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TIMING AND TRACKING STUDY: HALL OF FOSSILS – DEEP TIME

Prepared for the
National Museum of Natural History
Washington, D.C.

Timing and Tracking Study: Hall of Fossils - Deep Time
May 2022

Prepared for
National Museum of Natural History
https://naturalhistory.si.edu
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Recommended citation: RK&A. (2022). *Timing and Tracking Study: Hall of Fossils* - Deep Time. Unpublished report. Washington, D.C.: National Museum of Natural History.

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KEY TAKEAWAYS

This section presents key takeaways from the Timing and Tracking Study for the Hall of Fossils—Deep Time at the National Museum of Natural History (NMNH), based on observation data collected between October to December 2021. Key takeaways for the Timing and Tracking Study are informed by the data in this report and our years of experience working with museums.

VISITING DEEP TIME IS A HIGHLY SOCIAL EXPERIENCE

Most visitors to Deep Time visit in social groups of adults and kids or adult-only. Group composition has a direct impact on the visit experience in several ways—observation data show that those visiting in social groups spend more time in Deep Time, stop at more Dioramas, and touch more bronzes than those visiting alone. Additionally, visitors to Deep Time interact with one another in a variety of ways during their visit. Seventy percent, for instance, conversed with another visitor, and 51 percent pointed or beckoned to another visitor to come see something at least once. And, more than one-third of visitors took a photograph, which we consider a social behavior as it is often used to share the experience with family and friends (e.g., on social media). Social behaviors were especially high was at the various Dioramas peppered throughout the exhibition; 40 percent visited at least one diorama, and those that did were often observed conversing or reading aloud with another visitor, a sign of high engagement.

MOST VISITORS SEE ONLY A PORTION OF DEEP TIME

One way we think about how visitors use a space is by looking proportionally at how much of the available space they visit and how much time they spend. Of the 83 available stops in Deep Time, the median number of stops is 11, and the median time spent in Deep Time is 10 minutes 49 seconds. Notably, entrance used affects how long visitors spend—visitors spent several minutes more in Deep Time if they entered via the Rotunda Side versus the African Voices side. While there is no ideal number of stops or dwell time for a museum exhibition, as each space is unique, the time spent in Deep Time is relatively low for what we might expect of such a large space (31,000 sq ft). However, when we consider that the median time spent on the *entire second floor* of NMNH is 27 minutes 57 seconds[1], time spent in Deep Time is relatively high compared to time spent in other areas of NMNH.

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[1] RK&A, *Audience Research for Visitor Experience Master Plan,* prepared for NMNH and The Thinkwell Group (August 2016).

LARGE SPECIMENS AND SCIENTISTS DRAW VISITORS IN, AND INTERACTIVE EXPERIENCES IN THE AGE OF HUMANS AND MASS EXTINCTION HAVE STAYING POWER

Among the available exhibits in Deep Time, the most-visited stops are ones that showcase large specimens and scientists at work. Dinosaurs in a Flowering World had the highest percentage of stops (57 percent), which is not surprising since it has the T.rex specimen. FossiLab, which shows real scientists at work, was also highly visited (52 percent stopped). However, visitation (stops) does not always correlate to time spent at individual exhibits; in other words, just because a visitor stops at an exhibit does not mean they dwell there for long. In fact, in Deep Time, the most frequently visited stops *hardly overlapped* with stops that had the highest median dwell times. The exhibits with the highest median dwell times were mostly interactives and videos that included content on the Age of Humans and/or mass extinctions (e.g., Age of Humans had a median dwell time of 1 min 21 seconds, and the Day the World Changed Video had a median dwell time of 59 seconds); this is encouraging since these exhibits include core Deep Time messages. And notably, visitors spent more time in Deep Time overall when FossiLab was open.

MOST VISITORS MISS THE "TIME INDICATORS"

Unlike other Fossil Halls, Deep Time intentionally takes visitors on a journey *backwards in time*, from today to 4.6 billion years ago[2], an intentional strategy to help ground visitors in a familiar time so they can begin to make connections between life today and life in Deep Time. To help visitors know *where* they are in the exhibition and *when* they are in time, NMNH placed various time indicators throughout Deep Time, including Time Maps, Labels with Swizzle Sticks, and Navigating Deep Time labels. Use of these time indicators, however, was low overall. Most visitors (67 percent) did not look at any of the time indicators, and those who did mostly looked at only one. This does not necessarily mean that all visitors are missing the message about going backwards in time. Rather, the message may come through subtly as visitors experience various exhibits in Deep Time and notice how the environments and specimens they see are changing.

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[2] When entering Deep Time via the Rotunda Side, which has 3 doors and is considered the main entrance.

STUDY BACKGROUND

The Timing and Tracking Study is one of four studies that was conducted by RK&A as part of a summative evaluation of the Hall of Fossils – Deep Time exhibition for the Smithsonian's National Museum of Natural History (NMNH). The goal of this study is to provide an objective account of visitors' behaviors and engagement in the Deep Time exhibition.

STUDY OBJECTIVES

The Timing and Tracking study specifically explored:

- Overall time spent in the Deep Time exhibition;
- Stops at and time spent at specific areas of the Deep Time exhibition (hot and cold spots);
- Stops at and time spent at individual components/exhibits in Deep Time, especially the following exhibit types:
  - Age of Humans exhibits
  - Extinction Walls
  - Dioramas
  - Scientist exhibits
  - Evolution exhibits
- Frequency of behaviors in the Deep Time exhibition, such as pointing/beckoning, interactions with staff, conversation;
- Differences in behavior in the Deep Time exhibition by observable visitor characteristics, such as approximate age, group type, presence of children in visit group, etc.

METHODOLOGY

RK&A conducted entrance counts in October 2021 and timing and tracking observations from October to December 2021.

ENTRANCE COUNTS

Before beginning timing and tracking observations, RK&A conducted entrance counts to record how often visitors used each of the two entrances to the Deep Time exhibition. This helped us

decide how much time to allocate for timing and tracking observations beginning at each side of the exhibition. RK&A observed visitors from two vantage points in Deep Time with sightlines to the entrances: the Rotunda Side (with sightlines to the three Rotunda doors including Rotunda Marine Wall, Rotunda Central, and Rotunda Sloth doors) and the African Voices Side (with sightlines to the African Voices door). RK&A spent 30 minutes observing visitors from each vantage point and tallying the number of visitors to use each entrance side and door during that time, for a total of one hour of entrance counts.

Based on the data collected from the entrance counts, data collectors split their observation time across the two sides with entrances to Deep Time as follows: 75 percent of their time on the Rotunda side of the exhibition and 25 percent on the African Voices side. More time was spent observing visitors entering on the Rotunda side because it is designed to be the primary entrance to Deep Time, which RK&A's entrance counts confirmed (see Data Collection Conditions table in Appendix F).

TIMING AND TRACKING OBSERVATIONS

RK&A conducted timing and tracking observations of 344 unique visitors to the Deep Time exhibition from October to December 2021. Observations were conducted on weekdays and weekends between 10:30am and 5:00pm.[3] Timing and tracking observations provide an objective and quantitative account of how visitors experience Deep Time, including which areas visitors stop at, for how long, and how visitors behave. Timing and tracking observations document visitor behaviors in a standardized manner, which we can analyze statistically.[4]

Observations are unobtrusive, so visitors were not asked to participate but were selected randomly upon entering Deep Time. To select visitors, data collectors positioned themselves in sight of one of the two sides where visitors can enter Deep Time (the Rotunda Side and the African Voices side). They imagined a line in front of the various entrances on that side of the exhibition (e.g., elevator or stairs) and selected the first visitor who appeared to be age 11+ to cross an imaginary line.[5] Once the visitor crossed a line, the observer started a stopwatch and discreetly observed the movements of the selected visitor throughout Deep Time, recording the components used, time spent, and behaviors (see Appendix A for the timing and tracking form and Appendix C for the Stop and Behavior Guide).

As is standard in timing and tracking observations, RK&A analyzed data only for observed visitors who entered Deep Time, remained for 30 seconds or more after entering, and engaged with Deep Time components. Observations lasting less than 30 seconds were discarded.

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[3] Note NMNH is open 10:00am-5:30pm daily.
[4] See Appendix E for specific statistical analyses run.
[5] Note that, as is standard for timing and tracking observations, RK&A did not track kids who were obviously visiting on a school or group tour, meaning all kids tracked were visiting in other group types.

ABOUT THE SPACE

The Hall of Fossils – Deep Time is a 31,000 square foot exhibition at the Smithsonian's National Museum of Natural History (NMNH). RK&A and NMNH identified 83 unique components, or stops, in the exhibition, pictured on the stop map shown below. Keep in mind the stop map is meant only as a general graphical representation of Deep Time stops; it is used throughout this report to help readers see trends related to Deep Time visitation at a high level.

Also keep in mind that **this study only tracked visitors' experiences during a continuous visit to Deep Time**; we did not track visitors' experiences if/when they visited other NMNH galleries, or if they left and reentered the Deep Time exhibition.

DEEP TIME STOP MAP
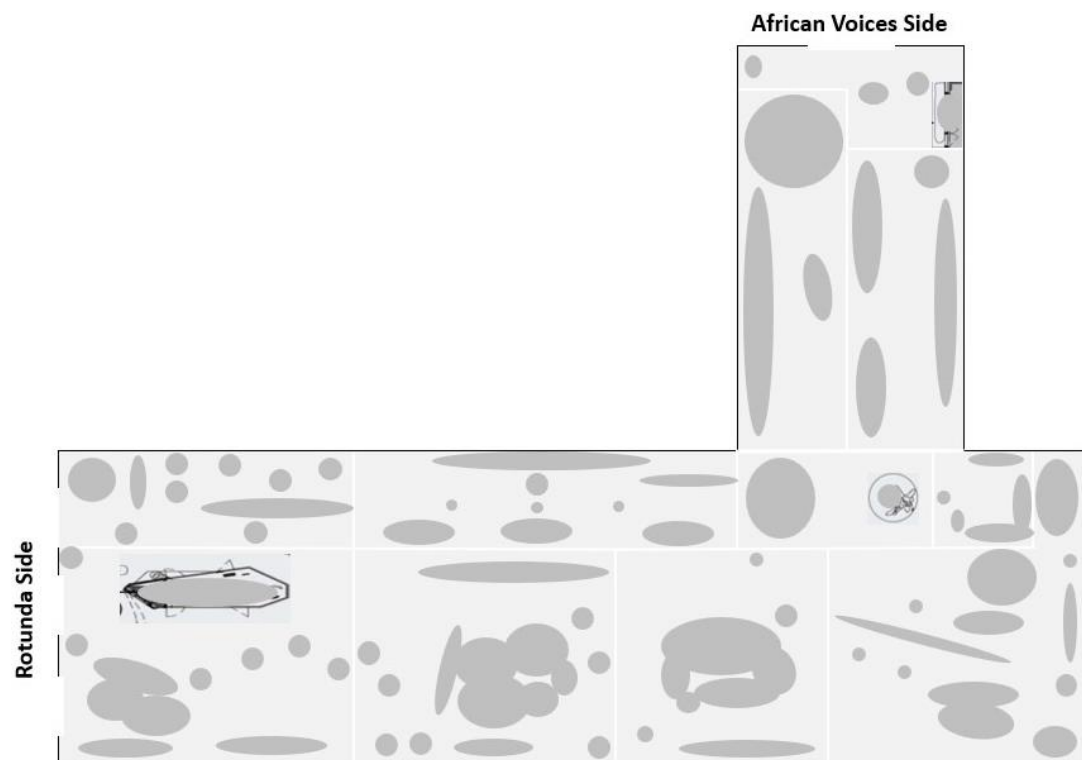
FINDINGS

RK&A conducted 344 observations from October to December 2021. Observations are unobtrusive to provide an objective account of how visitors experience the Deep Time exhibition.

VISITOR CHARACTERISTICS

Data collectors noted general characteristics of the 344 observed visitors. Visitors ranged in age, but the greatest percentage are adults: 54 percent of visitors are between the ages of 25 and 44 years, while smaller proportions are between the ages of 18 and 24 years (17 percent) and 45 years or older (22 percent). Over two-thirds of visitors were in a social group: 47 percent were visiting in an adult-only group, and 32 percent were visiting in a group of adults and kids. Visitors with children were mostly visiting with young children (80 percent of visitors with children were visiting with at least one child either 0 to 5 years old and/or a child 6 to 10 years old).

VISITOR CHARACTERISTICS

Approximate Age Range	% of Observed Visitors
11-14	3
15-17	4
18-24	17
25-34	29
35-44	25
45-54	9
55-64	8
65+	5

Group Composition	% of Observed Visitors
Adult Alone	19
Adult-only	47
Adults and Kids	32
Kids-only	3

Approximate Age of Children (in those visiting in a group of Adults and Kids)	% of Observed Visitors with Children
0-5	41
6-10	39
11-14	20
15-17	13

GALLERY CONTEXT

Most observations took place on weekdays (51 percent of observations), with one-half ending between the hours of 12-3pm (50 percent). Crowding was generally light (45 percent) or moderate (42 percent), with some observations taking place at times of high crowding (14 percent). There were no staff or volunteer-led activities taking place during any observations (0 percent). However, FossilLab was open with scientists working inside for two-thirds of the observations (63 percent).

RK&A recorded any down or unavailable components as context for use and time spent at individual components. As is typical in science museums, at least one component was down or unavailable during all observations (100 percent). These include:

DOWN OR UNAVAILABLE COMPONENTS DURING OBSERVATIONS

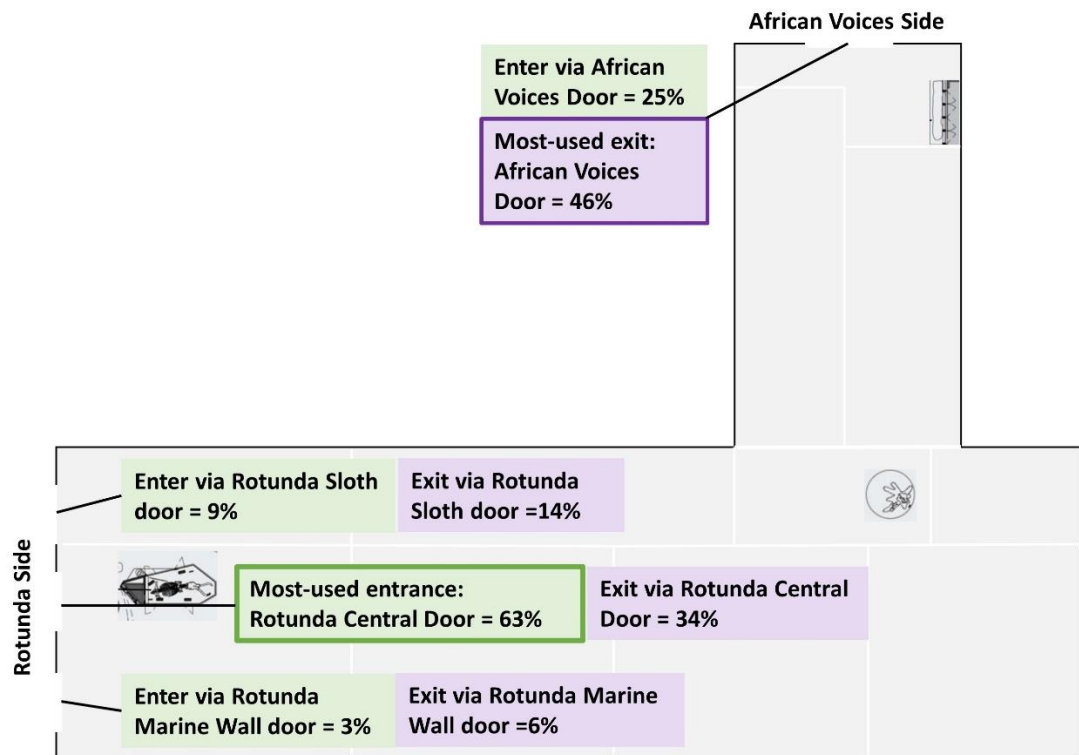| Component	Issue	% of Observations
Coal Mine Video	*No video, no audio, or both*	69
Overlook Rotunda (Paleogene/Neocene area)	*Touch screen malfunctioning*	56
Dinosaurs Take to the Air	*Touch screen malfunctioning*	38
Overlook Back (Jurassic area)	*Touch screen malfunctioning*	10
The Long Beginning Video	*Specimens not on display*	10
Your Body Through Time	*Touch screen malfunctioning and/or no videos*	5
Overlook Central (Cretaceous area)	*Touch screen malfunctioning*	3

ENTRANCE AND EXIT USED

As noted earlier, based on the data collected from the entrance counts, data collectors split their observation time across the two sides with entrances to Deep Time.[6] The majority of visitors entered via the Rotunda Side of the exhibition (75 percent) using one of the three doors available on that side; specifically, most of these visitors entered via the Rotunda Central door, and some entered via the Rotunda Sloth or the Rotunda Marine Wall doors. A smaller proportion entered via the African Voices door (25 percent).

When exiting Deep Time, a slight majority of visitors exited via the Rotunda Side (54 percent) using one of the three doors available on that side; similarly, most of these visitors exited via the Rotunda Central door versus the Rotunda Sloth or the Rotunda Marine Wall doors. Nearly one-half of visitors exited via the African Voices Side of the exhibition (46 percent).

ENTRANCES AND EXITS USED BY DEEP TIME VISITORS

African Voices Side

Enter via African Voices Door = 25%

Most-used exit: African Voices Door = 46%

Rotunda Side

Enter via Rotunda Sloth door = 9%

Exit via Rotunda Sloth door =14%

Most-used entrance: Rotunda Central Door = 63%

Exit via Rotunda Central Door = 34%

Enter via Rotunda Marine Wall door = 3%

Exit via Rotunda Marine Wall door =6%

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[6] Data collectors split their time as follows: 75 percent of their time doing observations that began on the Rotunda side of the exhibition and 25 percent of their time doing observations that began on the African Voices side.

TIME SPENT

Observed visitors spent between 31 seconds (0:31) and 1 hour 2 minutes 20 seconds (1:02:20) in the Deep Time exhibition, which is approximately 31,000 square feet.[7] Some visitors spent a short amount of time in the exhibition (23 percent spent less than 5 minutes in the exhibition) while some others spent a long time (23 percent spent more than 20 minutes). The median time spent in the exhibition is 10 minutes 49 seconds (10:49).[8]

Histogram of Time Spent in Deep Time

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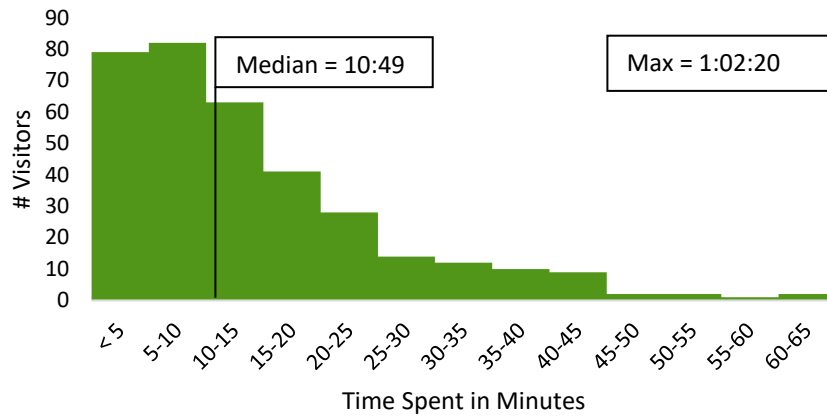
[7] As a reminder, RK&A did not analyze data for observations that turned out to be under 30 seconds long; these were considered "seeking" visits, meaning the observed person may not have truly intended to visit Deep Time. For instance, they might simply have been searching for a member of their group and entered Deep Time looking for someone.

[8] Medians (versus means) are reported because, as is typical, the number of components used and the time spent by visitors are distributed unevenly across the range. When the distribution is extremely asymmetrical (i.e., "lopsided"), the mean is affected by the extremes and, consequently, falls further away from the distribution's central area. In such cases, the median is a better indicator of the distribution's central area because it is not sensitive to the values of scores above and below it.

STATISTICAL RELATIONSHIPS

A few variables have a statistical relationship to the total time spent in *Deep Time*:

♦ **Entrance:** Visitors who entered Deep Time through the Rotunda Side (which has 3 doors) spent more time than those who entered the exhibition via African Voices (median of 11 minutes 38 seconds versus 7 minutes 3 seconds).

♦ **Group Composition:** Visitors in either groups of Adults and Kids or Adult-only groups spent more time than those visiting in Kids-only groups or adults visiting alone (medians of 13 minutes 10 seconds and 11 minutes 19 seconds versus 8 minutes 12 seconds and 6 minutes 17 seconds).

♦ **FossiLab Status:** Visitors who visited when FossiLab was open spent more time than visitors who visited when FossiLab was closed (median time 11 minutes 42 seconds versus 8 minutes 57 seconds).

STATISTICAL DIFFERENCES FOR TIME SPENT IN DEEP TIME

DIFFERENCES BY ENTRANCE

Entrance	Median Time Spent (min:sec)
Rotunda side	11:38
African Voices side	7:03

DIFFERENCES BY GROUP COMPOSITION

Group Composition	Median Time Spent (min:sec)
Adult Alone	6:17
Adults-only	11:19
Adults and Kids	13:10
Kids-only	8:12

DIFFERENCES BY FOSSILAB STATUS

FossiLab Status	Median Time Spent (min:sec)
Open (scientists working inside)	11:42
Closed (no scientists working inside)	8:57

TOTAL NUMBER OF STOPS

RK&A and NMNH identified 83 components in the exhibition (see the identified components on the timing and tracking form in Appendix A and the stop map). Components were selected because they are distinct and observable sections, text panels, object cases, or interactives in the exhibition. Components vary in size; some are small (e.g., a text panel such as the introduction text or a singular diorama) and some are large (e.g., Fossil Basecamp or the Age of Humans Movie). Of the 83 components, observed visitors stopped at between zero and 53 components. Like time spent, the number of stops does not follow a normal distribution; many visitors stopped at only a few components (e.g., 43 percent of visitors stopped at 10 or fewer components). The median number of stops is 11.

Histogram of Number of Stops in Deep Time

Median = 11 stops

Max = 53 stops
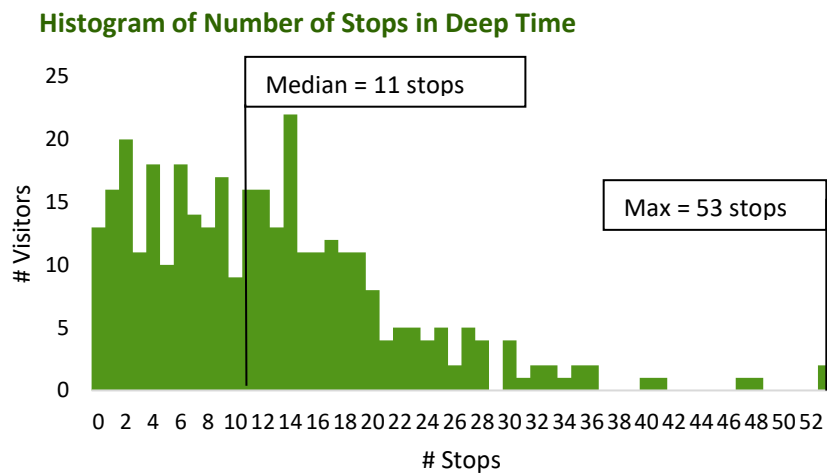
Visitors

Stops

STATISTICAL RELATIONSHIPS

Two variables have a statistical relationship to the total number of stops visitors make in *Deep Time*:

♦ **Entrance:** Visitors who entered Deep Time through the Rotunda Side (which has 3 doors) stop at more components than visitors who entered the exhibition via African Voices (median of 12 stops versus 7 stops).

♦ **Group Composition:** Visitors in either groups of Adults and Kids or Adult-only groups spent more time than those visiting in Kids-only groups or adults visiting alone (medians of 12 stops each versus 8 stops each).

STATISTICAL DIFFERENCES FOR NUMBER OF STOPS IN DEEP TIME

DIFFERENCES BY ENTRANCE

Entrance	Median # of Stops
Rotunda side	12
African Voices side	7

DIFFERENCES BY GROUP COMPOSITION

Group Composition	Median # of Stops
Adult Alone	8
Adults-only	12
Adults and Kids	12
Kids-only	8

VISITATION AND TIME SPENT BY SECTION

RK&A designated eleven sections of the Deep Time exhibition and the median number of sections visited is 6. The **most visited section is the Center Area (79 percent stopped),** followed by the Rotunda Central/Marine Area (72 percent stopped) and the Back Center Area (70 percent stopped), indicating these sections are highly attractive to visitors.

For the most part, the sections with the highest median dwell times are different than the most highly visited sections. The **highest median dwell time is in the Rotunda Sloth area (1 minutes 48 seconds)** followed by the Center Area (1 minutes 32 seconds); the Back Wall Area (1 minutes 19 seconds); and the Age of Humans/Overlook Area (1 minutes 17 seconds); and the Back Center Area (1 minute 2 seconds).[9]

DEEP TIME VISITATION AND TIME SPENT BY SECTION

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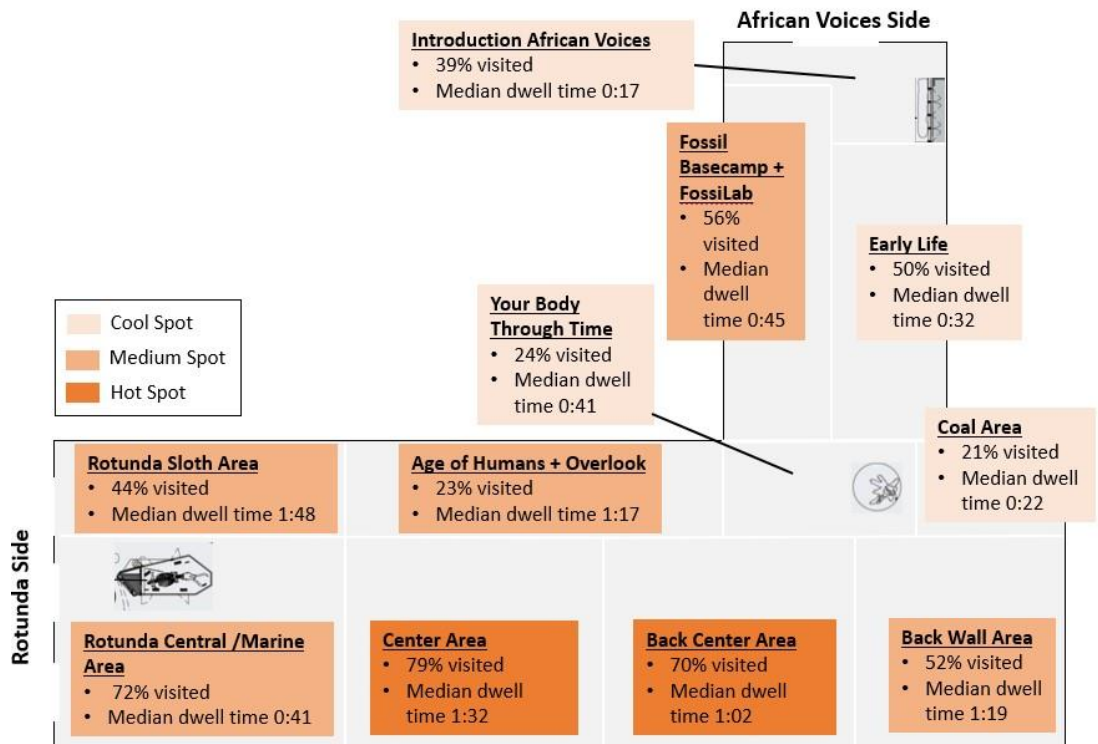
[9] See Appendix G for statistical relationships related to section visitation.

One variable of note has a statistical relationship to **time spent by section**[10]:

♦ **FossiLab Status:** Visitors who visited when FossiLab was open with scientists working inside spent more time in the Back Center Area, Back Wall Area, Coal Area, and Your Body Through Time than those who visited when FossiLab was closed (with no scientists working inside).

STATISTICAL DIFFERENCES IN TIME SPENT IN SECTIONS BY FOSSILAB STATUS

Section	Median Dwell Time (min:sec)	
	FossiLab Open	FossiLab Closed
Back Center Area	1:12	0:53
Back Wall Area	1:40	0:54
Coal Area	0:27	0:17
Your Body Through Time	1:02	0:24

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[10] See Appendix H for more statistical relationships related to time spent by section.

MOST-VISITED COMPONENTS

Eighteen stops[11] were visited by 25 percent of visitors or more; they comprise a mixture of stops with large specimens and some have interactive components. The most-visited stop is the Dinosaurs in a Flowering World, which is not surprising given that this stop displays the T.rex specimen.

MOST-VISITED STOPS

Stop	Section	% of Observed Visitors Stopped
37. Dinosaurs in a Flowering World	Center Area	57
80. FossiLab	Fossil Basecamp/FossiLab	52
2. American Mastodon	Rotunda Central/Marine Area	46
51. Giant Dinosaurs Living Large	Back Center Area	44
52. Born Small, Grow Fast	Back Center Area	37
74. It's Not Easy to Live on Land	Early Life	36
53. Spikes v. Claws	Back Center Area	34
36. Last American Dinosaurs	Center Area	33
81. Stegosaurus Puzzle	Introduction African Voices	33
41. Dinosaur Diversity Peaks	Center Area	29
54. Life in the High Seas Area	Back Center Area	28
67. Ecosystem/Flourishing Corner	Back Wall Area	26
76. From a Single Species	Early Life	26
59. P/T Extinction Video	Back Wall Area	25
11. Dense Forests Open Up	Rotunda Central/Marine Area	25
12. Giant Sloth	Rotunda Sloth Area	25
16. Life Changes as Earth Changes	Rotunda Sloth Area	25
42. Giant Sea Predators/New Weapons?	Center Area	25

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[11] As noted earlier, RK&A and NMNH designated 83 individual stops in Deep Time. See stop map in Appendix C for more.

VISITS TO INDIVIDUAL STOPS

From the heat map below, you will notice:

- ♦ **As shown in the table on the prior page,** Dinosaurs in a Flowering World (which has a view of the T.rex specimen) and FossiLab (which shows real scientists working) were the most heavily visited stops. Both stops were visited by 50 percent of visitors or more.

- ♦ **Around one-fifth of components were visited by a moderate number of visitors** (between 25-49 percent). They are scattered throughout the exhibition, but mostly concentrated near the entrances/exits or in the center of the exhibition (where there are several large specimens on view).

- ♦ **Nearly two-thirds of components had relatively low visitation (less than 25 percent stopped).** For instance, few stopped at the various components located on the Overlook. Some of these exhibits (12 total) were visited by less than 5 percent of visitors.

VISITS TO INDIVIDUAL STOPS
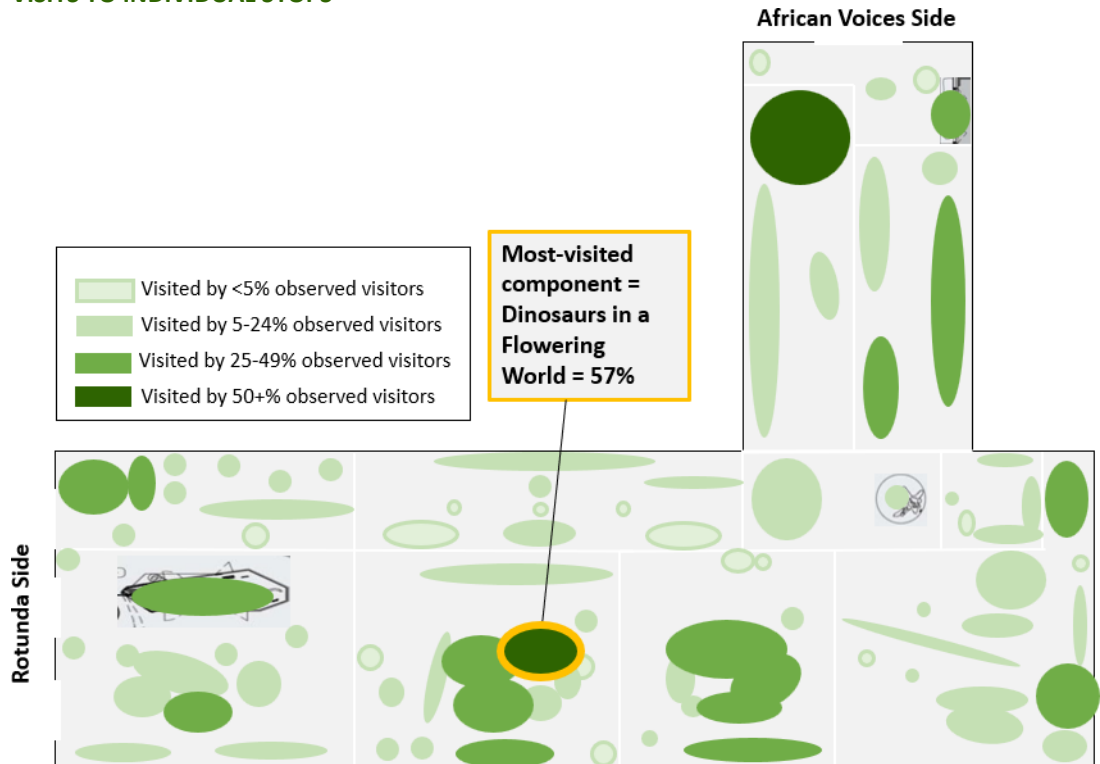
COMPONENTS WITH THE HIGHEST DWELL TIMES

Overall time spent at individual components in Deep Time is low—only 13 percent of components have median dwell times of 40 seconds or more. The 11 stops with the highest median dwell times (all 40 seconds or more) are listed below. Notice that dwell time (or engagement) does not always correlate to the number of stops (i.e., attraction). For instance, the Age of Humans Movie has the highest median dwell time (1 minute 21 seconds) but the percent of visitors who stopped there is low (11 percent).

