, gross.' Then [seeing their reaction] after they washed their hands . . . [but] there was [still] all this stuff on their hands. \*\*I liked the little girl [when] you tied her [University of Minnesota] bandanna on her head and . . . she came back with three more people and had the pencil behind her ear. She was a convert. \*\*\*I definitely liked the ability to work with the kids one-on-one. . . . It was a steady crowd, but we were still able to pair up with a kid. You could really tell that they liked that kind of individual attention. I think that makes a big difference. . . . \*\*\*\*All the different personalities [of the children] were fun to see. When you asked them questions, they all came up with all different things. So it was really fun.

### *Suggestions for Improving the Scientists' Presentation*

When asked what the SMM could do to support scientist presentations at the Demonstration Station, the scientists praised the efforts of Dr. Laurie Fink, the Human Biology Coordinator and *Tissues of Life* project leader. Because the scientists are busy with school and other public program engagements, they appreciated that Dr. Fink scheduled the Demonstration Station presentation well in advance, reminded them of their engagement, took care of Museum admission and parking fees, and helped them plan their activity. They noted that she also provided valuable suggestions for working with the public (see the quotation below).

Laurie gave us good advice. She [said], ‘Make sure that if you have an activity, have a person to man that activity.’ When I talked about doing [the glow germ activity], she thought it could work really well if there was one person in charge of it all the time. And then you have the others who help the kids do the activity. So you have the main person who can draw people into trying [the activity] and then people running the activity. . . . That was Laurie’s advice, and I thought that was good. \*And to keep it simple—a simple hands-on message. . . . When you can apply it to things that they do every day, that’s what works best.

## VISITOR INTERVIEWS

RK&A conducted open-ended telephone interviews with visitors four to six weeks after they participated in one of three programs (scientist demonstration, Tissues Bioreactor Project Lab Crew demonstration, or a craft activity)<sup>8</sup> at the Demonstration Station.

RK&A collected telephone numbers in July and August 2003, intercepting visitors as they departed from the Demonstration Station and asking them to participate in a telephone interview in a few weeks. Upon agreeing, visitors provided their telephone number. Of all visitors approached, two refused to participate, making an 8 percent refusal rate a low rate for museum studies.

**Visitors were not told that they would be interviewed about a demonstration to avoid cueing them to remember it and biasing the data.** From a pool of 22 telephone numbers, evaluators conducted 17 telephone interviews. Three visitors were called but did not remember seeing the demonstration, so the interviews were terminated. Two telephones had been disconnected.

### *Background information about Interviewees*

A total of 17 adults participated in the telephone interviews. More females ( $n = 11$ ) were interviewed than males ( $n = 6$ ). The median age of interviewees was 37 years.

More than half ( $n = 10$ ) were repeat visitors to the SMM: of these, one-half ( $n = 5$ ) had visited the SMM three or more times in the past 12 months; the other one-half ( $n = 5$ ) had visited the SMM two or fewer times in the past 12 months.

Interviewees were visiting for a variety of reasons. Some were tourists visiting the Museum as part of their sight seeing itinerary. Some of these noted that the Museum appealed to them because they thought it would be fun for their children or they were interested in science. Several interviewees were visiting to bring out-of-town guests—again as entertainment for children or because of pride in the Museum. A few visit the Museum often as something “fun and educational” to do with their children. A few others came to see specific Museum

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<sup>8</sup> The craft activity included making fabric collages of tissue types and model clay stem cells—two activities from the SMM *Tissues of Life* Web site.

attractions: two for the *Circus! Science Under the Big Top* traveling exhibition; one for the dinosaurs, and another for the Omni film.

### *Recollections of the Museum Visit*

Interviewees were asked with whom they had visited the Museum and what they recalled about their experiences in the Human Body Gallery. If they did not mention attending a presentation, they were explicitly asked about interacting with scientists, Lab Crew, or Museum staff at the Demonstration Station.

All 17 interviewees had visited the Museum with children. More of the children were males ( $n = 22$ ) than females ( $n = 18$ ). The median age of the children was 8 years.

Interviewees remembered exhibits they used or general topics they discussed in the Human Body Gallery. Several interviewees each talked about the using the *Cell Lab* benches, the exhibit about human variation and different body types, the Scope-On-A-Rope, or the exhibits with “real body parts” (the Body Slices and Introduction to Tissues) (see the first and second quotations below). A few each enjoyed watching the Bloodstream Superhighway or playing with the Sneezer or the Wounded Hand. One interviewee was impressed by the Perception Theater, while another praised Tissue Invaders. In addition to talking about exhibits, five interviewees mentioned demonstrations (see the third quotation).

(What, if anything, do you recall from the Human Body exhibition?) My son always likes the Sneeze[er]. He always thinks that’s funny. . . . We like the lab experiments [*Cell Lab* benches]. Those are fun—to get to do the experiments yourself. . . . The one where it shows you what a human hand looks like . . . magnified [*Scope-On-A-Rope*] . . . was interesting. Those were good. We had a good time [at the Museum]. [Male, 29 years]

The boys were really impressed with the blood going through the tube and the different pictures of the people coming in different shapes and sizes. They were all of the age where that was all ‘Yuck, gross.’ They really liked it. I remember the . . . sectional slices of the human body, the real body. That fascinated me. [Female, 43 years]

(What if, any thing, do you recall seeing in the Human Body exhibition?) The different pictures of the different people, their diversities, and the body molds. The one about germs—they put powder on your hands, made you wash your hands, and then put [them] under a black light [to see] where you missed your germs [and where] you got them. [Female, 27 years]

Once asked about the demonstrations, all interviewees could to describe the one they had attended (see the quotations below). In total, nine had participated in the scientists’ demonstration, five in the craft activity, and three in the Tissues Bioreactor Lab Crew presentation.

The kids put this glowing power [on] their hands [and put them] in a box [so] they could see if they had germs on them. Then they went and washed their hands and . . . put them back into the box to see if they glowed. I thought it was cute. [Female, 45 years]

There were four women and . . . they were very patient with the kids. . . . Each child had a piece of paper [with] a drawing of the shape of the body and then they had fabric samples that were all different textures and some wires. They explained to the kids about . . . different muscles and parts of the brain that relay messages and stuff like that. The kids were really interested in it. They liked the gluing and feeling the different fabrics. It added a lot. It was neat. [Female, 37 years]

(Did you happen to attend a presentation that day?) I wouldn't call it a presentation. I was just wondering what it was. These four girls were sitting at a table. . . . When we asked [them] what they were doing, I didn't quite understand it because it was kind of over my head. (Can you describe what they seemed to be doing?) They had some colored water and they had different dispensers and that they could feed these test tubes with. I'm not exactly sure. I didn't quite understand the whole concept of what they were doing. [Female, 33 years]

### *Opinions About the Demonstrations*

Interviewees were asked what aspects of the demonstrations they liked and disliked as well as whether they had suggestions for improving the presentations.

All of the interviewees who attended the scientists' demonstration said their children enjoyed the Glow-germ activity. They praised the scientists' engaging demeanor. They also appreciated the outcome of the demonstration—improved handwashing. Interviewees did not have any suggestions for improving the program, they were pleased with the experience it provided their children but since most parents did not actively participate in the presentation they were not familiar with its specifics. A quotation below exemplifies these interviewees' responses.

