



Draft Report

***Science on a Sphere
Front-end Evaluation***

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Evaluation Background and Methodology

Introduction

The Maryland Science Center contracted with RMC Research Corporation in June 2004 to conduct a front-end evaluation of Science on a Sphere, a new spherical film technology developed by the National Oceanic and Atmospheric Administration. The Maryland Science Center mounted Science on a Sphere for a two-week exploratory period, between June 15-30, 2004. The front-end evaluation aimed at assessing the educational strengths and potential of Science on a Sphere as exhibit technology in the museum setting.

Science on a Sphere is a six-foot diameter sphere that is suspended from the ceiling (or a specially designed frame). Driven by a bank of computers, four video projectors arranged around the Sphere display spherical images created from a potentially limitless number of data sets. Data sets used in the Maryland Science Center presentations included images of Earth and other bodies in our solar system. Some of the Earth projections include infrared satellite data depicting the development of storm systems as they move across the globe, sea surface temperatures depicting el niño and la niña events, an animation depicting 600 billion years of continental drift, and images of Earth's topography and bathymetry. Additional data sets depicted the surface of the Sun, Moon, Mars, and other bodies in our solar system.

Evaluation Questions

The evaluation plan developed by RMC was designed to address the cognitive and affective aspects of the Science on a Sphere for learning experiences, and was based on consideration of three aspects of the exhibit:

- visualization of data on the sphere
- interpretive program scripts
- sphere placement in the museum

Evaluation questions were developed for each of these areas.

The Visualization of Data on the Sphere

- What are visitors' first impressions of the Sphere? Do visitors understand the purpose and content of the Sphere? Do the visualizations convey the intended meanings? What kinds of supporting information are needed to make it both comprehensible and engaging?
- How do visitors respond to the visual presentation of data on the globe? What kinds of images are most provocative, memorable and engaging?

Interpretative Program Scripts

- What kinds of information and stories are most suitable for presentation in this format? What are its strengths and weaknesses in comparison to the presentation of information on a flat screen, in written text or via other media?
- What specific visual and narrative techniques are most effective in conveying both conceptual and factual content? How can complex ideas such as different time scales be best presented?
- How can the Sphere and accompanying scripts be used most effectively for depicting global systems and interconnectivity? For instance, how can information about the global nature of weather patterns be best presented given the visual and auditory aspects of the program?
- How do the visual and audio components of the program interact, and what are the best techniques for ensuring that the audio text supports and enhances the visual, and minimizing the degree to which it is inhibitive or over-prescribed?

Sphere Placement

- What are visitors' behavioral patterns of interaction with the Sphere, i.e. do they walk around it? Do they settle on a particular position or angle?
- What effect does the placement in the museum, including such factors as the size of the room, amount of traffic and noise level, on visitors' experiences?
- How might auxiliary information be presented in association with the Sphere?

Interview protocols were developed out of these broad evaluation questions, tested and refined as described below. During this process, it was decided that the first of the evaluation questions, that about the Visualization of Data on the Sphere, was the most important for this pilot exhibition.

Methodology

The evaluation plan developed for Science on a Sphere included the collection of observational and interview data during the two week stay of the Sphere. Data were collected in two phases, as follows:

Phase One (June 15-16) – During the first two days of the exhibit, an RMC staff member collected observational data, and conducted oral interviews using draft interview protocols developed prior to viewing the presentations. These interviews were intended as an opportunity to test the protocols, but are valuable as the only data collected of school group visits due to the timing of the exhibit. Interviews were conducted by an RMC staff member with the assistance of MSC and visiting science center personnel. Small groups (3 to 6 individuals) were interviewed, including student groups, their teachers, and the general public.

Phase Two (June 18-30) - Survey instruments were revised based on considerations described below and used for the remainder of the exhibit period. Two versions were again created to allow a wider range of questions to be asked. At the conclusion of each of the approximately eight presentations a day, visitors were asked by the presenter to

complete written surveys which had been placed on the projector stands around the Sphere on clipboards.

Interview protocols were revised based on the actualities of Sphere presentations, preliminary data, feedback from project principals, and availability of MSC staff for data collection, as follows. Contrary to expectations prior to viewing NOAA presentations, visitors were expected to move around the Sphere, sometimes as many as six times during a single presentation to see particular images on one part of the Sphere. As a result, issues originally built into the survey instruments were no longer meaningful.

In addition, no program scripts had been developed specifically for the exhibit. Rather presenters would be using a script developed by NOAA, or speaking extemporaneously on topics well-known to the presenter. Thus, project principles requested that the evaluation focus on capturing viewer responses to the Sphere as a medium of presentation, rather than on the Interpretative Program Scripts.