TIME SPENT BY STOP

Stops with Highest Median Dwell Time	% of Observed Visitors Stopped	Median Time (min:sec)
28. Age of Humans Movie	11	1:21
30. Central Benches	14	1:12
27. Love.Protect.Act Interactive	5	1:01
31. Day the World Changed Video	14	0:59
23. Overlook Rotunda (P/N)	2	0:59
32. Asteroid Extinction Wall	12	0:53
78. Fossil Basecamp Back Wall	23	0:52
22. Deer, Mummified Remains, Moa Area	24	0:44
72. Your Body Through Time	18	0:43
37. Dinosaurs in a Flowering World	57	0:41
59. P/T Extinction Video	25	0:41

TIME SPENT AT INDIVIDUAL STOPS

From the heat map below, you will notice:

- ♦ **In Deep Time, time spent does not always correlate to frequency of stops.** Dinosaurs in a Flowering World and the P/T Extinction Video, for instance, were both among the most-visited stops and the stops with the highest median dwell times (each 41 seconds). By contrast, the Age of Humans Movie was visited infrequently (only 11 percent stopped) but had the highest median dwell time of any stop in Deep Time (1 minute 21 seconds). Several other stops in the Age of Humans + Overlook section also had low visitation but high median dwell times among those who stopped.

- ♦ **Most stops in Deep Time (60 of 83 individual stops) were visited for less than 30 seconds.** This indicates that visitors are passing through Deep Time relatively quickly, making brief stops at many components.

TIME SPENT AT INDIVIDUAL STOPS
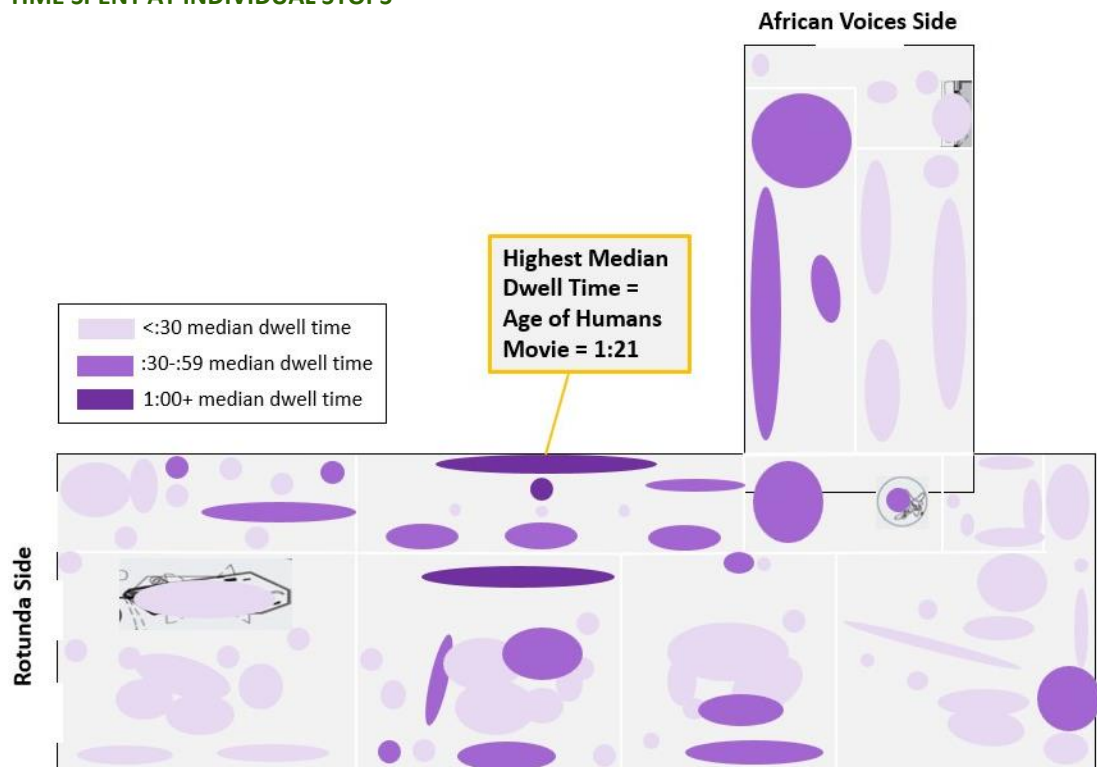
TIME SPENT AND VISITATION BY EXHIBIT TYPE

NMNH designated five exhibit types of interest in Deep Time: 1) Scientist exhibits, 2) Evolution exhibits, 3) Age of Humans exhibits, 4) Extinction Walls, and 5) Dioramas. Overall, two exhibit types—Evolution exhibits and Scientist exhibits—had high median dwell times (1:48 and 2:03, respectively) and high visitation (76 percent and 83 percent, respectively). The following pages present a detailed look at visitors' use of exhibit types of interest. Exhibit types are presented in order from most time spent to least time spent.

TIME SPENT AND STOPS BY EXHIBIT TYPE

Exhibit Type	Median Time (min: sec)	% of Observed Visitors Stopped
Scientist exhibits	2:03	83
Evolution exhibits	1:48	76
Age of Humans exhibits	0:47	47
Extinction Walls	0:32	33
Dioramas	0:26	40

SCIENTIST EXHIBITS

NMNH designated seventeen Scientist exhibits in Deep Time, which comprise a mix of videos, object-based exhibits with reader rails, digital interactives, and more. Each scientist exhibit in some way features an NMNH scientist at work; for instance, a scientist in the field (e.g., photomurals showing scientists in the PETM/Global Heat Wave Nook or footage of scientists in the field in the Day the World Changed Video), a scientist explaining how they use evidence to draw conclusions (e.g., the How Do We Know? text featuring Sabrina Schultz on one of the Deer, Mummified Remains, Moa Area reader rails), or even scientists working in the lab (e.g., FossiLab). Scientist exhibits are scattered throughout Deep Time (versus being confined to one section of the exhibition).

As noted earlier, visitation and engagement (dwell time) to Scientist exhibits was high compared to other exhibit types (83 percent of observed visitors stopped at a Scientist exhibit and the median time spent at Scientist exhibits is 2 minutes 3 seconds). Among those who stopped, the median number of Scientists exhibits visited was 3 (out of seventeen possible Scientist exhibits). The Age of Humans Movie had the highest median dwell time of any Scientist exhibit and any component in the exhibition overall (1 minute 21 seconds). This makes sense, given it is a film (which are usually popular components) and is in the center of the exhibition; however, considering the entire Age of Humans Movie is 25 minutes long comprised of five, 5-minute films, the median dwell time is perhaps lower than anticipated. Only 22 percent of those who stopped at the Age of Humans Movie watched more than one film (whether partially or in its entirety).

Two variables have a statistical relationship to Scientist exhibit visitation:

- **Exit by Side:** Visitors who exited Deep Time on the African Voices Side were more likely to stop at a Scientist exhibit than those who exited on the Rotunda Side.

- **FossiLab Status:** Visitors visiting when FossiLab was open (with scientist working inside) were more likely to stop at a Scientist exhibit than those visiting when FossiLab was closed (with no scientists working inside).

TIME SPENT AND VISITATION AT SCIENTIST EXHIBITS

Scientist exhibit	Median Time (min:sec)	% of Observed Visitors Stopped
28. Age of Humans Movie	1:21	11
31. Day the World Changed Video	0:59	14
78. Fossil Basecamp Back Wall	0:52	23
22. Deer, Mummified Remains, Moa Area	0:44	24
59. P/T Extinction Video	0:41	25
80. FossiLab	0:36	52
79. How Does the Earth Work? (Carbon Cycle Video)	0:35	5
45. Polar Forest Nook	0:32	3
18. Ice Core Video	0:31	11
64. Tree Corner	0:29	8
15. PETM/Global Heat Wave Nook	0:25	4
16. Life Changes as Earth Changes	0:25	25
36. Last American Dinosaurs	0:24	33
58. A Riot of Evolution	0:22	17
70. Coal Mine Video[12]	0:21	6
10. Cold Ocean, Plentiful Food	0:17	11

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[12] Keep in mind that the Coal Mine Video was down or unavailable during 69 percent of observations (with no working audio, video, or both), which may help explain the low dwell time and visitation.

EVOLUTION EXHIBITS

NMNH designated twenty-one Evolution exhibits in Deep Time, which comprise a mix of films, object-based exhibits with reader rails, digital interactives, and more. Each evolution exhibit in some way features information about evolution; for instance, a digital interactive on how life evolved from Deep Time to today (on the Overlook Rotunda side), a panel detailing how some species reproduce in the thousands and millions to increase their chances of survival (Playing the Numbers), or the tree of life diagram (the What is Life? Panel at From a Single Species). Evolution exhibits are scattered throughout Deep Time (versus being confined to one section of the exhibition).
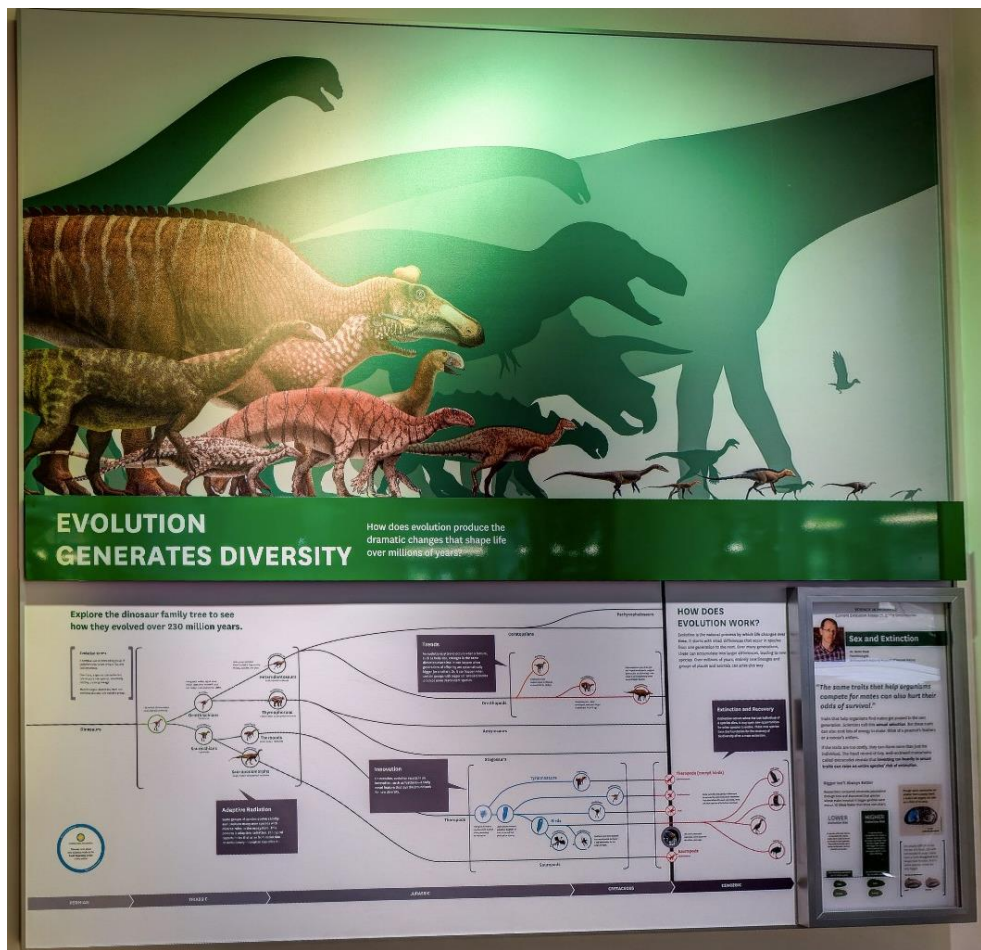
Visitation and engagement (dwell time) to Evolution exhibits was high compared to other exhibit types (76 percent of observed visitors stopped at an Evolution exhibit and the median time spent at Evolution exhibits is 1 minutes 48 seconds). Among those who stopped, the median number of Evolution exhibits visited was 3 (out of twenty-one possible Evolution exhibits). Among Evolution exhibits, some have high attraction but low dwell time; for instance, It's Not Easy to Live on Land was among the most-visited components in the exhibition (36 percent stopped and the majority of those who stopped viewed the tetrapod model) but the median dwell time was only 20 seconds. Others have low attraction, but a high dwell time among those who do stop; for instance, only 14 percent stopped at the Day the World Changed Video, but it had a median dwell time of 59 seconds, among the highest in the exhibition.

One variable has a statistical relationship to Evolution exhibit visitation:

♦ **Exit by Side:** Visitors who exited Deep Time on the African Voices Side were more likely to stop at an Evolution exhibit than those who exited on the Rotunda Side.

TIME SPENT AND VISITATION AT EVOLUTION EXHIBITS

Evolution exhibit	Median Time (min:sec)	% of Observed Visitors Stopped
31. Day the World Changed Video	0:59	14
23. Overlook Rotunda (P/N)[13]	0:59	2
32. Asteroid Extinction Wall	0:53	12
78. Fossil Basecamp Back Wall	0:52	23
72. Your Body Through Time	0:43	18
25. Overlook Back (Jurassic)	0:37	2
29. From Today to 600 MYA Wall	0:31	6
11. Dense Forests Open Up	0:29	25
64. Tree Corner	0:29	8
77. The Long Beginning Video	0:28	9
67. Ecosystems/Flourishing Corner	0:26	26
44. Dinosaurs Take to the Air	0:26	21
6. Rainforests Spread Across the Globe	0:26	11
58. A Riot of Evolution	0:22	17
74. It's Not Easy to Live on Land	0:20	36
76. From a Single Species	0:17	26
55. P/T Extinction Wall	0:17	14
10. Cold Ocean, Plentiful Food	0:17	11
71. Coal Mine Specimens	0:14	12
75. Life Ventures onto Land	0:11	15
66. Playing the Numbers	0:07	4

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[13]Keep in mind that the touchscreen at the Overlook Rotunda (P/N) stop was down or unavailable during 56 percent of observations, which may help explain the low visitation.

AGE OF HUMANS EXHIBITS

NMNH designated nine Age of Humans exhibits in Deep Time, most of which are longer films, short videos, or digital interactives. Each Age of Humans exhibit in some way features stories and information about how humans impact the planet today; for instance, a nook featuring panels, graphs, and a video comparing global heat wave changes millions of years ago to human-caused carbon dioxide and temperature changes today (PETM/Global Heat Wave Nook); a series of 5-minute films sharing real stories of how humans are helping to mitigate climate change (Age of Humans Movie), a digital interactive that shows visitors how they can take steps to protect things they love (Love.Protect.Act. Interactive). Several Age of Humans exhibits are spread throughout Deep Time, while three (Age of Humans Movie, Love.Protect.Act. Interactive, and the From Deep Time to Today Pillars) are concentrated in the Age of Humans + Overlook section.

Visitation to Age of Humans exhibits was moderate compared to other exhibit types (47 percent of observed visitors stopped at an Age of Humans exhibit), but engagement was relatively low (the median time spent at Age of Humans exhibits is only 47 seconds). As noted earlier, the Age of Humans Movie had the highest median dwell time of any component in the exhibition at 1 minute 21 seconds (though this is perhaps lower than expected given that the Age of Humans Movie is 25-minutes long). Among the other Age of Humans exhibits, circumstances vary. Some had low attraction, but high dwell time among those who do stop (like the Love.Protect.Act interactive, which had a median dwell time of 1 minute 1 second but only 5 percent stopped); others had moderate engagement and attraction (like the P/T Extinction Video, which had a median dwell time of 41 seconds and 25 percent stopped); and still others had low attraction and dwell times (like the From Deep Time to Tomorrow Pillars, which had a median dwell time of 24 seconds and only 3 percent stopped).

One variable has a statistical relationship to Age of Humans exhibit visitation:

- ◆ **Entrance by Side:** Visitors who entered Deep Time via any of the doors on the Rotunda Side were more likely to stop at an Age of Humans exhibit than those who entered on the African Voices Side.

TIME SPENT AND VISITATION AT AGE OF HUMANS EXHIBITS

Age of Humans exhibit	Median Time (min:sec)	% of Observed Visitors Stopped
28. Age of Humans Movie	1:21	11
27. Love.Protect.Act Interactive	1:01	5
59. P/T Extinction Video	0:41	25
79. How Does the Earth Work? (Carbon Cycle Video)	0:35	5
45. Polar Forest Nook	0:32	3
18. Ice Core Video	0:31	11
15. PETM Global Heat Wave Nook	0:25	4
26. From Deep Time to Tomorrow Pillars	0:24	3
70. Coal Mine Video[14]	0:21	7

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[14] Keep in mind that the Coal Mine Video was down or unavailable during 69 percent of observations (with no working audio, video, or both), which may help explain the low dwell time and visitation.

EXTINCTION WALLS

There are four Extinction Walls scattered throughout Deep Time. Most Extinction Walls detail a mass extinction event in the Earth's history (i.e., the P/T Extinction Wall shows life before and after the Permian-Triassic extinction, the Asteroid Extinction Wall details the resulting mass extinction after an asteroid struck the Earth 66 million years ago, and the Mass Extinction in the Making Wall shows how human-caused climate change is causing a mass extinction today). One wall—From Today to 600 MYA Wall—shows a timeline and results from all six major mass extinctions in the Earth's history. Extinction Walls are scattered throughout Deep Time corresponding to the "backwards in time" path, with the more recent mass extinction events located close to the Rotunda Side and the older ones located closer to the African Voices side.

Visitation and engagement (dwell time) at Extinction Walls was low compared to other exhibit types (33 percent of observed visitors stopped at an Extinction Wall and the median time spent at Extinction Walls was only 32 seconds). A couple of factors might explain this. First, all the Extinction Walls are located close to a popular film or video. The Age of Humans Movie, which was the most engaging exhibition component (with the highest median dwell time of all stops) is just a few feet away from the Mass Extinction in the Making and the From Today to 600 MYA Walls; the Day the World Changed Video is right next to the Asteroid Extinction Wall; and, the P/T Extinction Video is steps from the P/T Extinction Wall. It is possible the videos proved more attractive than the walls and, because they show similar topics, visitors might not have felt a need to stop at the walls. Additionally, two of the Extinction Walls—Mass Extinction in the Making and From 600 MYA to Today—are located on ramps leading into and out of the Age of Humans + Overlook section; it is possible that visitors did not feel comfortable stopping to spend time looking at the walls because doing so could have meant crowding a throughway.

No variables have a statistical relationship to Extinction Wall visitation.

TIME SPENT AND VISITATION AT EXTINCTION WALLS

Extinction Wall	Median Time (min:sec)	% of Observed Visitors Stopped
32. Asteroid Extinction Wall	0:53	12
19. Mass Extinction in the Making Wall	0:32	14
29. From Today to 600 MYA Wall	0:31	6
55. P/T Extinction Wall	0:17	14

DIORAMAS

There are nine Dioramas scattered throughout Deep Time. Each diorama features a realistic scene of what a specific ecosystem looked like at a significant time and location in the past; for instance, grasslands near Harrison Formation in Nebraska around 19 million years ago; floodplains near Hell Creek Formation in Montana around 67 to 66 million years ago; and rainforests near Willwood Formation in Wyoming around 56 to 53 million years ago. Notably, each Diorama is two-sided, allowing visitors to see through the glass into the scene from either side and potentially talk to each other while standing on opposite sides of the diorama. Dioramas are scattered throughout Deep Time corresponding to the "backwards in time" path, with the more recent scenes located close to the Rotunda Side and the older scenes located closer to the African Voices side.

Visitation and engagement (dwell time) at Dioramas was low compared to other exhibit types (40 percent of observed visitors stopped at a Diorama and the median time spent at Dioramas was only 26 seconds). Among those who stopped, the median number of Dioramas visited was 2 (out of nine possible Dioramas). Visitors who stopped at Dioramas were often observed conversing or reading aloud with another visitor (between 36 and 64 percent of those who stopped did so, depending on the Diorama) and pointing or beckoning (between 13 and 28 percent of those who stopped, depending on the Diorama). This is positive and a sign of high engagement, since when visitors talk and point at an exhibit, they are often asking questions or sharing with one another what they find interesting about the exhibit. However, very few who stopped at a Diorama conversed with someone standing on the *opposite side* of the Diorama (between 0 and 8 percent of those who stopped at a Diorama did so, depending on the Diorama). This indicates that visitors who conversed at Dioramas likely did so with someone in their visit group (who was standing next to them) versus with someone from another group (who might have been standing opposite them on the other side of the Diorama).

Two variables have a statistical relationship to Diorama visitation:

- ♦ **Entrance by Side:** Visitors who entered Deep Time on the Rotunda Side were more likely to stop at a Diorama than those who entered on the African Voices Side.

- ♦ **Group Composition:** Visitors who visited Deep Time in groups of Adults and Kids and Adult-only Groups are more likely to stop at a Diorama than Adults visiting alone or those visiting in Kids-only Groups.

TIME SPENT AND VISITATION AT DIORAMAS

Diorama	Median Time (min:sec)	% of Observed Visitors Stopped
50. Diorama: Giant Shadows	0:21	11
60. Diorama: Before Big Herbivores	0:21	6
57. Diorama: Conifers/Ferns	0:17	6
38. Diorama: Floodplains	0:15	11
69. Diorama: Swamp Spread/Tropics Dry	0:15	11
17. Diorama: A Time of Warmth	0:15	8
5. Diorama: Grasslands	0:13	11
21. Diorama: A Time of Ice	0:13	7
7. Diorama: Rainforests	0:12	9

BEHAVIORS

During observations, RK&A was looking for several behaviors in the exhibition. We have indicated what we consider the most salient data points on behavior on the following pages, but please see the Appendix for the prevalence of all behaviors by stop.[15]

GENERAL BEHAVIORS

RK&A recorded instances of four general behaviors in Deep Time: conversation/reading aloud, pointing/beckoning, photography, and interacting with a staff member or volunteer.

♦ **Point/beckon:** 51 percent of observed visitors pointed something out to another visitor or beckoned another visitor to come see something at least once in Deep Time. At most, visitors pointed or beckoned at twenty-four stops. Visitors who pointed or beckoned did so most often at Diorama: Giant Shadows and Dinosaurs in a Flowering World (28 percent and 25 percent of those who stopped, respectively). The latter is perhaps not surprising since Dinosaurs in a Flowering World has the T.rex specimen and was also the most-visited stop in Deep Time.

♦ **Conversation and Reading Aloud:** 70 percent of observed visitors conversed with another person at least once while in Deep Time.[16] At most, visitors talked to one another or read aloud at 41 of the 83 stops. Visitors who conversed or read aloud did so most often at Dinosaurs Share the World with Mammals (83 percent of those who stopped)[17]; Diorama: Big Life Before Herbivores (64 percent of those who stopped); Diorama: Giant Shadows (53 percent of those who stopped); and Dense Forests Open Up (51 percent of those who stopped).

♦ **Photography:** 38 percent of observed visitors took at least one photo in Deep Time. Visitors who took photos did so at between one and twenty-five stops: 25 percent at Dinosaurs in a Flowering World; 14 percent at Giant Dinosaurs Living Large; and 9 percent at the American Mastodon. All three of these stops have signature large specimens: the T.rex and the Triceratops, the Brachiosaurus and Diplodocus, and the American Mastodon.

♦ **Interacting with staff or volunteers:** Deep Time was not staffed during the observation period due to the COVID-19 pandemic. Consequently, no observed visitors interacted with an NMNH staff member or volunteer while in Deep Time.

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[15] See the Stop and Behavior Guide in Appendix C for definitions of behaviors.

[16] Keep in mind that 79 percent of observed visitors were visiting Deep Time in a social group of adults and/or adults and kids so we can infer most visitors in social groups conversed.

[17] Keep in mind that only 6 observed visitors stopped at Dinosaurs Share the World with Mammals, so among the 344 observed visitors to Deep Time it is still relatively few who conversed at this stop.

Group composition and FossiLab status have a statistical relationship to general behaviors in Deep Time:

♦ **Group composition:** Visitors who visited in Adult-only Groups or Groups of Adults and Kids are more likely to point/beckon and converse/read aloud while in Deep Time than visitors who were in Kids-only Groups or Adults visiting alone.

♦ **FossiLab status:** Visitors who visited Deep Time when FossiLab was open (with scientists working inside) were more likely to point/beckon than those who visited when FossiLab was closed (no scientists working inside).

STATISTICAL DIFFERENCES IN BEHAVIORS BY GROUP COMPOSITION

Behavior	% of Observed Visitors by Group Composition			
	Adult Alone	Adult-only Group	Adults and Kids Group	Kids-only Group
Point/beckon	2	60	67	36
Converse/read aloud	5	86	88	70

STATISTICAL DIFFERENCES IN BEHAVIOR BY FOSSILAB STATUS

Behavior	% of Observed Visitors by FossiLab Status	
	Open	Closed
Point/beckon	56	41

EXHIBIT INTERACTIVITY

RK&A recorded instances of three interactive behaviors with exhibits in Deep Time: looking at labels (including any interpretive text on large labels, reader rails, and wall text), looking at specimens (large and small), and touching bronzes.

♦ **Looking at labels:** Most observed visitors looked at one of the labels in Deep Time (79 percent[18]). Visitors who looked at labels did so at between 1 and 33 stops; the median number of stops at which labels were used is 4. When we consider the median number of total stops is 11, observations reveal that labels were used just over one-third of the time.

♦ **Looking at specimens:** Most observed visitors looked at one of the specimens in Deep Time (92 percent). Visitors who looked at specimens did so at between 1 and 28 stops; the median number of stops at which specimens were used is 6. When we consider the median number of total stops is 11, observations reveal that specimens were used just over one-half of the time.

♦ **Touching bronzes:** Less than one-third of observed visitors touched one of the bronzes that are scattered throughout the exhibition (28 percent). Visitors who did so touched between 1 and 5 bronzes; the median number of bronzes touched is 1. When we consider that there were 28 bronzes available, observations reveal that bronzes were touched only 4 percent of the time.

Group composition has a statistical relationship to exhibit interactive behaviors in Deep Time:

♦ **Group composition:** Visitors who visited in Groups of Adults and Kids and Kids-only Groups are more likely to touch bronzes while in Deep Time than visitors who were in Adult-only Groups or Adults visiting alone.

STATISTICAL DIFFERENCES IN BEHAVIORS BY GROUP COMPOSITION

Behavior	% of Observed Visitors by Group Composition			
	Adult Alone	Adult-only Group	Adults and Kids Group	Kids-only Group
Touch bronzes	11	24	43	36

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[18] Keep in mind that this includes large labels, reader rails, and Extinction Walls (which are essentially very large labels), but not smaller labels or those embedded in object cases, which are extremely difficult to reliably track. So, this data represents a close approximation of frequency of looking at labels in Deep Time; actual percentages may be higher.

LOOKING AT TIME INDICATORS

Unlike other fossil halls, the exhibits in Deep Time go *backwards* in time (when entering from the Rotunda Side). Because this is atypical for fossil halls and museum exhibitions in general, NMNH included various "time indicators" throughout Deep Time: 1) Time Maps and 2) Labels with Swizzle Sticks 3) Navigating Deep Time labels. At first glance, **Time Maps** look like standard exhibition maps, except they show visitors both *where* they are in the exhibition and *when* they are in time; all Time Maps begin with either the phrase "Travel Back in Time" or "Travel Forward in Time," depending on the map's position in Deep Time. **Labels with Swizzle Sticks** have tall poles (the Swizzle Stick) in different colors that display the time period that the surrounding exhibits and specimens correspond to (e.g., 2.6 billion to 359 million years ago); because they are so tall, they are visible from further away than a Time Map, which must be read up close. **Navigating Deep Time labels** show how the exhibition is organized by Earth's time periods. RK&A recorded instances of visitors looking at Time Maps, Labels with Swizzle Sticks, and Navigating Deep Time labels in Deep Time.

A Time Map (top left), Label with Swizzle Stick (top right), and a Navigating Deep Time label (bottom)

Use of time indicators was low overall. Most observed visitors to Deep Time <u>did not look</u> at any of the time indicators—the Time Maps, Labels with Swizzle Sticks, and Navigating Deep Time labels— while in the exhibition (67 percent). Most of those who looked at a time indicator looked at only one available time indicator, some looked at two, and just a few looked at all three available time indicators (78 percent, 20 percent, and 3 percent of those who looked, respectively). The most commonly used time indicators were Labels with Swizzle Sticks (28 percent of those who looked at a time indicator), followed by Time Maps and Navigating Deep Time labels.

There were no statistical relationships to looking at time indicators in Deep Time.

LOOKING AT TIME INDICATORS

Behavior	% of Observed Visitors
Does not look at time indicator	67
Looks at time indicator	33

# of Time Indicators Used	% of Observed Visitors who looked at Time Indicators
1 time indicator	78
2 time indicators	20
3 time indicators	2

Time Indicator Used	% of Observed Visitors who looked at Time Indicators
Label with Swizzle Stick	28
Time Map	21
Navigating Deep Time label	13

APPENDICES

APPENDIX A: TIMING AND TRACKING FORM AND OBSERVATION DATA

The naming of galleries on the form that follows are descriptive in nature to aid data collectors in collecting data accurately and reliably.