[My daughter] was fascinated by being able to see the artificial bacteria under the light [and] cleaning her hands. . . . It reinforces something that we have been trying to convey to her—sometimes she just doesn't want to go wash [her hands] . . . and since that presentation she's been pretty faithful about doing [it]. . . . I guess children can't assimilate non-physical, non-touchable things. Her senses had to come into play rather than her intellect, and when she was able to see this, then the phenomenon made sense to her, and it has had a marked improvement on her attitude towards washing her hands now. (That's terrific. How would you improve this presentation?) It's hard to say. . . . All the kids were into it. There was another little girl there maybe 10 years old who was also deeply involved with the other [presenter]. . . . [My daughter] enjoyed it and remembered it. [She] was completely enthralled while she was there, . . . so apparently it was pretty much delivered on her level and also at the older girl's level. (Anything they could do to improve the presentation for you?) It's hard to say, since I wasn't paying close attention. They [the presenters] were focused more on the children, so I wasn't

paying really close attention to be frank. [My daughter] was fascinated, so I backed off and let the [presenter] do her thing. [Male, 55 years]

All of the interviewees who did the craft activity complimented the presenters for their ability to work and communicate with children. They liked how presenters used questions to help the children select fabrics for their tissue collages but also maintained the open-ended feeling of the activity. In addition, they said it was fun to make something to take home. Interviewees offered few suggestions for improving the presentation. A couple of parents said they thought the content was too high level for their children but noted that their children still enjoyed the hands-on aspect of the activity. Two quotations—one for the tissue collage activity and one for the clay model stem cells—are below.

The presentation involved the kids taking a piece of paper and drawing an outline of themselves and using little scraps of either paper, yarn, or wire to put on their body and it would represent either the circulatory system or the nervous system or the digestive system. . . . I thought it was okay for the kids. (What, if anything, about the presentation worked well for your children?) I thought it was good the kids had an opportunity to put their hands on something and . . . create something that would help them understand the different systems of the body. (And what could be improved about this presentation?) I'm not sure my four-year old understood it, but I thought it was pretty good. I'm not sure specifically what could be improved. I guess it was a good introduction to systems for my kids. [Male, 34 years]

It [the craft activity] was excellent. There were different cells of the human body presented and so the girls were supposed to [use] clay [to] model some of the cells. . . . (What do you think worked well for your children?) It was very clearly presented. Very informative, not too much because sometimes when you get too much data the girls . . . would have been overloaded. [The presenter] answered all the questions that the girls had, like 'How does it work?' and 'Where does it go?' [The presenter] was giving them some answers and then it was leading to another question, so it was a very communicative approach. [Female, 45 years]

Interviewees who attended the Tissues Bioreactor Project Lab Crew demonstration had mixed responses. Two understood that the presenters were high school students but said they felt the demonstration was too informal and unorganized (see the first quotation below). The third appreciated the fact that the Museum had high school students working in the *Cell Lab* and complimented the Lab Crew for being able to answer his questions. He suggested, however, that their PowerPoint presentation was too dense and should be modified for a lay audience (see the second quotation).

It [the Tissues Bioreactor Project Lab Crew presentation] wasn't effective. I'm a teacher, so I'm really critical. (Why do you think it wasn't effective?) I can't even remember the topic. It wasn't easy to understand. . . . I do remember walking away really embarrassed for them because, whatever they were talking about wasn't well presented. (How do you think the presentation could be improved?) Visuals, asking one or two questions that would make a person think like, 'What are you trying to present?' I had to ask them what

they were doing and then they sort of went on and on. I was just curious so I stayed and I tried to listen. . . . They need to have their three or four talking points, and [two] of them need to be ‘Why are we doing this experiment? And why will the public care?’ I think it’s great that the Museum is focusing on students but they need to have some quality control for what the students are doing—there was a spelling mistake—and find a way to present it like a real presentation. . . . Looking at the screen of a laptop isn’t a presentation. [Female, 49 years]

I just enjoyed talking with them [Tissues Bioreactor Lab Crew]. I’m a teacher myself so I thought they were all very pleasant and interesting girls. . . . The questions that I had about what they were doing and so forth, they answered well. I believe they had developed a PowerPoint demonstration which talked about their project. I remember going through that [but] I don’t remember all the specifics of it. . . . (And how do you think the students’ presentation could be improved?) I remember thinking that the PowerPoint demonstration was a little dense with information. They might try just on any given slide, reducing the number of words. . . . I remember seeing a few slides that were rather dense with information, so having a few sentences and bullet points . . . would really be the only suggestion I could offer. [Male, 37 years]

### *Ideas Conveyed in the Demonstrations*

The evaluator asked interviewees were asked what the demonstrations intended to convey to visitors what were and their opinions about programs presented by the scientists or the Lab Crew.

### Main Messages

The scientists’ demonstration and craft activity conveyed consistent messages; however interviewees were already familiar with the ideas discussed in each of those presentations. All of the interviewees who attended the scientists’ demonstration said the main message was the importance of proper handwashing in preventing transmitting germs to yourself—a message important for their children and well understood by parents (see the first quotation below). The interviewees who participated in the craft activity said its intention was to introduce children to different parts of their bodies—the stem cell clay models were meant to convey the idea that “cells make up your body,” and the tissue fabric collage shows that there are different types of tissues. While it was an introduction for their children, for interviewees it was a review of things they had learned about in school (see the second quotation).

(What do you think the demonstration was trying to get across to visitors?) Just good hygiene, about how germs can spread and you need to wash your hands after you sneeze and handle things. (And what, if anything, new did you learn from this presentation?) As parents you’re really aware about the importance of washing your hands—we’re constantly telling our kids to do it. [Male, 46 years]

(What do you think the presentation was trying to get across to visitors?) For kids, that there are connective and other tissues. A lot of younger kids haven’t studied that part



yet—that there are different kinds of tissue in the body. (What, if anything, new did you learn from this presentation?) I didn't learn anything, but then I studied science in college. [Female, 48 years]

In contrast, the three interviewees who attended the Tissues Bioreactor Lab Crew demonstration each came away with different messages. One interviewee said the presentation was showing how “you feed cells.” Another understood that the Lab Crew was growing “cells in culture” (see the quotation below). The third had no idea what the presentation was trying to convey to visitors, stating that the information “was way over my head.”

The high school students had been working in the science museum with one of the science staff, learning how to develop a cell culture of some sort. They had a TV monitor [and video microscope] which was showing a culture. I don't recall whether it was growing or whether it was a still slide thing. (What, if anything, new did you learn from this presentation?) That you can grow cells, I guess. That's what I got out of it. [Male, 37 years]

### Opinions about Scientist and Lab Crew Programs

All but one interviewee said demonstrations by scientists and Lab Crew were helpful. Many said that live, staffed presentations of any sort are appreciated (see the first quotation below). A few who attended the scientists' demonstration said having “real” scientists made them feel more a part of their museum experience (see the second quotation). Two interviewees added that most of the scientists being women served as positive role models for their daughters (see the third quotation). In terms of the Lab Crew presentation, two of the interviewees complimented the Museum for fostering and supporting high school students' interest in science by having employment opportunities for youth (see the fourth quotation). In contrast, one interviewee said the Museum should exercise more “quality control” over presentations by high school students.

(Well what is your opinion about the Museum having presentations by scientists?) I think it's great. . . . When I usually take kids, they like to do things hands-on, so it just gives them another option of things to do and someone to talk to rather than just doing things by themselves on a machine or whatever. . . . The human contact is better. [Female, 48 years]

(What is your opinion about the Museum having presentations by scientists?) It made it [the Museum] more human. . . . When you go to some museums you don't interact with anybody, and when you get to talk to actual scientists it makes you feel more a part of the science experience at that museum. [Male, 34 years]

(What is your opinion about the Museum having presentations by scientists?) It was great for the younger girls to see women that are smart and what kind of jobs there are in the sciences. . . . I thought that was really good for my girls to see. [Female, 37 years]

(What is your opinion about the Museum having presentations by Lab Crew students?) I think that's a fantastic idea. I think it's wonderful that the Museum supports the high

schools in that way. To me it's just like a tremendous opportunity for that age, particularly all the students that I was talking to were young women. I thought that was wonderful that they were getting involved in science. So I saw that as a very positive thing. [Male, 37 years]

### *Impact of the Demonstrations*

The evaluator asked interviewees what impact, if any, the demonstrations had on their Museum visit and what topics from the demonstration they had discussed in the weeks following their visit.