Preliminary data and evaluation goals were reviewed at a workshop with Maryland Science Center and collaborating museum staff. MSC and visiting museum staff members were primarily concerned with how visitors responded to the Sphere, and issues such as whether the Sphere could be used without a presenter, and how to think about guided presentations in the science center day.

The goal of the evaluation of this pilot exhibition of Science on a Sphere in the Maryland Science Center was to understand viewer responses to the Sphere as an educational medium. Towards this end, visitors were asked open-ended questions as a way of surfacing the range of viewer responses to the medium. Written surveys that could be completed by visitors without the assistance of data collectors were developed for use.

An RMC staff member returned to the Maryland Science Center for the final two days of presentations. During this time, additional observational data was collected on visitor behavior, and randomly selected visitors were asked to respond to additional interview questions following completion of the written questionnaire.

School Group Interviews

Interviews were conducted during Phase One of the evaluation in order to gather initial feedback before refining study instruments. Due to the timing of the exhibition, these were the only opportunities for feedback from visiting school groups attending Science on a Sphere demonstrations. These included two visiting groups of fourth graders and one group of eighth graders. At each of these a handful of adult or family visitors also joined the presentations.

Surveys

A total of 326 surveys were collected. Visitors who completed surveys included 74 visitors under 18; 28 visitors between 18 and 25; 127 visitors ages 26-49; and 97 visitors ages 50 and older.

Instruments used in both interviews and survey are included in Appendix A. The data obtained using both sets of instruments is included in Appendix B.

The following discussion draws on survey, observational and interview data collected throughout the Sphere exhibition. Responses across survey instruments and method were very consistent.

Summary of Findings and Recommendations

Introduction

The Maryland Science Center hosted hourly free presentations using Science on a Sphere during the days of the SOS exhibit. Presentations were announced 15 minutes prior to the start of the presentation, and varied in length from 20 to 40 minutes.

The Sphere was located on the third floor, near a group of interactives and on the other side of the floor from the children's room. Although the Sphere was not located in a part of the science center conducive to visitors spontaneously joining presentations, visitors did occasionally do so, or return for a presentation after seeing the Sphere.

The Sphere was located in a relatively cool, quiet, dark corner of the museum. The projector stands acted as unintended benches for visitors to sit on both during presentations, and frequently to stop and relax while watching the globe "turn" between presentations. A few visitors commented that they would like seats all around, or "better seating"; and a few others suggested a darker room. There were also a few comments that the PA announcements were distracting. While these are all suggestions for ideal conditions for placing the Sphere, nothing about the Sphere's placement at MSC detracted seriously from the experience.

Presenters

Five different presenters gave presentations during this time. This included three presenters from NOAA and two from the Maryland Science Center. NOAA staff presentations followed a shared script, using the same sequence of databases. The programs conducted by MSC staff covered areas in the presenter's expertise.

The NOAA presentations followed a shared script. These programs included images of Earth's topography and the lights at night, global weather showing the formation of storms, several decades of surface water temperatures depicting *el niños* and *la niñas*, views of the surface of the Sun, Moon, Mars and Earth (NASA's "Blue Marble" view of Earth as seen from space), and concluded with an animation of 600 billion years of continental drift. Some presentations also included a projection of future global warming. The NOAA presenters covered largely the same information, though each presenter had a distinct style and sense of humor, and varied to the degree to which they shaped their presentations in response to particular audiences. These NOAA presentations constituted the far majority of presentations conducted over the two-week period.

Presentations conducted by MSC staff members covered two sets of topics – one focused on Earth's topography and geography and the second on the solar system. The first used data sets depicting Earth during the daytime, with the Earth's topography highlighted on one side, and lights at night on the other, thermal data depicting storm formation, continental drift, and finally the Blue Marble. In this presentation, the facilitator played with the tilt of images of Earth, allowing viewers to get a clear view of both poles. The solar system presentation began with the view of Earth from space, then two different kinds of imaging of the Sun, the Moon, Mars, Venus, Jupiter, Io and back to Earth.

Although evaluation questions did not directly ask about the presentations or presenters, there were several comments on both. Visitors appreciated having a live presenter and found it helpful for focusing. For instance, one viewer wrote, “The presentation helps focus your eye and mind. Even so, it is awesome even if you are just looking at it.” A number of visitors commended the presenters for their knowledge of topics covered, use of humor, and attentiveness to children. One viewer wrote, “The interpreter was excellent!! He is very knowledgeable and communicates very well. Maybe a waste of time with no interpreter.” These two quotes were unique in praising as well the value of having a presenter for making sense of the images on the Sphere.