DEEP TIME - T&T OBSERVATION FORM   Data collector initials: _____   ID #: _____

ENTRANCE: ☐ Rotunda Sloth ☐ Rotunda Central ☐ Rotunda Marine Wall ☐ African Voices

ROTUNDA CENTRAL/MARINE AREA

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
1	Rotunda Intro Labels				☐ Look Journey Through DT ☐ Look Navigating DT ☐ Look World Updates	☐ PB ☐ Converse/RA
2	American Mastodon				☐ Look label ☐ Look specimen	☐ PB ☐ Converse/RA
3	The Success of Grass				☐ Look label ☐ Look specimens	☐ PB ☐ Converse/RA
4	Browsing, Grazing, Moving in Herds				☐ Look label ☐ Look specimens ☐ Look reader rail Touch ☐ Poop ☐ Molars	☐ PB ☐ Converse/RA
5	Diorama: Grasslands				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
6	Rainforests Spread Across the Globe				☐ Look Rainforests Spread ☐ Look Taking Advantage ☐ Touch snake ☐ Use/watch tree periscope	☐ PB ☐ Converse/RA
7	Diorama: Lush Rainforests				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
8	The Not-So-Distant Past				☐ Look label ☐ Look specimens	☐ PB ☐ Converse/RA
9	Mammals Take to the Sea				☐ Look specimens/label ☐ Look reader rail	☐ PB ☐ Converse/RA
10	Cold Ocean, Plentiful Food				☐ Look Cold Ocean label ☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA
11	Dense Forests Open Up				☐ Look specimens ☐ Look reader rail(s)	☐ PB ☐ Converse/RA

ROTUNDA SLOTH AREA

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
12	Giant Sloth				☐ Look label	☐ PB ☐ Converse/RA
13	Ice Age Humans: Predators & Prey				☐ Look label ☐ Look Bronze Statues ☐ Touch Bronze Statues	☐ PB ☐ Converse/RA
14	No Species Can Live on its Own				☐ Look label ☐ Look specimen ☐ Touch saber tooth	☐ PB ☐ Converse/RA
15	PETM/Global Heat Wave Nook				☐ Look ☐ Past ☐ Today ☐ Mur ☐ Touch jaws ☐ Watch film	☐ PB ☐ Converse/RA
16	Life Changes as Earth Changes				☐ Look label ☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA
17	Diorama: A Time of Warmth				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side

Look Time Map (TALLY)	Interact w/ Volunteer/Staff (STOP #)	Take Photo (STOP #)

#							PB / Converse
18	Ice Core Video	🟩					☐ PB ☐ Converse/RA
19	Mass Extinction in the Making Wall					☐ Look Humans Change label ☐ Look wall (stairs side) ☐ Look wall (ramp side)	☐ PB ☐ Converse/RA
20	Life Near the Glacier's Edge					☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA
21	Diorama: A Time of Ice					☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
22	Deer, Mummified Remains, Moa Area					☐ Look label ☐ Look specimen(s) ☐ Look reader rail	☐ PB ☐ Converse/RA

AOH/OVERLOOK

#							PB / Converse
23	Overlook Rotunda (P/N)					☐ Use translucent oval ☐ Touch leaf ☐ Use/watch use console	☐ PB ☐ Converse/RA
24	Overlook Central (Cretaceous)					☐ Use translucent oval(s) Touch ☐ Lizard ☐ Triceratops ☐ Use/watch use console	☐ PB ☐ Converse/RA
25	Overlook Back (Jurassic)					☐ Use periscope ☐ Touch Camosaurus ☐ Use/watch use console	☐ PB ☐ Converse/RA
26	From Deep Time to Tomorrow Pillars					☐ Look Agriculture (L) ☐ Look Trade (C) ☐ Look We're Changing (C) ☐ Look Energy (R)	☐ PB ☐ Converse/RA
27	Love. Protect. Act. Interactive					☐ Look tall (attract) screen ☐ Use/watch use interactive	☐ PB ☐ Converse/RA
28	Age of Humans Movie	🟩				☐ Look label(s) ☐ Watch multiple films	☐ PB ☐ Converse/RA
29	From Today to 600 MYA Wall					☐ Look Highlights label ☐ Look wall	☐ PB ☐ Converse/RA

CENTER AREA

#							PB / Converse
30	Central Benches					☐ Touch statue	☐ PB ☐ Converse/RA
31	Day the World Changed Video	🟩					☐ PB ☐ Converse/RA
32	Asteroid Extinction Wall					☐ Look Death From label ☐ Look reader rail ☐ Look wall	☐ PB ☐ Converse/RA
33	Ancient Lakes and Woodlands					☐ Look label ☐ Look specimens	☐ PB ☐ Converse/RA
34	Putting the Rain in Rainforests						☐ PB ☐ Converse/RA
35	Mammals After Mass Extinction					☐ Look label ☐ Look specimens ☐ Touch mammals	☐ PB ☐ Converse/RA
36	Last American Dinosaurs					☐ Look specimens ☐ Look reader rail(s) ☐ Touch carnivore traces	☐ PB ☐ Converse/RA

Look Time Map (TALLY)	Interact w/ Volunteer/Staff (STOP #)	Take Photo (STOP #)

#	Stop				Behaviors	PB	Converse
37	Dinosaurs in a Flowering World				❑ Look label ❑ Look specimens ❑ Look reader rail ❑ Touch neck bone	❑ PB	❑ Converse/RA
38	Diorama: Floodplains				❑ Look through both sides	❑ PB	❑ Converse/RA ❑ Converse other side
39	Life Flourishes				■	❑ PB	❑ Converse/RA
40	Flowering Plants: A Wild Success				❑ Look label ❑ Look specimens ❑ Look reader rail	❑ PB	❑ Converse/RA
41	Dinosaur Diversity Peaks				❑ Look specimens ❑ Look reader rail ❑ Use/watch use interactive	❑ PB	❑ Converse/RA
42	Giant Sea Predators/New Weapons?				❑ Look label(s) ❑ Look specimens ❑ Look reader rail(s)	❑ PB	❑ Converse/RA
43	Chalk it Up / Origins of Oil				❑ Look Chalk It Up label ❑ Look Origins of Oil label	❑ PB	❑ Converse/RA
44	Dinosaurs Take to the Air				❑ Look specimens ❑ Look reader rail ❑ Look mechanical model (up) ❑ Use/watch use interactive	❑ PB	❑ Converse/RA

BACK CENTER AREA

#	Stop				Behaviors	PB	Converse
45	Polar Forest Nook				Look ❑ Past ❑ Pres ❑ Fut ❑ Look photomural ❑ Touch tree trunk	❑ PB	❑ Converse/RA
46	The Fossils in FF				■	❑ PB	❑ Converse/RA
47	Dinosaurs Share the World w/ Mammals				❑ Look label ❑ Touch jaw	❑ PB	❑ Converse/RA
48	Many Types of Mammals				❑ Look label ❑ Look specimens ❑ Touch mammals	❑ PB	❑ Converse/RA
49	Evolving Together				❑ Look specimens ❑ Look reader rail ❑ Use/watch use interactive	❑ PB	❑ Converse/RA
50	Diorama: Giant Shadows				❑ Look through both sides	❑ PB	❑ Converse/RA ❑ Converse other side
51	Giant Dinosaurs Living Large				❑ Look label ❑ Look specimens ❑ Look reader rail ❑ Touch humerus	❑ PB	❑ Converse/RA
52	Born Small, Grow Fast				❑ Look specimens ❑ Look reader rail(s)	❑ PB	❑ Converse/RA
53	Spikes vs. Claws				❑ Look specimens ❑ Look reader rail Touch ❑ Spike ❑ Tooth	❑ PB	❑ Converse/RA
54	Life in the High Seas Area				❑ Look label ❑ Look specimens ❑ Look reader rail(s) ❑ Use/watch use Fossil Secrets ❑ Use/watch use Teleost Jaw	❑ PB	❑ Converse/RA

Look Time Map (TALLY)	Interact w/ Volunteer/Staff (STOP #)	Take Photo (STOP #)

BACK WALL AREA

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
55	P/T Extinction Wall				☐ Look Worst Ext. label ☐ Look wall (BIG BEFORE) ☐ Look wall (BIG AFTER) ☐ Touch wall bronze(s)	☐ PB ☐ Converse/RA
56	Survivors				☐ Look label ☐ Touch survivors	☐ PB ☐ Converse/RA
57	Diorama: Conifers / Ferns				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
58	A Riot of Evolution				☐ Look label ☐ Look specimens ☐ Look reader rail(s)	☐ PB ☐ Converse/RA
59	P/T Extinction Video				☐ Watch video ☐ Look Before reef ☐ Look After reef	☐ PB ☐ Converse/RA
60	Diorama: Life Before Big Herbivores				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
61	Rise of the Herbivores/Large Plant Eaters Gain Advantage				☐ Look label ☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA
62	Permian Back Wall				☐ Look Perfect Preservation ☐ Look Sharks/Fishes	☐ PB ☐ Converse/RA
63	Ocean Renaissance				☐ Look label ☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA
64	Tree Corner				☐ Look Technicolor label ☐ Look Diversity Tree label	☐ PB ☐ Converse/RA
65	Energy for Life / An Eat or Be Eaten World / Rivers with Sharks				☐ Look specimens ☐ Look reader rail ☐ Use/watch use interactive	☐ PB ☐ Converse/RA
66	Playing the Numbers				☐ Touch snail shells	☐ PB ☐ Converse/RA
67	Ecosystem/Flourishing Corner				☐ Look mural/bubble labels ☐ Look reader rail(s) ☐ Touch giant millipede	☐ PB ☐ Converse/RA

COAL AREA

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
68	Carboniferous Introduction					☐ PB ☐ Converse/RA
69	Diorama: Swamp Spread/Tropics Dry				☐ Look through both sides	☐ PB ☐ Converse/RA ☐ Converse other side
70	Coal Mine Video				☐ Look label ☐ Watch video	☐ PB ☐ Converse/RA
71	Coal Mine Specimens				☐ Look specimens ☐ Look reader rail	☐ PB ☐ Converse/RA

Look Time Map (TALLY)	Interact w/ Volunteer/Staff (STOP #)	Take Photo (STOP #)

YOUR BODY THROUGH TIME

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
72	Your Body Through Time				Look label ❑ main ❑ mirror Video ❑ Watch ❑ Select ❑ Watch someone use mirror	❑ PB ❑ Converse/RA
73	Circular Bench				❑ Look label ❑ Touch tree stump	❑ PB ❑ Converse/RA

EARLY LIFE

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
74	It's Not Easy to Live on Land				❑ Look label(s) ❑ Look specimens ❑ Look tetrapod model	❑ PB ❑ Converse/RA
75	Life Ventures onto Land				❑ Look label ❑ Look land diorama ❑ Look reader rail	❑ PB ❑ Converse/RA
76	From a Single Species				❑ Look label ❑ Look reef diorama ❑ Look reader rail ❑ Look tree diagram ❑ Touch reef model	❑ PB ❑ Converse/RA
77	The Long Beginning Video				❑ Look label ❑ Look specimens ❑ Watch video	❑ PB ❑ Converse/RA

FOSSIL BASECAMP/FOSSILAB

	Component	Start Time	Stop Time	Total	Components Used	Social Behaviors
78	Fossil Basecamp Back Wall				❑ Visit ❑ one area ❑ multiple ❑ Look specimen(s) Touch ❑ Shells ❑ Rock Layer ❑ Trilobite ❑ Use/watch use EIA Interactive ❑ Use/watch use Fossil Interact.	❑ PB ❑ Converse/RA
79	How Does the Earth Work?				❑ Look label(s) ❑ Watch Carbon Cycle video	❑ PB ❑ Converse/RA
80	FossiLab				❑ Look sign ❑ Watch monitor	❑ PB ❑ Converse/RA

INTRODUCTION AFRICAN VOICES

	Component	Start Time	Stop Time	Total	Components Used	Behaviors
81	Stegosaurus Puzzle				❑ Look label(s) ❑ Look specimen	❑ PB ❑ Converse/RA
82	Giant Redwood				❑ Look label ❑ Look specimen	❑ PB ❑ Converse/RA
83	African Voices Intro Labels				❑ Look Journey Through DT ❑ Look Navigating DT	❑ PB ❑ Converse/RA

EXIT: ❑ Rotunda Sloth ❑ Rotunda Central ❑ Rotunda Marine Wall ❑ African Voices

End time:_____   **= Total time (sec):**_____

Look Time Map (TALLY)	Interact w/ Volunteer/Staff (STOP #)	Take Photo (STOP #)

VISITOR BACKGROUND

Approximate Age: 11 – 14 / 15 – 17 / 18-<u>24 /</u> 25-34 / 35-44 / 45-54 / 55-64 / 65+

Group composition: Adult <u>Alone /</u> Adult-Only Group / Adults and Kids / Kids only

If there are children in group (other than the person observed), approximate ages: 0-5 <u>/ 6</u>-10 / 11-14 / 15-17

OTHER VARIABLES

Day: <u>Weekend /</u> Weekday   **End Time:** 10am -12 pm / 12-3pm / 3-5:30pm   **Date:**_____

Crowding: <u>Light /</u> Moderate / Crowded   **FossiLab:** Open (scientists working inside) / Closed (no scientists working inside)

Any broken/unavailable components?: Yes / No
Describe (include stop #s):

Any staffed activities (e.g., carts) happening?: Yes / No
Describe (include stop #s):

Other Notes:

DEEP TIME - **T&T OBSERVATION FORM**

ENTRANCE: Rotunda Sloth: n = 32, 9%   Rotunda Central: n = 217, 63%

Rotunda Marine Wall: n = 9, 3%   African Voices: n = 86, 25%

ROTUNDA CENTRAL/MARINE AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
1	Rotunda Intro Labels	n = 39, 11%	Median = 0:18 Min = 0:03 Max = 3:28	Look Journey Through DT: n = 13, 33% Look Navigating DT: n = 27, 69% Look World Update: n = 2, 5%	Point/beckon: n = 7, 18% Converse/Read aloud: n = 12, 31%
2	American Mastodon	n = 159, 46%	Median = 0:17 Min = 0:03 Max = 1:22	Look label: n = 55, 35% Look specimen: n = 155, 98%	Point/beckon: n = 24, 15% Converse/Read aloud: n = 58, 37%
3	The Success of Grass	n = 27, 8%	Median = 0:17 Min = 0:04 Max = 0:55	Look label: n = 11, 41% Look specimens: n = 26, 96%	Point/beckon: n = 6, 22% Converse/Read aloud: n = 8, 30%
4	Browsing, Grazing, Moving in Herds	n = 83, 24%	Median = 0:22 Min = 0:02 Max = 2:24	Look label: n = 7, 8% Look specimens: n = 81, 98% Look reader rail: n = 40, 48% Touch Poop: n = 4, 5% Touch Molars: n = 4, 5%	Point/beckon: n = 14, 17% Converse/Read aloud: n = 27, 33%
5	Diorama: Grasslands	n = 37, 11%	Median = 0:13 Min= 0:04 Max= 1:25	Look through both sides: n = 4, 11%	Point/beckon: n = 8, 22% Converse/Read aloud: n = 16, 43% Converse other side: n = 1, 3%
6	Rainforests Spread Across the Globe	n = 37, 11%	Median = 0:26 Min = 0:26 Max = 2:56	Look Rainforests Spread: n = 29, 78% ==Look Taking Advantage==: n = 30, 81% Touch snake: n = 3, 8% Use/watch tree periscope: n = 9, 24%	Point/beckon: n = 6, 16% Converse/Read aloud: n = 18, 49%
7	Diorama: Lush Rainforests	n = 31, 9%	Median = 0:12 Min = 0:04 Max = 1:16	Look through both sides: n = 3, 10%	Point/beckon: n = 5, 16% Converse/Read aloud: n = 11, 36% Converse other side: n = 1, 3%
8	The Not-So-Distant Past	n = 56, 16%	Median = 0:18 Min = 0:03 Max = 1:23	Look label: n = 24, 43% Look specimens: n = 55, 98%	Point/beckon: n = 11, 20% Converse/Read aloud: n = 25, 45%
9	Mammals Take to the Sea	n = 63, 18%	Median = 0:19	Look specimens/label: n = 61, 97%	Point/beckon: n = 7, 11%

			Min = 0:03 Max = 2:07	Look reader rail: n = 45, 71%	Converse/Read aloud: n = 22, 35%
10	Cold Ocean, Plentiful Food	n = 38, 11%	Median = 0:17 Min = 0:03 Max = 3:31	Look Cold Ocean label: n = 8, 21% Look specimens: n = 37, 97% Look reader rail: n = 26, 68%	Point/beckon: n = 7, 18% Converse/Read aloud: n = 12, 32%
11	Dense Forests Open Up	n = 87, 25%	Median = 0:29 Min = 0:04 Max = 3:57	Look specimens: n = 85, 98% Look reader rail(s): n = 62, 71%	Point/beckon: n = 19, 22% Converse/Read aloud: n = 44, 51%

ROTUNDA SLOTH AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
12	Giant Sloth	n = 87, 25%	Median = 0:23 Min = 0:03 Max = 1:46	Look label: n = 30, 35%	Point/beckon: n = 13, 15% Converse/Read aloud: n = 38, 44%
13	Ice Age Humans: Predators & Prey	n = 28, 8%	Median = 0:13 Min = 0:03 Max = 1:05	Look label: n = 17, 61% Look Bronze Statues: n = 27, 96% Touch Bronze Statues: n = 2, 7%	Point/beckon: n = 3, 11% Converse/Read aloud: n = 8, 29%
14	No Species Can Live on its Own	n = 44, 13%	Median = 0:16 Min = 0:04 Max = 1:04	Look label: n = 27, 63% Look specimen: n = 42, 98% Touch saber tooth: n = 2, 5%	Point/beckon: n = 9, 21% Converse/Read aloud: n = 18, 42%
15	PETM/Global Heat Wave Nook	n = 12, 4%	Median = 0:25 Min = 0:06 Max = 4:44	Look Past: n = 8, 67% Look Today: n = 4, 33% Look Mur (mural): n = 3, 25% Touch jaws: n = 0, 0% Watch film: n = 3, 25%	Point/beckon: n = 1, 8% Converse/Read aloud: n = 6, 50%
16	Life Changes as Earth Changes	n = 87, 25%	Median = 0:25 Min = 0:01 Max: 2:16	Look label: n = 21, 24% Look specimens: n = 87, 100% Look reader rail: n = 51, 59%	Point/beckon: n = 15, 17% Converse/Read aloud: n = 37, 43%
17	Diorama: A Time of Warmth	n = 27, 8%	Median = 0:15 Min = 0:04 Max = 1:06	Look through both sides: n = 4, 15%	Point/beckon: n = 4, 15% Converse/Read aloud: n = 13, 48% Converse other side: n = 1, 4%
18	Ice Core Video	n = 38, 11%	Median = 0:31 Min = 0:04 Max = 4:39	■■■■■■	Point/beckon: n = 0, 0% Converse/Read aloud: n = 5, 13%
19	Mass Extinction in the Making Wall	n = 47, 14%	Median = 0:32 Min = 0:04	Look Humans Change label: n = 12, 26%	Point/beckon: n = 9, 19% Converse/Read aloud: n = 18, 38%

			Max = 3:03	Look wall (stairs side): n = 33, 70% Look wall (ramp side) n = 17, 36%	
20	Life Near the Glacier's Edge	n = 83, 24%	Median = 0:26 Min = 0:04 Max: 1:40	Look specimens: n = 83, 100% Look reader rail: n = 53, 64%	Point/beckon: n = 12, 15% Converse/Read aloud: n = 31, 37%
21	Diorama: A Time of Ice	n = 24, 7%	Median = 0:12 Min = 0:04 Max = 1:00	Look through both sides: n = 5, 21%	Point/beckon: n = 3, 13% Converse/Read aloud: n = 11, 46% Converse other side: n = 2, 8%
22	Deer, Mummified Remains, Moa Area	n = 83, 24%	Median = 0:44 Min = 0:06 Max = 3:03	Look label: n = 19, 23% Look specimen(s): n = 83, 100% Look reader rail: n = 60, 72%	Point/beckon: n = 20, 24% Converse/Read aloud: n = 38, 46%

AOH/OVERLOOK

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
23	Overlook Rotunda (P/N)	n = 8, 2%	Median = 0:59 Min = 0:09 Max = 4:23	Use translucent oval: n = 2, 25% Touch leaf: n = 0, 0% Use/watch use console: n = 6, 75%	Point/beckon: n = 1, 13% Converse/Read aloud: n = 4, 50%
24	Overlook Central (Cretaceous)	n = 23, 7%	Median = 0:36 Min = 0:03 Max = 3:39	Use translucent oval(s): n = 3, 14% Touch Lizard: n = 3, 14% Touch Triceratops: n = 2, 9% Use/watch use console: n = 18, 82%	Point/beckon: n = 4, 18% Converse/Read aloud: n = 10, 46%
25	Overlook Back (Jurassic)	n = 8, 2%	Median = 0:37 Min = 0:14 Max = 7:03	Use periscope: n = 4, 50% Touch Camosaurus: n = 0, 0% Use/watch use console: n = 4, 50%	Point/beckon: n = 0, 0% Converse/Read aloud: n = 4, 50%
26	From Deep Time to Tomorrow Pillars	n = 9, 3%	Median = 0:24 Min = 0:03 Max = 1:03	Look Agriculture (L): n = 3, 33% Look Trade (C): n = 4, 44% Look We're Changing (C): n = 2, 22% Look Energy (R): n = 2, 22%	Point/beckon: n = 1, 11% Converse/Read aloud: n = 1, 11%
27	Love. Protect. Act. Interactive	n = 18, 5%	Median = 1:01 Min = 0:07 Max = 3:05	Look tall (attract) screen: n = 4, 22% Use/watch use interactive: 17, 94%	Point/beckon: n = 4, 22% Converse/Read aloud: n = 7, 39%
28	Age of Humans Movie	n = 37, 11%	Median = 1:21	Look label(s): n = 7, 19%	Point/beckon: n = 3, 8%

			Min = 0:05 Max = 25:21	Watch multiple films: n = 8, 22%	Converse/Read aloud: n = 8, 22%
29	From Today to 600 MYA Wall	n = 20, 6%	Median = 0:31 Min = 0:10 Max = 3:29	Look Highlights label: n = 7, 35% Look wall: n = 20, 100%	Point/beckon: n = 3, 15% Converse/Read aloud: n = 6, 30%

CENTER AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
30	Central Benches	n = 48, 14%	Median = 1:12 Min = 0:04 Max = 16:44	Touch statue: 10, 21%	Point/beckon: n = 6, 13% Converse/Read aloud: n = 20, 43%
31	Day the World Changed Video	n = 49, 14%	Median = 0:59 Min = 0:05 Max = 4:07		Point/beckon: n = 2, 4% Converse/Read aloud: n = 5, 10%
32	Asteroid Extinction Wall	n = 41, 12%	Median = 0:53 Min = 0:05 Max = 9:02	Look Death From label: n = 14, 34% Look reader rail: n = 30, 73% Look wall: n = 39, 95%	Point/beckon: n = 5, 12% Converse/Read aloud: n = 11, 27%
33	Ancient Lakes and Woodlands	n = 42, 12%	Median = 0:25 Min = 0:04 Max = 1:26	Look label: n = 13, 31% Look specimens: n = 41, 12%	Point/beckon: n = 7, 17% Converse/Read aloud: n = 15, 36%
34	Putting the Rain in Rainforests	n = 10, 3%	Median = 0:19 Min = 0:03 Max = 0:50		Point/beckon: n = 0, 0% Converse/Read aloud: n = 3, 30%
35	Mammals After Mass Extinction	n = 17, 5%	Median = 0:22 Min = 0:05 Max = 0:54	Look label: n = 14, 82% Look specimens: n = 17, 100% Touch mammals: n =.2, 12%	Point/beckon: n = 1, 6% Converse/Read aloud: n = 6, 35%
36	Last American Dinosaurs	n = 113, 33%	Median = 0:24 Min = 0:03 Max = 4:40	Look specimens: n = 113, 100% Look reader rail(s): n = 64, 57% Touch carnivore traces: n = 4, 4%	Point/beckon: n = 24, 21% Converse/Read aloud: n = 51, 45%
37	Dinosaurs in a Flowering World	n = 197, 57%	Median = 0:41 Min = 0:03 Max = 4:32	Look label: n = 20, 10% Look specimens: n = 196, 99% Look reader rail: n = 93, 47% Touch neck bone: n = 11, 6%	Point/beckon: n = 49, 25% Converse/Read aloud: n = 96, 49%
38	Diorama: Floodplains	n = 37, 11%	Median = 0:15 Min = 0:01	Look through both sides: n = 7, 18%	Point/beckon: n = 8, 21% Converse/Read aloud: n = 17, 45%

			Max = 1:12		Converse other side: n = 0, 0%
39	Life Flourishes	n = 6, 2%	Median = 0:14 Min = 0:03 Max = 0:44	███████	Point/beckon: n = 1, 17% Converse/Read aloud: n = 2, 33%
40	Flowering Plants: A Wild Success	n = 30, 9%	Median = 0:12 Min = 0:04 Max = 1:46	Look label: n = 1, 3% Look specimens: n = 29, 97% Look reader rail: n = 16, 53%	Point/beckon: n = 3, 10% Converse/Read aloud: n = 9, 30%
41	Dinosaur Diversity Peaks	n = 98, 29%	Median = 0:26 Min = 0:05 Max = 7:59	Look specimens: n = 97, 99% Look reader rail: n = 55, 56% Use/watch use interactive: n = 10, 10%	Point/beckon: n = 17, 17% Converse/Read aloud: n = 37, 38%
42	Giant Sea Predators/New Weapons?	n = 88, 26%	Median = 0:31 Min = 0:04 Max = 4:34	Look label(s): n = 10, 11% Look specimens: n = 86, 98% Look reader rail(s): n = 50, 57%	Point/beckon: n = 11, 13% Converse/Read aloud: n = 25, 28%
43	Chalk it Up / Origins of Oil	n = 12, 4%	Median = 0:25 Min = 0:03 Max = 1:58	Look Chalk It Up label: n = 5, 42% Look Origins of Oil label: n = 8, 67%	Point/beckon: n = 0, 0% Converse/Read aloud: n = 1, 8%
44	Dinosaurs Take to the Air	n = 72, 21%	Median = 0:26 Min = 0:04 Max = 3:45	Look specimens: n = 45, 63% Look reader rail: n = 28, 39% Look mechanical model (up): n = 57, 79% Use/watch use interactive: n = 17, 24%	Point/beckon: n = 11, 15% Converse/Read aloud: n = 29, 40%

BACK CENTER AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
45	Polar Forest Nook	n = 10, 3%	Median = 0:32 Min = 0:11 Max = 3:06	Look Past: n = 6, 60% Look Present: n = 5, 50% Look Future: n = 5, 50% Look photomural: n = 5, 50% Touch tree trunk: n = 1, 10%	Point/beckon: n = 2, 20% Converse/Read aloud: n = 4, 40%
46	The Fossils in FF	n = 8, 2%	Median = 0:13 Min = 0:03 Max = 0:53	███████	Point/beckon: n = 0, 0% Converse/Read aloud: n = 2, 25%
47	Dinosaurs Share the World w/ Mammals	n = 6, 2%	Median = 0:14 Min = 0:08 Max = 0:25	Look label: n = 5, 83% Touch jaw: n = 0, 0%	Point/beckon: n = 2, 33% Converse/Read aloud: n = 5, 83%
48	Many Types of Mammals	n = 29, 8%	Median = 0:14	Look label: n = 13, 45% Look specimens: n = 24, 83%	Point/beckon: n = 4, 14%

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
				Min = 0:03 Max = 2:08	Touch mammals: n = 11, 38%	Converse/Read aloud: n = 14, 48%
49	Evolving Together	n = 55, 16%	Median = 0:19 Min = 0:04 Max = 2:10	Look specimens: n = 45, 82% Look reader rail: n = 32, 58% Use/watch use interactive: n = 8, 15%	Point/beckon: n = 7, 13% Converse/Read aloud: n = 16, 29%
50	Diorama: Giant Shadows	n = 39, 11%	Median = 0:21 Min = 0:04 Max = 1:11	Look through both sides: n = 10, 25%	Point/beckon: n = 11, 28% Converse/Read aloud: n = 21, 53% Converse other side: n = 2, 5%
51	Giant Dinosaurs Living Large	n = 152, 44%	Median = 0:23 Min = 0:03 Max = 3:07	Look label: n = 16, 11% Look specimens: n = 149, 98% Look reader rail: n = 54, 36% Touch humerus: n = 22, 15%	Point/beckon: n = 31, 20% Converse/Read aloud: n = 60, 40%
52	Born Small, Grow Fast	n = 91, 37%	Median = 0:29 Min = 0:03 Max = 3:18	Look specimens: n = 90, 99% Look reader rail(s): n = 47, 52%	Point/beckon: n = 19, 21% Converse/Read aloud: n = 40, 44%
53	Spikes vs. Claws	n = 116, 34%	Median = 0:31 Min = 0:04 Max = 11:16	Look specimens: n = 116, 100% Look reader rail: n = 58, 50% Touch Spike: n = 9, 8% Touch Tooth: n = 4, 3%	Point/beckon: n = 24, 21% Converse/Read aloud: n = 54, 47%
54	Life in the High Seas Area	n = 97, 28%	Median = 0:34 Min = 0:05 Max = 4:38	Look label: n = 9, 9% Look specimens: n= 94, 97% Look reader rail(s): n = 64, 66% Use/watch use Fossil Secrets: n = 17, 18% Use/watch use Teleost Jaw: n = 23, 24%	Point/beckon: n = 13, 13% Converse/Read aloud: n = 41, 42%

BACK WALL AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
55	P/T Extinction Wall	n = 48, 14%	Median = 0:19 Min = 0:03 Max = 1:37	Look Worst Ext. label: n = 18, 38% Look wall (BIG BEFORE): n = 30, 63% Look wall (BIG AFTER): n = 24, 50% Touch wall bronze(s): 1, 2%	Point/beckon: n = 3, 6% Converse/Read aloud: n = 16, 33%
56	Survivors	n = 10, 3%	Median = 0:19 Min = 0:04 Max = 0:41	Look label: n = 8, 80% Touch survivors: n = 2, 20%	Point/beckon: n = 1, 10% Converse/Read aloud: n = 3, 30%

#	Location	n	Time	Behaviors (look)	Behaviors (social)
57	Diorama: Conifers / Ferns	n = 21, 6%	Median = 0:17 Min = 0:06 Max = 1:19	Look through both sides: n = 6, 29%	Point/beckon: n = 4, 19% Converse/Read aloud: n = 10, 48% Converse other side: n = 0, 0%
58	A Riot of Evolution	n = 60, 17%	Median = 0:22 Min = 0:02 Max = 1:40	Look label: n = 2, 3% Look specimens: n = 57, 95% Look reader rail(s): n = 34, 57%	Point/beckon: n = 6, 10% Converse/Read aloud: n = 19, 32%
59	P/T Extinction Video	n = 86, 25%	Median = 0:41 Min = 0:05 Max = 5:03	Watch video: n = 66, 77% Look Before reef: n = 29, 34% Look After reef: n = 35, 41%	Point/beckon: n = 5, 6% Converse/Read aloud: n = 23, 27%
60	Diorama: Life Before Big Herbivores	n = 22, 6%	Median = 0:21 Min = 0:03 Max = 2:08	Look through both sides: n = 7, 32%	Point/beckon: n = 5, 23% Converse/Read aloud: n = 14, 64% Converse other side: n = 1, 5%
61	Rise of the Herbivores/Large Plant Eaters Gain Advantage	n = 47, 14%	Median = 0:14 Min = 0:03 Max = 2:01	Look label: n = 4, 9% Look specimens: n = 46, 98% Look reader rail: n = 21, 45%	Point/beckon: n = 1, 2% Converse/Read aloud: n = 7, 15%
62	Permian Back Wall	n = 17, 5%	Median = 0:15 Min = 0:04 Max = 1:29	Look Perfect Preservation: n = 14, 82% Look Sharks/Fishes: n = 9, 53%	Point/beckon: n = 2, 12% Converse/Read aloud: n = 7, 12%
63	Ocean Renaissance	n = 36, 11%	Median = 0:18 Min = 0:04 Max = 3:08	Look label: n = 1, 3% Look specimens: n = 35, 97% Look reader rail: n = 18, 50%	Point/beckon: n = 3, 8% Converse/Read aloud: n = 10, 28%
64	Tree Corner	n = 27, 8%	Median = 0:29 Min = 0:03 Max = 2:11	Look Technicolor label: n = 21, 78% Look Diversity Tree label: n = 16, 59%	Point/beckon: n = 1, 4% Converse/Read aloud: n = 11, 41%
65	Energy for Life / An Eat or Be Eaten World / Rivers with Sharks	n = 84, 24%	Median = 0:25 Min = 0:04 Max = 5:15	Look specimens: n = 84, 100% Look reader rail: n = 42, 50% Use/watch use interactive: n = 10, 12%	Point/beckon: n = 19, 23% Converse/Read aloud: n = 39, 46%
66	Playing the Numbers	n = 12, 4%	Median = 0:07 Min = 0:03 Max = 0:14	Touch snail shells: n = 0, 0%	Point/beckon: n = 1, 8% Converse/Read aloud: n = 2, 17%
67	Ecosystem/Flourishing Corner	n = 89, 26%	Median = 0:26	Look mural/bubble labels: n = 48, 54%	Point/beckon: n = 16, 18%

			Min = 0:06 Max = 4:04	Look reader rail(s): n = 84, 94% Touch giant millipede: n = 21, 24%	Converse/Read aloud: n = 37, 42%

COAL AREA

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
68	Carboniferous Introduction	n = 0,0%	Median = 0:00 Min = 0:00 Max = 0:00	████████	Point/beckon: n = 0, 0% Converse/ Read aloud: n = 0, 0%
69	Diorama: Swamp Spread/Tropics Dry	n = 38, 11%	Median = 0:15 Min = 0:03 Max = 1:14	Look through both sides: n = 4, 11%	Point/beckon: n = 5, 13% Converse/ Read aloud: n = 16, 42% Converse other side: n = 0, 0%
70	Coal Mine Video	n = 22, 6%	Median = 0:21 Min = 0:08 Max = 2:20	Look label: n = 5, 23% Watch video: n = 14, 64%	Point/beckon: n = 1, 5% Converse/Read aloud: n = 5, 23%
71	Coal Mine Specimens	n = 41, 12%	Median = 0:14 Min = 0:05 Max = 1:24	Look specimens: 41, 98% Look reader rail: 12, 29%	Point/beckon: n = 0, 0% Converse/Read aloud: n = 8, 19%

YOUR BODY THROUGH TIME

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
72	Your Body Through Time	n = 63, 18%	Median = 0:43 Min = 0:03 Max = 12:05	Look label main: n = 16, 25% Look label mirror: n = 7, 11% Watch video: n = 60, 17% Select video: n = 7, 11% Watch someone use mirror: n = 5, 8%	Point/beckon: n = 7, 11% Converse/Read aloud: n = 20, 32%
73	Circular Bench	n = 36, 11%	Median = 0:32 Min = 0:04 Max = 4:40	Look label: n = 14, 39% Touch tree stump: n = 8, 22%	Point/beckon: n = 4, 11% Converse/Read aloud: n = 12, 33%

EARLY LIFE

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
74	It's Not Easy to Live on Land	n = 125, 36%	Median = 0:20 Min = 0:03 Max = 1:56	Look label(s): n = 28, 22% Look specimens: n = 83, 66% Look tetrapod model: n = 106, 85%	Point/beckon: n = 21, 17% Converse/Read aloud: n = 58, 46%
75	Life Ventures onto Land	n = 52, 15%	Median = 0:11 Min = 0:03 Max = 2:04	Look label: n = 11, 21% Look land diorama: n = 38, 72% Look reader rail: n = 41, 77%	Point/beckon: n = 6, 11% Converse/Read aloud: n = 12, 22%
76	From a Single Species	n = 89, 26%	Median = 0:17 Min = 0:02 Max = 5:25	Look label: n = 9, 10% Look reef diorama: n = 77, 87% Look reader rail: n = 63, 71% Look tree diagram: n = 10, 11% Touch reef model: n = 7, 8%	Point/beckon: n = 14, 16% Converse/Read aloud: n = 35, 39%
77	The Long Beginning Video	n = 30, 9%	Median = 0:28 Min = 0:04 Max = 4:32	Look label: n = 0, 0% Look specimens: n = 7, 23% Watch video: n = 25, 83%	Point/beckon: n = 1, 3% Converse/Read aloud: n = 9, 30%

FOSSIL BASECAMP/FOSSILAB

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
78	Fossil Basecamp Back Wall	n = 79, 23%	Median = 0:52 Min = 0:07 Max = 13:50	Visit one area: n = 25, 32% Visit multiple areas: n = 51, 65% Look specimen(s): n = 64, 81% Touch Shells: n = 4, 5% Touch Rock Layer: n = 7, 9% Touch Trilobite: n = 2, 3% Use/watch use EIA Interactive: n = 17, 22% Use/watch use Fossil Interact: n = 16, 20%	Point/beckon: n = 12, 15% Converse/Read aloud: n = 36, 46%
79	How Does the Earth Work?	n = 17, 5%	Median = 0:35 Min = 0:08 Max = 4:56	Look label(s): n = 7, 41% Watch Carbon Cycle video: n = 17, 100%	Point/beckon: n = 1, 6% Converse/Read aloud: n = 2, 12%
80	FossiLab	n = 178, 52%	Median = 0:36 Min = 0:03 Max = 7:10	Look sign : n = 94, 53% Watch monitor: n = 69, 39%	Point/beckon: n = 23, 13% Converse/Read aloud: n = 72, 40%

INTRODUCTION AFRICAN VOICES

	Component	Number (n) and % stopped	Time (mins : secs)	Components Used: Number to use component, % stopped to use component	Social Behaviors: Number to do Behavior, % stopped to do behavior
81	Stegosaurus Puzzle	n = 113, 33%	Median = 0:15 Min = 0:03 Max = 2:46	Look label(s): n = 43, 13% Look specimen: n = 110, 97%	Point/beckon: n = 15, 13% Converse/Read aloud: n = 37, 33%
82	Giant Redwood	n = 34, 10%	Median = 0:17 Min = 0:05 Max = 2:09	Look label n = 13, 38% Look specimen: n = 32, 94%	Point/beckon: n = 6, 18% Converse/Read aloud: n = 11, 32%
83	African Voices Intro Labels	n = 10, 3%	Median = 0:07 Min = 0:03 Max = 4:36	Look Journey Through DT: n = 6, 60% Look Navigating DT: n = 5, 50%	Point/beckon: n = 0, 0% Converse/Read aloud: n = 0, 0%

EXIT: Rotunda Sloth: n = 49, 14%   Rotunda Central: n = 117, 34%
Rotunda Marine Wall: n = 21, 6%   African Voices: n = 157, 46%

APPENDIX B: STOP MAP

Below is a map indicating the 83 designated stops in Deep Time.