### Perceived Impact

Nearly all interviewees said the demonstrations had a positive impact on their Museum visit. Many said that staffed programs, in general, enriched their Museum experiences (see the first quotation below). Several others said they and their children learn more when they participate in staffed programs (see the second quotation). Conversely, one interviewee said the demonstration she attended had no impact on her Museum visit. Another said the demonstration had a negative impact because of its poor quality.

I think it [the scientists' demonstration] adds to the whole experience of going there [to the Museum]. It just adds more to the experience [instead of] just looking at free standing displays. [When] you combine one [with the other] it adds a lot to your experience of the Museum. (And why is that?) It just adds another dimension to the Museum. You can go to any museum and see artifacts, but now [in] many museums you can actually . . . interact with somebody showing you how to do things. Albeit, there [are] more things you can do at your Museum than a normal museum, but it's just one more facet that makes [the Museum] really good—that you can interact with somebody. [Female, 48 years]

One of the problems that my family has when they go there [to the Museum], is if I'm not accompanying them, they kind of don't get it. They look at the differential in the axle of an automobile, for example, and they go, 'Well, yeah, okay.' They don't understand how the gears work, or the history behind some of these dinosaurs, or what the various science exhibits mean. . . . A person there that helps explain what the exhibit is about. Demonstrations just augment the display phenomenally—tenfold—so I think more of that would be fantastic. . . . So I think this interaction is great and on an adult note, I think the same is true. There was a presentation that I'd attended probably two or three times prior to this visit, where an elderly woman there was doing a fascinating presentation on the history of the Pacific, and I learned a lot from that. [Female, 27 years]

## Content Revisited

Most interviewees had not thought about the content of the demonstrations in the weeks following their Museum visit. A few who attended the scientists' demonstration said they had noticed an improvement in their children's handwashing (see the first quotation below). One interviewee said her son's tissues collage was posted on the refrigerator, serving as a reminder of their visit (see the second quotation).

I'm sure it made my son more aware about how germs can travel and the importance of good hygiene. . . . He's an avid handwasher now, so I hope that impact lasts. [Male, 29 years]

The thing he made—the connective tissue picture—was hanging on the refrigerator for weeks. He was proud of his [creation], so maybe that reinforced [his experiences] at the Museum. [Female, 48 years]

#### IV. PRINCIPAL FINDINGS: *WHAT IS LIFE?* INTERVIEWS

RK&A conducted open-ended interviews with visitors four to six weeks after they saw the *What Is Life?* play at the SMM, designing the interview guide to explore:

- Visitors' responses to and understanding of the play;
- Whether visitors reflected on the play and, a few weeks after their visit, continued to think about issues raised in the play;
- Whether visitors connect issues raised in the play with the content of the *Tissues of Life* exhibition; and
- Suggestions for improving the play.

The evaluator collected telephone numbers in July and August 2003. Visitors were intercepted at the SMM as they entered the Science Live Theater for a performance of *What Is Life?* and asked to participate in a telephone interview in a few weeks. Upon agreeing, visitors provided their telephone number. Of all the visitors approached, 10 refused to participate in the study, making a 26 percent refusal rate, a relatively low rate for museum studies, and less than the 52 percent refusal rate RK&A experienced during another evaluation using telephone interviews.<sup>9</sup>

The evaluator selected 25 visitor telephone numbers at random from a pool of 39 telephone numbers to conduct 25 telephone interviews. During the course of random selection, nine visitors were called but did not remember seeing the play, so those interviews were terminated.

#### BACKGROUND INFORMATION ABOUT INTERVIEWEES

##### *Demographics*

A total of 27 adults participated in the telephone interviews.<sup>10</sup> Slightly more females ( $n = 15$ ) were interviewed than males ( $n = 12$ ); interviewees median age was 42 years.

##### *Priors Visits to SMM and Theater Attendance*

Nearly all ( $n = 23$ ) were repeat visitors to the SMM. Of the repeat visitors, about one-half ( $n = 15$ ) had visited the SMM two or fewer times in the past 12 months, and about one-half ( $n = 12$ ) had visited the SMM three or more times in the past 12 months.

For most interviewees ( $n = 18$ ), *What Is Life?* was the first theatrical production they had ever seen at the SMM. Nine interviewees had seen other plays in the Science Live Theater.

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<sup>9</sup>Randi Korn & Associates, Inc. (2000). "Whole Museum Experiences: Findings from Exit Interviews, Surveys, and Post-visit Telephone Interviews." Unpublished manuscript. San Jose, CA: The Tech Museum of Innovation.

<sup>10</sup> On two telephone calls, two adults participated.

## RECOLLECTIONS OF *WHAT IS LIFE?*

The evaluator asked interviewees with whom they had seen *What Is Life?* and what they recalled about it. Many interviewees ( $n = 21$ ) had attended *What Is Life?* with children. More of the children, whose median age was 9 years, were females ( $n = 26$ ) than males ( $n = 19$ ).

Nearly all interviewees recalled the general presentation style of *What Is Life?* They remembered that two female actors took turns portraying different scientists by changing costumes and speaking in various accents (see the first quotation below). Many talked about how the actors actively involved the audience by asking questions, which struck them as a unique approach (see the second quotation). Additionally, some complimented the actors for their “fast-paced” and “high energy” performances (see the third quotation).

(What, if anything, do you recall about the play?) It was two gals and they were playing different characters throughout scientific history. They were talking about ‘What is life?’ and the different [time] periods. [They] were changing their wigs and jackets and stuff and speaking in an Italian [or] some [other] accent. [Female, 47 years]

I remember that there were two women. . . . The kids thought it was funny when they were changing costumes and they got a kick out of that, yet it teaches you something. . . . They [the actors] would ask the audience, ‘What is life? Is this alive? Is it not alive? Or are you not sure?’ And they’d say something like a plant, or a rock or . . . an amoeba or an atom. They were just throwing out these things and asking the audience to respond. There was a lot of audience participation and that’s not what I expected from a play. [Female, 38 years]

What [I] remember most [are] the two ladies. (What about them?) Their delivery and changing costumes—they were very quick and it was continuous, so they were very talented ladies. [Male, 82 years]

Most interviewees also remembered ideas and issues presented in *What Is Life?* Many described the play as discussing “what is living and nonliving,” with some providing examples from the discussion (see the first quotation below). A few added that the play presented different scientists’ perspectives (see the second quotation).

There was some [discussion] about life, like what is living and what’s not. They talked about wood. (About wood?) Yeah, wood, asking if it’s living. . . . There were some questions asked like, ‘[Is] wood living? Is a rock a form of life?’ [Male, 47 years]

It [the play] discussed what life was, and they [the actors] had a lot of interactions where they asked people if they thought something was life or if it wasn’t, and discussed different scientists and what they thought on the subjects. [Male, 23 years]

A few recalled that the play was poorly attended and suggested that the Museum better publicize theater offerings (see the quotation below).