Level of Engagement

Structured observation of Sphere programs during the opening and closing days of the exhibit, as well as visitor comments suggest visitor engagement during presentations was very high. Maryland Science Center staff had originally planned on 20 minute presentations, but when the NOAA staff held audiences for 40 minute presentations, that became the norm. Presentations were free and maintained a constant number of visitors – with the few who left during a presentation replaced by others who joined. The far majority of individuals who began a presentation, stayed through to the end. In most cases, people were engrossed throughout. In one case, two presenters did back to back presentations lasting nearly 2 1/2 hours. Some visitors stayed over an hour, and others came and went to catch pieces of more than one presentation. Visitors often asked questions, and after almost every presentation, visitors stayed to talk either about the technology, the Sphere’s value as an educational tool, or about the content of the presentation.

Parents and teachers frequently commented on how engaged their children were throughout the demonstration, which was generally longer than what they had come to expect in the Science Center. One parent was impressed that “My kids held on for 30 minutes.” Another parent described how the Sphere had captured the attention of her twelve year-old son. “My son was feeling bored when we were going through some of the rest of the museum. He didn't want to come today. He sat through the sphere exhibit spellbound.”

All of the classroom groups observed were highly enthralled throughout the forty-minute presentations. In these programs, the facilitator did tailor the content and level of interactivity (asking questions) to the school group. In any case, teachers were impressed. “They were into it,” noted one teacher, “even some of the more active ones.”

Very young children were the most difficult audience members to hold. In several cases, one parent left with a very young child (varying in ages, but often under 6 years) and could be seen at the interactive exhibits just beyond the Sphere area, while other family members continued with the presentation. When there were a sizeable number of children in the group, some of the presenters kept children engaged by asking questions of the audience throughout the program.

There was little communication between visitors during the presentations. One notable exception was observed. A presentation about Earth’s topographical features, with a slowly revolving earth, inspired considerable pointing and discussion among visitors. A

combination of the slow spin of the globe and the discussion of a familiar topic - Earth's topography - seemed to offer an experience that the viewers could participate in and share information among themselves.

Presenters asked audiences to move around the Sphere several times during the course of the program. In most cases, visitors responded positively to this, both in action and in their comments. For instance, a group of fourth graders said they, "liked moving around the globe, it was fun to look at." A few were not as comfortable moving about. One visitor commented, "Like sphere - didn't like having to move - wanted to sit down." On occasion, visitors simply chose not to move.

Sometimes a particular image or data set would inspire even those passive audience members to rejoin the group at a particular vantage point. Images of the formation of Hurricane Isabel, which had hit Maryland the previous summer, was one of these. Segments of the continental drift animation were also captivating. For instance, two young boys were sitting on the sides, but when the presenter started talking about an asteroid striking the earth during the time of the dinosaurs, the boys moved from their benches to look at the image of the asteroid's impact. In another case, a couple who had been relaxing on the side got up to see the formation of North America during the plate tectonics demonstration.

Visitor Ratings

Visitors responded very positively to Science on a Sphere. On a 5-point scale from poor to excellent, an overwhelming 98% of visitors across all age groups, rated the sphere as either very good (67%) or excellent (31%). Less than 2% (6) gave the Sphere a rating of Average and less than 1% (1) gave it a rating of Fair. A detailed chart of responses is included in Appendix B.

First Impressions

Responses to the question "what most impressed you about the Sphere?" offer an overview of viewer reactions to the Sphere presentation. Responses to this question reflected three main themes heard throughout the evaluation. These include appreciation for the Sphere as:

- an innovative piece of technology,
- an aesthetic experience, and
- a versatile educational tool for adults and children.

Sphere Technology

Visitors were very impressed with the technology of the Sphere. One exclaimed that "The technology is amazing!" and another said, "Magnificent! How do they do it? I spent some time trying to figure out how it's done." Other visitors marveled about "The dynamics of setting it up and getting it perfectly placed to effectively show the presentation," and "that two thin wires could hold a sphere that size." They were impressed by "how you can project something onto a sphere," "the ability to see

everything to scale,” and the resolution, clarity, color, and ability to depict historical change.

Others commented on the way in which the projections were made to appear realistic, and were impressed by “How it looks like it rotates,” and “How it was exactly the same tilt as the earth.” “At first you think the globe is moving. But it's not. It's definitely different... Good not to have distortion.” One visitor described the Sphere as “modern” and “up to date.” Many more responses dealt with the unique ways in which data was visualized on the Sphere. These will be addressed in a section below.