DEEP TIME STOPS

African Voices Side

Rotunda Side
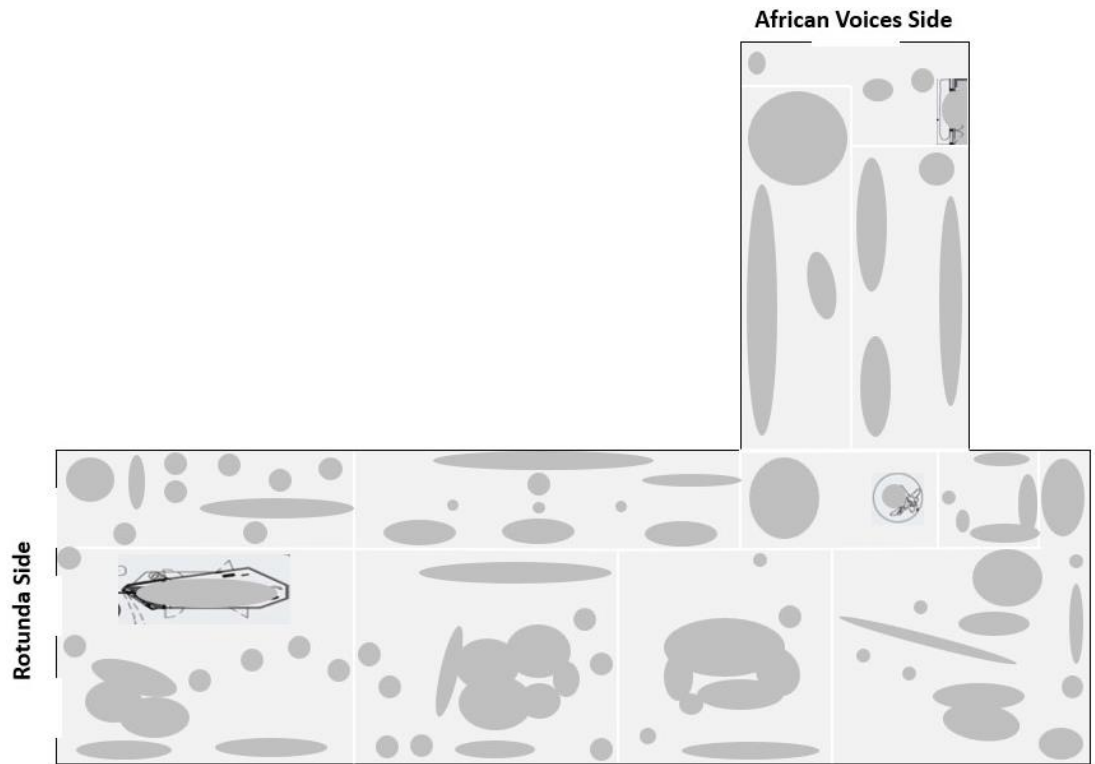
APPENDIX C: STOP AND BEHAVIOR GUIDE

This form defines behaviors that were tracked during timing and tracking observations (e.g., what does Converse/Read Aloud mean?) and categorizes stops in the exhibition by exhibit type (e.g., Scientist exhibits). RK&A used this form to code stops and run frequencies and statistics for behaviors and exhibit type visitation.

Component and Behavior Definitions (applies to all stops)	
Components Used	**Visual examples of components**
Look specimen(s) = Look at the specimen(s) behind glass, for any amount of time. This includes both specimens in large, glass object cases (e.g., 37. Mammals Take to the Sea) and larger specimens behind the glass in pod area (e.g., 2. American Mastodon). Does not include specimens embedded in reader rails (for that, check Look readers rail behavior).	
Look label(s) = Look at text panels that are mounted on a wall or pillar (including swizzle stick pillars), for any amount of time.	
Look reader rail(s) = Look at horizontal, waist height panel(s), for any amount of time. Includes reader rails that are text-only, reader rails with embedded specimens, and reader rails with embedded mechanical interactives.	
Use/watch use interactive = Touch screen to do any part of the interactive activity on screen (some or all) OR watch someone else use the interactive on screen (i.e., the visitor is not touching the screen themselves but someone they are standing next to is and	

the visitor is watching what is happening on the screen)		
Touch = Touch a bronze tactile or designated real fossil (e.g., the bronze human statues, the sauropod humerus)		
Use translucent oval(s) = Look through a translucent oval located on the Overlook, for any amount of time. Adult visitors may lean over to do so.		
Look Time Map = Look at one of the Travel Through Time map signs placed throughout the exhibition, for any amount of time. This includes the large maps located at the exhibition entrances/exits and the smaller map signs located throughout the exhibition. Does not include paper handheld maps.		
Interact with Volunteer/Staff = Interact with an NMNH volunteer or staff member while in the exhibition, for any amount of time. Would only include FossiLab if there is a direct conversation between the observed visitor and staff in FossiLab (i.e., does not include the FossiLab staff smiling at a visitor).	N/A	

Look through both sides = Look through both sides of a Diorama (i.e., a 360 interaction→ looks through one side, walks around to other side to look through). Note that looking through one side is implicit when they stop (we wouldn't mark them as stopping at the diorama unless they do this).	

Behaviors	
PB (Point / beckon) = Point out an object or part of stop to someone in their group or to beckon a group member to join them at a stop	**N/A**
Converse / RA (Converse/read aloud = Talk within their group at a stop or read aloud content to someone in your group. Note: this is sometimes difficult to tell with masks on, so pay attention to body language.	**N/A**
Converse other side = While visiting a Diorama stop, converse with someone who is immediately on the other side of the diorama	**N/A**

Stops by Exhibit Type

Dioramas
  5. Diorama: Grasslands
  7. Diorama: Rainforests
  17. Diorama: A Time of Warmth
  21. Diorama: A Time of Ice
  38. Diorama: Floodplains
  50. Diorama: Giant Shadows
  57. Diorama: Conifers/Ferns
  60. Diorama: Before Big Herbivores
  69. Diorama: Swamp Spread/Tropics Dry

Extinction Walls
  19. Mass Extinction in the Making Wall
  29. From Today to 600 MYA Wall
  32. Asteroid Extinction Wall
  55. P/T Extinction Wall

Age of Humans Exhibits
  15. PETM/Global Heat Wave Nook

*Please note the colors serve as an internal guide only, so RK&A can code each stop according to their exhibit type in analysis (after the data has been collected). Data collectors will use a black and white form.

18. Ice Core Video
26. From Deep Time to Tomorrow Pillars
27. Love. Protect. Act. Interactive
28. Age of Humans Movie
45. Polar Forest Nook
59. P/T Extinction Video
70. Coal Mine Video
79. How Does the Earth Work? (Carbon Cycle Video)

Evolution Exhibits (specific part of the exhibit that is related to evolution highlighted in yellow)

6. Rainforests Spread Across the Globe → Taking Advantage panel
10. Cold Ocean, Plentiful Food → reader rail
11. Dense Forests Open Up → reader rail
23. Overlook Rotunda (P/N) → console
25. Overlook Back (Jurassic) → console
29. From Today to 600 MYA Wall
31. Day the World Changed Video
32. Asteroid Extinction Wall
44. Dinosaurs Take to the Air → interactive
55. P/T Extinction Wall
58. A Riot of Evolution
64. Tree Corner → Diversity Tree panel
66. Playing the Numbers
67. Ecosystem/Flourishing Corner → reader rail
71. Coal Mine Specimens
72. Your Body Through Time
74. It's Not Easy to Live on Land
75. Life Ventures onto Land
76. From a Single Species
77. The Long Beginning Video
78. Fossil Basecamp Back Wall → interactive

Scientist Exhibits – (specific part of the exhibit that features a scientist is highlighted in green)

10. Cold Ocean, Plentiful Food → Cold Ocean Label (How Do We Know? Featuring Brian Huber quote/pic)
15. PETM/Global Heat Wave Nook → photomural (Scott Wing)
16. Life Change as Earth Changes → reader rail (Science in Progress, Jessica Blois)
18. Ice Core Video
20. Life Near the Glacier's Edge → reader rail (Science in Progress, S. Kathleen Lyons)
22. Deer, Mummified Remains, Moa Area → reader rail (How Do We Know?, Sabrina Schultz)
28. Age of Humans Movie
31. Day the World Changed Video
36. Last American Dinosaurs → reader rail (Science in Progress, Matthew Carrano)

45. Polar Forest Nook → photomural (Johnny Issaluk) 58. A Riot of Evolution → reader rail on the right (Science in Progress, Susana Magallon) 59. P/T Extinction Video → video 64. Tree Corner → Diversity Tree Label (Science in Progress, Gene Hunt) 70. Coal Mine Video → video 78. Fossil Basecamp Back Wall → all four areas, 3 have photos and quotes of scientists (Gene Hunt, Erin DiMaggio, Kay Behrensmeyer) 79. How Does the Earth Work? → label (on the left side has photo and quote from scientist, Katherine Maher) 80. FossiLab	
Stops with a Swizzle Stick (a going backwards in time indicator) 4. Browsing, Grazing, Moving in Herds 16. Life Changes as Earth Changes 37. Dinosaurs in a Flowering World 51. Giant Dinosaurs Living Large 58. A Riot of Evolution 61. Rise of the Herbivores/Large Plant Eaters Gain an Advantage 68. Carboniferous Introduction 75. Life Ventures onto Land 76. From a Single Species	

APPENDIX D: STOPS AND TIME SPENT AT INDIVIDUAL STOPS

Below is a list of stops on the second floor in order from most- to least-visited as compared to the median dwell time for each stop.

STOPS AND MEDIAN DWELL TIMES

Stop ID & Name	% of Observed Visitors Stopped	Median Dwell Time (min:sec)
37. Dinosaurs in a Flowering World	57	0:41
80. FossiLab	52	0:36
2. American Mastodon	46	0:17
51. Giant Dinosaurs Living Large	44	0:23
52. Born Small, Grow Fast	37	0:29
74. It's Not Easy to Live on Land	36	0:20
53. Spikes vs. Claws	34	0:31
36. Last American Dinosaurs	33	0:24
81. Stegosaurus Puzzle	33	0:15
41. Dinosaur Diversity Peaks	29	0:26
54. Life in the High Seas Area	28	0:34
42. Giant Sea Predators/New Weapons?	26	0:31
67. Ecosystem/Flourishing Corner	26	0:26
76. From a Single Species	26	0:17
59. P/T Extinction Video	25	0:41
11. Dense Forests Open Up	25	0:29
16. Life Changes as Earth Changes	25	0:25
12. Giant Sloth	25	0:23
22. Deer, Mummified Remains, Moa Area	24	0:44
20. Life Near the Glacier's Edge	24	0:26
65. Energy for Life/ An Eat or Be Eaten World/ Rivers with Sharks	24	0:25
4. Browsing, Grazing, Moving in Herds	24	0:22
78. Fossil Basecamp Back Wall	23	0:52
44. Dinosaurs take to the Air	21	0:26
72. Your Body Through Time	18	0:43
9. Mammals Take to the Sea	18	0:19
58. A Riot of Evolution	17	0:22
49. Evolving Together	16	0:19
8. The Not-So-Distant Past	16	0:18
75. Life Ventures onto Land	15	0:11
30. Central Benches	14	1:12
31. Day the World Changed Video	14	0:59

Legend:
- High Attraction (% of Stops)
- High Engagement (Median Dwell Time)

19. Mass Extinction in the Making Wall	14	0:32
55. P/T Extinction Wall	14	0:19
61. Rise of the Herbivores/Large Plant Eaters Gain Advantage	14	0:14
14. No Species Can Live on its Own	13	0:16
32. Asteroid Extinction Wall	12	0:53
33. Ancient Lakes and Woodlands	12	0:25
71. Coal Mine Specimens	12	0:14
28. Age of Humans Move	11	1:21
73. Circular Bench	11	0:32
18. Ice Core Video	11	0:31
6. Rainforests Spread Across the Globe	11	0:26
50. Diorama: Giant Shadows	11	0:21
1.Rotunda Intro Labels	11	0:18
63. Ocean Renaissance	11	0:18
10. Cold Ocean, Plentiful Food	11	0:17
38. Diorama: Floodplains	11	0:15
69. Diorama: Swamp Spread/Tropics Dry	11	0:15
5. Diorama: Grasslands	11	0:13
82. Giant Redwood	10	0:17
77. The Long Beginning Video	9	0:28
7. Diorama: Lush Rainforests	9	0:12
40. Flowering Plants: A Wild Success	9	0:12
64. Tree Corner	8	0:29
3. The Success of Grass	8	0:17
17. Diorama: A Time of Warmth	8	0:15
48. Many Types of Mammals	8	0:14
13. Ice Age Humans: Predators & Prey	8	0:13
24. Overlook Central (Cretaceous)	7	0:36
21. Diorama: A Time of Ice	7	0:12
29. From Today to 600 MYA Wall	6	0:31
60. Diorama: Life Before Big Herbivores	6	0:21
70. Coal Mine Video	6	0:21
57. Diorama: Conifers/Ferns	6	0:17
27. Love. Protect. Act. Interactive	5	1:01
79. How Does the Earth Work?	5	0:35
62. Permian Black Wall	5	0:15
35. Mammals After Mass Extinction	5	0:22
43. Chalk It Up/Origins of Oil	4	0:25
15. PETM/Global Heat Wave Nook	4	0:25

66. Playing the Numbers	4	0:07
45. Polar Forest Nook	3	0:32
26. From Deep Time to Tomorrow Pillars	3	0:24
34. Putting the Rain in the Rainforests	3	0:19
56. Survivors	3	0:19
83. African Voices Intro Labels	3	0:07
23. Overlook Rotunda (P/N)	2	0:59
25. Overlook Back (Jurassic)	2	0:37
39. Life Flourishes	2	0:14
47. Dinosaurs Share the World w/Mammals	2	0:14
46. The Fossils in FF	2	0:13
68. Carboniferous Introduction	0	0:00

APPENDIX E: STATISTICAL ANALYSES

Timing and tracking data are quantitative and were analyzed using IBM SPSS Statistics Version 20. Analyses include:

♦ Frequency distributions (e.g., percent of visitors to stop at a component)

♦ Summary statistics (e.g., median time spent at a component)

♦ Inferential statistics to examine the relationship among variables, including:

▪ Cross-tabulations to show the joint frequency distribution of the variables, and the chi-square statistic ($X2$) to test the significance of the relationship.

▪ The Kruskal-Wallis (K-W) test, which is a nonparametric test for differences in the medians of two or more groups.[19]

A 0.01 level of significance (*p*) was employed to preclude findings of little practical significance. When the level of significance is set to $p = 0.01$, any finding that exists at a probability (*p*-value) ≤ 0.01 is "significant." When a finding (such as a relationship between two variables) has a *p*-value of 0.01, there is a 99 percent probability that the finding exists; that is, in 99 out of 100 cases, the finding is correct. Conversely, there is a 1 percent probability that the finding would not exist; in other words, in 1 out of 100 cases, the finding appears by chance.

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[19] The Kruskal-Wallis (K-W) test is a nonparametric statistical method for testing the equality of population medians of two or more groups. Nonparametric statistical methods do not assume that the underlying distribution of a variable is "normal" with a symmetric bell-shape, so they are appropriate for testing variables with asymmetric distributions such as "total time in the exhibition." The K-W test is analogous to a One-way Analysis of Variance, with the scores replaced by their ranks. The K-W test statistic H has approximately a chi-square distribution.

APPENDIX F: DATA COLLECTION CONDITIONS

Below is a table detailing the conditions of the 344 total observations.

DATA COLLECTION CONDITIONS

Day of Week	% of Observations
Weekday	51
Weekend	49

Crowding	% of Observations
Light	45
Moderate	42
Crowded	14

Observation End Time	% of Observations
10am – 12pm	21
12 – 3pm	50
3 – 5:30pm	29

FossiLab Open/Closed	% of Observations
Open (scientists are working inside)	63
Closed (no scientists working inside)	37

Staffed Activities in the Gallery	% of Observations
No	100
Yes	0

APPENDIX G: STATISTICAL RELATIONSHIPS BY SECTION VISITATION

A few variables have a statistical relationship to **section visitation**:

- ♦ **Entrance by Side:**
    - ▪ Visitors who entered via the Rotunda Side were more likely to visit the Rotunda Central/Marine Area and the Center Area.
    - ▪ Visitors who entered via the African Voices Side were more likely to visit the Introduction African Voices Area.

- ♦ **Exit by Side:**
    - ▪ Visitors who exited via African Voices were more likely to stop at the Back Wall Area, the Coal Area, Your Body Through Time, Early Life, Fossil Basecamp/FossiLab, and the Introduction African Voices Area.

- ♦ **Day of the Week:**
    - ▪ Visitors who visited on weekdays were more likely to stop at the Introduction African Voices Area.

- ♦ **Observation End Time:**
    - ▪ Visitors who ended their visit between 10am-12pm were more likely to stop at the Introduction African Voices Area.

STATISTICAL DIFFERENCES IN SECTION VISITATION BY ENTRANCE SIDE

	% of Observed Visitors	
Section	Enter via Rotunda Side	Enter via African Voices Side
Rotunda Central/Marine Area	80	48
Center Area	85	62
Introduction African Voices	34	54

STATISTICAL DIFFERENCES IN SECTION VISITATION BY EXIT SIDE

	% of Observed Visitors	
Section	Exit via Rotunda Side	Exit via African Voices Side
Back Wall Area	42	64
Coal Area	16	29
Your Body Through Time	18	31
Early Life	33	70
Fossil Basecamp/FossiLab	33	84
Introduction African Voices	25	56

STATISTICAL DIFFERENCES IN SECTION VISITATION BY DAY OF WEEK

	% of Observed Visitors	
Section	Weekday	Weekend
Introduction African Voices	49	29

STATISTICAL DIFFERENCES IN SECTION VISITATION BY OBSERVATION END TIME

	% of Observed Visitors		
Section	10am-12pm	12-3pm	3-5:30pm
Introduction African Voices	55	37	31

APPENDIX H: STATISTICAL RELATIONSHIPS BY TIME SPENT BY SECTION

A few additional variables have a statistical relationship to **time spent by section**:

♦ **Entrance by side:** Visitors who entered via the Rotunda side spent more time in the Center Area than those who entered via African Voices.

♦ **Exit by side:** Visitors who exited via the African Voices side spent more time in the Rotunda Sloth Area than those who exited via the Rotunda Side.

♦ **Day of Week:** Visitors who visited on a weekend spent more time in the Back Center Area than those who visited on a weekday.

♦ **Observation End Time:**

▪ Visitors who ended their visit between 3-5:30pm spent more time in the Rotunda Sloth Area than those who ended their visit between 10am-12pm or 12-3pm.

▪ Visitors who ended their visit between 10am-12pm spent more time in the Back Center Area than those who ended their visit between 12-3pm or 3-5:30pm.

STATISTICAL DIFFERENCES IN TIME SPENT IN SECTIONS BY ENTRANCE SIDE

	Median Dwell Time (min:sec)	
Section	Enter via Rotunda Side	Enter via African Voices Side
Center Area	1:40	0:51

STATISTICAL DIFFERENCES IN TIME SPENT IN SECTIONS BY EXIT SIDE

	Median Dwell Time (min:sec)	
Section	Exit via Rotunda Side	Exit via African Voices Side
Rotunda Sloth Area	1:27	2:07

STATISTICAL DIFFERENCES IN TIME SPENT IN SECTIONS BY DAY OF WEEK

	Median Dwell Time (min:sec)	
Section	Weekday	Weekend
Back Center Area	0:55	1:17

STATISTICAL DIFFERENCES IN TIME SPENT IN SECTIONS BY OBSERVATION END TIME

	Median Dwell Time (min:sec)		
Section	10am-12pm	12-3pm	3-5:30pm
Rotunda Sloth Area	1:42	1:19	3:07
Back Center Area	1:29	1:01	0:54

MAIN MESSAGES STUDY: HALL OF FOSSILS - DEEP TIME

Prepared for the
National Museum of Natural History
Washington, D.C.

Main Messages Study: Hall of Fossils - Deep Time
May 2022

Prepared for
National Museum of Natural History
https://naturalhistory.si.edu/
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Recommended citation: RK&A. (2022). *Main Messages Study: Hall of Fossils - Deep Time.*
Unpublished report. Washington, D.C.: National Museum of Natural History.

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TABLE OF CONTENTS

KEY TAKEAWAYS

The Main Messages study of the Hall of Fossils – Deep Time exhibition revealed 5 key takeaways discussed below. Please see the report for all findings presented by the two methodologies: standardized assessment and performance-based assessment.

1. VISITORS ENJOYED THE HALL OF FOSSILS – DEEP TIME EXHIBITION

Visitors responded positively to the Hall of Fossils – Deep Time exhibition. Almost all participants rated the exhibition as "fun" and also indicated they "felt amazed" by the exhibition. Seeing fossils and specimens was the highlight of participants' experiences with the exhibition. This suggests the Hall of Fossils – Deep Time exhibition was successful in stimulating interest among visitors. We and NMNH theorize fossils as a fundamental impact area that leads to development of understanding and building capacity within natural history.

2. THE HALL OF FOSSILS - DEEP TIME BROADENED VISITORS' IDEAS ABOUT FOSSILS BEYOND DINOSAURS

Not surprisingly, dinosaurs were the dominant choice when participants were asked what comes to mind when they think about fossils. Positively though, participants who had experienced the Hall of Fossils – Deep Time were more likely to select other ideas about fossils, such as evidence of past life and Earth's history. Additionally, many (86 percent) agreed that "there was a lot more to learn about fossils than expected".

3. THE HALL OF FOSSILS - DEEP TIME EXPANDED VISITORS' KNOWLEDGE ABOUT MASS EXTINCTIONS AND EVOLUTION

The study showed that visitors to NMNH generally understand evolution and the adaptation of species. Importantly though, the Hall of Fossils – Deep Time expanded participants' knowledge about the evolution of life on earth in two ways. First, participants who experienced the exhibition grew their knowledge about the role of mass extinctions in spurring the greater diversification among surviving species. Second, participants who experienced the exhibition grew their knowledge that evolution is not a directed process leading to the "best" species.

4. THE HALL OF FOSSILS - DEEP TIME HELPED EMPHASIZE THE CONNECTIVITY OF HUMANS AND NATURE, BUT THE STUDY ALSO REVEALED AREAS FOR ADDITIONAL GROWTH

The study showed that visitors to NMNH generally understand they are part of nature, and their actions can affect other life on earth. Notably, the Hall of Fossils – Deep Time expanded participants' knowledge of this connection to include the idea that all life today is descended from a common ancestor that lived billions of years ago. Nevertheless, the study showed there are still opportunities to expand visitors' knowledge. For example, only about one-half of participants recognized that humans and plants have a common ancestor (and visitation to the Hall of Fossils – Deep Time did not affect this understanding).

5. THE STUDY DID NOT SHOW GROWTH IN CAPACITY TO TALK ABOUT COMPLEX SCIENTIFIC SUBJECTS

Per the impact framework, we theorized that understanding the process of scientists and the skills required is requisite for being able to talk about complex scientific topics. We found that the exhibition did not deepen visitors' understandings in these areas. For instance, when asked to describe how scientists would study a fossil, the majority did not describe their work as a process (44 percent of Control and 43 percent of Treatment). Additionally, visitors' main takeaway about a scientists' work is that it is a challenging or hard job (55 percent). Building capacity is typically an area that is difficult to affect in a short and singular experience. So, while it is ultimately a goal for the exhibition, it may be an area that grows only through repeated visitation or experiences.

STUDY BACKGROUND

The Main Messages study is one of four studies that was conducted by RK&A as part of a summative evaluation of the Hall of Fossils – Deep Time exhibition. The study includes two assessments—one standardized and one performance-based—that explored changes in visitors' interest and understanding of science.

ABOUT DEEP TIME MAIN MESSAGES

The Hall of Fossils – Deep Time exhibition explores the big idea that *Earth's distant past is connected to the present and shapes our future.* We explored visitor outcomes per the impact framework shown on the next page

METHODOLOGY

RK&A designed two assessments for the main messages study—1198 standardized assessments and 305 performance-based assessments. Both assessments were administered to a control and treatment group. The control group were recruited at NMNH prior to entering Deep Time. The treatment group was recruited upon exiting Deep Time.

The standardized assessment used select-response questions, like multiple choice and rating scales to assess visitors' perceptions and understandings of main messages (see Appendix A). The performance-based assessment required visitors to choose an image of a fossil to discuss (see Appendix C for images) and then RK&A asked visitors questions about the image to assess outcomes-based skills (see Appendix B). RK&A coded their responses during the interview using a rubric with three performance-based levels (see Appendix D).

RK&A administered both assessments to visitors 11 years of age and older onsite at NMNH. One-half of each sample was collected from visitors before they saw Deep Time (serving as the "pre-test") and the other one-half was collected from visitors as they exited Deep Time (serving as the "post-test"). The assessments were administered interview-style, meaning the evaluator posed questions to the visitor and recorded their responses on an iPad.

Both assessments produced numerical data. The survey results were analyzed statistically using SPSS 20 for Windows. Analyses include:

- ♦ Frequency distributions (e.g., percent of respondents by grade level taught).
- ♦ Summary statistics (e.g., mean ratings).
- ♦ Inferential statistics to examine the relationship among variables, including:
  - ▪ Cross-tabulations show the frequency of response options by group. We conducted chi-square tests to examine whether the associations between variables are statistically significant.
  - ▪ Analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference between groups on continuous measures.

Stimulate interest...

Develop understanding....

Strengthen capacity...

Visitors will feel amazed by Earth's deep past.
- Visitors are drawn in by the fossils and specimens.
- Visitors appreciate the fossils and specimens in Deep Time as once-living organisms that existed in ecosystems of the past
- Visitors appreciate the fossils and specimens in Deep Time as past organisms that are different from today's organisms but connected in the evolutionary tree of life.

Visitors will understand that the evolution of life on Earth is a result of continuous interactions between species and their ecosystems.
- Visitors describe how all life is connected through time.
- Visitors describe evolution as a continual process without specific direction or purpose (not as a ladder being climbed leading to "the best" species).
- Visitors describe species as adapted to their environment and able to adapt to environmental changes.
- Visitors describe evolution as a non-linear process that results in the diversity of life.
- Visitors describe extinctions as transformative events broadly affecting the evolution of life.

Visitors will understand how humans and nature are interconnected.
- Visitors describe themselves as part of nature (humans are just one species in the vast scale of geological time).
- Visitors describe themselves as connected to other species in Deep Time and into the present.
- Visitors describe humans' actions as having effects on life on Earth.
- Visitors describe that human effects are on the same scale as past (biological and geological) events in Earth's history.

Visitors will be better able to talk about complex scientific topics.
- Visitors are comfortable engaging in conversation even if to say they are unsure or still have questions about something.
- Visitors recognize scientific work as "in process"—continual exploration of questions and answers leading to more questions.
- Visitors describe skills scientists use in their work, such as observing, comparing, analyzing, and inferring.

Visitors will feel empowered about humans' ability to impact Earth's future.
- Visitors feel that they can make a difference on the planet.
- Visitors understand that human impact is causing rapid change and that urgent action can lead to solutions.
- Visitors describe how learning about the Earth's past can help humans make more informed choices about our actions now and in the future.
- Visitors continue to learn about the planet (through museum or other scientifically reputable sources).
- Visitors express interest in taking a personal step toward a more sustainable future.

FINDINGS: STANDARDIZED ASSESSMENTS

RK&A collected 1198 standardized assessments from visitors 11 years and older. 598 assessments were collected from visitors prior to experiencing the Hall of Fossils – Deep Time exhibition (Control group). 601 assessments were collected from a separate sample of visitors after experiencing the Hall of Fossils – Deep Time exhibition (Treatment group). The participation rate is 35 percent.

BACKGROUND CHARACTERISTICS

Of those who responded to the standardized assessment:

- **Visitation:** 54 percent were visiting NMNH for the first time; 46 percent are repeat visitors although the majority have not visited NMNH in the past two years.

- **Visit group:** 86 percent were visiting in groups, and 14 percent alone; 22 percent were visiting in a group with children.

- **Areas visited:** 40 percent said the Hall of Fossils – Deep Time was their first stop in NMNH. Those visitors who had been to other areas of NMNH prior to the Hall of Fossils – Deep Time were most likely to have visited the Ocean Hall or Mammals.

- **Age:** 4 percent are age 11-17, 55 percent are age 18-34, 30 percent age 35-54, and 12 percent age 55 years or older.

- **Gender identity:** 50 percent identify as male, 49 percent as female and 1 percent in another way.

- **Race/ethnicity:** 71 percent identify as White, 15 percent Hispanic, Latino, or Spanish, 11 percent Asian, 6 percent Black or African American, 2 percent American Indian or Alaska Native, 1 percent Middle Eastern or North African, 1 percent Native Hawaiian or other Pacific Islander.

- **Disability:** 6 percent are visiting the museum with a person with a disability that affects their visit.

- **Education:** 72 percent have a Bachelor's degree or higher level of education.

- **SASSY climate audience:** Using the SASSY groupings, 69 percent identify as Alarmed, 21 percent as Concerned, 9 percent as Curious, 1 percent as Doubtful, and 1 percent as Dismissive.

IDEAS ABOUT FOSSILS

Visitors were asked to identify up to two associations (from a list of six) that came to mind for them when they think about fossils. "Dinosaurs" was the most selected choice, followed by "evidence of past life." Positively, the Treatment group selected "dinosaurs" significantly less than the control group (p = .035). This suggests that **the Hall of Fossils – Deep Time exhibition broadened visitors' ideas about fossils.**

One of the things the museum has here are fossils. What two things on this list most come to mind when you think about fossils? Don't overthink it. Just whatever two things jump out at you first. (n = 1198)

■ Control   ■ Treatment

	Control	Treatment
Dinosaurs	77%	72%
Evidence of past life	34%	38%
Paleontologists	33%	32%
Earth's history	27%	28%
Digs/field work	16%	16%
Old	13%	13%
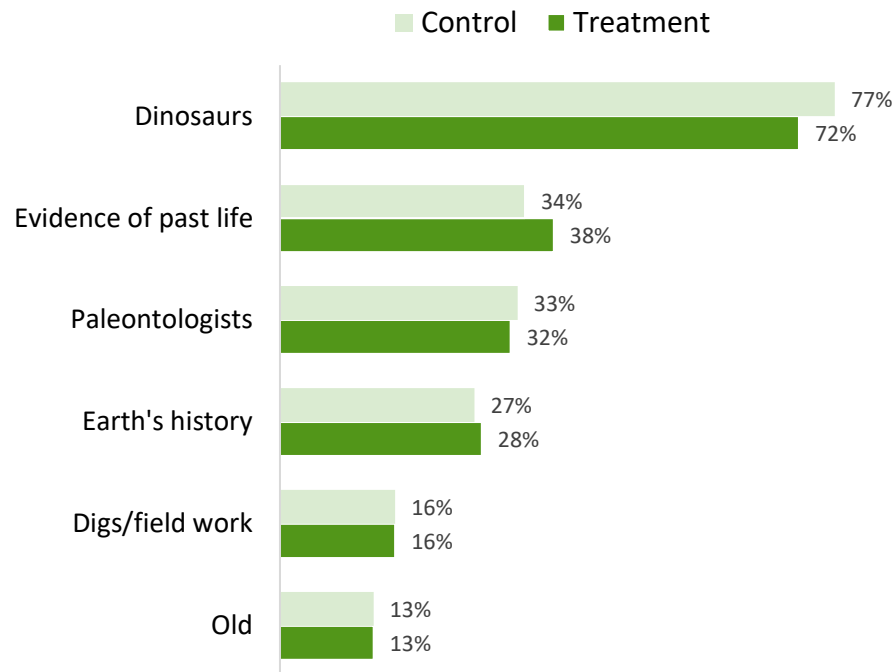
UNDERSTANDING THE EVOLUTION OF LIFE ON EARTH

Visitors were asked to rate eight statements on a 5-point scale (disagree / somewhat disagree / unsure / somewhat agree / agree). The chart below shows the percent of those who somewhat agree or agree. See the appendix for the distribution of responses across all 5 points of the scale.