We've been members of the Science Museum for two years and I didn't . . . know they were playing that day until I passed the door and saw that they had something going on. We went in to see the play just because we walked by and there weren't many people there. So, I felt kind of bad for the actresses. The Museum [needs to have] better advertisement about what is actually going on. [Male, 39 years]

## OPINIONS OF *WHAT IS LIFE?*

The evaluator asked interviewees their opinions of the format and content of *What Is Life?*

### *Format*

While most interviewees had positive responses to the play's format, a few found it problematic. Many enjoyed the open-ended line of questioning and its participatory nature (see the first quotation below). Several added that the actors' entertaining performances made the play work well for a range of ages (see the second quotation). In contrast, a few objected to the "disrespectful" portrayal of scientists and "corny" jokes. One interviewee had a particularly negative reaction to the "Disney-like" format of the play (see the third quotation).

They [the actors] involved the audience which I thought was great. . . . It let everybody think and be able to share their opinions, and basically they [the actors] said, 'That's an opinion.' I thought it was really great how they handled it. They were very good—[even when] someone gave a wrong answer they didn't let you feel that way. . . . Very open minded. (How were they open minded?) If somebody said something, they would write it down and then they would ask the whole audience where . . . it should go. They categorized everything and [stressed that] we're talking about opinions. . . . I thought that was really good. [Female, 71 years]

It [the play] really got the kids' attention, and they [the actors] seemed to go . . . out of their way to make sure the adults in there were . . . entertained, too. They made sure to ask the adults questions too, so it seemed to [be] a hit [with] both the adults and the kids. [Male, 23 years]

I'm a teacher and I found it [the play] appalling. (Ok, can you tell me why?) I felt some of the ways they were depicting historical figures was very disrespectful . . . and cavalier. I felt it was superficial, and I often have this reaction to this kind of publicly-produced way of presenting educational facts to children. I really don't agree that it needs to be brought into the realm of Walt Disney and disrespect for children to be interested and for them to be excited and engaged, so I was appalled. I wanted to leave. . . . I realize that the people [actors] had their whole hearts into it and were doing an enthusiastic job, but it was a too flat in-your-face, fast-paced kind of Disney [presentation] rather than the natural interest you could have in that subject. . . . People are afraid that that won't engage kids, but I think that is selling kids short—that we always make things so sugar-coated and wild in order to have interest. Especially when they brought out the doll at the end, pulling the intestines out—if you are looking at that from the point of view of a child

who is just learning what a human body is, it's shocking. (Could you elaborate for me, when you say it was too Disney like?) Too much tongue and cheek. . . . It almost felt like it was poking fun at these famous scientists. . . . I know it [is] really difficult to convey that much time [in the history of science] and not do it in that kind of sound bite, commercialized, fast paced, Disney sort of way, but to me it's sad. . . . All of those things are so exciting in and of themselves. I don't think they need to be turned into a comedy show to be palatable. [Female, 42 years]

### *Content*

Interviewees offered mixed opinions about the play's content. Several appreciated the ideas and issues presented in the play, describing it as thought-provoking and balanced (see the first two quotations below). Several others said they enjoyed the content themselves but it was too high-level for their children (see the third quotation). Some interviewees had very negative reactions to the content. A few complained that the play raised questions but never answered them or discussed criteria for answering the question, "What is life?" (see the fourth quotation). A few others said the content was unbalanced, objecting to the perceived pro-evolution message (see the fifth quotation).

I thought it was nice that they [the Museum] had it [the play] there. It created a good set of topics that we could discuss with the family about issues regarding . . . science—how science and religion interact together was how we ended up talking about the content of the play. So it was a good way to create topics to talk about. [Male, 39 years]

I thought it [the play] was good. It was educational. They focused on the scientific aspect of it and they were respectful of the fact that some people may have religious issues with it. I thought it was a good balance in the sense that they explained that they were a science museum and that's why they were looking at the science perspective as opposed to other theories of the beginning of life such as creationism and they avoided that. I thought that was appropriate because it was a science museum, so I thought they handled it well. [Female, 30 years]

It [the play] was okay. Some of it . . . didn't catch the interest of my youngest daughter who is 10, but . . . it's hard to get all the age ranges and make it interesting for everybody. Overall, I thought it was just a cute little show for the kids and I actually learned something, too. (Why do you think it didn't appeal to your daughter?) It was just over her head. She doesn't know what a virus or an atom is. So it just didn't make a lot of sense to her. [Female, 40 years]

I wasn't very pleased with it [the play]. It was empty in terms of what it presented. I understand that the task was mainly to raise questions, but I think the kids would have gotten a lot more out of it with a little bit more definition. . . . They [the actors] asked, 'What do you think a virus is—life or not life?' It would have been nice to see a little bit of discussion about whether it could be in one category or another, rather than just taking the audience's opinions, putting them on the board and then never discussing anything. I just found that really kind of open ended and without any sense of closure. My kids at

the end of it were really asking me, ‘Well what was the point of that?’ (What if anything could be improved about it?) I understand the effort to get audience participation, but in the same sense that a person leading a meeting can’t simply sit back and let everyone else talk, the women presenting the play could have done a better job in leading the discussion and in causing some discussion to happen. It was very much, ‘What do you think? Do you think this could be life? Not life? Sort of life?’ And someone from the audience would say, ‘Sort of life,’ and they’d say, ‘Okay that’s possible,’ and they’d write it down even if it just didn’t make sense. That would have been a really good time to discuss what those categories [meant], but that was really never raised. . . . That would have been a really interesting discussion—to discuss what constitutes life. [Male, 36 years]

I didn’t like it [the play], because they pushed Darwinism and really made it seem like the creation story was an invalid version. It was really focused towards Darwinism rather than creationism, and [I] got the impression that they were taking that viewpoint rather than objectively looking at Creationism versus Darwinism. Darwinism isn’t my personal choice. I think that being a public institution that if it’s going to voice an opinion, that it should objectively look at both sides, not just push one versus the other. [Male, 44 years]

#### IDEAS CONVEYED IN *WHAT IS LIFE?*

The evaluator asked interviewees what the play intended to convey to visitors and their opinions about programs that raise—rather than answer—questions. Interviewees were also asked what connection, if any, there was between *What Is Life?* and the Museum exhibits they had visited.

##### *Main Messages*

As noted earlier, most interviewees perceived the main message of *What Is Life?* as exploring what is living and nonliving. Some added that it demonstrated one aspect of the nature of science—that there are still unanswerable questions (see the first quotation below). A few said the play intended to show that science is subject to interpretation (see the second quotation). One said the message was explicitly “pro-Darwinism.” Another said the play showed her that “more things are living” than she had thought previously and that “you need to respect life.”

(What do you think this play was trying to get across to visitors?) Just that there are different theories about, ‘What is life?’ and ‘Where do you draw the line?’ I think it’s just meant to be a little more thought provoking. It didn’t give an answer. There was no answer, there’s no one right answer. [Female, 47 years]

I think the play was trying to get across to visitors the idea that science is not a hard and fast rule, that it’s open to some interpretation and sort of different philosophical viewpoints using the question of ‘What is life?’ [Female, 32 years]



### *Opinions about Programs that Raise Unanswered Questions*

Most interviewees praised the Museum for presenting a play that asks questions and examines the nature of science. Some appreciated that the play let the audience members make up their own minds about an issue and complemented the actors for their ability to maintain neutral responses and promote discussion (see the first three quotations below). A few said it is important for the Museum to show that scientific knowledge changes through time to inspire future scientists (see the fourth quotation).