Aesthetic Experience

While many of the children spoke of the Sphere as “cool,” adult visitors described the Sphere as “beautiful” and “riveting.” “The beautiful colors [are] like an abstract painting. The globe is gorgeous to look at,” “It's so amazingly beautiful and we are SO small in the scheme of things!” “Beauty, reality, content, storytelling by the presenter. Comparisons. History. Scale. Simply awed,” wrote one visitor. While another explained that she was impressed “Simply by the idea of it - never seen anything like it! I'm not even much of a science person - it's just very cool.” One visitor suggested “I think you should have a cocktail partly around it. It's very engaging. It moves.” Others noted that it appeared to float in mid-air.

Even outside of formal presentations, visitors often stopped to rest and watch the “Blue Marble,” global weather data, and other images. “It's also very relaxing to just look at it,” commented one such itinerant visitor. A few visitors described the Sphere as “tangible,” “Much more comprehensive and tangible,” “It think it becomes very tangible to see the actual planets rotating.” This tangible experience of the Sphere was reinforced by the numerous passing children who ran up to the Sphere to touch it, to the chagrin of NOAA staff. Another visitor described the experience as “intimate.”

Educational Tool

Across all age groups visitors mentioned the educational value of Science on a Sphere. Among the many visitor comments were that “It makes the images more relevant,” “I think it is a great educational tool,” and “It shows dynamism, complexity, weather and economic development. Very informative and insightful.” One visitor was impressed by “The amount of scientific information that was presented,” and another noted that “It's a great visual learning tool.”

A few of the more extensive comments gathered in interviews suggest the enthusiasm of educators and some of the myriad ways they were imagining using the Sphere. A former aerospace engineer from Arizona, who will be teaching high school in the coming school year, was very excited about the Sphere as a learning tool. He said, “There is so much there to learn. So much of presentation you could focus on - Mars, Sun, history of Earth....” He found it helped him to understand his local weather, “Watching weather over Arizona vs. other locations, you can see why Arizona is desert.” And said he “would love to be able to take a group of 7th and 8th graders... This would stimulate kids.”

A educational grant writer in Texas marveled at her own daughter's learning, explaining that “When he [the presenter] held up the nickel [demonstrating the relative sizes of the

Earth and Sun], my daughter said, "Think how small we are." She felt that this lesson in perspective would be valuable for the inner-city students she works with in Texas, and said "We have inner city kids. The Sphere would help them to see outside of their world - help them to see beyond Waco." She recognized, however, that the program would have to be more interactive to hold the attention of the students. She also shared a number of ideas for how to use the Sphere for a GPS data project. She marveled, "To hook this up to geological and cultural systems data would be cool. With global information systems, you can show whole civilizations growing. Could show it on this. Could combine this with global positioning system activities. Kids would make a cognitive leap."

Another teacher was enthusiastic about using the Sphere for teaching Earth Science as well as biology and chemistry. She suggested the integration of children's animated characters as a way of appealing to very young children. "You could have the Magic School Bus which just had an episode on Venus, for school presentations to reach the age of kids like her 5 year old."

One teacher suggested more lessons/more information, including a lecture on all four oceans. "Make it more interactive, visual aids of dinosaurs etc for changing earth."

Versatility: Visitors were also impressed by the versatility of the Sphere. Some of these responses noted the "Richness of the technology and data sets presented," "The ability to show many different topics and time periods," "The way it could be used to show various data sets in their native global format," and the "Ability to switch views and interactively observe events and objects, planets, and their atmosphere."

Responses to the question of what impressed visitors most about the Sphere also included a number of mentions of the knowledgeable presenters and appreciation of having a live presentation. Many visitors also mentioned particular images, data sets, or facts that they were particularly impressed by. These are all addressed in subsequent sections.

Overall, visitors were very impressed with the Sphere. Many took still or video footage of the Sphere. One of the children interviewed liked the sphere so much that he said "I want to come for my birthday."

Most Memorable Image

In surveys, visitors were asked to name the image most memorable to them. Virtually every data set was mentioned, suggesting that all of the data sets were of interest to at least some of the visitors. However, some data sets, particular facts, and images stood out for large numbers of visitors. Keep in mind that the various programs included different data sets. For instance, with the exception of the presentations exclusively on the solar system, the continental drift animation was given considerable time and shown three times in most presentations, while images of other bodies in the solar system were covered relatively quickly compared to their treatment in the presentation exclusively on the solar system. Thus the different numbers of people listing each segment doesn't necessarily mean that some images are inherently more interesting than others, but may reflect the varying amounts of time and attention given to them in different presentations.