Almost all visitors—Control and Treatment—agreed that "species are adapted to their environment," "evolution is the process by which life changes over time," and "the diversity of life on Earth has resulted because of evolution." While the Treatment group agreed with the statements more than the Control group overall, there was one statement on which responses differed statistically: "Mass extinctions can spur greater diversification among surviving species" (p = .003). This suggests **the Hall of Fossils – Deep Time exhibition was successful in communicating mass extinctions as transformative events affecting the evolution of life.**

Rate the statements on a 5-point scale from disagree to agree. (n = 1192-1195)
% indicates those to either "somewhat agree" or "agree" with the statements.

Control   Treatment

Statement	Control	Treatment
Species are adapted to their environment	99%	99%
Evolution is the process by which life changes over time	97%	97%
The diversity of life on Earth has resulted because of evolution	92%	93%
Mass extinctions can spur greater diversification among surviving species	77%	84%
All life today is descended from a common ancestor that lived billions of years ago	75%	79%
Plants and dinosaurs are related	56%	59%
Evolution is not a directed process leading to the "best" species	46%	51%
Individuals of a species cannot evolve over their lifetime	38%	41%

UNDERSTANDING THE CONNECTIVITY OF HUMANS AND NATURE

Visitors were asked to rate six statements on a 5-point scale (disagree / somewhat disagree / unsure / somewhat agree / agree). The chart below shows the percent who somewhat agree or agree. See the appendix for the distribution of responses across all 5 points of the scale.

Almost all visitors—agreed with the statements that "I am part of nature," "human actions can cause other species to adapt," "the time from the appearance of our species to the present is a tiny fraction of the history of life on Earth," "human actions are causing mass extinctions," and "humans are descended from earlier forms of life." While agreement with the former statements suggests widespread understanding of the connectivity of humans and nature, only about one-half of visitors agree that "humans and plants have a common ancestor." This suggests that there is dissonance between visitors understanding general recognition of connectivity when confronted with specific examples. Further, there are no differences between the Control and Treatment groups suggesting **the Hall of Fossils – Deep Time exhibition did not deepen people's understanding of the connectivity of humans and nature.**

Rate the statements on a 5-point scale from disagree to agree. (n = 1189-1193)
% indicates those to either "somewhat agree" or "agree" with the statements.

Control ▪ Treatment

Statement	Control	Treatment
I am part of nature	98%	98%
Human actions can cause other species to adapt	96%	98%
The time from the appearance of our species to the present is a tiny fraction of the history of life on Earth	95%	95%
Human actions are causing mass extinctions	94%	95%
Humans are descended from earlier forms of life	86%	89%
Humans and plants have a common ancestor	57%	57%

FAVORITE PART OF THE HALL OF FOSSILS – DEEP TIME EXHIBITION

Visitors who experienced the Hall of Fossils – Deep Time exhibition (Treatment group) were asked to describe their favorite part. Visitors were not shown any potential responses; data collectors either selected a response from a list based on the visitors' comments or wrote the response down if it fit outside the list to be coded later.

The majority of visitors said their favorite part was seeing fossils or specimens (55 percent). Nearly one-half said seeing or learning about dinosaurs (40 percent). From there, responses varied. Some named things they were interested in learning, such as science/natural history generally (7 percent), evolution/adaptation (7 percent), extinction (6 percent), and climate change (2 percent). Others named specific aspects of the exhibition design that they enjoyed, such as the videos (5 percent), the design in general (4 percent), interactives (3 percent), dioramas (2 percent), and the FossiLab (2 percent).

What was your favorite part of visiting the Hall of Fossils – Deep Time? (n = 601)

Category	Percent
Seeing fossils/specimens	55%
Seeing or learning about dinosaurs	40%
Learning about science/natural history generally	7%
Learning about evolution/adaptation	7%
Learning about extinction	6%
Videos	5%
Exhibition design generally	4%
Seeing/thinking about timeline & scale	4%
Interactives	3%
Ocean/sealife content	2%
Learning about climate change	2%
Dioramas	2%
FossiLab	2%

ENJOYMENT OF THE HALL OF FOSSILS – DEEP TIME EXHIBITION

Visitors who experienced the Hall of Fossils – Deep Time exhibition (Treatment group) were asked to rate six statements on a 5-point scale (disagree / somewhat disagree / neutral / somewhat agree / agree). In the chart below, we present the percent of those who somewhat agree or agree. See the appendix for the distribution of responses across all 5 points of the scale.

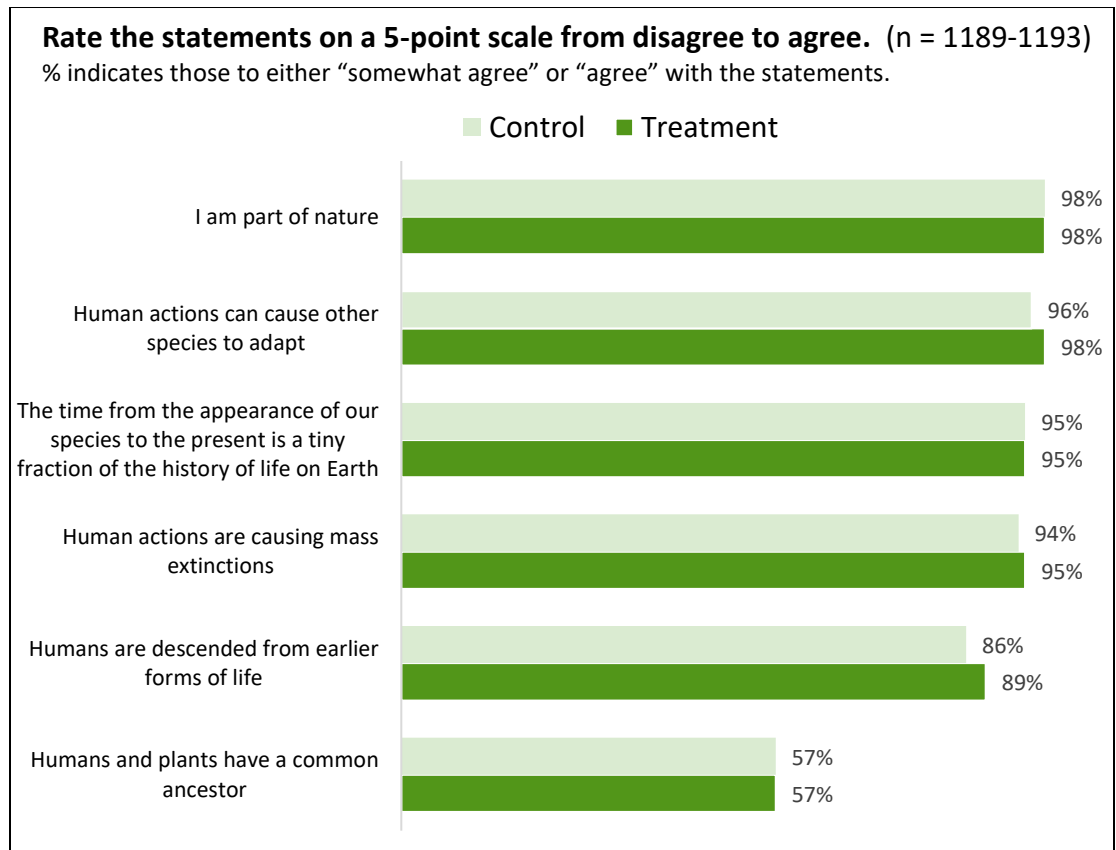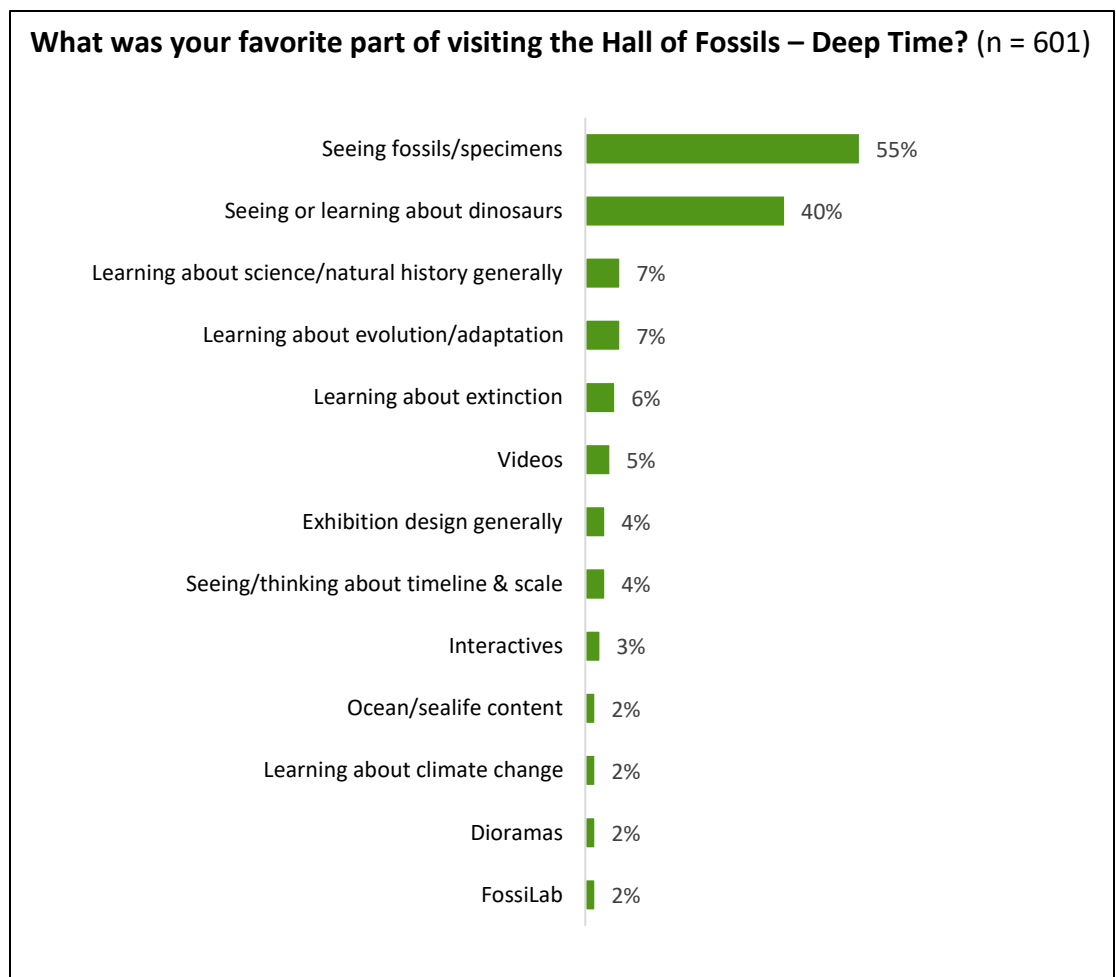Most visitors "thought the exhibition was fun" (98 percent) and "felt amazed by the exhibition" (92 percent). Additionally, many agreed that "there was a lot more to learn about fossils than expected" (86 percent), they "want to learn more about the ideas in the exhibition" (85 percent), and "felt the ideas in the exhibition are relevant to [their] life" (79 percent). **This suggests the Hall of Fossils – Deep Time exhibition was successful in stimulating interest among visitors and helped them feel amazed by Earth's deep past.**

Additionally, visitors who entered the exhibition from the Rotunda are more likely to agree that "the exhibition ideas are relevant to their life" than those who entered from African Voices (p = .000). **This suggests that the orientation of the exhibition around people and moving back in time was successful in helping visitors find relevance.**

Rate the statements on a 5-point scale from disagree to agree. (n = 582-585)
% indicates those to either "somewhat agree" or "agree" with the statements.

Statement	%
I thought the exhibition was fun	98%
I felt amazed by the exhibition	92%
There was a lot more to learn about fossils than expected	86%
I want to learn more about the ideas in the exhibition	85%
I felt the ideas in the exhibition are relevant to my life	79%
I thought there would be more fossils on display	15%

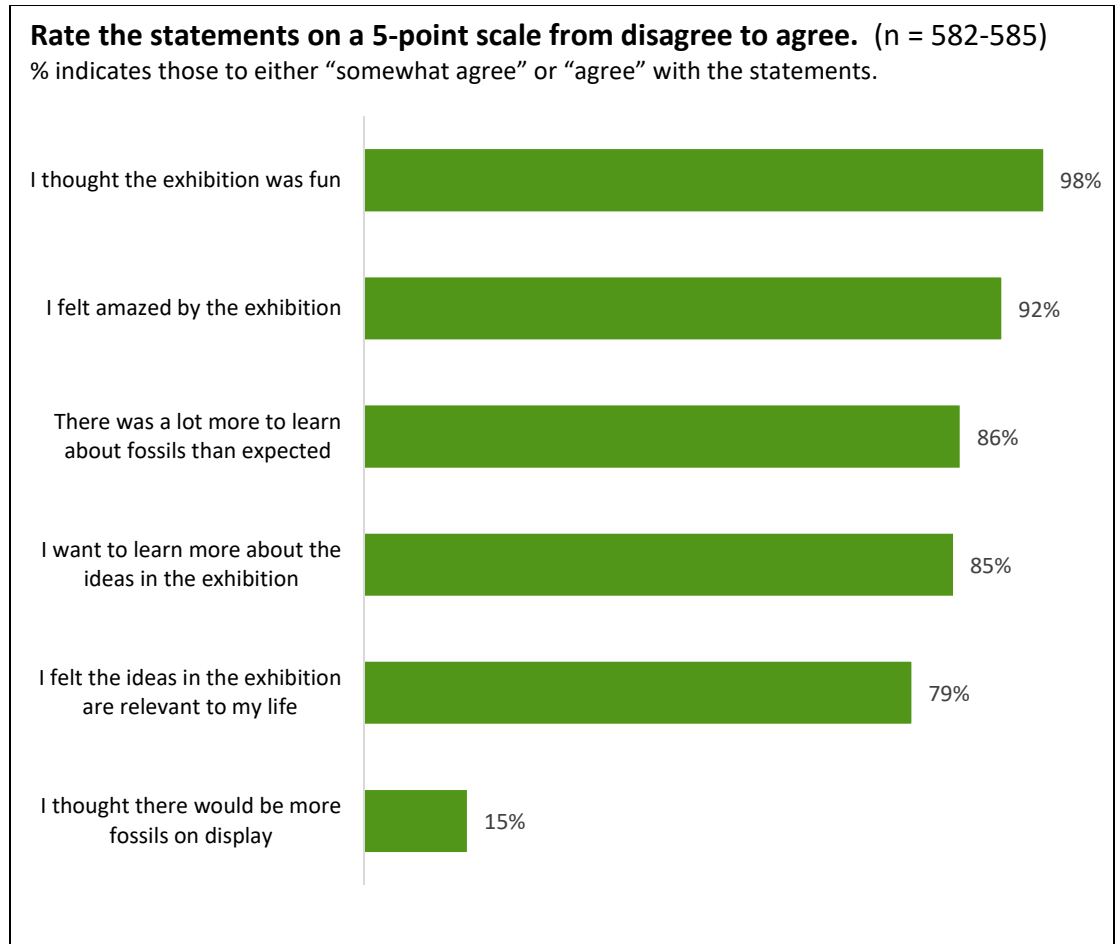## MAIN MESSAGES OF THE HALL OF FOSSILS – DEEP TIME EXHIBITION

Visitors who experienced the Hall of Fossils – Deep Time exhibition (Treatment group) were asked to describe what they perceived as the Main Message. Visitors were not shown any potential responses; data collectors either selected a response from a list based on the visitors' comments or wrote the response down if it fit outside the list to be coded later.

Nearly one-half of visitors said the main idea had to do with the connectivity of humans and other life on Earth (48 percent). More than one-third said the main message was the evolution of life on Earth (39 percent), and another one-third said the vast scale of geologic time (32 percent). Beyond these three trends, responses varied and included everything from climate change (10 percent) to the promotion of conservation (1 percent).

What do you think was the main idea or message the museum wanted visitors to walk away with from the Hall of Fossils – Deep Time? (n = 601)

Connectivity of humans and other life on Earth	48%
Evolution of life on Earth	39%
Vast scale of geological time	32%
Climate change	15%
Dinosaurs and other fossils	10%
History of life on Earth	5%
Human harm to life on Earth	5%
Characteristics of life (complex, fragile, resilient)	2%
History of mass extinctions	1%
Importance of science	1%
Diversity of life, animals, species	1%
Promote conservation	1%

PERCEPTION OF SCIENTISTS

Visitors who experienced the Hall of Fossils – Deep Time exhibition (Treatment group) were asked to describe what, if anything, the exhibition made them think about the people who do scientific research. Visitors were not shown any potential responses; data collectors either selected a response from a list based on the visitors' comments or wrote the response down if it fit outside the list to be coded later.

One-half of visitors perceived being a scientist as a challenging or hard job (55 percent). Additional responses varied widely from scientific research being fun or exciting (16 percent), to important work (12 percent), to scientists are patient (3 percent) and dedicated (2 percent).

What, if anything, did the Hall of Fossils – Deep Time make you think about the people who do scientific research? (n = 601)

Response	Percent
Being a scientist is challenging/hard	55%
Being a scientist is fun/exciting	16%
Scientists are important	12%
They appreciate scientists	8%
They study many different subjects	5%
There are many kinds of careers in science/they don't just work in a lab	4%
They are just like me/I could be a scientist	4%
Many scientists work at/do research at NMNH	3%
Scientists are patient	3%
Scientists are dedicated	2%
Scientists are underpaid	1%

FINDINGS: PERFORMANCE-BASED ASSESSMENTS

RK&A collected 305 performance-based assessments from visitors 11 years and older. 135 assessments were collected from visitors prior to experiencing the Hall of Fossils – Deep Time exhibition (Control group). 170 assessments were collected from a separate sample of visitors after experiencing the Hall of Fossils – Deep Time exhibition (Treatment group). The participation rate is 30 percent.

BACKGROUND CHARACTERISTICS

Of those who responded to the performance-based assessment:

♦ **Visitation:** 54 percent were visiting NMNH for the first time; 46 percent are repeat visitors although the majority have not visited NMNH in the past two years.

♦ **Visit group:** 83 percent were visiting in groups, and 17 percent alone; 24 percent of all participants were visiting in a group with children.

♦ **Areas visited:** 39 percent said the Hall of Fossils – Deep Time was their first stop in NMNH. Those visitors who had been to other areas of NMNH prior to the Hall of Fossils – Deep Time were most likely to have visited the Ocean Hall or Mammals.

♦ **Gender identity:** 56 percent identify as male, 42 percent as female, and 2 percent in another way.

♦ **Age:** 5 percent are age 11-17, 55 percent are age 18-34, 27 percent age 35-54, and 12 percent age 55 years or older.

♦ **Race/Ethnicity:** 70 percent identify as White, 14 percent Hispanic, Latino, or Spanish, 12 percent Asian, 8 percent Black or African American, 2 percent American Indian or Alaska Native, 1 percent Middle Eastern or North African, 1 percent Native Hawaiian or other Pacific Islander.

♦ **Disability:** 8 percent are visiting the museum with a person with a disability that affects their visit.

♦ **Education:** 68 percent have a Bachelor's degree or higher level of education.

♦ **SASSY climate audience:** Using the SASSY groupings, 67 percent identify as Alarmed, 20 percent as Concerned, 8 percent as Curious, 3 percent as Doubtful, and 1 percent as Dismissive.

INTEREST IN FOSSILS

Visitors were presented with three examples of fossils (see Appendix C). They were asked to select one they were curious about and describe why they choose the fossil they did. Responses were categorized by the interviewer on a continuum:

- ♦ **High passion**: visitor names something specific they are interested in.

- ♦ **Some passion**: visitor makes general comments about why they picked a fossil and may use words like "cool" or "interesting."

- ♦ **Low passion**: visitor says they picked one for the sake of the interview and expresses no general interest.

The majority expressed some passion or enthusiasm about the fossil they chose (56 percent of Control and 65 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically (at p < .05) despite more Treatment responses falling into the high and some passion categories (93 percent) as compared to Control responses (85 percent).

Question: These are three examples of life on Earth from the distant past. Choose one that you are curious about. Why did you choose this one?

Measure: Visitors are drawn in by the fossils and specimens. (n = 305)

■ Control   ■ Treatment

Category	Control	Treatment
High passion	29%	28%
Some passion	56%	65%
Low passion	15%	8%
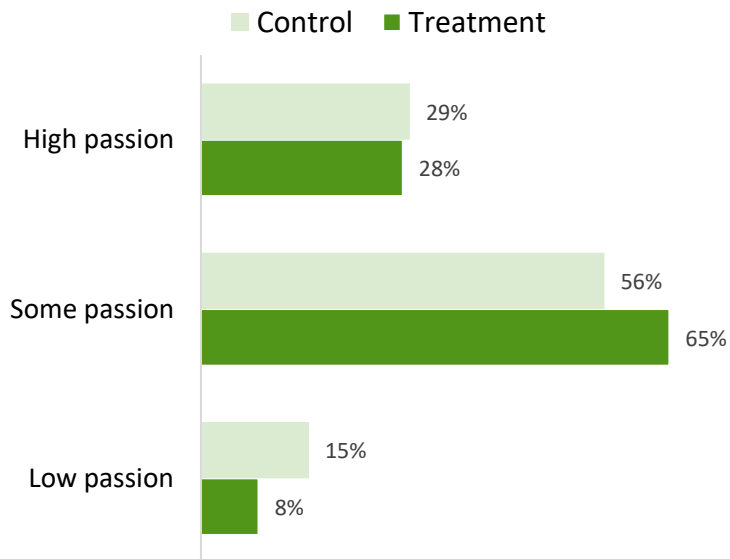
CURIOSITY ABOUT FOSSILS

Visitors were then asked about what questions or curiosities they have about the fossil they selected. Responses were categorized by the interviewer on a continuum:

♦ **High curiosity**: visitor asks at least one open-ended question that gets into how or why curiosities (e.g., how can this tell us about climate change)

♦ **Some curiosity**: visitor asks at least one open-ended question but they are cursory or vague (e.g., how this helps us understand the Earth)

♦ **Low curiosity**: visitor only asks closed-ended questions (what is it, when did it live, etc.)

The majority expressed low curiosity (62 percent of Control and 51 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically (at $p < .05$) despite more Treatment responses falling into the high and some curiosity categories (49 percent) as compared to Control responses (38 percent).

Question: What questions or curiosities do you have about that one?

Measure: Visitors are curious about fossils and specimens. (n = 305)

Control ▪ Treatment

High curiosity
15%
21%

Some curiosity
23%
28%

Low curiosity
62%
51%
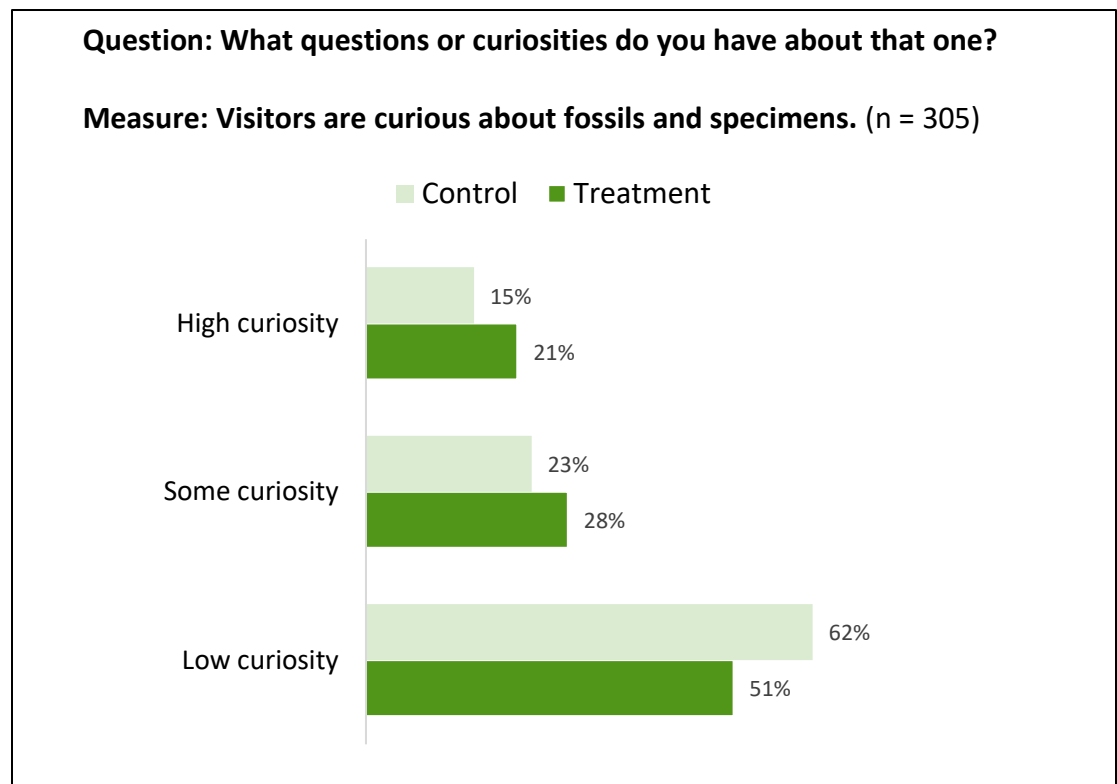
RECOGNIZING SCIENTIFIC SKILLS

Visitors were asked what they think a scientist might do if studying the fossil that they selected. Responses were categorized by the interviewer on a continuum:

♦ **High skill awareness**: visitor names more than one skill of scientists, such as observing, comparing, analyzing, and inferring

♦ **Some skill awareness**: visitor names one skill of scientists

♦ **Low skill awareness**: visitor does not name skills of scientists (i.e., something irrelevant or inaccurate)

The majority expressed some skill awareness (49 percent of Control and 43 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.

Question: What do you think a scientist might do if they were studying this?

Measure: Visitors describe skills scientists use in their work. (n = 303)

Control   Treatment

High skill awareness: Control 34%, Treatment 32%

Some skill awareness: Control 49%, Treatment 43%

Low skill awareness: Control 18%, Treatment 25%
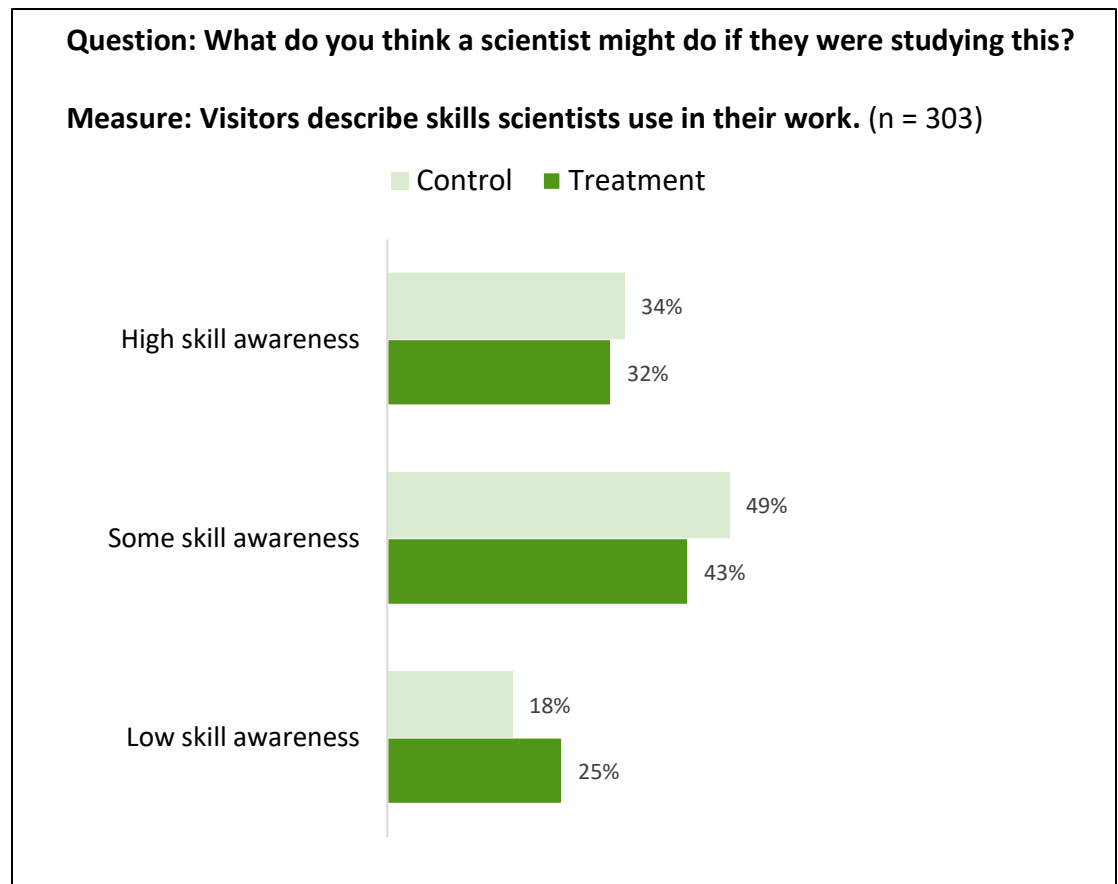
UNDERSTANDING SCIENTISTS' WORK AS IN PROCESS

Visitors were then asked about how they thought the process would go. Responses were categorized by the interviewer on a continuum:

- ♦ **High process awareness**: visitor describes scientists' work as open-ended, continual process of exploring questions
- ♦ **Some process awareness**: visitor describes scientists' work as closed-ended, answering questions with a suggested end point
- ♦ **Low process awareness**: visitor does not describe scientists' work in terms of process

The majority expressed low process awareness (44 percent of Control and 43 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.

Question: How do you think the process would go? For example, how long might a scientist study it?

Measure: Visitors recognize scientific work as "in process"—continual exploration of questions and answers leading to more questions. (n = 304)

■ Control ■ Treatment

High process awareness — Control 29%, Treatment 30%
Some process awareness — Control 27%, Treatment 28%
Low process awareness — Control 44%, Treatment 43%

UNDERSTANDING HOW THE STUDY OF EARTH'S PAST IS RELEVANT

Visitors were asked what they think scientists might learn about Earth by studying the fossil and how it might be relevant today. Responses were categorized by the interviewer on a continuum:

- ♦ **High relevance awareness**: visitor describes the study of the Earth's past as clearly related to the present and future

- ♦ **Some relevance awareness**: visitor describes the study of the Earth's past as related to present and future but in vague terms

- ♦ **Low relevance awareness**: visitor does not describe the study of the Earth's past as related to present and future

The majority expressed some relevance awareness (39 percent of Control and 40 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.
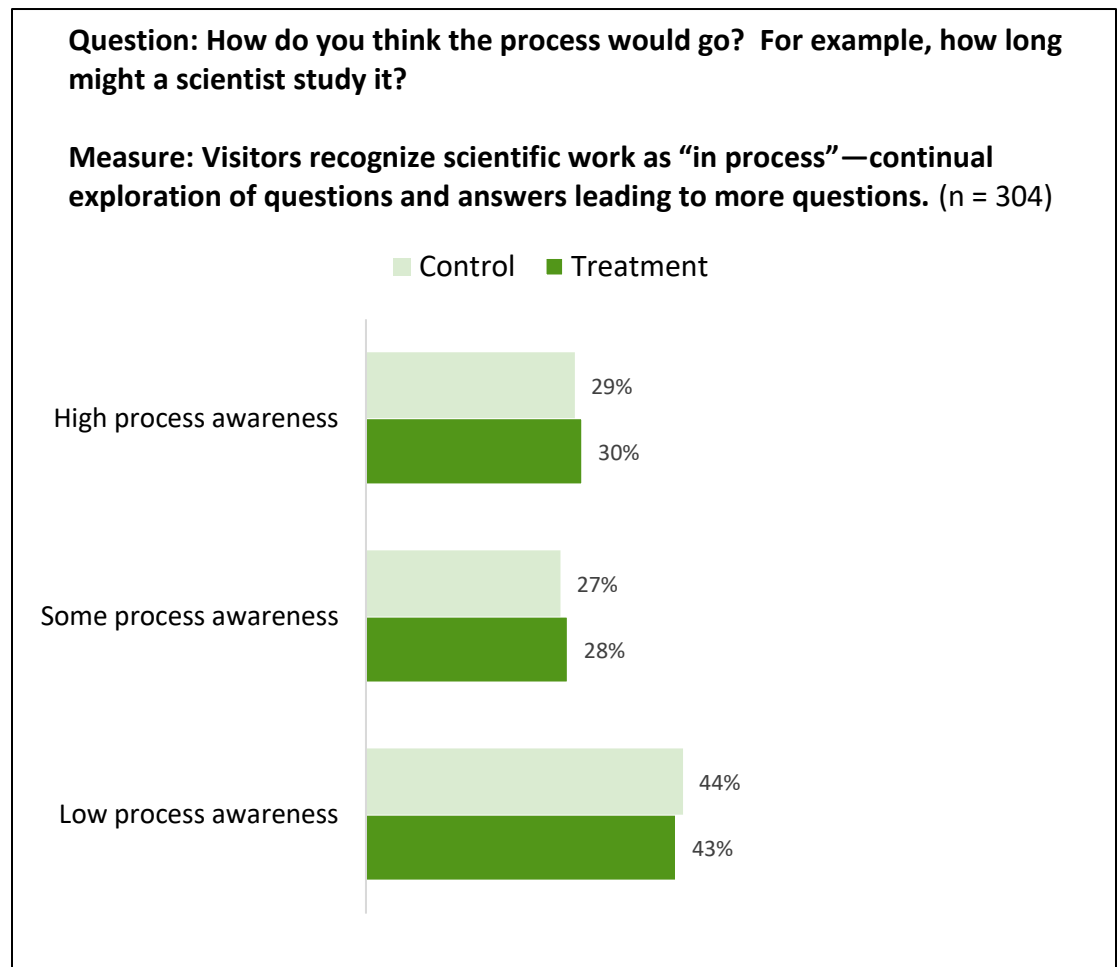
Question: What do you think scientists might learn about Earth by studying this fossil? How might that be relevant to us today?