(What is your opinion about the Museum having presentations like the *What Is Life?* play that deal with ongoing scientific questions and issues that don't necessarily have a right or wrong answer?) I think it's good. Evolution was brought up [during the play] and that can be a discussion or it can be an argument. The ladies [actors] did a nice job by just taking opinions. . . . The ladies they didn't say, 'This is exactly the way it is,' again it was an opinion. I thought that was handled well. . . . The whole play—instead of all facts it was opinionated. . . . I thought that was good for kids to learn instead of always believing everything you hear, sometimes you just need to stay with what you believe in, but we can listen to what another person may have to tell us. [Male, 82 years]

I love the fact that it [the play] makes you think. I came out of there [thinking about] the computer [example]. . . . Because [when] you think about it, there can be an argument made either way [that it is living or nonliving]. I like how they make you think and they don't just try to say, 'Here's what we're trying to teach you and this is what you need to learn.' They're trying to make people think for themselves and form their own opinions which I love. [Female, 38 years]

I'm all in favor of [programs like this]. I think they're wonderful. I think that it's very important that science be taught in a way that's not just reduced to a bunch of stray and random facts and that you not create the interpretation that everything is ultimately decipherable. Because most of the interesting issues in science—at least most of the interesting ethical issues in science—really get down to matters of personal philosophy or religious perspective. . . . And at the same time, it did it in a nice way because it wasn't preaching, it was just opening up ground for various interpretations of the same set of facts. [Female, 32 years]

I think it [the play] will inspire kids to become scientists. Things that we thought we knew the answer to . . . have changed because they learn things new all the time and continue to learn new things. [Male, 45 years]

Several interviewees had negative comments or suggestions about the Museum creating programs like *What Is Life?* A few cautioned that such programs need to be balanced and provide multiple perspectives, especially when talking about evolution. One interviewee complained that the program made science seem unfounded, arguing that there are right and wrong answers in science and the Museum should not be afraid to confront this (see the first quotation below). Another liked the idea of programs that enable visitors to explore scientific

issues, but said such programs were appropriate for a teen or adult audience and not children—the perceived target audience of *What Is Life?* (see the second quotation).

I think there are a couple of different ways that they could be presented. I was really looking forward to an interesting discussion. Granted, something like that you could end up in a six-hour graduate level debate and not come away with any hard core conclusions but just an interesting discussion. I think . . . whoever was writing it or whoever was directing it . . . were too afraid to draw conclusions. I think there's a general tendency in pop science to leave a lot of things to be relative, to be dependent on the viewpoint of the observer and things like that. That's all well and good but there are some things that are definitions and there are some right and wrong answers. One shouldn't shy away from them in making a presentation like this just to avoid any hidden confrontations. [Male, 36 years]

I think that's great that the science museum is experimenting with things like this. . . . It's good to have things [about] current controversies [in the Museum]. I don't know if you should . . . involve children as young as 4, 5, or 6 year-olds in having a part in that debate. . . . These things are more maybe appropriate for junior high, high school, adults to be delving into. So I guess that's my objection—a lot of this stuff are kind of high level concepts—and to water it down so that little ones can participate takes away from it for the rest of us. [Female, 42 years]

#### *Connection Between What Is Life? and Museum Exhibits*

Most interviewees said *What Is Life?* connected with the exhibits in a general way—both were about different forms of life (including humans) and the life sciences (see the first quotation below). Several said the play was about the nature of science and all the exhibits in the Museum are about science (see the second quotation). A few mentioned that, like the exhibits, the play is educational. A few others did not see any connection between the play and the exhibits.

I didn't think about that [the connection between the play and the exhibits], but on reflection, they have excellent exhibits on life, different life forms, human life, anatomy, biology, and medical knowledge. I didn't think about the connection during the play, I did not think about the connection between the play and the exhibits that we had just wandered through, that would be something that the play could highlight better if that's one of their purposes. [Female, 73 years]

You're dealing with scientific history, so there's a definite connection between a discussion of life and a discussion of science and what science is—not a collection of cold, hard facts but an ongoing conversation. . . . Everything in the Museum is science, so that's the connection. [Male, 41 years]

## IMPACT OF *WHAT IS LIFE?*

The evaluator asked interviewees what impact, if any, the play had on their Museum visit and what topics from the play they had discussed in the weeks following their visit.

### *Perceived Impact*

Most interviewees said attending *What Is Life?* positively impacted their visit to the Museum. Some said the play was “a nice change of pace” from looking at exhibits or added variety to their experience (see the first quotation below). Others praised the Museum as a whole, appreciating the play as a new offering (see the second quotation). A few said they thought the play added richness to their Museum experience with its thought-provoking content (see the third quotation). A few others said the play had promoted discussion among their family members (see the fourth quotation).

I thought it [*What Is Life?*] was just a fun addition. In the past when I’ve been [at the Museum] we’ve . . . done the Omni theater, and so it was nice to have this other alternative to look at rather than reading something . . . or just kind of watching something. It was more of an interactive-type of good experience. It was interesting in that sense—different way of learning—reading and touching and seeing versus interacting with an instructor who was playing a role. I thought it was a different way of learning and just as a break from the other kinds of things we were looking at. [Female, 30 years]

I . . . think the museum is great. To have an extra bonus when you go there, that’s wonderful. I think it’s great that you guys keep changing things. [Female, 71 years]

I think with the play makes the visit to the museum even more full. . . . Just to go out and look at the dinosaur bones is one thing, but the show . . . it makes us think. And I think it makes you think more about what you just saw, like the dinosaur bones. [Male, 47 years]

(What impact, if any, did seeing this play have on your visit to the museum?) Anything that [promotes] questioning, thinking, or asking mom or dad a question later about something—that’s always a positive experience. Those are teachable moments, you latch onto it. You can go home and talk about them more. . . . I think it [the play] was . . . teaching tool that we used as far as bringing up [topics to talk about] with our girls. [Female, 40 years]

In contrast, two interviewees said the play had no effect on their Museum visit. Two others, who had negative opinions of the play, said they “wish they hadn’t seen the play, but didn’t let it ruin their day.”

### *Ideas or Issues Revisited*

Most interviewees did not think about any of the ideas or issues from *What Is Life?* in the weeks between viewing the play and participating in the telephone interview. Five interviewees did.

Three said they wondered whether any visitors had been offended by the play's content (see the first quotation below). Two said they discussed the play with family members who had not seen it (see the second quotation).

\*In our conversations, [my wife] and I thought there may have been people who were offended by the questions and the assumptions—or what I call the frame of reference of the questions—and we wondered if they asked you to get feedback on it because of that. . . . Because we could see how some people might be offended by them, if they have a very nonscientific point of view or anti-science point of view. \*\*We discussed [the play] afterwards, realizing that with a strong religious point of view you might have questioned or been offended by that. (Were there aspects that you found offensive or problematic?) \*No, but we're not particularly religious, but other people in our community are and stuff like this can raise eyebrows. [Male, 80 years; Female, 73 years]

My husband wasn't able to come . . . with us. . . . So I had to relay the whole play to him afterwards. (What did you tell him?) There were a couple of things that came up that [are] really interesting because it made me think, 'Is it alive?' There are some people who were so sure, 'Yes it is [alive],' and there were some people who were, 'No it's not,' and it made me think . . . there are two different opinions about this. Both of them could be right. There could be arguments made for both. . . . There were obvious things like plants, a rock, but [the] computer was . . . one of the things that came up. Because, it's a machine but yet, it can think, you can play chess against the computer, but is it alive or isn't it? [Female, 38 years]

## V. PRINCIPAL FINDINGS: WEB SITE INTERVIEWS

RK&A conducted open-ended interviews with visitors within a few weeks after they visited the *Tissues of Life* exhibition at the SMM, designing the interview guide to explore:

- Web site users' responses to the exhibition's companion *Tissues of Life* Web site;
- Non-users' barriers to using the Web site;
- Whether using the *Tissues of Life* Web site deepens visitors' understanding of the exhibition by comparing responses of Web site users and non-users; and
- Ways in which the *Tissues of Life* Web site can extend the exhibition experience.