Continental Drift: Almost one third of the visitors mentioned the animated sequence on plate tectonics in response to the question about the most memorable image. As one

viewer wrote, “The most memorable image was rather a series of images – the animation of plate tectonics and continental drift through millions of years. It gave an easily understandable, broad view of continental drift.” The combination of a global view, with a historical view - “Pangaea to the present day” - and the visual excitement of seeing such dramatic change in the Earth’s plates were all factors in making this memorable. . Several viewers mentioned in particular the visualization of time. Some of these comments included, “600 million years to present! Time-warp – one of the best learning tools I’ve seen,” and “The continental drifts. Just seeing them. This is 3-D (vs. map). Books are books. You see it – passage of time.” This sequence was mentioned in response to questions about what most impressed visitors, and what they learned, as well as the most memorable image.

Responses throughout the surveys also noted specific occurrences in the plate tectonics animation, such as “Indiana moving,” and “India crashing into Asia.” Also of interest to many visitors was the discussion of what the Earth looked like in the time of the dinosaurs, the story of the comet crash during that time, and changes in Earth’s vegetation. Interestingly, none of this information had visual components, yet were mentioned throughout the survey responses.

Global Warming: The global warming data set was the second most frequently mentioned in response to the question of most memorable image, but also came up as a significant area of learning, and as what some visitors found most impressive. A group of students gasped as global warming was projected into the future. One viewer wrote, “ I learned how global warming will affect the earth in 500 years.” Other viewer comments suggested concern with the implications of what they saw, “How global warming is a reality and will have scary consequences.” And the display left one viewer wondering, “If we know about global warming, why isn't anything done about it?”

Weather: Also frequently mentioned were the images of the weather, including the formation of hurricanes and specifically of hurricane Isabel. Several mentioned the image of “Storms forming in Africa,” and “The storms coming across the oceans.” Several others mentioned being impressed by the ability “To actually see weather systems in real time.” Also mentioned were the images of *el niños*, and *la niñas*. A discussion with one of the visiting class teachers spoke to the memorable storm images. She said the presentation was good for her students. In particular, “The model of Earth and tracking storms is good for them. They’ll remember the eye of the storm. It was a great experience.”

A number of visitors in both interviews and on surveys were taken by a range of images, and could not pick out a particular image as most memorable. Some of these comments include “All of the images were fascinating,” “All of them were great,” and the “Entire presentation was interesting.”

Earth at Night: Smaller numbers of people mentioned the image of Earth at Night – “The way it showed the earth at night and how the light on earth can be seen in space” and were impressed by the mapping of human use of electricity. “The presentation was very thorough. The human use of electricity was mind blowing.”

Mars: Several visitors mentioned images of Mars as among the most memorable images. Several noted in particular the large canyon and mountain described in presentations and

compared with features on Earth. Others mentioned the poisonous gas on Jupiter. The Sun, other planets, and moons (Earth's and Jupiter's) were also mentioned, though noting somewhat less detail. This may be because with the exception of a few presentations exclusively on the solar system, these images constituted a much shorter portion of the presentation.

Visualization of Data on the Sphere

Visitors were asked “What is the point of the Sphere?” This question was meant to get at whether visitors understand the purpose of the Sphere and its unique value in visualizing data. Visitors unequivocally grasped the unique ways in which the Sphere allows for data to be presented, and expressed it through a variety of phrases, capturing the significance of the imaging on the Sphere through contrasts with other media. Some offered a broad view. For instance, as one visitor stated, “It gives a different perspective that you can't get from other media.” Others found more detailed ways of describing the imaging. And some found social and political meaning in the global views.

3-dimensional views: The most common term to describe the uniqueness of the Sphere's imagery was to call it 3-D and to contrast it with “normal” 2-D views of maps and videos. “The point of the Sphere is to give the audience a 3-D image of the information being relayed. It's more lifelike,” “It makes the images normally portrayed in a flat, 2-D manner more tangible, thus making them more "real.” “Sphere approach makes presentation much more “actual” – as the components of the solar system really are huge steps beyond flat screen approach which we've seen all our lives.”

Realistic or “alive”: As noted earlier, visitors commented on the movement, color, size and detail of the imagery, as well as the tilt, rotation and ability to see planetary features to scale. Numerous visitors described the Sphere's imaging as “more realistic” or “lifelike.” These included comments such as “It gives a more realistic impression of the planets, moon, sun, etc,” “You get to see things like they are,” and “It brings the image to life.” It also “reflects how alive our planet is.” “It's more like real life with the sphere.” “Shaped like Earth – realistic perspective of relationships.” “It gave us a real feel for the shape and events happening on the surface of the planets.”

