

## **Front End Evaluation for *Life Underground*, a Field Museum Exhibition about Life in the Soil**

Deborah Perry, Ph.D., and Cecilia Garibay, Selinda Research Associates, Chicago, IL, and Eric D. Gyllenhaal, Ph.D., The Field Museum, Chicago, IL

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### **Abstract**

While planning *Life Underground*, a major exhibition about life in the soil, The Field Museum contracted with Selinda Research Associates to conduct a front end analysis of how museum visitors understand and think about the soil. During in-depth, naturalistic interviews with 175 museum visitors in 85 groups, most visitors seemed surprised that soil would be the topic of a museum exhibition. Although quite familiar with the topic, visitors indicated that they rarely thought about the soil. Some visitors said they were not interested in soil, but various aspects of the planned exhibit intrigued almost everyone, especially the concept of being shrunk and going underground into a 100x reconstruction of a natural soil. Five major exhibit concepts were investigated in depth: (1) Most visitors indicated at best a superficial understanding about the composition of soil. (2) Most visitors showed a basic understanding of soil's role in ecosystems. (3) Many visitors had noticed regional differences in soil, often based on their personal travels. (4) Most visitors had never thought about the idea that soil changes naturally over time. (5) Although *Life Underground* will be set in a local tallgrass prairie, most visitors were adamant that pre-settlement Chicago was not a prairie.

### **Introduction**

As this paper is written in the Fall of 1997, the Field Museum is entering the production phase of a major exhibition about life in the soil. The 10,000-square foot permanent exhibition will be located, appropriately, in the basement of the museum. At the time this study was conducted in 1996, the working title of the exhibition was *Life Underground*, and exhibit developers were planning five major sections for the exhibition:

- An introductory experience that introduced the prairie setting of the exhibit and prepared visitors to be "shrunk" for a trip into the soil
- A walk-through 100x "diorama" of life in a tallgrass prairie soil in the Chicago area, with enlarged models and audioanimatronics of soil animals, plants, and fungi
- A multimedia presentation on how soil develops over thousands of years
- An exhibit about global differences in soils from different biomes
- A final section on soil conservation and sustainable use

*Life Underground* was planned to present four major messages, repeated throughout the exhibit:

- A lot of things live underground

- These living things are inter-connected
- These connections are vital to the Earth's life support systems
- Humans are an important part of these interconnections

As part of the development of *Life Underground*, the Field Museum contracted with Selinda Research Associates to find out how museum visitors understand and think about the soil and related concepts (Perry & Garibay, 1996). The study initially focused on four primary research questions:

- How do visitors think about and understand dirt, soil, and life underground?
- What are visitors' personal connections to dirt, soil, and life underground?
- How do visitors feel about dirt and soil and life underground?
- What are visitors' reactions to specific exhibition ideas?

The first question evolved into a more specific investigation of visitors' understandings of five major concepts planned for the exhibition and of terminology that could be used in the exhibition.

### **Methodology and Methods**

This study employed a naturalistic methodology (Lincoln and Guba, 1985). Naturalistic inquiry is based on the assumption that the best way to find out about a particular set of phenomena is to study the object of inquiry in its natural setting, gathering information from multiple sources until a realistic picture is painted to describe the phenomena in as much detail as possible. Often contrasted with positivistic research which relies on the objective investigation of carefully controlled and pre-determined variables, naturalistic inquiry identifies a focus of study, and through the systematic collection and analysis of data, identifies and reports on issues of importance as they emerge. Naturalistic inquiry is based on building an intimacy with the respondents which allows them to talk frankly and openly about the subject matter.

The data for this study came primarily from face-to-face depth interviews with casual visitors to the Field Museum, conducted during February through April, 1996. The study used purposive sampling methodology (Lincoln & Guba, 1985). Visitors or visitor groups were selected for depth interviews because we thought they could contribute in some particular way to our growing understanding of a given research question. For instance, respondents were selected to include many different perspectives on a given topic (e.g., soil life), ranging from those who expressed disinterest or dislike for the subject to those who had expert knowledge gained through education or employment. Purposive sampling is by definition not representative; however, visitors were selected to represent a wide a range of ages, genders, races, and configurations of the social group with whom they were visiting.