The evaluator collected telephone numbers in July and August 2003, by intercepting visitors who were intercepted at the SMM as they exited the *Tissues of Life* exhibition and asking them to participate in a telephone interview in a few weeks. Upon agreeing, visitors provided their telephone number, were asked to visit the *Tissues of Life* Web site, and were given the Web site URL. Of 112 visitors approached, 32 refused to participate in the study, making a refusal rate of 29 percent, a relatively low rate for museum studies, and less than the 52 percent refusal rate RK&A experienced during another evaluation using telephone interviews.<sup>11</sup>

For the telephone interviews, phone numbers were randomly selected from a pool of 80 until 50 telephone interviews were conducted—25 interviewees who had used the Web site at the time of the interview (Web site users) and 25 interviewees who had not (non-users). During random selection, six visitors who were called did not remember visiting the Museum, so those interviews were terminated.

### BACKGROUND INFORMATION ABOUT INTERVIEWEES

#### *Demographics*

Almost three-quarters of interviewees were female (72 percent), and slightly more than one-quarter of interviewees were male (28 percent). Interviewees' median age was 41 years.

#### *Prior Visits to SMM*

Of the 25 non-users, fifteen were first-time visitors to SMM, and ten were repeat visitors. Of the 25 Web site users, five were first-time visitors, and 20 were repeat visitors to the Museum.

#### *Internet Usage*

Web site users were asked to rate their experience using the Internet—"inexperienced," "somewhat experienced," or "very experienced." In all, the evaluator interviewed 25 visitors who used the *Tissues of Life* Web site (Web site users). Of those, 13 said they were "very experienced" at using the Internet, 10 said they were "somewhat experienced," and two rated

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<sup>11</sup>Randi Korn & Associates, Inc. (2000). "Whole Museum Experiences: Findings from Exit Interviews, Surveys, and Post-visit Telephone Interviews." Unpublished manuscript. San Jose, CA: The Tech Museum of Innovation.

themselves as “inexperienced” at using the Internet. Additionally, though not directly asked, nearly one-half of the users indicated that they had professional training in medicine or teaching science.

## REPORTED USE OF WEB SITE

### *Use with Others*

Most Web site users said they used the Web site alone. A few used it with their children, who ranged in ages from three to seven years old, and a couple added that their children enjoyed using the Web site (see the quotation below).

My six-year-old was sitting with me as I was going through [the Web site]. She thought it was really neat. In fact, she wanted to play with it after I was done. [Male, 31 years, Web-site user]

### *Home page Features Used*

Web site’s home page included two features: Mike the Microscope and the Glossary. Nearly all Web site users used Mike. Most said it worked well and that they enjoyed using the feature (see the first quotation below), but a couple said the barking noise was annoying (see the second quotation). Several had problems using Mike, primarily because they had difficulty reading the small text or the slides’ images were not clear. A few also had trouble dragging the specimen to the correct place (see the third quotation), and one Web site user said it took a long time to load the specimens’ images. Regarding the Glossary, fewer used the feature, but those who did said it worked well for them.

I found it cool when you first logged on and it had that microscope where you can drag stuff [over] and see what it looks like up-close. I thought it was pretty cool. [Male, 37 years, Web site user]

When you are on the main page, there is a little barking microscope, which I thought the sound [it was making] was annoying. [Female, 45 years, Web site user]

It was difficult sometimes to get the slide to stay on him [Mike]. I would drag it over there and it would jump back and I would drag it over there and it would jump back [again]. He was not as easy to [use] as I hoped he would be. [Female, 39 years, Web site user]

### *Home page Links Used*

When asked which homepage links they visited, over one-half of Web site users reported visiting three links or fewer, and slightly less than one-half said they visited four or more links. Many users said they visited Play Tissues Activities, followed closely by Look at Body Tissues. Less

than one-half used Visit the Tissue Exhibit, Meet Tissues Researchers, and Discover Tissues in the News; and about one-quarter visited About this Web site.

Web site users offered various reasons for choosing particular links. Several said they chose links because they seemed more interesting or interactive (see the first quotation below). Several others said they tried all of the links to get an overview of the Web site—either to determine if the site would work well for their children or students (see the second quotation), or to be well-informed for the interview (see the third quotation). A few users said they chose particular links to view more information about topics they saw in the exhibition (see the fourth quotation).

I think more of the interactive stuff in the beginning, the games, are probably more enticing than news about tissues and things like that. [Male, 33 years, Web site user]

I just wanted to check out the whole Web site [to] see what it was about. I was just curious to see if [there was] something that my kids would be interested in. [Female, 41 years, Web site user]

I wanted to do an overview of everything [on the Web site] just to see what you might be asking [about] and looking for [in the interview]. [Female, 35 years, Web site user]

I was interested in the researcher [link]. I thought that would be something that was not at the Museum. . . . I thought it would give me more information. And then [I clicked] to see the regular tissues, since I had trouble determining a diseased or a good one at the Museum. I thought that one would probably show me [the difference]—this is a diseased one, this is a good one so I would not have to make that determination on my own. [Female, 46 years, Web site user]

Many Web-site users said they skipped links because they took a long time to load (see the first quotation below). A couple chose not to use links if they had no interest in the subject, and others did not use links that required a lot of reading, though they indicated that they would revisit them if they needed information about the subject (see the second quotation).

I tried to visit all of [the links]. I did not have the patience to do it. I tried to open the games [Play the Tissues Activities]. . . . I tried to go to two [others], and after several minutes opening each of those, I gave up [on the rest]. [Female, 45 years, Web site user]

(Why did you skip the other links?) They looked like they would involve a lot of reading. . . . When there is a lot of information that you can read about, that is something I really would use as a resources as opposed to just reading it through for interest's sake. I would go back to [those links] if I needed to have information about something specific. [Female, 35 years, Web site user]

## OVERALL OPINION OF WEB SITE

The evaluator asked Web site users a series of questions to gauge their overall opinion of the Web site—they discussed their favorite and least favorite items and gave their opinion about the level of information provided. Users were also asked to recount any frustrations they experienced—such as navigation problems and downloading software.

### *Content*

Nearly all Web site users commented positively about the content of the *Tissues of Life* Web site. Many described it as “informative” and “interesting,” and some added that they book-marked it as a reference (see the first quotation below). Moreover, most praised the level of the site’s content, saying they found the information accessible and appropriate for a range of audiences (see the second quotation). However, a few said the Web site was too general and needed more information (see the third quotation).

[The Web site is] an excellent tool. In fact, I have put it on our favorites [menu option] so that when [my children] do science things, I can print off some of those pages and help them with things [about tissues]. [Female, 35 years, Web site user]

[The level of content] was not elementary, but it was not advanced. I would say [the Web site presents] a little bit more information than the average person who goes to a museum would require. That is good, because if you know quite a bit about tissues, you could still learn a little bit more. If you were a kid, you would not be overwhelmed by the information and skip the whole thing. It was good for a range of levels. [Female, 46 years, Web site user]

I thought [the Web site’s content] needed a little improvement. . . . I thought this would be a really great compliment for someone in high school or junior high who is doing a science project on tissues. But it was not expanded enough, it was very brief. I thought there could be more detail to it. [Female, 41 years, Web site user]

Web site users discussed a range of features they enjoyed. Many said they appreciated the magnified tissue images: some discussed Mike the Microscope, followed by Superhealers, Scope-On-A-Rope, and Body Slices (see the first two quotations below). Several others said the information on Meet Tissues Researchers, Tissues in the News, and the Glossary provided more detailed information than the exhibition (see the third quotation). Finally, a couple of Web site users enjoyed the photographs shown on Visit the Tissues Exhibit because the photos reminded them of the exhibition (see the fourth quotation).