Measure: Visitors describe how learning about the Earth's past can help humans make more informed choices about our actions now and in the future. (n = 305)

■ Control   ■ Treatment

Category	Control	Treatment
High relevance awareness	31%	30%
Some relevance awareness	39%	40%
Low relevance awareness	30%	30%

TALKING ABOUT COMPLEX SCIENTIFIC TOPICS

Visitors were asked about how they felt talking about complex scientific topics. Responses were categorized on a continuum:

♦ **Feel high comfort**: visitor describes feeling confident

♦ **Feel some comfort**: visitor describes feeling comfortable even if unsure at moments

♦ **Feel low comfort**: visitor describes feeling uncomfortable

The majority expressed some comfort (43 percent of Control and 45 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.
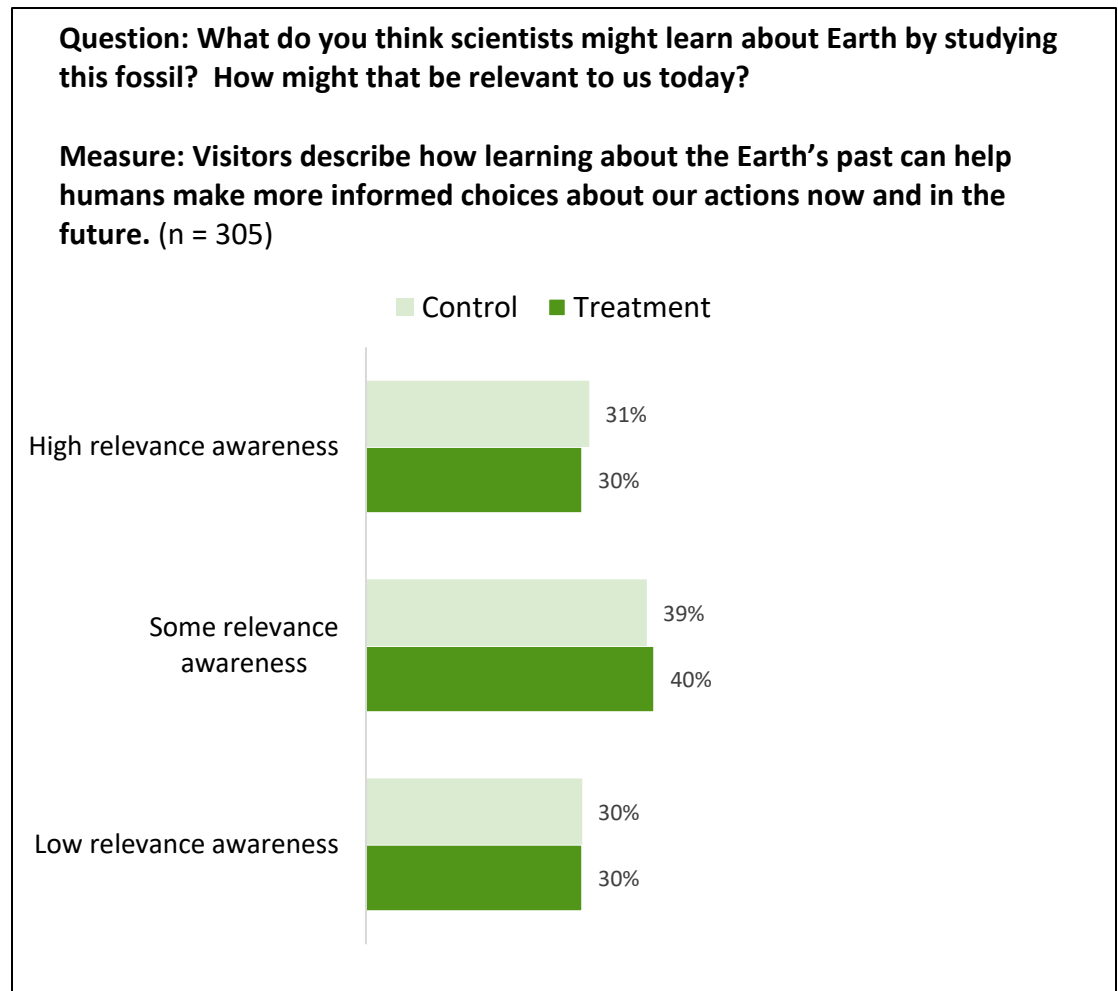
Question: Talking about Deep Time and the work of scientists is complex. How did it feel for you to talk with me about these topics? Why do you think it made you feel that way?

Measure: Visitors will be better able to talk about complex scientific topics. (n = 305)

■ Control ■ Treatment

Feel high comfort
- Control: 38%
- Treatment: 32%

Feel some comfort
- Control: 43%
- Treatment: 45%

Feel low comfort
- Control: 19%
- Treatment: 24%

AWARENESS OF SCIENTISTS AT THE SMITHSONIAN

Visitors were asked if they knew that scientists work for the Smithsonian and are doing work now. Most were aware that scientists work for the Smithsonian before their visit to NMNH (72 percent of Control and 70 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.

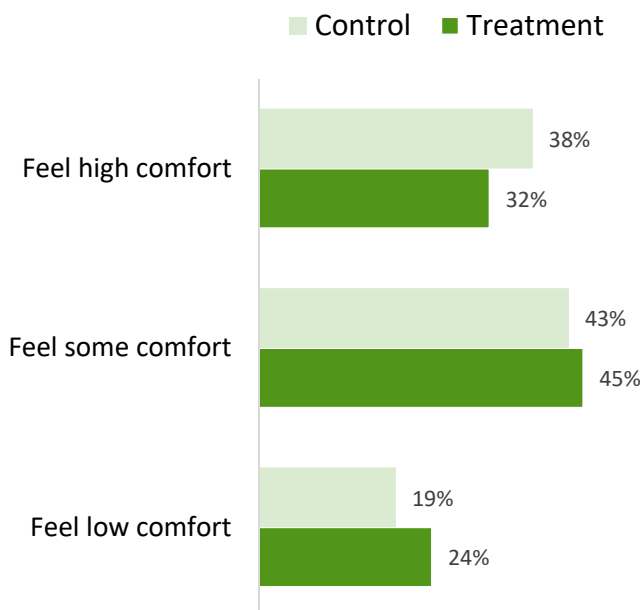**There are lots of scientists who work for the museum, studying fossils in the collection and also collecting new fossils. Before today, did you know that scientists work for the Smithsonian and are doing work now?** (n = 305)

Control ■ Treatment

- Yes
  - 72%
  - 70%
- No
  - 28%
  - 30%

Most visitors said knowing that scientists work at the Smithsonian gives them a more favorable perception of the museum (80 percent of Control and 83 percent of Treatment). When compared by Control and Treatment group, responses do not differ statistically.
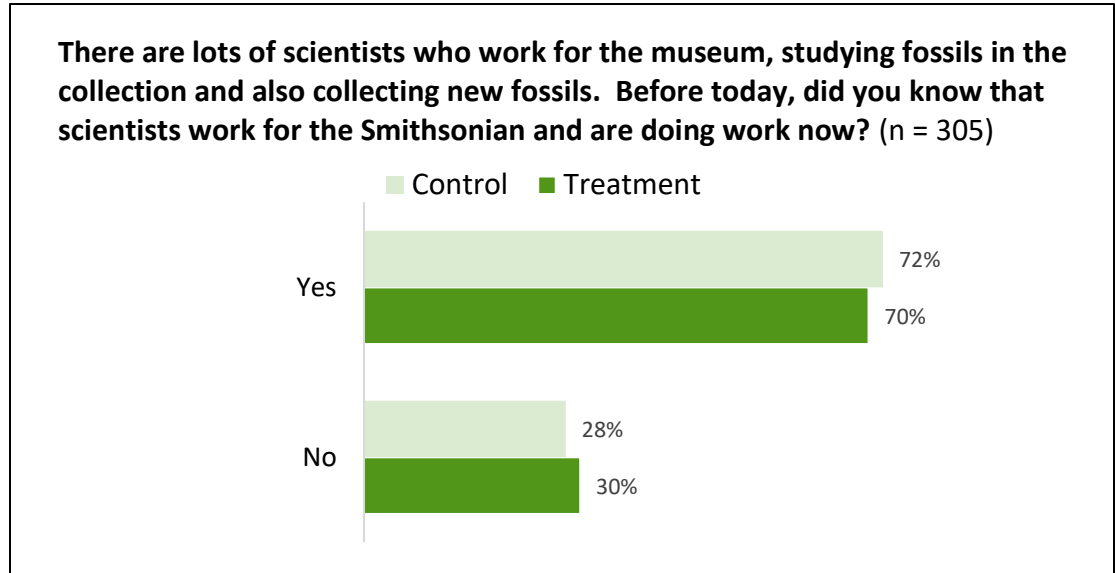
How, if at all, does knowing that the museum has scientists collecting and studying fossils impact your perception of the museum? (n = 255)

Control ■ Treatment

- Gives me a more favorable impression of the museum
  - 80%
  - 83%
- Does not change my impression of the museum
  - 20%
  - 17%
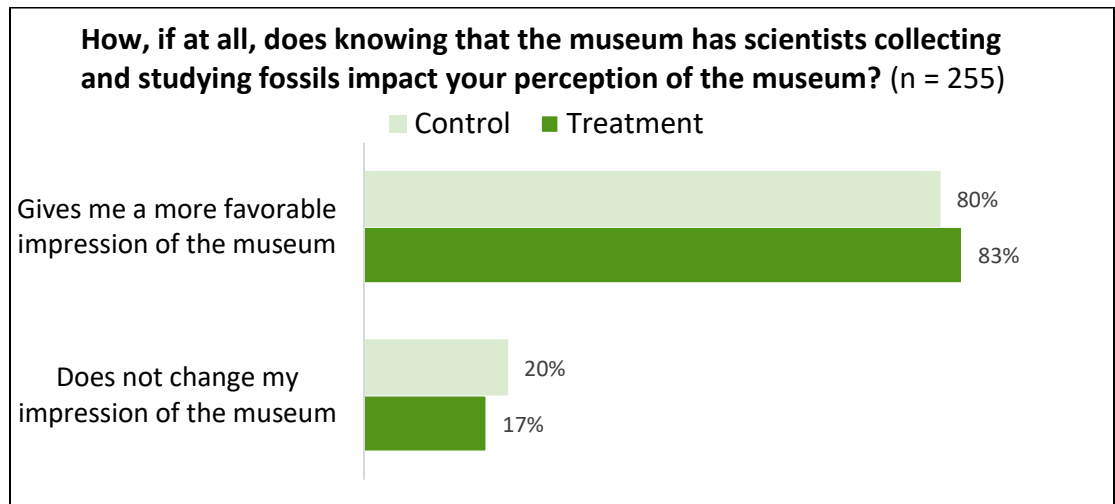
APPENDIX A: STANDARDIZED ASSESSMENT

Consent

1. **Hi, the museum is collecting visitors' thoughts about natural history topics. If you have about 10 minutes, I would like to ask you some questions.**

○ Yes

○ No

Thank you for agreeing to share your thoughts. Before we begin, I just want to let you know that I will be noting your responses on this tablet. However, your responses are anonymous—your name or contact information will not be requested or recorded. Your participation is completely voluntary, and we can stop at any time. This is not a test and there are no right or wrong answers; the museum is just interested in understanding the perspective of visitors like you.

[If the visitor is 18 years or older] Do you agree to participate?

[If the visitor is 11 to 17 years] As their parent/guardian, do you agree they can participate?

[To visitor 11 to 17 years] Do you agree to participate?

Background Info

Thanks for speaking with me.

2. **Is this your first time visiting the museum?**

   ○ Yes

   ○ No

3. [If no] **Have you visited in the past two years...other than today?**

   ○ Yes

   ○ No

4. **Are you visiting the museum with in a group today...family or otherwise?**

   ○ Alone

   ○ Group

5. [If in a group] **Does your group include children?**

   ○ Yes

   ○ No

6. **How much of the museum have you visited so far today?**

   [check all that apply, ask about specific places not named]

   ○ First stop

   ○ Mammals

   ○ Human Origins

   ○ Ocean Hall

   ○ Q?rius

   ○ Other

Standardized questions

7. One of the things the museum has here are fossils. What two things on this list most come to mind when you think about fossils? Don't overthink it. Just whatever two things jump out at you first.

○ Evidence of past life

○ Old

○ Dinosaurs

○ Paleontologists

○ Digs/field work

○ Earth's history

8. I am going to ask you to rate some statements on a scale, from disagree to agree.

	Disagree	Somewhat disagree	Unsure	Somewhat agree	Agree
All life today is descended from a common ancestor that lived billions of years ago.	○	○	○	○	○
Plants and dinosaurs are related.	○	○	○	○	○
Evolution is the process by which life changes over time.	○	○	○	○	○
Evolution is not a directed process leading to the "best" species.	○	○	○	○	○
Species are adapted to their environment.	○	○	○	○	○
Individuals of a species cannot evolve over their lifetime.	○	○	○	○	○
The diversity of life on Earth has resulted because of evolution.	○	○	○	○	○
Mass extinctions can spur greater diversification among surviving species.	○	○	○	○	○

9. Great. I have another set of statements to rate on the same scale

	Disagree	Somewhat disagree	Unsure	Somewhat agree	Agree
I am part of nature.	○	○	○	○	○
Humans and plants have a common ancestor.	○	○	○	○	○
Humans are descended from earlier forms of life.	○	○	○	○	○
The time from the appearance of our species to the present is a tiny fraction of the history of life on Earth.	○	○	○	○	○
Human actions can cause other species to adapt.	○	○	○	○	○
Human actions are causing mass extinctions.	○	○	○	○	○

10. **Wonderful. We are almost done. [Mark pre or post]**

  ⭘ Pre

  ⭘ Post

11. **What was your favorite part of visiting the Hall of Fossils – Deep Time? What did you like about that?** [Do not show/read list—listen to responses, mark all that apply.]

☐ Seeing fossils/specimens

☐ Seeing or learning about dinosaurs

☐ Learning about climate change

☐ Learning about extinction

☐ Learning about evolution/adaptation

☐ Learning about human's connection to all nature/species

☐ Learning about science generally

☐ Other (please specify)

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[                                                              ]
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12. **Please rate the following statements on a scale from disagree to agree.**

	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
I felt amazed by the exhibition.	○	○	○	○	○
I felt the ideas in the exhibition are relevant to my life.	○	○	○	○	○
I want to learn more about the ideas in the exhibition.	○	○	○	○	○
I thought the exhibition was fun.	○	○	○	○	○
I thought there would be more fossils on display.	○	○	○	○	○
There was a lot more to learn about fossils than I expected.	○	○	○	○	○

13. **What do you think was the main idea or message the museum wanted visitors to walk away with from the Hall of Fossils – Deep Time?** [Do not show/read the list—listen to responses, mark all that apply]

☐ Dinosaurs and other fossils

☐ Vast scale of geological time

☐ Evolution of life on Earth

☐ Climate change

☐ Connectivity of humans and other life on Earth

☐ Other (please specify)