The interviews were conducted in the museum's halls, and visitors were offered a small gift at the conclusion of the interview. Depth interviews were conducted with a total of 85 groups, including 175 individuals, for a total of 38 hours of conversations. Most interviews were tape recorded, and most tape recorded interviews were later transcribed.

We relied on pre-determined interview protocols to focus the interviews. Our intent was to get the answers to the research questions mentioned above by approaching the issues from as many

different routes as necessary, listening carefully to the words the visitors used and the ways they described their understandings. The conversations often went in unanticipated directions and yielded rich and interesting information that we would otherwise have missed. Respondents were usually asked to participate in a card sort activity, using 25-30 cards with various words written on them (e.g., biodiversity, decay, erosion, fungus, mulch, organic matter, stewardship, and weathering). After sorting the cards into whatever categories they wanted to, visitors were engaged in discussion of their piles and what they were thinking about as they engaged in the card sort activity.

## Results

In conducting this study, many interesting themes emerged from the data. The following paragraphs describe these themes. When appropriate, we refer to quantities of visitors who held a particular viewpoint with the words *all*, *most*, *many*, *some*, *few*, and *none*.

### Overview of Findings

In general, we found that most visitors seemed very surprised that soil would be the topic of a museum exhibition. However, unlike many topics undertaken by museums, dirt and soil are very familiar to many people. In addition to seeing dirt and soil almost daily, many visitors we spoke with -- particularly younger ones -- recalled studying earth science in school. Despite their familiarity with the topic, most visitors indicated that they rarely thought about the soil. Some visitors said they were not interested in soil, but various aspects of the exhibit intrigued almost everyone, especially the concept of being shrunk and going underground into a 100x reconstruction of a natural soil.

### Visitors' Understandings of Major Exhibit Concepts

Five of the major exhibit concepts were investigated in depth, including construction of *knowledge hierarchies* describing visitor understandings within the context of the planned exhibit (Perry, 1993). A knowledge hierarchy presents a range of visitor understandings about a certain topic, but it is more than just the range of things that visitors know about the topic, and it is more than just the range of things that exhibit developers hope to communicate. A knowledge hierarchy emerges as the data, in this case visitor interviews, are analyzed *within the context* of the conceptual information that might be included in the exhibition. The hierarchy is based on the assumption that inherent in each exhibit is an internal knowledge structure, located at the intersection of the exhibit developer's and the visitor's organization and understanding of the topic (Perry, 1993).

The knowledge hierarchy usually describes five or six levels of understanding which characterize the full range of how visitors think about a topic, generally by increasing levels of sophistication. It does not identify the number of visitors in each category; instead, it represents, in a manageable form, virtually all visitors' understandings about that aspect of the topic. As such, knowledge hierarchies are a way of helping us address the needs and interests of a greater proportion of our multiple audiences.

The structure of the soil-related knowledge hierarchies tended to follow this pattern:

- Level 0: "Don't know and don't care." Visitors at this level had not thought much about the soil and hadn't developed any particular interest in it. Visitors at this level *can* develop a curiosity about soil, it's just that they haven't thought about it much on their own, prior to the interview. (The interview itself was often able to get them interested in certain topics.)
- Level 1: "Don't know, but I was wondering." These visitors had formed questions about the soil in their minds, but they hadn't yet developed answers to their questions. (They sometimes began to work out their own answers during the interview.)
- Level 2: These visitors were interested enough in the soil that they had formed some understanding of it, but their ideas were unsophisticated, largely incomplete, and sometimes incorrect in important ways.
- Level 3: These visitors had a fairly accurate *basic* understanding of the soil, although they were fuzzy or sometimes incorrect on the details.
- Level 4: These visitors had a more sophisticated and accurate understanding of the soil and could often articulate detailed information about one or more aspects of soil systems. These visitors often had a background in college-level science or direct experience working with the soil.
- Level 5: These visitors had a very sophisticated understanding of the soil and included people who had studied soil extensively or had chosen a soil-related career.