[My favorite aspect of the Web site was seeing] the enlarged tissues sample [under Mike the Microscope]. . . . Seeing things enlarged is kind of interesting. . . . You are always [interested] in something that is unable for the normal eye to see. [When] we magnify it [to be] very visible, that is interesting. [Male, 30 years, Web site user]



[My favorite aspect was] Body Slices, under the Look [at Body Tissues] section. . . . I found that really interesting. It is not something that you can see everywhere. I remember when they were doing that process and I remember it being in the news a lot when they were making the slices. [Then] I thought that was a really interesting process they went through to make the slices, so I like looking at them [online]. [Female, 35 years, Web site user]

[I most enjoyed] where [the Web site] told you about different people in the profession [of researching tissues]. . . . That gave me another aspect [of tissues] that I did not find in the exhibition. [Female, 36 years, Web site user]

[I enjoyed] the pictures of the actual exhibition. . . . It was fun looking at a photograph of what you have seen. It reminds me that . . . I did that. [Female, 53 years, Web site user]

Several Web site users found the content of particular activities and links—such as the interactive activities, Meet Tissue Researchers, About this Web site, the Glossary, and Mike the Microscope—“boring” or lacking in detail (see the quotations below).

[My least favorite aspect of the Web site was] the visit with the researcher [Meet Tissue Researchers link]. . . . I do not know if it could be better written or maybe give several researchers and different types of information [that] might be more interesting. But it was just boring. [Female, 53 years, Web site user]

It was not too sensational to drag the tissues over [to Mike the Microscope]. You could move it around, but . . . it did not explain a whole lot about the make-up [of the different types of tissues]. [Female, 65 years, Web site user]

### *Design*

Two thirds of Web site users did not encounter any difficulties with the Web site’s design—many said it was simple to use, and several commented that the Web Pages were well designed and colorful (see the quotation below). A few complimented the audio components.

[The Web site is] very easy to navigate and it is pretty intuitive. It was not so cramped [with images and text] that you had to squint. So it would really work well for children . . . and adults who have not used computers [before]. . . . It was very easy and operable. [Male, 29 years, Web site user]

In contrast, one-third of Web site users indicated that some aspect of the design negatively impacted their experience. Several said they had difficulty reading its small text (see the first quotation below), and a few others had trouble navigating the Web site once they left the home page (see the second quotation). A couple of users complained of needing to scroll their screens up and down to see all of the interactive games (see the third quotation), and others said the pop-up screens, such as the videos, were too small.

I found [the Web site] very difficult to read. . . . The print was just not easy to read at all. I found it very difficult to read any questions or comments or anything that was printed. I went to several parts [of the Web site], and it was all the same print. They should have chosen a different type. I do not think it was my screen because everything else I get is very easy to read. [Female, 46 years, Web site user]

I was not sure a couple of times how to get back to the . . . main screen. Instead of exiting back to the main screen, I had to exit out [of the Web site] altogether. I closed [the Web site], which was not good. So, then I would have to get back in [to continue using it]. [Female, 53 years, Web site user]

[I think that the designers should] size [the Superhealers game] so that it fits, so that you can see the whole thing when you are playing it, rather than having to scroll up and down to see all of the words and play the game. [Female, 35 years, Web site user]

### *Technical Issues*

About two-thirds of Web site users encountered technical difficulties that negatively impacted their experience, and many said they least enjoyed parts where they encountered such problems. More specifically, some users reported that many of the Web site's features, such as the interactive activities and interviews with the researchers, took a long time to download (see the first quotation below), and several added that the length of time spent downloading information or activities made them terminate use (see the second quotation). Several users complained of "dead links," and a few also said that the tissue images and videos were unclear (see the third quotation). A few others were unable to use all of the Web site because they needed to download software—which a couple could not do because of a lack of directions (see the fourth quotation).

I was really disappointed with the Web site, horribly disappointed with the Web site. The Museum was so much better than the Web site. The Web site was cumbersome. It took a long time to load, even though I have a high-speed connection. [Male, 50 years, Web site user]

[Using the Web site was] extremely frustrating because everything was so slow to open. Just loading the main page took almost four minutes. Every time I tried to get into something, it would take an extremely long time. I gave up in frustration on most of them. [Female, 45 years, Web site user]

The pictures were not very clear. . . . There were some things when it talked about tissues and discussing scars, some pictures came up and you really could not see anything. [Male, 37 years, Web site user]

(You mentioned that you were not able to view certain things on your computer because you did not have Flash 6.0?) Yes, there were parts that were interactive and I was not able to do [them]. [My computer screen] said, 'If you do not have this [software], go to

the bottom of the page and follow the directions.’ There were not any directions, so I was not able to do any of [the interactive activities]. [Female, 46 years, Web site user]

## IMPACT OF WEB SITE ON THE EXHIBITION EXPERIENCE

### *Comparison of Web site Users and Non-Users*

The evaluator asked Web site users and non-users a series of similar questions, and their responses were compared to assess the impact of the Web site on the exhibition experience. The evaluator asked Web site users and non-users to discuss their recollections of the *Tissues of Life* exhibition, and what they learned from their experiences in the exhibition (and from the Web site). Additionally, they were asked to discuss any topics or ideas from the exhibition (and Web site) they had thought about since their visit.

### Interviewees’ Background

As discussed earlier, more Web site users than non-users were repeat visitors to SMM. This difference suggests that users were vested in the Museum, and may have been more likely than non-users to visit the Web site and recall specific details about the *Tissues of Life* exhibition.

### Recollection of Exhibitions

Most interviewees described the exhibition as “informative” and “interesting,” and some added that it worked well for their children, as one said, “[The exhibits] are very fun, very attractive, and the kids liked them.” However, Web-site users recalled more about *Tissues of Life* than non-users—over two-thirds of users remembered two or more components, while over one-half of non-users recalled one or fewer components.

Overall, interviewees said they enjoyed nearly all the same aspects of the exhibition: most said they enjoyed using one or more of the physical interactives, and nearly all of these discussed the Wounded Hand (see the first quotation below), followed by Scope-On-A-Rope. A few said they and their young children enjoyed using the Model of a Cell (see the second quotation), and a couple discussed the Flowcytometer. Some added that their children enjoyed doing the *Cell Lab* activities and looking at specimens under a microscope (see the third quotation). Some others found the Body Slices fascinating (see the fourth quotation).

One [exhibit] that really stood [out] was the big plastic finger [Wounded Hand] that showed a fingernail. They had a little spot where [there was] a sore . . . and [it showed] how a scab forms. [Female, 43 years, Web site user]

My three year-old and I did the cell . . . puzzle [Model of a Cell], where you match up what the cell looks like with the puzzle piece. Then you can read about what that part of the cell does. That was the main attraction for my three-year-old. We played with that for probably a half an hour. [Female, 33 years, non-user]

One of the coolest things [in the exhibition] . . . was the laboratory [*Cell Lab*] where my kids were able to do a miniature experiment. They got a sample from the inside of their mouth. That was cool, they liked that. [Male, 41 years, non-user]

The most interesting was the actual slices of the body [Body Slices] on display. . . . It is just interesting to see an actual section of everything, to be able to see where things are [in the body] firsthand. It is different than reading a textbook, [it is] more hands-on and interesting. [Male, 29 years, Web site user]

However, Web-site users discussed two exhibition aspects that non-users did not. Several users mentioned learning about specific topics from exhibits, such as stem cell research and research by local scientists (see the quotation below). Additionally, a few users recalled the multimedia activities, specifically Tissue Invaders and Superhealers—both of which are also on the Web site.