Lack of distortion: Visitors spoke of the lack of distortion of the images on the Sphere, and contrasted them with a map or video. “On a map or video, you can not walk around the image and [on the Sphere] the image isn't distorted. The point of the sphere is to teach people about Earth in a new and innovative way.” “One is really seeing the true shapes and sizes of images opposed to flattened distorted images found on 2D maps and computer screens.”

Global views: Visitors spoke about seeing the whole planet and the whole picture. Some of these comments include: “You can actually see all around,” “You can view the earth in its totality,” and “Map doesn't show other ways around. Globe shows it better than a flat map.” Many viewers commented on the particular systems for which it was valuable to see a global view. These include, “Gives a world view of geological phenomena,” “Gives full view of planet weather, plate shift,” and “Very realistic – Can't possibly present this on a flat surface – i.e. night and day.”

Global interrelationships: Visitors noted that the Sphere “shows the relationship of events on Earth,” provides an opportunity “To represent various interactions (weather, electricity, topography) involved with the planet,” and “To understand how connected the earth is; to demonstrate that to people. The sphere allows you to see the interaction of weather around the globe,” And “The way weather patterns move from the equator to the hemispheres.”

Several visitors believed this global perspective valuable: “Global perspective is new and important in a nationalistic society,” And that it’s “Good to get out of the North America – the storm systems begin in Southern Hemisphere. It shows that what happens on other continents affects us.” Others noted that it provides context, or the big picture, “Ability to visualize effects on a global basis. The big picture.”

New Perspective: A number of visitors described the Sphere as providing a new perspective, suggesting that the images projected on the Sphere challenged how they see the world. Several visitors likened this to seeing the view of an astronaut. One student noted the value of this view, “being an astronaut allows you to see these things, how it rotates, electricity at night – we use a lot of lights, volcanoes in the ocean.” Another visitor said, “With the “Earth” suspended in “air” it felt as if I was in “outer space” looking in.”

In some cases, visitors noted simply the value of having things visualized that hadn’t been visualized before. An 8th grade teacher explained that her students “Knew about Earth’s formation billions of years ago, but it was new to see it. Also new was how the earth looks at night, and how people use electricity.” She continued that it in fact answered questions children had previously asked. She said, “The visual is good for them. To see from the astronaut’s view. “What do they [astronauts] see?” That’s a question I’ve had in class... Seeing nighttime and daytime is interesting.

In addition, a few visitors noted the value of having time and space visualized, such as the visitor who was impressed by, “The perspectives over time and the spatial perspective (“the big picture”).”

The Local in the Global

While noting the value of a global perspective, visitors were often drawn to images of places with personal relevance. Maryland visitors generally marveled at seeing the path of hurricane Isabel, while visitors from Burma to Arizona eagerly looked at weather patterns near their homes. Another visitor commented on the highlighting of Indiana in the plate tectonics animation, and noted the value of having local places noted. “[The Sphere] is unique for getting a world wide perspective, though it’s always good to point out particular places. [In the animation of continental drift] show Maryland not Indiana”

Other viewers found relevancy and connection based on criteria other than place. A woman who commented on why she selected Mars as among her favorite images noted it was because Mars had been in the news recently. She explained that she had difficulty choosing between Earth and Mars as her favorite image. First she described what appealed to her about the image of Earth. “For Earth, you get so caught up in your life - I live in Maryland. When you see the Earth so far away it puts life into perspective. You see the whole thing you think about all the wars going on... This is 3-D and puts it more

visually into perspective.” In contrast, her connection to Mars came through following events in the news. “When we look at Mars it's interesting because of the activity going on with the Rovers.” These comments suggest that specific details provide a focus, relevancy, and personal connection within this global view.

Would Recommend to Others or Return

Visitors overwhelmingly said they would recommend the Sphere to others, or return to see other presentations. A response from one of the students visiting with his class was, “Yes [I would return]. It was awesome, coolest, the best.” Other visitors said they would return because “it gets you up and about to view the various quadrants of the sphere rather than just lectures you while you sit in one spot,” and “Absolutely! Very visually stimulating from a macro/"God's-eye" view of the world.” And one young woman said simply, “It’s bitchin’.”

Several also gave it superlative ratings among museum exhibits, including “Yes, it's informative. The magnitude, the size of the globe is impressive. This is one of the best exhibits right now,” and “Best presentation I have seen in any museum in quite some time.” Others spoke of how the information came to life. “Definitely - makes history and general conditions of earth come alive,” and “Absolutely. Brings science to life.”