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[                                                              ]
```

14. **What, if anything, did the Hall of Fossils – Deep Time make you think about the people who do scientific research?** [Do not show/read the list—listen to responses, mark all that apply]

- [ ] They are diverse (gender, ethnicity, etc.)
- [ ] They are just like me/I could be a scientist
- [ ] Being a scientist is fun/exciting
- [ ] Being a scientist is challenging/hard
- [ ] They study many different subjects
- [ ] There are many kinds of careers in science/they don't just work in a lab
- [ ] Many scientists work at/do research at NMNH
- [ ] Nothing
- [ ] Other

15. **Where did you enter the Hall of Fossils – Deep Time?**

- ( ) Rotunda
- ( ) African Voices side

16. **Did you happen to speak with any museum staff while in the Hall of Fossils – Deep Time?**

- ( ) Yes
- ( ) No

Demographic and Background Questions

17. Your Age?

[   ]

18. Your gender?

[   ]

19. Your zipcode or country of residence?

[   ]

20. What is the highest level of education you have completed?

○ Less than high school diploma

○ High school diploma

○ Associate's degree

○ Bachelor's degree

○ Graduate/ Professional degree

21. Do you or someone in your visiting group have a disability that affects your visit to the museum?

○ No

○ Yes

22. If someone in your group has a disability, please describe.

[   ]

23. With which US Census racial or ethnic group(s) do you identify with? Select all that apply.

☐ American Indian or Alaska Native

☐ Asian

☐ Black or African American

☐ Hispanic, Latino, or Spanish

☐ Middle Eastern or North African

☐ Native Hawaiian or other Pacific Islander

☐ White

☐ Another racial or ethnic group (please specify)

[_____]

24. How important is the issue of climate change to you personally?

○ Extremely important

○ Very important

○ Somewhat important

○ Not too important

○ Not at all important

25. How worried are you about climate change?

○ Very worried

○ Somewhat worried

○ Not very worried

○ Not at all worried

26. How much do you think climate change will harm you personally?

○ A great deal

○ A moderate amount

○ Only a little

○ Not at all

○ Don't know

27. **How much do you think climate change will harm future generations of people?**

◯ A great deal

◯ A moderate amount

◯ Only a little

◯ Not at all

◯ Don't know

28. **How often do you discuss climate change with your family and friends?**

◯ Often

◯ Occasionally

◯ Rarely

◯ Never

29. **How interested or uninterested would you be in joining a campaign to convince elected officials to take action to reduce climate change?**

◯ Participating now

◯ Interested in joining

◯ Not sure

◯ Uninterested in joining

Thank you! Please pass the tablet back to the interviewer.

APPENDIX B: PERFORMANCE-BASED ASSESSMENT

Consent

1. Hi, the museum is collecting visitors' thoughts about natural history topics. If you have about 10 minutes, I would like to ask you some questions.

◯ Yes

◯ No

Thank you for agreeing to share your thoughts. Before we begin, I just want to let you know that I will be noting your responses on this tablet. However, your responses are anonymous—your name or contact information will not be requested or recorded. Your participation is completely voluntary, and we can stop at any time. This is not a test and there are no right or wrong answers; the museum is just interested in understanding the perspective of visitors like you.

[If the visitor is 18 years or older] Do you agree to participate?

[If the visitor is 11 to 17 years] As their parent/guardian, do you agree they can participate?

[To visitor 11 to 17 years] Do you agree to participate?

Background Info

Thanks for speaking with me.

2. **Is this your first time visiting the museum?**

◯ Yes

◯ No

3. [If no] **Have you visited in the past two years...other than today?**

◯ Yes

◯ No

4. **Are you visiting the museum with in a group today...family or otherwise?**

◯ Alone

◯ Group

5. [If in a group] **Does your group include children?**

◯ Yes

◯ No

6. **How much of the museum have you visited so far today?**
[check all that apply, ask about specific places not named]

◯ First stop

◯ Mammals

◯ Human Origins

◯ Ocean Hall

◯ Q?rius

◯ Other

Performance-based questions

This exhibition [depending on pre-post say "you just visited" or "are about to visit"] **is called Hall of Fossils - Deep Time.**

"Deep Time" is a term being used more often to describe geological time. It expresses the vastness of the time of life on Earth —3.7 billion years.

7. **These are three examples of life on Earth from the distant past.**

[show them the fossils on separate page].

Take a moment to look at all of them and then pick the one you feel most curious about.

◯ A

◯ B

◯ C

8. **Why did you choose this one?**

Measure:
Visitors will feel amazed by Earth's deep past.
Visitors are drawn in by the fossils and specimens.

☐ No passion, had to pick one

☐ Some passion, may use words like cool or interesting

☐ High passion

9. **What questions or curiosities do you have about that one?**

Measure:
Visitors will feel amazed by Earth's deep past.
Visitors are drawn in by the fossils and specimens.

◯ Only asks closed-ended questions (what is it, when did it live, etc.)

◯ Asks at least one open-ended question but they are cursory or vague

◯ Asks at least one open-ended question that gets into how or why curiosities

10. **What do you think a scientist might do if they were studying this?**

Measure:
Visitors describe skills scientists use in their work, such as observing, comparing, analyzing, and inferring.

○ Does not name skills of scientists

○ Names one skill of scientists

○ Names more than one skill of scientists

11. **How would they go about studying it? What would the process be like?**

Measure:
Visitors recognize scientific work as "in process"—continual exploration of questions and answers leading to more questions.

○ Does not describe scientists' work in terms of questions (asking, answering, exploring)

○ Describes scientists' work as closed-ended, answering questions

○ Describes scientists' work as open-ended, exploring questions

12. **What do you think scientists might learn about Earth by studying this fossil?**

How might that be relevant to us today?

Measure:
Visitors describe how learning about the Earth's past can help humans make more informed choices about our actions now and in the future.

○ Does not relate study of past to present and future

○ Describes study of past as related to present and future but in vague terms

○ Describes study of past as clearly related to the present and future

13. **Talking about Deep Time and the work of scientists is complex. How did it feel for you to talk with me about these topics?**

What do you think made you feel that way?

Measure:
Visitors will be better able to talk about complex scientific topics.
Visitors are comfortable engaging in conversation even if to say they are unsure or still have questions about something.

○ Low comfort

○ Medium comfort, may be unsure but tries to talk through things

○ High comfort

14. **There are lots of scientists who work for the museum, studying fossils in the collection and also collecting new fossils. Before today, did you know that scientists work for the Smithsonian and are doing work now?**

○ Yes

○ No

15. **How, if at all, does knowing that the museum has scientists collecting and studying fossils impact your perception of the museum?**

○ It gives me a more favorable impression of the museum

○ It does not change my impression of the museum

○ It gives me a less favorable impression of the museum

16. **Wonderful. We are almost done. [Mark pre or post]**

○ Pre

○ Post

Post-only questions

17. **Where did you enter the Hall of Fossils – Deep Time?**

○ Rotunda

○ African Voices side

18. **Did you happen to speak with any museum staff while in the Hall of Fossils – Deep Time?**

○ Yes

○ No

Demographic and Background Questions

19. Your Age?

[   ]

20. Your gender?

[   ]

21. Your zipcode or country of residence?

[   ]

22. What is the highest level of education you have completed?

- ( ) Less than high school diploma
- ( ) High school diploma
- ( ) Associate's degree
- ( ) Bachelor's degree
- ( ) Graduate/ Professional degree

23. Do you or someone in your visiting group have a disability that affects your visit to the museum?

- ( ) No
- ( ) Yes

24. If someone in your group has a disability, please describe.

[   ]

25. With which US Census racial or ethnic group(s) do you identify with? Select all that apply.

☐ American Indian or Alaska Native

☐ Asian

☐ Black or African American

☐ Hispanic, Latino, or Spanish

☐ Middle Eastern or North African

☐ Native Hawaiian or other Pacific Islander

☐ White

☐ Another racial or ethnic group (please specify)

[   ]

26. How important is the issue of climate change to you personally?

◯ Extremely important

◯ Very important

◯ Somewhat important

◯ Not too important

◯ Not at all important

27. How worried are you about climate change?

◯ Very worried

◯ Somewhat worried

◯ Not very worried

◯ Not at all worried

28. How much do you think climate change will harm you personally?

◯ A great deal

◯ A moderate amount

◯ Only a little

◯ Not at all

◯ Don't know

29. **How much do you think climate change will harm future generations of people?**

○ A great deal

○ A moderate amount

○ Only a little

○ Not at all

○ Don't know

30. **How often do you discuss climate change with your family and friends?**

○ Often

○ Occasionally

○ Rarely

○ Never

31. **How interested or uninterested would you be in joining a campaign to convince elected officials to take action to reduce climate change?**

○ Participating now

○ Interested in joining

○ Not sure

○ Uninterested in joining

Thank you! Please pass the tablet back to the interviewer.

A

B

C
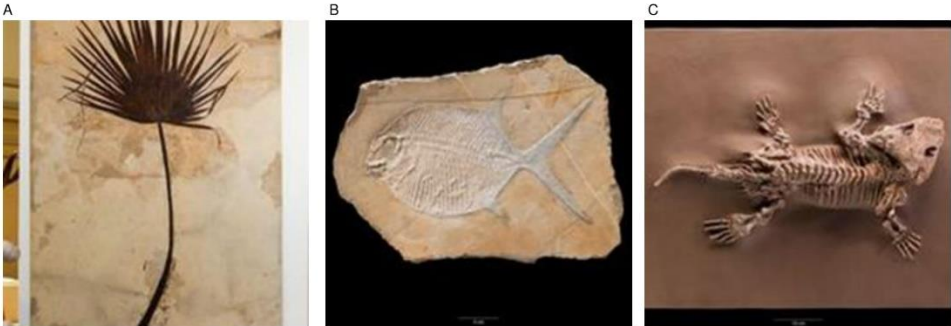
APPENDIX D: PERFORMANCE-BASED ASSESSMENT RUBRIC

NMNH DEEP TIME MAIN MESSAGES STUDY PRE-POST PERFORMANCE BASED INSTRUMENT
Rubric Examples

1. **"Deep Time" is a term being used more and more often to describe geological time. It expresses the vastness of the time of life on Earth—3.7 billion years. These are three examples of life on Earth from the distant past** [show them the fossils on separate page (currently at end of this doc). **Take a moment to look at all of them and then pick the one you feel most curious about.**
   a. **Why did you choose this one?**

Outcome	**Visitors will feel amazed by Earth's deep past.** (Visitors are drawn in by the fossils and specimens.)		
Rubric Levels (draft)	No passion, had to pick one	Some passion, may use words like cool or interesting	High passion, name something specific they are interested about.
Examples	"They are all about the same." "Seemed familiar." "Thought is was easiest to talk about." "I don't know."	"This one seems interesting." "This one looks cool." "This looks like a fish. I like fish."	"This one is super cool looking. I wonder what type of animal it is." "I love plants. I was curious about the scale of it. Is the image to scale or is it much bigger than this?"

2. **What questions or curiosities do you have about this one [name item selected]?**

Outcome	**Visitors will feel amazed by Earth's deep past.** (Visitors are drawn in by the fossils and specimens.)		
Rubric Levels (draft)	Only asks closed-ended questions (what is it, when did it live, etc.)	Asks at least one open-ended question but they are cursory or vague	Asks at least one open-ended question that gets into how or why curiosities
Examples	"What is it?" "When did it live?" "How old is it?"	"I am curious about where it was found, and what scientists may be able to learn about it based on its location."	

3. What do you think a scientist might do if they were studying this?

Outcome	Visitors will be better able to talk about complex scientific topics. (Visitors describe skills scientists use in their work, such as observing, comparing, analyzing, and inferring.)		
Rubric Levels (draft)	Does not name skills of scientists	Names one skill of scientist	Names more than one skill of scientists
Examples	"They would look at it and read about it."	"They would observe it closely under a microscope."	"They would observe it closely under a microscope. Then they might compare it to other fossils found in a similar location. Based on the comparison they can form a hypothesis about life."

4. How do you think the process would go? For example, how long might a scientist study it?

Outcome	Visitors will be better able to talk about complex scientific topics. (Visitors recognize scientific work as "in process"—continual exploration of questions and answers leading to more questions.)		
Rubric Levels (draft)	Does not describe scientists' work in terms of process but as individual tasks	Describes scientists' work as a closed-ended process with a definitive end point	Describes scientists' work as an open-ended, continual process of exploring questions
Examples	"They would look at it closely, maybe use a microscope. They could also use knowledge from the past. Other people's research."	A scientist would find a fossil, bring it back to the lab and study it. It would help us answer questions about Earth."	"A scientist may start with a question, like what did the species eat. Then it might do some research, read what is known about the species, run some lab experiments. If they answer the question, it might lead to another question and they start the whole process again."

5. **What do you think scientists might learn about Earth by studying this fossil?**
   a. **How might that be relevant to us today?**

Outcome	**Visitors will feel empowered about humans' ability to impact Earth's future.** (Visitors describe how learning about the Earth's past can help humans make more informed choices about our actions now and in the future.)		
Rubric Levels (draft)	Does not relate study of past to present and future	Describes study of past as related to present and future but in vague terms	Describes study of past as clearly related to the present and future
Examples	"It might tell us about animals that lived in the past. It is interesting to learn about the past."	"Well it will tell us about life on Earth and that helps us know about life today because it is all connected."	"Knowing how species lived and understanding mass extinctions can help us to understand human impacts on Earth.'

6. **Talking about Deep Time and the work of scientists is complex. How did it feel for you to talk with me about these topics?**
   a. **What do you think made you feel that way?**

Outcome	**Visitors will be better able to talk about complex scientific topics.** (Visitors are comfortable engaging in conversation even if to say they are unsure or still have questions about something.)		
Rubric Levels (draft)	Low comfort	Medium comfort, may be unsure but try to talk through things	High comfort
Examples	"Eh. I don't know science well." [Said with hesitation]: "It was ok. I am no expert." "I felt uncomfortable. I am more of an art person."	[Said with a chuckle]: "It was ok. I am no expert, but it really makes me think!" "I felt a little uncomfortable. I did not study science in college, but I find it really interesting. There is so much we don't know about Earth so it is cool to think about it."	"Totally fine. I like thinking about all the complexities of scientific research." "Interesting! I never really put myself in the shoes of a scientist to think about their work, so that was enlightening."

APPENDIX E: STANDARDIZED ASSESSMENT SUPPLEMENT

TABLES FOR SCALAR ITEMS

All life today is descended from a common ancestor that lived billions of years ago.

Crosstab			Pre	Post	Total
All life today is descended from a common ancestor that lived billions of years ago.	Disagree	Count	67	70	137
		% pre or post	11.3%	11.7%	11.5%
	Somewhat disagree	Count	11	15	26
		% pre or post	1.9%	2.5%	2.2%
	Unsure	Count	71	43	114
		% pre or post	12.0%	7.2%	9.6%
	Somewhat agree	Count	52	79	131
		% pre or post	8.8%	13.2%	11.0%
	Agree	Count	392	393	785
		% pre or post	66.1%	65.5%	65.8%
Total		Count	593	600	1193
		% pre or post	100.0%	100.0%	100.0%

Plants and dinosaurs are related.

Crosstab			Pre	Post	Total
Plants and dinosaurs are related.	Disagree	Count	161	138	299
		% pre or post	27.1%	23.0%	25.0%
	Somewhat disagree	Count	12	20	32
		% pre or post	2.0%	3.3%	2.7%
	Unsure	Count	89	91	180
		% pre or post	15.0%	15.2%	15.1%
	Somewhat agree	Count	65	89	154
		% pre or post	10.9%	14.8%	12.9%
	Agree	Count	267	262	529
		% pre or post	44.9%	43.7%	44.3%
Total		Count	594	600	1194
		% pre or post	100.0%	100.0%	100.0%

Evolution is the process by which life changes over time.

Crosstab

			Pre	Post	Total
Evolution is the process by which life changes over time.	Disagree	Count	9	9	18
		% pre or post	1.5%	1.5%	1.5%
	Somewhat disagree	Count	1	0	1
		% pre or post	0.2%	0.0%	0.1%
	Unsure	Count	9	8	17
		% pre or post	1.5%	1.3%	1.4%
	Somewhat agree	Count	23	18	41
		% pre or post	3.9%	3.0%	3.4%
	Agree	Count	552	565	1117
		% pre or post	92.9%	94.2%	93.6%
Total		Count	594	600	1194
		% pre or post	100.0%	100.0%	100.0%

Evolution is not a directed process leading to the "best" species.

Crosstab

			Pre	Post	Total
Evolution is not a directed process leading to the "best" species.	Disagree	Count	177	175	352
		% pre or post	29.8%	29.2%	29.5%
	Somewhat disagree	Count	40	40	80
		% pre or post	6.7%	6.7%	6.7%
	Unsure	Count	101	79	180
		% pre or post	17.0%	13.2%	15.1%
	Somewhat agree	Count	34	61	95
		% pre or post	5.7%	10.2%	8.0%
	Agree	Count	242	245	487
		% pre or post	40.7%	40.8%	40.8%
Total		Count	594	600	1194
		% pre or post	100.0%	100.0%	100.0%

Species are adapted to their environment.

Crosstab

			Pre	Post	Total
Species are adapted to their environment.	Disagree	Count	1	3	4
		% pre or post	0.2%	0.5%	0.3%
	Somewhat disagree	Count	3	1	4
		% pre or post	0.5%	0.2%	0.3%
	Unsure	Count	2	2	4
		% pre or post	0.3%	0.3%	0.3%
	Somewhat agree	Count	27	25	52
		% pre or post	4.5%	4.2%	4.4%
	Agree	Count	561	567	1128
		% pre or post	94.4%	94.8%	94.6%
Total		Count	594	598	1192
		% pre or post	100.0%	100.0%	100.0%

Individuals of a species cannot evolve over their lifetime.

Crosstab

			Pre	Post	Total
Individuals of a species cannot evolve over their lifetime.	Disagree	Count	285	280	565
		% pre or post	48.0%	46.7%	47.3%
	Somewhat disagree	Count	34	36	70
		% pre or post	5.7%	6.0%	5.9%
	Unsure	Count	51	39	90
		% pre or post	8.6%	6.5%	7.5%
	Somewhat agree	Count	31	40	71
		% pre or post	5.2%	6.7%	5.9%
	Agree	Count	193	205	398
		% pre or post	32.5%	34.2%	33.3%
Total		Count	594	600	1194
		% pre or post	100.0%	100.0%	100.0%

The diversity of life on Earth has resulted because of evolution.

Crosstab

			Pre	Post	Total
The diversity of life on Earth has resulted because of evolution.	Disagree	Count	22	33	55
		% pre or post	3.7%	5.5%	4.6%
	Somewhat disagree	Count	2	4	6
		% pre or post	0.3%	0.7%	0.5%
	Unsure	Count	22	8	30
		% pre or post	3.7%	1.3%	2.5%
	Somewhat agree	Count	43	41	84
		% pre or post	7.2%	6.8%	7.0%
	Agree	Count	506	514	1020
		% pre or post	85.0%	85.7%	85.4%
Total		Count	595	600	1195
		% pre or post	100.0%	100.0%	100.0%

Mass extinctions can spur greater diversification among surviving species.

Crosstab

			Pre	Post	Total
Mass extinctions can spur greater diversification among surviving species.	Disagree	Count	45	24	69
		% pre or post	7.6%	4.0%	5.8%
	Somewhat disagree	Count	14	9	23
		% pre or post	2.4%	1.5%	1.9%
	Unsure	Count	78	64	142
		% pre or post	13.2%	10.7%	11.9%
	Somewhat agree	Count	72	74	146
		% pre or post	12.1%	12.4%	12.2%
	Agree	Count	384	428	812
		% pre or post	64.8%	71.5%	68.1%
Total		Count	593	599	1192
		% pre or post	100.0%	100.0%	100.0%

I am part of nature.

Crosstab

			Pre	Post	Total
I am part of nature.	Disagree	Count	8	8	16
		% pre or post	1.3%	1.3%	1.3%
	Unsure	Count	4	2	6
		% pre or post	0.7%	0.3%	0.5%
	Somewhat agree	Count	11	15	26
		% pre or post	1.9%	2.5%	2.2%
	Agree	Count	570	575	1145
		% pre or post	96.1%	95.8%	96.0%
Total		Count	593	600	1193
		% pre or post	100.0%	100.0%	100.0%

Humans and plants have a common ancestor.

Crosstab

			Pre	Post	Total
Humans and plants have a common ancestor.	Disagree	Count	132	135	267
		% pre or post	22.3%	22.5%	22.4%
	Somewhat disagree	Count	16	15	31
		% pre or post	2.7%	2.5%	2.6%
	Unsure	Count	106	109	215
		% pre or post	17.9%	18.2%	18.1%
	Somewhat agree	Count	50	44	94
		% pre or post	8.4%	7.3%	7.9%
	Agree	Count	288	296	584
		% pre or post	48.6%	49.4%	49.0%
Total		Count	592	599	1191
		% pre or post	100.0%	100.0%	100.0%

Humans are descended from earlier forms of life.

Crosstab

			Pre	Post	Total
	Disagree	Count	43	45	88
		% pre or post	7.3%	7.5%	7.4%
Humans are descended from earlier forms of life.	Somewhat disagree	Count	4	3	7
		% pre or post	0.7%	0.5%	0.6%
	Unsure	Count	21	19	40
		% pre or post	3.5%	3.2%	3.4%
	Somewhat agree	Count	17	18	35
		% pre or post	2.9%	3.0%	2.9%
	Agree	Count	507	514	1021
		% pre or post	85.6%	85.8%	85.7%
Total		Count	592	599	1191
		% pre or post	100.0%	100.0%	100.0%

The time from the appearance of our species to the present is a tiny fraction of the history of life on Earth.

Crosstab

			Wonderful. We are almost done. [Mark pre or post]		Total
			Pre	Post	
	Disagree	Count	14	12	26
		% pre or post	2.4%	2.0%	2.2%
The time from the appearance of our species to the present is a tiny fraction of the history of life on Earth.	Somewhat disagree	Count	2	5	7
		% pre or post	0.3%	0.8%	0.6%
	Unsure	Count	14	12	26
		% pre or post	2.4%	2.0%	2.2%
	Somewhat agree	Count	19	16	35
		% pre or post	3.2%	2.7%	2.9%
	Agree	Count	542	554	1096
		% pre or post	91.7%	92.5%	92.1%
Total		Count	591	599	1190
		% pre or post	100.0%	100.0%	100.0%

Human actions can cause other species to adapt .

			Pre	Post	Total
Human actions can cause other species to adapt .	Disagree	Count	9	5	14
		% pre or post	1.5%	0.8%	1.2%
	Somewhat disagree	Count	5	2	7
		% pre or post	0.8%	0.3%	0.6%
	Unsure	Count	11	8	19
		% pre or post	1.9%	1.3%	1.6%
	Somewhat agree	Count	25	27	52
		% pre or post	4.2%	4.5%	4.4%
	Agree	Count	541	556	1097
		% pre or post	91.5%	93.0%	92.3%
Total		Count	591	598	1189
		% pre or post	100.0%	100.0%	100.0%

Crosstab

Human actions are causing mass extinctions.

			Pre	Post	Total
Human actions are causing mass extinctions.	Disagree	Count	13	16	29
		% pre or post	2.2%	2.7%	2.4%
	Somewhat disagree	Count	4	5	9
		% pre or post	0.7%	0.8%	0.8%
	Unsure	Count	16	7	23
		% pre or post	2.7%	1.2%	1.9%
	Somewhat agree	Count	56	72	128
		% pre or post	9.4%	12.0%	10.7%
	Agree	Count	504	499	1003
		% pre or post	85.0%	83.3%	84.1%
Total		Count	593	599	1192
		100.0%	100.0%	100.0%	

Crosstab

STATISTICALLY SIGNIFICANT RELATIONSHIPS

IDEAS ABOUT FOSSILS

There are a few relationships between visitors' ideas about fossils and background characteristics:

- **NMNH Visitation**: Visitors who had visited NMNH before were more likely to select "paleontologists" than visitors who were visiting NMNH for the first time (p = .000).

- **Age**: Younger visitors (34 years and younger) were more likely to select "old" than older visitors (35 years and older) (p = .006).

- **SASSY**: Visitors who identify as Dismissive are more likely to select "evidence of past life" than other SASSY groups (p = .035). Also, visitors who identify as Concerned or Cautious are more likely to select "dinosaurs" than other SASSY groups (p = .011). And, visitors who identify as Cautious are more likely to select "old" than other SASSY groups (p = .005).

UNDERSTANDING THE EVOLUTION OF LIFE ON EARTH

There are a few relationships between visitors' understanding and background characteristics:

- **NMNH visitation:** Visitors who had visited NMNH in the past were more likely to agree that "species are adapted to their environment" than first-time visitors. (p = .008).

- **Age:** Young visitors (34 years and younger) were more likely to agree that "all life today is descended from a common ancestor that lived billions of years ago" than older visitors (35 years and older) (p = .035). Children (11-17 years) were least likely to agree that "plants and dinosaurs are related" (p = .001) and "the diversity of life on Earth has resulted because of evolution" (p = .021).

- **SASSY:** Visitors who identify as Alarmed are more likely to agree that "all life today is descended from a common ancestor that lived billions of years ago" (p = .000) and "plants and dinosaurs are related" (p = .000) than other SASSY groups. Also, visitors who identify as Alarmed or Dismissive are more likely to agree that "evolution is not a directed process leading to the 'best' species" than other SASSY groups (p = .035). And, visitors who identify as Alarmed or Concerned are more likely to agree that "the diversity of life on Earth has resulted because of evolution" than other SASSY groups (p = .000).

UNDERSTANDING THE CONNECTIVITY OF HUMANS AND NATURE

There are a few relationships between visitors' understanding and background characteristics:

- **NMNH visitation:** Visitors who had visited NMNH in the past were more likely to agree "that humans and plants have a common ancestor" (p = .030); "humans are descended from earlier forms of life" (p = .013); and "human actions can cause other species to adapt" (p = .006) than first-time visitors.

- **Age:** Children age 11-17 years were least likely to agree that "humans are descended from earlier life forms" (p = .015) ; "the time from the appearance of our species to the present is a tiny fraction of the history of life on Earth" (p = .000); and "human actions cause other species to adapt" (p = .001) than adults (18 years and older).

- **SASSY:** Visitors who identify as Alarmed are more likely to agree "that humans and plants have a common ancestor" (p = .000) and "humans are descended from earlier forms of life" (p = .000) than those who identify with other SASSY groups.

Additionally, visitors who identify as Alarmed or Concerned are more likely to agree that "human actions are causing mass extinctions" than those who identify with other SASSY groups.

FAVORITE PART OF THE HALL OF FOSSILS – DEEP TIME EXHIBITION
Visitors 55 years and older are more likely to say they are interested in learning about evolution and adaptation than visitors 11 to 54 years (p = .009).

ENJOYMENT OF THE HALL OF FOSSILS – DEEP TIME EXHIBITION
There are a few relationships between visitors' enjoyment and other characteristics:

♦ **Entrance:** Visitors who entered the exhibition from the Rotunda are more likely to agree that "the exhibition ideas are relevant to their life" than those who entered from African Voices (p = .000).

♦ **NMNH visitation:** First-time visitors to NMNH are more likely to feel amazed by the exhibition than visitors who have been to NMNH before (p =.044).

♦ **Age:** Visitors 11 to 34 years are more likely to be amazed by the exhibition than those visitors 35 years and older (p = .007).

♦ **SASSY:** Visitors who identify as Alarmed are more likely to agree that "the exhibition ideas are relevant to their life" than visitors who identify with other SASSY groups (p = .000). Also, visitors who identify as Dismissive are less likely to feel amazed by the exhibition than other SASSY groups (p = .000).

APPENDIX F: PERFORMANCE-BASED ASSESSMENT SUPPLEMENT

STATISTICALLY SIGNIFICANT RELATIONSHIPS

INTEREST IN FOSSILS

♦ **SASSY:** Visitors who identify as Alarmed or Concerned are more likely to express high passion for the fossil as compared to visitors who identify with other SASSY groups ($p = .031$).

CURIOSITY ABOUT FOSSILS

♦ **Fossil selection:** Visitors who selected the plant fossil were more likely to express low curiosity about the fossil as compared to those who selected the other two fossils ($p = .042$).

COMFORT TALKING ABOUT COMPLEX SCIENTIFIC TOPICS

♦ **Age:** Adults 55 years and older were more likely to express high comfort in talking about complex scientific topics than children and adults 54 years and younger ($p = .011$).

AWARENESS OF SCIENTISTS WORKING AT THE MUSEUM

♦ **NMNH Visitation**: Visitors who had visited NMNH before were more likely to know prior to that visit that scientists work at the Smithsonian than visitors who were visiting NMNH for the first time ($p = .005$).

♦ **Age:** Children age 11-17 years were least likely to know prior to that visit that scientists work at the Smithsonian than adults (18 years and older) ($p = .018$).

AGE OF HUMANS STUDY: HALL OF FOSSILS - DEEP TIME

Prepared for the
National Museum of Natural History
Washington, D.C.

Age of Humans Study: Hall of Fossils - Deep Time
May 2022

Prepared for
National Museum of Natural History
https://naturalhistory.si.edu/
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Recommended citation: RK&A. (2022). *Age of Humans Study: Hall of Fossils - Deep Time.*
Unpublished report. Washington, D.C.: National Museum of Natural History.

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KEY TAKEAWAYS

This section presents 3 key takeaways from the Age of Humans Study for the Hall of Fossils—Deep Time based on interview data collected onsite at the National Museum of Natural History (NMNH) during October and November 2021. Key takeaways for the Age of Humans study are informed by the data and our years of experience working with museums.

1. VISITORS UNDERSTOOD A KEY MESSAGE IN DEEP TIME AS HUMANS' RELATIONSHIP TO EARTH

While not the top message visitors came away with, it is promising that over one-third noted humans' relationship with the Earth as a key idea in Deep Time. It is especially notable that this idea came through to visitors because it was embedded in a fossil hall where most are drawn to and expect to learn about dinosaurs and fossils. Not surprisingly, visitors who are already concerned about climate change (Concerned or higher SASSY audience) were particularly attuned to this message (45 percent Concerned or higher vs 13 percent Cautious or lower said it is the main message).

2. DEEP TIME ENCOURAGES VISITORS TO CONSIDER THE POSITIVE AND NEGATIVE ASPECTS OF HUMANS' ROLE IN SHAPING THE ENVIRONMENT.

Deep Time successfully encourages visitors to consider both the positive and negative aspects of humans' role in shaping the environment and life on Earth—past, present, and future. Many visitors described humans' role in shaping the environment and life on Earth as negative, citing not only specific effects (e.g., carbon emissions, habitat loss, destruction of ecosystems) but also the pace and scale of change and the need for humans to conserve and care for the Earth. On the other hand, two-thirds of visitors also thought about a range of positive impacts they could have on the Earth and, encouragingly, those who visited at least four of the Age of Humans exhibits were more likely to come away with this idea.

3. VISITORS WHO ARE ALREADY CONCERNED ABOUT CLIMATE CHANGE AND THOSE WHO VISITED FOUR OR MORE AGE OF HUMANS EXHIBITS ARE MOST ENGAGED WITH AGE OF HUMANS' KEY MESSAGES.

Interview data indicate that those who are already concerned about climate change are more likely to think about the effects humans have on the world in nuanced and complex ways; they are also more likely to consider actions they can take to have a positive impact on the Earth in the future. This suggests that future Deep Time programming related to Age of Humans ideas should be geared toward those who are already concerned about climate change and humans' impacts on the Earth (rather than trying to win over those who are unconvinced about the role of humans in climate change and environmental impacts). Moreover, Future Deep Time programming that can highlight or tie to multiple Age of Humans exhibits may help guide more visitors to grapple with the important Age of Humans ideas through multiple exposures.

STUDY BACKGROUND

The Age of Humans study is one of four studies that was conducted by RK&A as part of a summative evaluation of the Hall of Fossils – Deep Time exhibition. The objectives of this study are to explore the ways in which visitors understand how humans impact global ecosystems and identify opportunities to deepen visitors' understanding of this theme.

ABOUT AGE OF HUMANS

The Hall of Fossils - Deep Time explores how human actions are driving Earth's rapidly changing climate and how the choices we make today will impact the future in several areas of the exhibition, which together comprise the Age of Humans exhibits. This study focused on seven of these areas, including:

- Age of Humans Gallery
- Carbon Cycle video
- Coal Mine video
- Ice Core video
- Permian/Triassic Extinction video
- PETM/Global Heat Wave section
- Polar Forest section

METHODOLOGY

RK&A conducted 169 in-depth interviews with visitors 11 years of age and older after they had visited the Hall of Fossils - Deep Time exhibition. RK&A showed participants images of Age of Humans exhibits to determine which exhibits they had seen that day and asked them questions about their experiences overall and in Age of Humans specifically (see interview guide in Appendix A and images in Appendix B). Interviewers took detailed notes of all interviews to facilitate analysis.

Interview data are qualitative, meaning that results are descriptive. In analyzing the data, the evaluator studied the interview notes for meaningful patterns and grouped similar responses into codes representing trends and themes in the data.   Findings are reported in narrative, supplemented with quotations from participants. Trends and themes in the data are presented from most- to least-frequently occurring. When describing the findings, this report uses proportions and qualitative data terms such as "most" and "some"—such descriptive language is intended to provide readers with a sense of the general patterns.

RK&A also analyzed interview codes statistically using SPSS 20 for Windows. Analyses include:

- Frequency distributions (e.g., percent of respondents by AOH exhibit visited).
- Inferential statistics to examine the relationship among variables, including:

- Cross-tabulations show the frequency of response options by group. We conducted chi-square tests to examine whether the associations between variables are statistically significant.
- Analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference between groups on continuous measures.

RK&A has reported only statistically significant results of inferential statistics using $p < .01$. Consistent variables for inferential statistics include:

- AOH exhibits visited (individual exhibits; visited 4+ AOH exhibits versus visited 3 or fewer AOH exhibits)
- SASSY climate audience (Concerned or higher versus Cautious or lower)
- Gender identity
- Age
- Race/ethnicity
- Visitation
- Visit group type

FINDINGS

RK&A conducted 169 interviews with visitors 11 years and older after they visited the Hall of Fossils – Deep Time exhibition. The participation rate for the interviews is 40 percent.[1]

BACKGROUND CHARACTERISTICS

Of the participants:

- **Visitation**: Over one-half (53 percent) are repeat visitors; less than one-half (46 percent) are first time visitors. Of the repeat visitors, one-quarter (23 percent) visited in the past two years.

- **Visit group**: Two-thirds (70 percent) visited in an adult-only group, one-fifth (19 percent) visited in a group with children, and several (11 percent) visited alone.

- **Age**: Ages ranged from 11 to 78 years.

  - **Adults**: Most (90 percent) are adults. The median age is 30 years and the mean is 35 years.

  - **Youth**: Several (10 percent) are youth. The median and mean age of youth was 14 years.

- **Gender identity**: Over one-half (52 percent) identify as female, less than one-half (47 percent) identify as male, and two did not specify (1 percent).

- **Race/ethnicity**: Two-thirds (70 percent) identify as White; several (16 percent) identify as Asian; several (16 percent) identify as Hispanic, Latino, or Spanish; a few (4 percent) identify as Black or African American; a few (2 percent) identify as American Indian or Alaska Native; a few (2 percent) have another racial or ethnic identity.[2] Several (9 percent) identify with more than one race/ethnicity.

- **Region**: Nearly two-thirds (62 percent) reside in the South; and several each reside in the Northeast (16 percent), West (11 percent), or Midwest (10 percent).

- **Education**: Over one-third (42 percent) have a graduate or professional degree, one-third (33 percent) have a bachelor's degree, a few (8 percent) have an associate's degree, and several (18 percent) have a high school diploma.

- **Disability**: Most (98 percent) did not specify a disability (personally or in their visit group) that would affect their visit. A few (2 percent) specified disabilities.[3]

- **SASSY climate audience:** Two-thirds (65 percent) are Alarmed, one-fifth (21 percent) are Concerned, several (10 percent) are Cautious, and a few each are Disengaged (1 percent), Doubtful (1 percent), or Dismissive (2 percent).

---

[1] The participation rate is calculated by dividing the number of visitor groups who agreed to participate in the interview (169) by the number of all eligible visitor groups recruited (427). Additionally, 15 participants were deemed ineligible owing to language barriers. Note that respondents in a group with children were statistically more likely than adult only visitors/groups to decline to participate in an interview.

[2] Two identify as Middle Eastern/North African, one identifies as Native Hawaiian/other Pacific Islander.

[3] Disabilities included: Physical limitations; Has trouble walking and standing for too long; hearing loss; and heart condition.

AREAS VISITED

Participants were shown images of seven Age of Humans exhibits and asked which ones they remembered using or looking at during their visit. One-quarter (25 percent) visited four or more of the Age of Humans exhibits during their visit.

- ♦ **Age of Humans Gallery**: Two-thirds (65 percent) said they visited the Age of Humans Gallery.

- ♦ **Permian/Triassic Extinction video**: Nearly one-half (46 percent) said they visited the Permian/Triassic Extinction video.

- ♦ **PETM/Global Heat Wave section**: Nearly one-third (30 percent) said they visited the PETM/Global Heat Wave section.

- ♦ **Ice Core video**: Nearly one-third (30 percent) said they visited the Ice Core video.

- ♦ **Coal Mine video**: Over one-quarter (28 percent) said they visited the Coal Mine video.

- ♦ **Polar Forest section**: One-fifth (21 percent) said they visited the Polar Forest section.

- ♦ **Carbon Cycle video**: One-fifth (21 percent) said they visited the Carbon Cycle video.
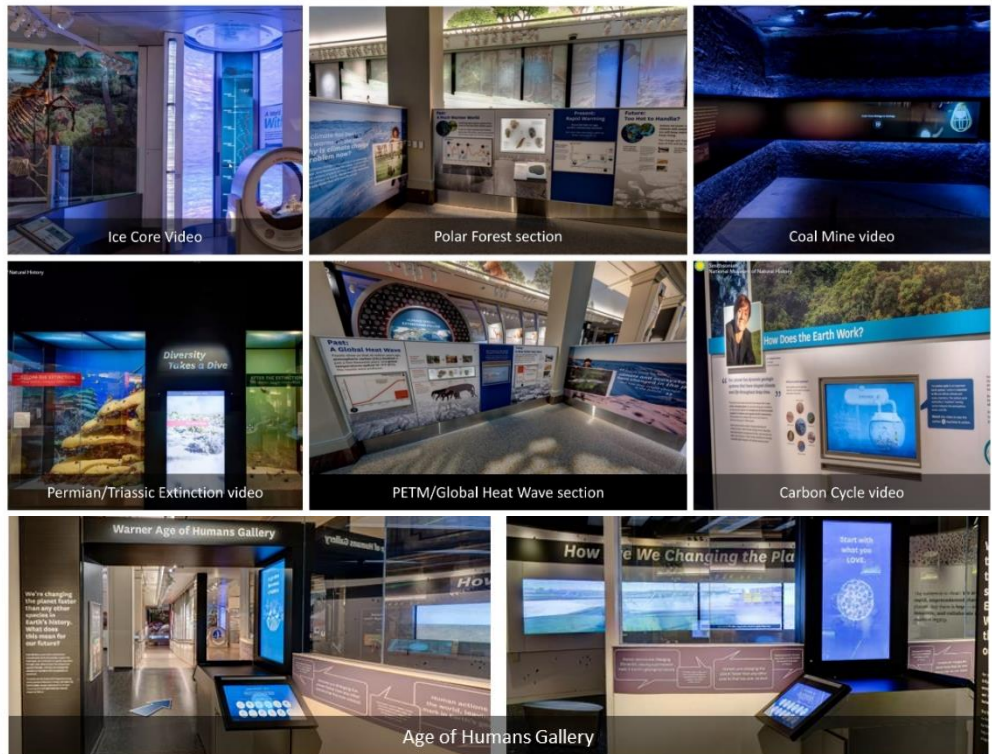
FAVORITE PART

Participants were asked to name their favorite part of the Hall of Fossils – Deep Time. Unsurprisingly, most participants enjoyed Deep Time's display of various fossils:

♦ **Fossils**: Almost three-quarters (72 percent) talked about fossils generally. They liked seeing real-life fossils in person and discovering what fossils could tell them about organisms that lived in the past (i.e., how they looked, their habitat and behavior, etc.). Over one-third identified specific fossils (e.g., T-Rex, giant sloth, mammoth).

♦ **Evolution and mass extinctions**: Less than one-fifth (15 percent) said they liked learning about the evolution of plant and animal life (i.e., reading about and seeing visual representations of how species evolved over time). They also mentioned the impact and scale of mass extinctions (i.e., viewing life before and after mass extinctions as well as understanding correlations between these events and today's climate change).

♦ **Interactive elements**: Less than one-fifth (14 percent) said they liked Deep Time's audio/video and interactive elements (e.g., videos in the Gallery's amphitheater, Permian/Triassic Extinction video, "Your Body Through Time" interactive). They said they enjoyed Deep Time interactives because they could select what they wanted to learn about. They also said that Deep Time's videos brought important facts to life through visuals, real-life examples, and interviews with experts.

♦ **FossiLab:** Less than one-fifth (11 percent) identified the FossiLab (particularly seeing scientists at work) as their favorite part because it offered a "behind-the-scenes" look at scientists' process.

♦ **Climate change and humans' role:** A few (4 percent) said they liked seeing information about climate change and humans' effects on the environment.

There are no statistically significant relationships related to this question.

> **FOSSILS**
>
> 66 Seeing the fossils and skeletons. Especially the big ones. It is so different, and you get a physical sense of the scale and difference. Just based off observation, seeing the long necks and the sheer size of something we don't have around anymore." *[Male, 19]*
>
> **EVOLUTION AND MASS EXTINCTIONS**
>
> 66 I really liked seeing the evolution areas - I like how it was divided by time periods and different parts of history. In school when you learn it, it's very vocab based so it was nice to physically walk through something and see it." *[Female, 21]*

MAIN MESSAGE

Participants were asked about the main idea or message the museum wanted them to take away from the Hall of Fossils - Deep Time. Most participants identified more than one message.

♦ **Evolution and mass extinctions**: Slightly more than one-half (54 percent) said the main message was learning about the evolution of plant and animal life on Earth—or, relatedly, the impact and scale of mass extinctions on plant and animal life. Participants often discussed evolution and mass extinctions together. They also often mentioned how the layout of Deep Time (i.e., physically walking through time periods, seeing timelines and large signposts that marked Permian-Triassic and Cretaceous–Paleogene extinctions) gave them this impression.

Seeing diversity of Earth's past life: Nearly one-half (44 percent) said the main message was about seeing examples of past animal and plant life (through real-life fossils and artifacts) and understanding the diversity of organisms that have lived on Earth over time.

♦ **Humans' relationship with the Earth**: Over one-third (40 percent) of participants talked about humans' relationship with the environment. They talked about this idea in many ways, such as humans as one species on the planet and humans' impact on the Earth, contributions to climate change, and interconnectedness with nature. When asked what in the exhibition brought this message to their minds, they discussed a range of videos, graphics on human migration and extinction rates, and climate change sections (PETM/Global Heat Wave and Polar Forest sections).

♦ **Taking action:** Less than one-fifth (12 percent) discussed the need for humans to take action to care for the Earth (e.g., conserve nature, make sustainable decisions, combat climate change). For example, one participant said, "These lives ended and ours can end the same way. It's up to us to make the changes and fix what we can."

> **Significant relationship:** Respondents in the SASSY climate audience Concerned or higher are more likely to say that the exhibition's main message was about humans' relationship with the Earth.

EVOLUTION AND MASS EXTINCTIONS

" Most transitions between time periods have some kind of extinction. There were a bunch of small events that could lead to a large mass extinction, and it could happen again. Seeing the microscopic remnants pushing towards the existence of evolution. All forms of science worked together to support evolution in the exhibit. I also picked up things on human interaction." *[Female, 68]*

HUMANS' RELATIONSHIP WITH EARTH

" Humans affect our environment significantly. People have a significant impact on the trajectory of the planet, and it is a good reminder. The Carbon Cycle video mentioned how farming and urbanization lead to climate change." *[Male, 25]*

HUMANS' ROLE IN SHAPING LIFE ON EARTH

Participants were asked how, if at all, the Hall of Fossils – Deep Time make them think about humans' role in shaping the environment and life on Earth in the present and future. Most participants said that humans were affecting the Earth in negative ways. Participants often mentioned more than one idea.

> **Significant relationship:** Respondents in the SASSY climate audience Concerned or higher are more likely to describe humans as having a generally negative impact on the Earth.

- **Negative impact:** Nearly one-half (45 percent) described humans having a generally negative impact on the Earth, stating that actions such as overconsumption and carbon emissions are directly causing species extinction, habitat loss, and destruction of ecosystems and land. When asked what communicated that idea, they often cited exhibit panels on the ramp of the Age of Humans' Gallery (human footprint and extinction rates), the Polar Forest section, and the PETM/Global Heat Wave section.