There was [information about] stem cell [research]. . . . It had some very interesting things about stem cell research and it was rather politically correct, very diplomatic, I must say. [Male, 50 years, Web site user]

#### *Content of Tissues of Life Exhibition*

There were no differences in what Web site users and non-users said they learned about cells and tissues from their experiences. Three-fifths of users and non-users said that they did not learn anything new from their experiences (see the first quotation below). In contrast, some users and non-users said that seeing tissues magnified gave them a new understanding of them (see the second and third quotations). A few said they learned about the healing process; and others had idiosyncratic responses, saying they learned about skin replacement, how germs disperse, and about DNA extraction.

I did not learn much. . . . I think instead of really gaining additional knowledge, [the exhibition and Web site] just reinforced knowledge that I learned in school. [Male, 29 years, Web site user]

[I learned about] the incredible amount of stuff that is on your skin that you did not realize [was there], that you do not see with the naked eye. [Male, 41 years, non-user]

[The] one particular exhibit that I found very, very interesting was the cross-section—getting to actually see what emphysema looked like and what the actual hemorrhage of the brain looked like. . . . For me as a health professional, it turned lights on that maybe I would not have ever experienced had I not see that cross-section. [Female, 35 years, Web site user]

When the evaluator asked Web site users and non-users what topics or ideas from the exhibition and Web site they had reflected on since their visit, differences emerged. More than two-thirds of users said they had thought about the exhibition or the Web site after their experiences, while less than one-third of non-users said that they had thought about the exhibition beyond their visit.

More specifically, some users said they thought about the interactive activities—Tissue Invaders, Superhealers, and Scope-On-A-Rope—displayed in the exhibition and on the Web site (see the first quotation below), and a few others said they thought about how tissues affect health issues, such as cancer (see the second quotation) and personal hygiene. Finally, one said he got ideas for teaching students about tissues from the exhibition and Web site.

[I thought about] the healing process. There was a computer game [in the exhibition], it was the same game that was on the Web site, where you could try to heal a scar. There were three other things you had to decide what you needed [to heal the wound]—red blood cells or antibodies. There were a number of things [on the Web site and in the exhibition, but] that one stuck out and I mentioned it to my children, when they had a cut or something, and we talked about it. [Female, 46 years, Web site user]

[I thought about] breast tissue and the cancer cells and the body and that type of thing. [Female, 48 years, Web site user]

### *Web site's Relationship to Exhibition Experience*

The evaluator told Web site users that the Museum's intent was that the Web site would enhance visitors' exhibition experience. Visitors were asked to discuss how visiting the Web site after seeing the exhibition impacted them. Users were also asked how it could be changed to compliment their exhibition experience.

Web-site users voiced different opinions about the degree to which the Web site extended their exhibition experience, if at all. Over one-half of users said the Web site referenced information that they saw or activities that they did in the exhibition, but they did not indicate that it enhanced their understanding of the subject (see the first quotation below). In contrast, over one-quarter said the Web site added to the experience they had in the exhibition. More specifically, several said the Web site was a resource for more information about tissues (see the second quotation), and several others said it allowed them to experience parts of the exhibition that they missed or skimmed over (see the third quotation). A few users said it did not impact them at all.

[The Web site] did something similar to . . . the displays in the Museum. . . . I enjoyed the experience in the Museum and therefore, being able to do [the same activity] online was also interesting. [Male, 30 years, Web site user]

I think the Web site had a lot of the same information, but at the same time it [had] some Web links to other resources that you would not get without that Web service available. [Male, 29 years, Web site user]

The Web site was good because I could [take] my time looking over stuff [that I was interested in] as opposed to when there are other people waiting to look at exhibits . . . I could not spend a lot of time looking at all the things. [Female, 35 years, Web site user]

Web site users had a range of suggestions for ways the Web site could better extend the exhibition experience. Some indicated that addressing the technical issues—slow loading times

and poor visibility of images and text—would encourage visitors to use the Web site more thoroughly once they logged on. Several users said the Web site should explicitly reference the exhibition, and a few recommended adding more detail to the exhibit tour map, moving it to the home page, and creating links from exhibit components (see the quotation below). A few others suggested adding more information not displayed in the exhibition, and a couple recommended incorporating more interactive or audio components.

I do not know that I would have sensed from my initial entry into the Web site that the two [the Web site and the exhibition] could have been related, that I could see similar things. It might be helpful to have on the main screen of the Web site more [of a] . . . correlation to what you saw at the exhibit. . . . The correlation between what you saw and what was there was not obvious. It might be nice to have something that ties the two together. . . . It was not intuitively obvious to me that the two were tied together.  
[Female, 39 years, Web site user]

## BARRIERS TO WEB SITE USE AND SUGGESTIONS FOR IMPROVING IT

Web site users and non-users mentioned several reasons why they would not have used or did not use the *Tissues of Life* Web site. Several—including a few who used the Web site—said they do not like using the Internet other than e-mail, and would never have looked at the Web site (see the first quotation below). A few non-users said they did use not the Web site because they did not find the subject interesting, and a couple said they did not initially perceive the SMM Web site as a resource (see the second quotation).

I do not really care for the computer. . . . I was not raised on the computer. I am an older person. . . . The computer . . . that does nothing for me, I just use it as a course for e-mail. . . . I do not sit at the computer and surf [the Internet]. [Female, 43 years, Web site user]

Had I not been approached that day, I probably would not have gone to the [Web] site. . . . Had I not been informed that the information was there, I would not have gone there at all. I would not have thought the Science Museum of Minnesota [Web] site as a place to study tissues and cells or find information. [Male, 30 years, Web site user]

The evaluator asked non-users how the Museum could encourage visitors to visit the Web site. About one-half of non-users and a few users said the Web site need to be advertised more in the exhibition, and some added that the Museum should provide the address on colorful handouts for visitors to take home (see the first quotation below). Others had idiosyncratic suggestions, such as creating a reminder listserv for e-mail reminders about the Web site, encouraging teachers to put it as a link on their home pages, offering discount incentives for use, and posting questions throughout the exhibition that are answered on the Web site (see the second and third quotations).

There should be a bigger posting of the actual Web site [in the exhibition] or maybe a little business card that people could take with that listed on it, then they would have a visual reminder that they might want to look at it. [Female, 54 years, non-user]

What if they had a sort of bounce back coupon that said, 'If you do this, you will get 10 percent off your next visit at the museum.' . . . That would be kind of a reward enhancement. [Female, 52 years, non-user]

It seems to me that one of the reasons we used the Web is to answer questions. . . . Maybe [post] some questions . . . to find out more. [Use] big cards that people could pick, so then you would go home and say, 'Gee, I don't know about that question, and I did not find that answer at the Science Museum, but I can go to this Web site and find it.' You need a purpose to go to the Web site. Just to go to the Web site to visit, is not something I might necessarily do unless I have a question or something I am seeking. But to leave the Science Museum with further questions that would maybe make me go to the Web site. [Female, 48 years, non-user]

## **APPENDICES**



**APPENDICES A-F removed for proprietary reasons**

**APPENDIX G**  
**Tissue Invaders Exhibit, Where Microbes Were Placed**

**Table 17**  
**Placement of Microbes at Tissue Invaders**

<b>Microbe Placement</b>	<b>Number of Visitors that Used Component</b>
Tetanus	
Nose	2
Throat	1
Both	4
Rabies	
Nose	4
Throat	4
Both	4
Pertussis	
Nose	2
Throat	3
Both	2
Rhinovirus	
Nose	3
Throat	3
Both	2
HPV	
Nose	1
Throat	2
Both	3