The most common responses were that the Sphere is interesting and informative. A few of these many comments include, “Absolutely - it's phenomenal,” “Yes, superb instruction,” “Yes - extremely enlightening and educational. This variety of information is amazing!,” “it is much easier to understand complex ideas with visual pictures and a live explanation,” and “Yes, because it is very informative. This sphere that constantly changes, goes back in time, can predict the weather, changes from earth to Mars and I've never seen anything like it before. It's awesome.”

Others elaborated on the educational value of the Sphere in being able “to see these things up close. A typhoon actually forming, landmasses forming, differences among planets, etc. Great idea for presenting a lot of science,” and to help “people to actually feel the changes that planet has gone through.”

Several said they wanted to return to learn more. For instance, “Too much to see in one visit,” “a lot of information to absorb - would retain and learn more if repeated,” “[would come back] just to keep learning, lots of information, and it was very cool to watch,” and “Would come back as often as possible. Wonderful learning experience.”

Visitors felt the Sphere provided a valuable learning experience for children and adults. They said it was “Very educational for all ages,” “[an] excellent tool for children. Brings all the data to life,” and “This is excellent material to understand the earth and Mars! I am not good at the science, but it's easy to understand for me! You should show all children in the world. Everyone loves it.” Others mentioned with whom they would return. “This time I would bring children especially, so that they could see how everything is connected,” and “I would bring my Earth Science class to see this.”

There were a few negatives. One visitor said, “It is entertaining but not factual.” And another said they would come back, “but would prefer home computer version.” And one student said he wouldn't return “because we do not need to know all that stuff yet.”

Learning

When asked about what they had learned, several individuals in both written surveys and interviews following presentations were unable to specify particular things they learned or overwhelmed. Some of these comments include, "So much - absorbed like a sponge - will have to take time to decipher," "Quite a bit too much to list. Maybe a prop(s) to help illustrate the scale - the earth is so large and the time covered so vast. It is a GREAT IDEA/exhibit," and "Too much to list here. The earth to sun perspective. Information on Mars. Formation of the various countries. Explanation of why the crust moves."

Some provided lists of what they had learned and mentioned disparate ideas from several different data sets. One wrote "Clear view of Pangaea and movement of plates through time. Weather near the South Pole is really turbulent. South Korea has a lot more electricity than North Korea. Denver was underwater around the time of the dinosaurs," and another," and another recalled the following: "I never realized the degree of movement of the continents. That there's water on Mars [at] the Polar Ice Cap. Some of the details - long canyon, high mountains, hot spots." One woman contrasted the things her daughter learned, "about Mars and weather on earth" and the things she had learned," about the sun's weird rotation pattern."

The animation of plate tectonics was again mentioned by a large number of visitors, followed by global warming, weather, and features of the solar system. Visitors comments suggest that they learned big ideas, mechanical explanations, and gained an ability to visualize global views, time and scale, and scientific events. These are described below, with examples drawn particularly from the plate tectonics animation.

Big Ideas: Visitors gained an appreciation for the earth as dynamic, and made comments such as that "The Earth is always changing," and "The earth is constantly evolving."

Mechanical Explanations: Visitors commented on gaining new understandings of things like how the continents formed, "Seeing the continental drift and the "million years ago countdown" - it explained the concept to me, for once it was clear!," that "The world is liquid rock and how the world was long ago," "The way the continents moved through the years and what happened to the life on Earth," and "Why Mt. Everest is getting higher."

Visualization of global views: Visitors noted visualizing a variety of global views and processes. This included global views of geographic features, "Pacific Ocean covers nearly half of the planet," storm patterns, such as "liked seeing the storm patterns – can see where the storm activity is. Parts of the world get more, I can't say enough about it," and "Didn't know where all the storms came from, where weather patterns come from," among other images.

Visualization of time and scale: Several people noted that they were unaware of plate tectonics prior to Pangaea, "Didn't know there was a continent before Pangaea," and others noted the extent of continental movement, "I never realized the degree of movement of the continents," and "Earth movements over time have been much more dramatic than I realized." Visitors noted learning about scale in relation to some of the planetary comparisons, "I learned how big earth is compared to the sun," and they also

realized the scale of global warming, “I learned about the degree to which the Earth is getting warmer, which was the most impressive for me.”

Visualization of significant events: Visitors noted that the Sphere helped them to visualize a variety of events, including “what earth was like long ago and prognosis to come and why,” “What land masses looked like in prehistoric times,” “Extinction of dinosaurs. It was very photogenic in regards to how comet hit the earth. Easier to understand when you saw it on the globe,” and “How the world was 600 million years ago and also where Indiana was located.”