Five knowledge hierarchies were constructed during this study, one for each of the following major exhibit concepts: The composition of soil, soil's role in ecosystems, soils differing from place to place, soils changing over time, and prairies in the Chicago area.

***Composition of soil:*** Most visitors indicated superficial understandings about the composition of dirt (level two), mentioning only one or two components such as ground-up rocks. Some visitors appeared to understand that soil is a combination of many types of different organic and inorganic materials (level three). A few visitors were more specific about the ingredients of soil and the fact that these ingredients occur in varying proportions in different types of soil (level four), but we didn't speak with any visitors who indicated a very sophisticated understanding of soil composition (level five). We were encouraged to note that there appeared to be relatively few misconceptions about what soil is made of, and that most visitors expressed an interest in soil composition, even those who indicated that they hadn't thought much about the topic.

***Soil's role in ecosystems:*** Three of the four primary messages of the *Life Underground* exhibition have to do with the inter-connectedness of things both within and above the soil. Virtually all respondents, including young children, indicated that they understood that there is a relationship between the soil and growing things, although they didn't necessarily understand the details of the relationship (level three). Some visitors also discussed the idea that soil is part of a larger cycle of life and were able to describe some of the reasons why it is important (level four). Some visitors saw soils in more global terms, as critical to major ecosystems (level five).

***Soils differing from place to place:*** Visitors' understandings of this topic spanned a six-level hierarchy. Some visitors, particularly children, expressing a belief that "dirt is dirt" and that soil was the same from one geographic area to another (level two). However, many visitors had noticed regional differences in soil, often based on their personal travels and experiences with soil in different parts of the country (level three). These visitors understood that soil differed over broad geographic areas, such as the differences between Chicago's soil and the red clays of the southern United States, although they didn't understand the reasons for these differences. A few visitors related these regional differences to differing biomes, telling us about how the geographic differences in life and climate contributed to the different types of soils (level four). One visitor, who had been involved with soil testing, expressed a more sophisticated understanding of the many inter-related reasons for soil variation (level five).

***Soils changing over time:*** The idea that soil changes over time was a difficult concept for most visitors we spoke with. Most respondents either indicated that this was not something they had thought about (level zero), or that they believed soil does not change or changes only superficially, such as by getting drier (level two). Some visitors did talk about soil changing, but they attributed the changes only to human intervention, citing the negative impacts of activities such as agriculture, pollution, industrialization, and the building of cities (level three). A few visitors understood some of the natural forces that change soil, including climate, life, volcanic eruptions, and glaciers (level four). No respondents expressed a sophisticated understanding of the subtleties and complexities of soil changes (level five). When respondents did think about soil changing over time, most tended to think of a relatively short time period of 200 years ago or less. Most visitors who discussed older time periods referred to the glacial period and did not talk about the intervening time span since the last glacier (during which Chicago area soils changed dramatically).

***Prairies in the Chicago area:*** Although *Life Underground* will allow visitors to walk through a 100x recreation of the soil under a local tallgrass prairie, most visitors were adamant that pre-settlement Chicago was not a prairie, placing prairies in other parts of the country (level 2). Most respondents associated pre-settlement Chicago with landscapes such as forests, dunes, and swamps, rather than the prairie that was once the most common habitat in the Chicago region. A few respondents had a basic understanding that the Chicago area -- or at least the Midwest -- used to be predominately prairie (level three). A few visitors expressed a sophisticated understanding of prairies in general (level four), but no respondents indicated a detailed understanding of the Chicago area prairies specifically (level five). We were surprised at how tenaciously many respondents held onto the notion that prairies were just about anywhere but in the Chicago area. This seemed to be rooted in the notion that before cities there were trees, and there were also indications that most visitors didn't understand prairies in general.