- **Caring for the Earth**: One-third (33 percent) said that humans need to consider consequences of our actions; they said humans have a responsibility to conserve and care for the Earth. When asked what exhibition part reinforced this need, most mentioned the Age of Humans' "human footprint" and extinction rate panels as well as videos (e.g., ice core video, carbon cycle video, Permian/Triassic Extinction video, and videos in the Age of Humans' Gallery amphitheater).

- **Accelerated change:** One-fifth (20 percent) specifically discussed humans' negative impact on the pace and scale of environmental changes—they said despite humans' relatively short time on Earth, human activities have led to significant, massive change such as increasingly rising temperatures and faster rates of species extinction. Participants mentioned various components in the exhibition that reinforced these ideas: ice core video, carbon cycle video, PETM/Global Heat Wave section, Polar Forest section, timelines showing humans' time on Earth, and videos in the Age of Humans' Gallery amphitheater.

> **Significant relationship:** Respondents in the SASSY climate audience Cautious or lower are more likely to say they did not think about humans' role shaping the environment and life on Earth.

- **Did not think about it**: Less than one-fifth (16 percent) said that they did not think about humans' role when going through Deep Time.

- **No impact**: A few (2 percent) said that humans had no impact on the Earth while a few (9 percent) stated that humans are just part of an ecosystem and life goes on regardless of their impact.

NEGATIVE IMPACT

❝ We've had and continue to have a large role to play…[the exhibition] reinforced that we're not living in a vacuum, everything we do affects everything else on Earth…We can't live on the planet with this many people and not be conscientious." *[Male, 43]*

TAKING ACTION

❝ As you go through the exhibit, you get stats on extinction, and it shows how many animals that used to be here are now gone. For humans, that could be us one day. Humans have to preserve the earth and care for it…Dinosaurs were dominant just like humans. Their extinction wasn't in their control but ours is." *[Female, 25]*

PERSONAL ACTIONS TO HAVE A POSITIVE IMPACT ON THE EARTH

Participants were asked how, if at all, the exhibition made them think about what they can do to have a positive impact on the Earth.

- ♦ **Thought about positive impacts**: Almost two-thirds (60 percent) said the exhibition made them think about ways to positively impact the Earth. In particular:

  - ▪ **Specific daily actions**: About one-quarter (26 percent) identified individual, daily actions (e.g., growing your own food, buying fuel efficient cars, walking instead of driving, recycling, etc.) as important steps for creating a positive impact.

  - ▪ **Caring for the Earth**: Less than one-fifth (12 percent) generally discussed taking care of the Earth, conserving the environment, and being good stewards of the planet. For instance, one participant said, "Conservation comes to mind. Be mindful of my own role even if it's a small one. We are a very small part of a big process."

  - ▪ **Collective action**: A few (9 percent) identified examples of collective action needed to positively impact the Earth such as upholding environmental laws, supporting sustainable practices and companies that are sustainable and eco-friendly, and regulating carbon emissions.

  - ▪ **Education**: A few (8 percent) talked about the importance of education on environmental issues—making both adults and children aware of our impact on the Earth.

  - ▪ **Miscellaneous**: A few (5 percent) had miscellaneous responses.

- ♦ **Did not think about it:** About one-third (37 percent) said the exhibition did not make them think about how they could positively impact the Earth. While most said they simply did not think of it, a few said Deep Time reinforced actions they already did, and a few said their individual actions could not make a significant difference.

Significant relationship: Respondents who visited four or more AOH exhibits were more likely to say the exhibition made them think about ways they can have a positive impact on the Earth.

SPECIFIC, DAILY ACTIONS

❝ We watched [a] video on beaches and farms. We want to grow our own food and buy local. People need to do their part to clean the ocean. It was inspiring to see people are actually out there doing it now." *[Female, 34]*

COLLECTIVE ACTION

❝ The impact of maintaining green space to try to make sure there is a balance of green space and cement in our built-up areas. [In the Age of Humans Gallery it mentioned] the rooftops in Chicago and how they said it makes a difference there." *[Female, 46]*

SCIENTISTS AND THEIR WORK

Participants were asked how, if at all, the Hall of Fossils – Deep Time made them think about the ways scientists do their work. Most participants discussed the expertise and skills of scientists, demonstrated interest in scientific processes, or described scientists' work as "cool" or "interesting."

♦ **Scientists' knowledge and skills:** Slightly more than one-half (51 percent) described scientists' work as "precise," "detailed," and requiring "patience" because processes were time consuming and complex. When asked to identify an exhibition component that prompted these thoughts, several discussed the FossiLab (i.e., seeing scientists at work, viewing the lab's equipment). A few said that seeing fossil reconstructions and displays made them consider the detail, time, and effort scientists devoted to their work.

♦ **Scientific process**: Over one-third (38 percent) were interested in how scientists find and analyze fossils to draw conclusions about the past. Specifically, participants said they thought about the different stages of the research process and the process of fossil collection, analysis, and reconstruction. Participants talked about many places in Deep Time that promoted this idea such as the FossiLab and videos and labels explaining the process of collecting, extracting, and analyzing fossils.

♦ **Generally interested**: Less than one-fifth (14 percent) described scientists' work as generally "cool" or "interesting". Most described how the FossiLab provided a "behind-the-scenes" look into scientists' methods and tools.

♦ **Did not think about it**: Less than one-fifth (12 percent) said they did not think about ways in which scientists do their work.

SCIENTISTS' KNOWLEDGE AND SKILLS

❝ We take the small things for granted. It is so difficult to identify the age. An exhibit showed that. It is not an easy job. It is very difficult throughout the process. Between identifying and the timing. The lab is one place that makes the work more real. We can really see it as opposed to reading about it." *[Male, 53]*

SCIENTIFIC PROCESS

❝ There are different ways to analyze work, like ice core analysis. There are different sources to paint a picture of the past. There are a lot of ways to present the past and show change through time." *[Male, 23]*

CURIOSITY TO LEARN MORE

Participants were asked what, if anything, they saw or heard in the Hall of Fossils – Deep Time that sparked their curiosity to explore more later.

- ♦ **Fossils:** Slightly less than one-half (44 percent) said that seeing fossils in person and models of prehistoric animals (such as the tetrapod model) piqued their curiosity. Some were intrigued by what fossils could tell us about past life (e.g., what species looked like, how they lived and evolved through time, and how they were impacted by mass extinctions events and human migration). Some were curious about the process behind finding, studying, and preserving fossils as well as reconstructing fossil displays.

- ♦ **Evolution and mass extinction**: One-fifth (20 percent) said exhibits on mass extinction events and evolutionary timelines made them curious to learn more. Most said they wanted to learn more about the causes behind and impact of mass extinctions (e.g., species extinction, acid rain). A few were curious about evolutionary timelines— when different species existed and how they evolved.

- ♦ **Nothing**: Less than one-fifth (16 percent) said nothing in Deep Time made them curious.

- ♦ **FossiLab**: A few (5 percent) mentioned the FossiLab—they wanted to know more about scientists' jobs and processes.

- ♦ **Videos**: A few (6 percent) mentioned a variety of videos sparked their personal interests (e.g., ice core video, Permian/Triassic extinction video, videos in the Age of Humans' amphitheater).

There are no statistically significant relationships related to this question.

FOSSILS

❝ Curiosity is always there, but when you come to these places, curiosity blooms. We would like to learn about more animals, like the sloth, that were around back then and not now. So, we can compare them to what is around now." *[Male, 28]*

APPENDICES

APPENDIX A: AGE OF HUMANS INTERVIEW GUIDE

NMNH DEEP TIME AGE OF HUMANS INSTRUMENT

ID#: _____   Recruited at: AV / Rot   Date: _____   Time of day: Morning / Afternoon

Interview Script:
Thank you for talking with me today! I'd like to ask you a few questions about your experience in the Hall of Fossils—Deep Time.

1. What was your favorite part of the Hall of Fossils – Deep Time?
   a. [probe: Why did you like that most? What did you see or hear that brought that idea to mind?]

2. What is the <u>main idea or message</u> you think the museum wanted visitors to walk away with from the Hall of Fossils – Deep Time?
   a. [probe: Can you think of an example of something you saw or heard that brought that idea to mind? Tell me more about that.]

3. Which of the following areas do you remember using or looking at during your visit? [show picture board of AOH focus areas and record which areas were visited].
   ☐ Age of Humans Gallery
   ☐ PETM/Global Heat Wave section
   ☐ Polar Forest section
   ☐ Carbon Cycle video
   ☐ Permian/Triassic Extinction video
   ☐ Ice Core video
   ☐ Coal Mine video

4. How, if at all, did the Hall of Fossils – Deep Time make you think about <u>humans' role in shaping the environment and life on Earth in the present and future</u>?
   a. [probe: Tell me more about that. What did you see or hear in the exhibition that brought that idea to mind?]

5. How, if at all, did the exhibition make you think about <u>what you can do</u> to have a positive impact on the Earth?

   a. [If not already mentioned] Are there any <u>actions</u> you heard about in the exhibition that you plan to adopt? What about what you saw or heard inspired you to make that change?

6. How, if at all, did the Hall of Fossils – Deep Time make you think about <u>the ways scientists do their work</u>?
   a. [probe: Tell me more about that. What did you see or hear in the exhibition that brought that idea to mind?]

7. What, if anything, did you see or hear in the Hall of Fossils – Deep Time that sparked your curiosity to explore more later?
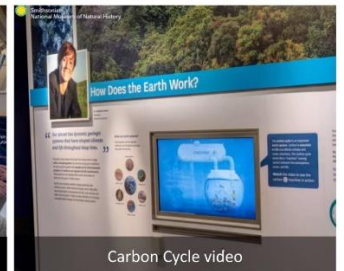   a. [probe: Tell me more about that. What did you see or hear in the exhibition that brought that idea to mind?]
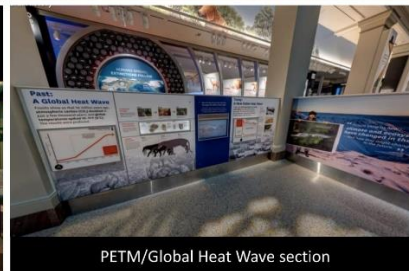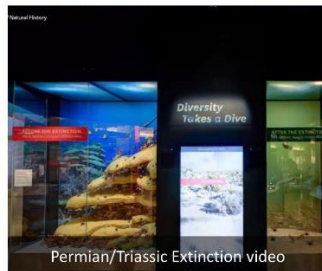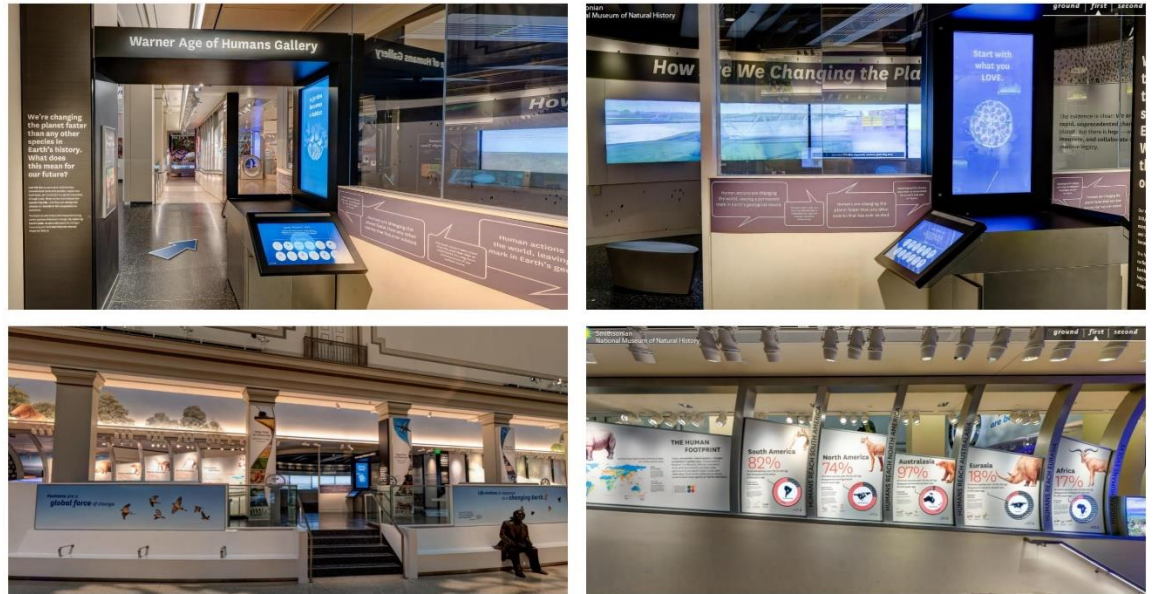
Thanks! I just have a few background questions to ask before we finish [pass visitor survey to complete]:

1. Is this your first time visiting the museum?
   - ❒ Yes
   - ❒ No
         [If no] Had you visited in the past two years?
         - ❒ Yes
         - ❒ No

2. Are you visiting alone or in a group?
   - ❒ Alone
   - ❒ Group
         [If in a group] Did your group include children?
         - ❒ Yes
         - ❒ No

3. Age: _____

4. Gender: _____

5. Zip code: _____

6. [Adults only] What is the highest level of education you have completed?
   - ❒ Less than high school diploma
   - ❒ High school diploma
   - ❒ Associate's degree
   - ❒ Bachelor's degree
   - ❒ Graduate/ Professional Degree

7. Do you or someone in your visiting group have a disability that affects your visit the museum?
   - ❒ Yes
   - ❒ No

8. If yes to Question 7, please describe:_____

9. With which US Census racial or ethnic group(s) do you identify with? Select all that apply.
   - ❒ American Indian or Alaska Native
   - ❒ Asian
   - ❒ Black or African American
   - ❒ Hispanic, Latino, or Spanish
   - ❒ Middle Eastern or North African
   - ❒ Native Hawaiian or other Pacific Islander
   - ❒ White
   - ❒ Other racial or ethnic group:_____

10. How important is the issue of climate change to you personally?
    - ❒ Extremely important
    - ❒ Very important
    - ❒ Somewhat important
    - ❒ Not too important
    - ❒ Not at all important

11. How worried are you about climate change?
    - ❒ Very worried
    - ❒ Somewhat worried
    - ❒ Not very worried
    - ❒ Not at all worried

12. How much do you think climate change will harm you personally?
    - ❒ A great deal
    - ❒ A moderate amount
    - ❒ Only a little
    - ❒ Not at all
    - ❒ Don't know

13. How much do you think climate change will harm future generations of people?
    - ❒ A great deal
    - ❒ A moderate amount
    - ❒ Only a little
    - ❒ Not at all
    - ❒ Don't know

14. How often do you discuss climate change with your family and friends?
    - ❒ Often
    - ❒ Occasionally
    - ❒ Rarely
    - ❒ Never

15. How interested or uninterested would you be in joining a campaign to convince elected officials to take action to reduce climate change?
    - ❒ Participating now
    - ❒ Interested in joining
    - ❒ Not sure
    - ❒ Uninterested in joining

Thank you so much for your time today. Enjoy the rest of your visit.

Ice Core Video

Polar Forest section

Coal Mine video

Permian/Triassic Extinction video

PETM/Global Heat Wave section

Carbon Cycle video

APPENDIX C: STATISTICALLY SIGNIFICANT RELATIONSHIPS

MAIN MESSAGE

Difference by SASSY Audience

	% Concerned or higher	% Cautious or lower	
Humans' relationship with Earth	45	13	$p = .00$

HUMANS' ROLE IN SHAPING LIFE ON EARTH

Difference by SASSY Audience

	% Concerned or higher	% Cautious or lower	
Negative impact	50	17	$p = .00$
Did not think about it	12	46	$p = .00$

PERSONAL ACTIONS TO HAVE A POSITIVE IMPACT ON THE EARTH

Difference by AOH areas visited

	% Visited 4+ AOH areas	% Visited 3 or fewer AOH areas	
Thought about positive impacts	78	56	$p = .01$

RK&A
LEARN WITH US

LONGITUDINAL STUDY: HALL OF FOSSILS - DEEP TIME

Prepared for the
National Museum of Natural History
Washington, D.C.

Longitudinal Study: Hall of Fossils - Deep Time
May 2022

TABLE OF CONTENTS

KEY TAKEAWAYS

This section presents 3 key takeaways from the Longitudinal Study for the Hall of Fossils—Deep Time based on interview data collected up to one month after participants had visited the National Museum of Natural History (NMNH) during March and April 2022. Key takeaways for the Longitudinal Study are informed by the data and our years of experience working with museums:

1. MAIN MESSAGES RELATED TO CLIMATE CHANGE AND THE CONNECTIONS OF ALL LIFE RESONATE OVER TIME

Weeks after a visit, many participants took away aspects of the exhibition's big idea that *Earth's distant past is connected to the present and shapes our future*, including how climate change and human action influences that connection. For instance, more than one-half perceived the main message to be how life is connected through deep time and that humans are a small part of the story of life. And, when probed specifically about human impact, many (almost three-quarters) said they thought about how humans are negatively impacting life on Earth and/or have a responsibility to protect the Earth through their actions.

2. FOSSIL DISPLAYS AND WORKING SCIENTISTS MADE A LASTING IMPRESSION ON VISITORS

Participants were highly engaged by the large and dynamic fossil displays as well as seeing scientists in the FossiLab. For instance, many noted that the large-scale fossils and how they were dynamically positioned brought the history of the animals to life. They also enjoyed the FossiLab because it contextualized what paleontologists do and was a fun way to see them in action. And, when probed specifically about their perceptions of scientists in general and at the museum, participants had overwhelmingly positive things to say, ranging from general appreciation for the work of scientists to genuine interest in how they contribute to knowledge and discovery.

3. TAKING CONCRETE, SPECIFIC ACTIONS AGAINST CLIMATE CHANGE WAS NOT TOP OF MIND A FEW WEEKS AFTER A VISIT TO DEEP TIME

While more than one-half of participants said they generally thought about how they could positively impact the environment while in Deep Time, only one-quarter said they saw specific actions in Deep Time they could take. And, less than one-fifth said they were curious to learn more about climate change in the Earth's past and the impact of climate change today. Instead, participants expressed interest in learning more about the fossils on display and how animals had evolved over time.

STUDY BACKGROUND

The Longitudinal study is one of four studies that was conducted by RK&A as part of a summative evaluation of the Hall of Fossils – Deep Time exhibition. The objectives of this study are to explore the extent to which the exhibition had a longer-term effect on visitors' knowledge, impressions, and behavior following their experiences in Deep Time.

ABOUT DEEP TIME

The Hall of Fossils – Deep Time exhibition explores the big idea that *Earth's distant past is connected to the present and shapes our future.* The exhibition also explores how human actions are driving Earth's rapidly changing climate and how the choices we make today will impact the future.

METHODOLOGY

RK&A conducted 65 interviews with visitors 16 years and older who had visited Deep Time up to one month prior. RK&A intercepted eligible visitors onsite and asked them to participate in a telephone interview a few weeks after their visit. Those who agreed were e-mailed a link to schedule an interview after visiting. During interviews, RK&A asked participants questions about their experiences overall, their perceptions of the main idea or message of Deep Time, and how they thought humans fit into and have shaped life on Earth. We also asked participants to discuss whether Deep Time had sparked curiosities or made them think differently about how they can have a positive impact on the Earth (see interview guide in Appendix A). Interviewers took detailed notes of all interviews to facilitate analysis, and all participants received a $20 gift card for their participation.

Interview data are qualitative, meaning that results are descriptive. In analyzing the data, the evaluator studied the interview notes for meaningful patterns and grouped similar responses. Findings are reported in narrative, supplemented with quotations from participants. Trends and themes in the data are presented from most- to least-frequently occurring. When describing the findings, this report uses proportions and qualitative data terms such as "most" and "some"—such descriptive language is intended to provide readers with a sense of the general patterns.

FINDINGS

RK&A conducted 65 interviews with visitors 16 years and older after they visited the Hall of Fossils – Deep Time exhibition. The participation rate for the interviews was 22 percent.[1]

BACKGROUND CHARACTERISTICS

Of the participants:

♦ **Visitation**: Over one-half of participants (57 percent) are repeat visitors; less than one-half (43 percent) are first-time visitors. Of the repeat visitors, one-fifth (22 percent) visited in the past two years.

♦ **Visit group**: Less than two-thirds (62 percent) visited in adult-only groups, one-quarter (26 percent) visited in a group with children, and less than one-fifth (12 percent) visited alone.

♦ **Age**: Ages ranged from 16 to 75 years, with a median of 30 years and a mean of 34 years.

♦ **Gender identity**: Over one-half (54 percent) identify as female, less than one-half (42 percent) identify as male (42 percent); and one identifies as non-binary.

♦ **Race/ethnicity**: Three-quarters (75 percent) identify as White, less than one-fifth (15 percent) identify as Asian, and the remaining participants identify as Hispanic/Latino/Spanish (5 percent) or Black/African American (3 percent).[2]

♦ **Region**: One-half (51 percent) reside in the South, one-quarter (23 percent) reside in the Midwest, and less than one-fifth each reside in the Northeast (11 percent) and West (8 percent); a few reside internationally (2 in Canada, 1 in United Kingdom).

♦ **Education**: Less than one-half (45 percent) have a graduate or professional degree, one-third (32 percent) have a bachelor's degree, a few (5 percent) have an associate's degree, and less than one-fifth (17 percent) have a high school diploma (or are in high school currently).

♦ **SASSY climate audience:** Two-thirds (65 percent) are Alarmed, one-quarter (23 percent) are Concerned, and the remaining participants are Cautious (9 percent), Disengaged (2 percent), or Doubtful (2 percent).

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[1] The participation rate is calculated by dividing the number of visitors who agreed to participate in the interview (65) by the number of all eligible visitors recruited (291).

[2] The total does not equal 100 percent because two participants declined to answer the question.

MOST ENGAGING ASPECTS

Participants were asked to discuss the most engaging or surprising aspects of their visit to the Hall of Fossils - Deep Time.

- ♦ **Scale and dynamic context of fossils**: Two-thirds of participants said the fossils were most interesting because they were large in scale and brought the history of the animals to life. They said they enjoyed the various positioning of the fossils and seeing scientists work on the fossils in the FossiLab. Many noted they liked the FossiLab because it contextualized what paleontologists do and was a fun way to see them in action.

- ♦ **Diverse range of topics:** About one-half said they found the diversity of topics most interesting and enjoyed learning new information about a variety of topics other than dinosaurs. These topics included ancient ocean life, evolution of various species, learning about human origins, deep time, and how scientists investigate these topics.

- ♦ **Climate change messaging**: About one-quarter noted they were surprised to learn about the effects of climate change on extinctions and evolution because they were not expecting to find that in the Hall of Fossils. Some noted they did not know much about the effects of climate change prior to their visit.

- ♦ **Easily navigated exhibition design:** About one-fifth said they found the exhibition layout and design interesting because they felt it had a good flow, using the space efficiently to present a large amount of information. A few also noted they were impressed by the exhibition designers' ability to create a space that many people could easily navigate at once.

SCALE AND DYNAMIC POSITIONING OF FOSSILS

❝ I thought it was interesting that some of the fossils were displayed in active poses. The skeletons were brought to life and it was very notable. It helps make the connections between species because it doesn't isolate the individual fossils or species. That hopefully connects it to a larger ecosystem and then hopefully to humans." *[Male, 45]*

DIVERSE RANGE OF TOPICS

❝ I just think I am always surprised by how much more there is to learn. I don't study fossils but I remember walking in and seeing the giant sloth and thinking about how vast the biodiversity was back then." *[Male, 45]*

MAIN MESSAGE

Participants discussed what they perceived as the main idea or message of the Hall of Fossils - Deep Time.

♦ **Understanding how life is connected through time:** More than one-half of participants said they thought the main idea was to communicate how life is connected through deep time to better contextualize past animals, life forms and modern humans. They said they were unaware of the scope of deep time and felt that understanding these connections helped them see that humans are just a blip on the timeline.

♦ **Understanding human harm:** More than one-fifth said they felt the main message was to better understand how humans have harmed Earth through the lens of deep time and what we can do to stop further negative impact.

♦ **Inspiring wonder and curiosity:** About one-fifth said they thought the main message was to inspire wonder and curiosity for visitors, especially children. They said it was a great way to interact with new, "larger-than-life" concepts and inspired them to learn more. They also said the FossiLab served as a tangible introduction to ways kids could channel their future curiosities.

♦ **Unsure:** Two said they were not sure what the main idea or message was, explaining that it seems geared towards general education (if anything).

UNDERSTANDING HOW LIFE IS CONNECTED THROUGH TIME

" I left that exhibit with the message that humans are not the main characters on this planet; there were things before us and maybe things after us. We are coexisting, we have taken up more space. You know there are all these beautiful life forms that came before us that we drove out, and I think that part of the message was to be more conscientious of creatures and how we're all connected." *[Non-binary, 20]*

UNDERSTANDING HUMAN HARM

" We are the only species that, through our own actions, have affected the climate. Other species adapt or go extinct, but they by their actions don't really affect the climate. Meanwhile, humans affect the climate in major ways. Animals didn't accelerate climate change, we did. Our governor needs to go to that exhibit. He said he doesn't understand climate change." *[Female, 72]*

HUMANS ROLE IN EARTH'S HISTORY

Participants were asked how, if at all, the Hall of Fossils – Deep Time made them think about how humans fit in with other species over the course of Earth's history.

♦ **Humans are a small part of Earth's history**: About one-third of participants said they thought about how humans' time on Earth is minuscule compared to Earth's long history; a few also added that Deep Time's fossils and displays reminded them that humans are physically smaller than several species in Earth's past. A few mentioned how Deep Time's timeline brought this idea to mind. For instance, one participant explained that seeing humans' small place in Earth's history offered them "some perspective" and made them "realize that however big and dominant humans feel now, we're just one little blip and moment in history like anything else."

♦ **Humans' negative impact**: About one-third said they thought about humans' significant, negative impact on the Earth, despite their relatively short existence on the planet. They discussed how human activities have increased pollution, accelerated climate change, damaged habitats, and contributed to species extinction.

♦ **Humans as part of Earth's ecosystems**: Less than one-fifth said they thought about humans' relationship with other species. They said that humans have coexisted with animals, discussing how humans shared resources with animals like mammoths, or that humans are animals who, like other animals, have evolved throughout Earth's history.

♦ **Did not think about humans:** Less than one-fifth said they did not think about humans as they went through Deep Time. A few said they thought more about humans in the Hall of Human Origins.

HUMANS ARE A SMALL PART OF EARTH'S HISTORY

❝ It made me think about how little time humans have actually been on earth and how much has happened before humans even evolved. I thought it was crazy how for the entirety of the exhibit, there were no humans around and then humans showed up around at the latest era in there. It put into perspective how much time had passed before human history began." *[Male, 19]*

HUMANS' NEGATIVE IMPACT

❝ We are the only species that though our own actions have affected the climate. Other species adapt or go extinct, but they by their actions don't really affect the climate. Meanwhile, humans affect the climate in major way. Animals didn't accelerate climate change, we did. Our governor needs to go to that exhibit. He said he doesn't understand climate change." *[Female, 72]*

HUMANS' ROLE IN SHAPING THE ENVIRONMENT

Participants were asked how, if at all, the Hall of Fossils – Deep Time made them think about humans' role in shaping life and the environment on Earth in the present and future.

♦ **Humans negative impact on the Earth**: About one-half of participants said that human actions were damaging the Earth by increasing the scale and pace of environmental change. When asked what in Deep Time brought these ideas to mind, they said the exhibition's dioramas (i.e., what life looked like before human intervention), fossils, videos (such as the Permian/Triassic extinction video) and panels on climate change and species extinction rates (on the ramp near the Age of Humans' Gallery).

♦ **Taking action**: One-quarter said that, given humans' interconnectedness with Earth's ecosystems, humans have a responsibility to conserve and preserve life on Earth, like being good stewards of the Earth, rethinking our relationship with the Earth, revising environmental policies, and decreasing pollution.

♦ **Did not think about it:** Slightly less than one-fifth said they did not think about humans' role. While a few said they simply did not think about it, others said they did not remember viewing any information about humans' role, they already had ideas about humans' role before Deep Time, or they thought about humans' role in another exhibit (such as the Hall of Human Origins).

♦ **No impact**: A few said that humans did not have a significant impact on the Earth, stating that events such as asteroids or volcanos have more impact than humans; past extinction events have no connections to today's climate change; or that, due to humans' short time on Earth, humans have not drastically affected the environment.

HUMANS' NEGATIVE IMPACT

❝ The scale of impact is way more and way worse in so many ways. Not only are we predatory amongst other animals, but the way in which we degrade our resources and consume and deplete and pollute. I just think we are really horrible. It doesn't really compare - the scale at which we are destructive compared to other species who are in balance." *[Female, 36]*

TAKING ACTION

❝ It affected me because I walked in there with a respect of life forms and walked out with an even deeper respect for life and how we exist. It was sad for me to see the fossils of animals who no longer exist…I don't think we can dismiss that. We should own that, and we should make better choices for the environment and the future. So personally, it affected me by being more conscious of that. That ramp with the percentages really brought it to my mind and the fossil in the back, the mummified deer, how it was an actual fossil."
[Non-binary, 20]

HAVING A POSITIVE IMPACT ON THE EARTH

Participants were asked how, if at all, the Hall of Fossils – Deep Time made them think about what they can do to have a positive impact on the Earth. Then, they were asked if there were any actions they saw in Deep Time that they have taken or plan to take to have a positive impact on the Earth. While more than one-half said they generally thought about how they could positively impact the environment while in Deep Time, only one-quarter said they saw specific actions in Deep Time they could take.

♦ **Generally caring for the Earth**: Over one-third said they thought generally about how they could take care of the Earth, including changing environmental policies, decreasing pollution, and being mindful of humans' impact on the environment.

♦ **Did not think about it:** Over one-third said the exhibition did not make them think about how they could positively impact the Earth. While most said they simply did not think of it, a few said they were already environmentally conscious (i.e., Deep Time reinforced actions they already did), and a few said they thought about it more in other exhibits (such as the Ocean Hall). A few mentioned they were not aware that actions were presented in the exhibition.

♦ **Specific actions:** Almost one-quarter identified specific actions (e.g., recycling, composting, planting trees, conserving water, providing environmental awareness education, making sustainable choices, advocating for environmental issues, etc.) as ways to positively impact the Earth. Most said they already had these actions in mind and, although they did not remember seeing specific actions in Deep Time, they said generally visiting Deep Time (and viewing its discussion of climate change) reinforced these ideas. However, a few said they remember reading about "reuse, recycle" in Deep Time; one participant said they completed the "Love, Protect, Act" interactive at the Age of Humans Gallery, which inspired them to plant trees with their friends.

CARING FOR THE EARTH

    ❝ I think that consciousness about how we have the possibility and potential to change a lot about or environment if we continue the way we continue. I think it was a reminder that we have the potential and the opportunity to make choices that are environmentally conscious now to prevent drastic alterations to the environment in the future." *[Female, 26]*

SPECIFIC ACTIONS

    ❝ There were a few instances [in Deep Time] talking about recycling making a difference and the way humans interact with the environment. It had something to do with our visit; we upped our recycling efforts 300% since we came back. I imagine that was more subconscious. We figured out new ways to be more recycling heavy since then." *[Male, 35]*

PERCEPTIONS OF SCIENTISTS

Participants were asked what, if anything, the Hall of Fossils – Deep Time made them think about people who do scientific research and whether they knew that the museum has scientists on staff doing research on a wide range of subjects. More than one-half said they knew that the museum has scientists doing research and learned about it in various ways: SI's website, Deep Time's FossiLab, quotes and panels on the museum's exhibit walls (in Deep Time and other halls), guided tours, personal connections to SI, and familiarity with Smithsonian research and opportunities. When talking about their perceptions of scientists, participants described a variety of thoughts, including:

♦ **Appreciative of scientists:** Almost one-half said they were generally appreciative of scientists' knowledge, skills, and time, often saying that scientists had to be patient, dedicated, and detailed. Several said they were impressed by scientists' time, effort, and knowledge in finding, excavating, collecting, and analyzing fossils. A few mentioned that they were appreciative not only of scientists' skills and knowledge, but also their efforts to make scientific research accessible to the public.

♦ **Generally interested in scientists' work**: One-fifth generally described the work that scientists do as "cool" or "interesting."

♦ **Importance of scientists' work to society**: Slightly less than one-fifth said that Deep Time made them think about the importance of scientific research and the significance of scientists' roles in society. They said that scientists' work was important because it helped us better understand our world, and a few said that scientific work needed to be fully funded.

♦ **Interested in scientific disciplines**: Slightly less than one-fifth said that Deep Time made them curious about the field of paleontology as a scientific discipline, explaining the FossiLab sparked this interest. They wanted to learn more about the scientific field (e.g., differences and similarities between fields, how and why scientists selected their chosen field, female scientists).

GENERALLY APPRECIATIVE

❝ Just an appreciation for what they do and their attention to detail. It [science] is constantly evolving so they [scientists] must be adaptable and open-minded. And how time consuming that probably is - especially excavating fossils and how they can figure out what the fossils are." *[Female, 45]*

INTEREST IN FURTHER LEARNING

Participants were asked what, if anything, they were curious to learn more about after visiting the Hall of Fossils – Deep Time. Then, if participants mentioned an idea, they were asked what steps they have taken to learn more about it. While most were curious to learn more, only about one-quarter said they pursued this interest after their visit. When discussing what they wanted to learn more about, participants named a variety of topics, including:

♦ **Fossils:** More than one-half wanted to learn more about fossils (e.g., where fossils are located in the US, how fossils form, how scientists excavate, analyze, and preserve fossils) and facts about past animal and plant life. A few identified specific plants and animals they were interested in (e.g., hippo, sloth, pterosaurs). A few said that, after visiting, they looked up facts online, talked to others about fossils, or watched media that featured dinosaurs.

♦ **Evolution**: Less than one-fifth said they were interested in learning more about how animal and plant life evolved over time, specifically how changing environments and conditions influenced their evolution and evolutionary connections between different species.

♦ **Climate Change**: Less than one-fifth said they were curious about climate change in the Earth's past and the impact of climate change today. They also wanted to know more about how the Earth might look in the future and "next steps" for combating climate change (i.e., specific, daily actions they could implement in their lives and strategies that governments and companies could adopt). One participant said that, after their visit, they researched what they could do to address climate change.

♦ **Nothing**: A few said they were not curious about learning more.

FOSSILS

❝ I would really like to learn more about how geological time works and how they can tell how long ago something was formed or an organism lived based on how deep in the ground the fossil was. I've talked to my dad about it. He's not a geologist but he took geology classes that he loved and talks about so he talks about how they take core samples and that was cool to learn about." *[Female, 16]*

CLIMATE CHANGE

❝ I am more interested to know about, [and what] was amplified by this exhibit, is what humans need to do as a whole, or what companies and industries [need to do], and I'm very curious to know how effective my own environmental awareness is. I take public transport or see a piece of garbage on the street, I pick it up. I walk when I can. How effective is that really? Or is this more of a capitalist issue? Is it effective at an individual level? What can I be doing?" *[Non-binary, 20]*

POST-VISIT DISCUSSIONS

Participants were asked if they talked about their experience at the Hall of Fossils – Deep Time with others after they visited. If they did, they were asked with whom they talked about their experience and what they told them.

♦ **Discussed with others**: Three-quarters talked generally about their museum visit with their family, friends, partners, and colleagues. For instance:

▪ Some discussed the scale and layout of Deep Time and the volume and presentation of exhibition information (i.e., accessible to a broad audience, incorporation of videos and interactives).

▪ Some discussed the experience of learning about Earth's past animal life and viewing fossils in person (for example, one participant described Deep Time as a "time warp").

▪ Less than one-fifth said they recommended Deep Time to others, and less than one-fifth discussed the National Museum of Natural History generally (e.g., talking about how they enjoyed their visit, comparing it to other natural history museums).

♦ **Did not discuss with others:** About one-quarter said they did not talk about Deep Time after their visit.

DICUSSED WITH OTHERS

❝ [I discussed Deep Time with] my friends, my family. We talked about how [my friends with younger children] would love to see all the fossils and there's so much to experience there and the different interactions. It caters to all ages with the videos about mass extinctions or how they uncover fossils and date them. So, we talked about a few of those things." *[Female, 28]*

❝ I talked about it with friends who had also been there. I talked about it with my mom because they were simultaneously having the Smithsonian 'If She Can' exhibit [#IfThenSheCan: The Exhibit] where they had the statues of women and research scientists scattered throughout the museum. My mom was very excited about the exhibit, so I talked about that with her too." *[Female, 21]*

APPENDICES

APPENDIX A: LONGITUDINAL STUDY INTERVIEW GUIDE

Telephone Interview Script:
Thank you for talking with me today! You visited the National Museum of Natural History recently, and during your time there you visited the Hall of Fossils – Deep Time. The Hall of Fossils – Deep Time is located on the first floor, and you might have entered it from the main rotunda with the large elephant or through the African Voices exhibition. We included some images of the fossil hall and its floorplan in our scheduling email with you to remind you of the space.

I want you to think back to your visit to the Hall of Fossils – Deep Time as we are talking.

1. What was the <u>most interesting</u> part of the Hall of Fossils – Deep Time?
    a.   [probe: Why did you find that interesting? Can you think of an example of something you saw or heard in the fossil hall that brought that idea to mind?]

2. What was the <u>most surprising thing</u> you saw or learned about in the Hall of Fossils – Deep Time?
    a.   [probe: Why was that most surprising?]

3. What do you think was the <u>main idea or message</u> the museum wanted visitors to walk away with from the Hall of Fossils – Deep Time.
    a.   [probe: Can you think of an example of something you saw or heard in the fossil hall that brought that idea to mind? Tell me more about that.]

4. How, if at all, did the Hall of Fossils – Deep Time make you think about <u>how humans fit in with other species</u> over the course of Earth's history?
    a.   [probe: Tell me more about that. What did you see or hear that brought that idea to mind?]

    b.   [probe about any mention of: humans as a part of nature and/or connected to other species]

5. How, if at all, did the Hall of Fossils – Deep Time make you think about <u>humans' role in shaping life and the environment on Earth in the present and future?</u>

    a.   [probe: Tell me more about that. What did you see or hear in the fossil hall that brought that idea to mind?]

    b.   [probe about any mention of: humans' effects on life/environment on Earth; the <u>scale</u> of human effects on Earth's history compared to past events, or the <u>pace of change</u> humans are making on Earth versus non-human events in Deep Time.]

6. What, if anything, are you <u>curious</u> to learn more about after visiting the Hall of Fossils – Deep Time?
   a. Have you taken any steps to learn more about [x idea mentioned]?

7. [If not already mentioned] How, if at all, did the Hall of Fossils – Deep Time make you think about <u>what you can do</u> to have a positive impact on the Earth?

   a. Are there any <u>actions</u> you heard about in the Hall of Fossils – Deep Time that you have taken or plan to take to have a positive impact on the Earth? What about what you saw or heard inspired you to make that change?

8. Have you talked about your experience at the Hall of Fossils – Deep Time with others after you visited?

   a. [if yes] Who did you talk to about your experience? What did you tell them?
   b. [if no] No problem.

9. What, if anything, did the Hall of Fossils – Deep Time make you think about <u>the people</u> who do scientific research?

   a. Did you know that the National Museum of Natural History has scientists on staff doing research on a wide range of scientific topics? [If yes, probe: How did you know that?]

Now I have just a few more background questions for you.

10. How important is the issue of climate change to you personally?
    ❒ Extremely important
    ❒ Very important
    ❒ Somewhat important
    ❒ Not too important
    ❒ Not at all important

11. How worried are you about climate change?
    ❒ Very worried
    ❒ Somewhat worried
    ❒ Not very worried
    ❒ Not at all worried

12. How much do you think climate change will harm you personally?
    ❒ A great deal
    ❒ A moderate amount
    ❒ Only a little

☐ Not at all

☐ Don't know

13. How much do you think climate change will harm future generations of people?
    ☐ A great deal
    ☐ A moderate amount
    ☐ Only a little
    ☐ Not at all
    ☐ Don't know

14. How often do you discuss climate change with your family and friends?
    ☐ Often
    ☐ Occasionally
    ☐ Rarely
    ☐ Never

15. How interested or uninterested would you be in joining a campaign to convince elected officials to take action to reduce climate change?
    ☐ Participating now
    ☐ Interested in joining
    ☐ Not sure
    ☐ Uninterested in joining

Thank you!