In summary of the five hierarchies, visitors seemed to have the best grasp on the notion that there is a relationship between soil and plants. This indicates that most visitors are ready to move along the conceptual ladder to start to understand the various relationships between soil and other living things. Many visitors also had a basic understanding of what soil is made of, plus an interest in finding out more about this topic. Also, many visitors could grasp the idea that soil differs from place to place, particularly when they related this idea to places that they had lived or visited. The two other major concepts were more difficult for visitors. Not only were visitors

surprised to hear that the Chicago area used to be prairie, but some were quite adamant that prairies were not present in this area. Also, most visitors seemed to resist the idea that soil changed naturally over time. Some visitors attributed changes to the negative impact of human activities, but most visitors did not appear particularly interested in the whole concept of soil changing over time.

### Visitors' Expectations Regarding the Underground Experience

We were curious to find out what visitors would mention when asked to imagine what they might see if they went underground. We were particularly interested in what living things visitors might speak about, how they would relate personally to the things they were naming, and what their preconceptions and expectations might be of an exhibit where they would be exploring an enlarged underground environment. During interviews, we introduced this topic by describing the idea that visitors would be shrunk down to three-quarters of an inch tall and step out into this underground world. We then asked them to tell us what they would expect to see.

Almost all visitors talked about seeing living things. Most respondents mentioned worms, insects, and bugs, and they often talked more specifically about beetles, grubs, ants, and centipedes. Some respondents talked about burrowing animals, such as rabbits, groundhogs, moles, skunks, and snakes. These visitors sometimes mentioned the burrows themselves, talking about worm tunnels, gopher holes, and ant "farms." Respondents also talked about seeing plant parts, including grass and tree roots, mosses, seeds, and root-vegetables such as potatoes and carrots. Some visitors mentioned compost or decomposing matter, and a few mentioned mushrooms.

Many visitors also talked about various non-living components in the soil. Some visitors mentioned rocks and dirt, and a few discussed more specific inorganic components such as sand, minerals, loam soil, and fossils. Children sometimes mentioned dinosaur bones and mummies, perhaps because they were remembering their experiences in the nearby exhibits, *Life Over Time* and *Inside Ancient Egypt*. Some visitors imagined water dripping from the ceiling or underground pools and streams. Others mentioned human artifacts, like old toys, a gardener's shovel, or some garbage. A few visitors talked about seeing caves and stalactites.

Some visitors talked about what they would see in the context of being shrunk. Often these visitors talked excitedly about monster ant colonies, gigantic moles, 2000-foot snakes, and rocks as big as mountains. A few visitors seemed stumped by the idea of finding something underground, apparently because they had never really thought about it before.

In general, the idea of being shrunk elicited very strong reactions, both positive and negative. Some visitors immediately lit up at the idea and responded with, "Wow! Cool! Neat!" They seemed intrigued by the idea of exploring something they had never seen before. Many visitors described the underground environment as feeling cold, dark, and damp, and others used words like quiet, cozy, dingy, and creepy. Some visitors expressed concern about the idea of being underground and mentioned that they might feel claustrophobic. Many older children and teenagers we spoke with seemed to think that the shrinking component would be fun, but many younger children seemed afraid of being that small (often because they were afraid they would be

stepped on!) Some visitors mentioned the movie, *Honey, I Shrunk the Kids!*, generally in positive terms. Parents especially talked about how much their children enjoyed the movie.

### Visitors' Understandings of Soil Terminology

As we talked with visitors about life underground, we were interested in finding out what sort of connotations the words "dirt" and "soil" had for visitors. When questioned about the topic, most visitors differentiated between soil, having positive connotations, and dirt, having negative ones. Qualities generally attributed to soil included being rich and moist, nutritious and good for growing things, and useful for humans and other life. Dirt, on the other hand, often was seen as dry and dusty, associated with the word "dirty" in all its connotations, and considered to be without purpose and of low value.

However, some of the same visitors who differentiated clearly between "dirt" and "soil" in one part of the interview used the terms interchangeably later in the interview.

During the interviews, and particularly during the card-sort study of soil-related terminology, many visitors had problems understanding the following technical terms: biome, biota, biodiversity, savannah, steppe, and stewardship. When the terms soil processes and soil communities were included in the card sort, no respondents discarded them as too hard to understand, but they seemed to gloss over them during the ensuing discussion. Terms that were not as problematic for visitors included: climate, decay, ecology, ecosystem, environment, erosion, forest, fungus, glacier, living system, mulch, organic matter, and weathering.

### Visitors' Personal Connections to the Soil

One of our assumptions going into this study was that everyone has a connection with dirt, even if it is an aversion to it. When we spoke with visitors about their personal connections to the soil, most visitors had stories to share about the roles dirt played in their lives. Seven distinct categories of connections emerged:

- *Sensory experiences:* Some visitors talked of the smell, feel, and taste of dirt.
- *Leisure activities:* Some visitors talked of leisure activities that take place in the dirt, such as gardening or playing sports.
- *Getting dirty:* Some visitors talked about getting dirty, often (but not always!) in positive or enjoyable terms.
- *Playing in the dirt:* Many visitors recalled experiences where they played in the dirt, especially as children.
- *Environmental concerns:* Many visitors related soil to larger ecological issues and expressed concern.
- *Economic interests:* Some visitors talked about the economics of soil, particularly in terms of their careers in soil-related fields.
- *Spiritual connections:* A few visitors talked about a spiritual connection to dirt and talked about death and reincarnation.

## Visitors' Questions About Soil

When visitors were asked what questions they would like the exhibit to answer, many replies seemed to have been prompted by the questions that we had asked of them. Most questions revolved around the composition of soil, and some respondents wanted to know more specifically about the various properties of soil. Some visitors wondered about the origins of dirt, often in conjunction with their questions about its composition. Other visitors were curious about animal life in the soil, and a few asked about environmental issues, such as soil pollution.

### **Conclusions and Recommendations**

This research project turned out to be full of surprises. We were surprised at how incredulously visitors looked at us when we said we wanted to talk to them about dirt. We were also surprised about the vehemence with which visitors rejected the notion of the Chicago area as a prairie. We were pleasantly surprised that so many visitors had favorite stories and fond childhood memories about the soil, and we also enjoyed hearing visitors talk about feeling, smelling, and tasting dirt.

This exhibition promises to be a lot of fun for visitors. Although visitor reactions to specific exhibit ideas were very positive, the exhibit development team should keep in mind that most visitors did not express much interest in the "intellectual" approach to soil. The vehicle to get visitors to think about and ponder the interrelationships within soil and the larger connections to the world ecosystem will be through immersing visitors in a new world full of sensory experiences of all types, and through connecting with their imaginations, personal dirt stories, and childhood memories.

Following are some more specific recommendations for the exhibit team to consider:

- Emphasize the immersion/shrinking part of the exhibit. Since visitors were most excited by this aspect, it's one way of getting them intimately involved in a subject that they don't appear to think about very often.
- Answer the two most commonly asked questions: "What is dirt made of?" and "Where did it come from?"
- If Chicago-as-prairie is going to be an important underlying theme of the exhibit, then visitors need to be told this repeatedly and in different ways.
- The time dimension of soils will be very difficult to communicate to visitors. The notion that soil changes over time was a difficult topic for visitors to grasp, and it was one of the few topics that visitors just didn't get charged about.
- Emphasize visitors' personal connections to the soil through sensory experiences and by triggering their personal memories of the soil.
- Address visitors' special needs, including audio experiences for those with vision limitations, "panic" exits for those with claustrophobia, and reassurances for young children.

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## Author Note

Deborah Perry, Selinda Research Associates; Cecilia Garibay, Selinda Research Associates; and Eric D. Gyllenhaal, Exhibits Department (now at Selinda Research Associates).

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