Particular facts and specific examples: There were numerous facts and specific examples mentioned by visitors, including “That India “crashed” into Asia,” “That the Earth got as cold as it did during the Perma-extinction,” that “Indiana used to be underwater and the Niobra Sea was much bigger than I thought,” and “that Mars has a North Pole made of ice.”

In some of these cases, visitors were struck by aspects of the visuals that were not specifically articulated by presenters, such as the amount of plate movement over the 600 billion years of Earth’s history, while in other cases they picked up on particular details mentioned by the facilitator. For instance, individuals mentioned the formation of the Himalayas, watching Indiana move, India crashing into Asia, following Hurricane Isabel and the size of the Valles Marinas canyon.

Interestingly visitors consistently incorrectly remembered the time span of the plate tectonics animation. They consistently wrote that the animation depicted 600 million years, when in fact it depicted 600 billion years of continental drift. It is unclear what exactly led to this confusion.

Comments and questions during and after the presentations suggested how closely visitors were listening to the presenter, and following the imagery on the Sphere. For instance, a little girl asked at the end of one presentation whether Mt. Everest will ever get high enough to fill the Marianas Trench, piecing together disparate bits of information provided in the presentation.

Clarity

In response to a question whether there was anything confusing in the presentation, the responses were overwhelmingly no. Many stated that the presentation was clear. In every presentation, visitors freely asked questions, and some even commented on written surveys that they had no questions because they had been able to ask them directly. “The presentation was not confusing -- answers (to our questions) were immediate” A teacher noted, “The presenter answered questions well and gave good information. It was clear. He respected kids’ questions and had a good understanding of kids.”

In a few cases, visitor comments suggest that they were initially confused by a visual, but a satisfactory explanation had been provided by the facilitator. These comments include, “Weather patterns - but it was explained,” “Temperature rise because of CO2 over the next 140 years - but then he explained it more.”

Two visitors noted that the representation of elevation on the Mars image was counter-intuitive and though they understood the image, felt it was worth pointing out. “One

image of Mars looked reversed. Meaning high areas looked depressed and low stood out.” This was the only misleading visual noted by visitors.

There were a few remaining questions which visitors indicated on surveys. One visitor wrote “*El Niño*- What is it exactly?” and “What was confusing was the thing of the hurricanes.” Another visitor seemed to want more in-depth explanations, and wrote, “Yes. About as informative and simultaneously confusing as weather descriptions on TV. Too much, too fast, without making clear what is happening, what the causes/effects are.”

A few visitors questioned some of the scientific data presented, particularly the reconstruction of continental drift reaching back 600 million years. For instance, ““Scientific” theory of continental drift reaching back more than 200 million years seems to be reaching too far.”

One noted that the presentation would have to be changed for children, “The information shared verbally was very geared to adult language and understanding. To make the exhibit more interesting to kids the information needs to be refined some to their level.”

Suggestions for Modifications

In an effort to see how visitors could imagine changes in the presentation, or if they considered other interactive modes for the Sphere, visitors were asked what they would do if they could control the images on the Sphere. “Would they slow them down, speed them up? And what else would they like to see?”

There was little consistency in their responses. Visitors were divided between those who said the image speed was good, or wanted either faster or slower images. In some cases they suggested that some images should be slower and others faster. There were a handful that requested that the images of weather be speeded up to highlight patterns, such as: “I would speed it up, especially the weather to see patterns or irregularities. It would be interesting to have more pictures to see different occurrences at different times. One visitor suggested slower animation in the recent years of Earth’s evolution. “I would like to see the images change over shorter time periods as it nears present day (i.e. - instead of 1 million year increments, go by 50K increments for past few million years, then 5 K increments, so can see effects of recent ice ages, human development, etc.”

Visitors suggested a number of other modifications to the images. These included repeating images, tilting images, and zooming in or augmenting with illustrative images. These are described below.

Repeating Images: A few mentioned the value of repeating or stopping animations, as presenters did, frequently in the tectonic plates demonstration, but in others as well. For instance, “Replay them and include maybe some more pauses.”

Tilt: Others noted the ability to tilt images and suggested incorporating this effect to a greater extent. “Be able to tilt the images on the earth’s axis for a different perspective.” “Rotate the image so all sides are seen.”” Bring the poles to the side (so equator runs N to S) for some of the views.” This was in fact done in the presentation on Earth’s topography.

Zoom: Several recommended zooming in on geological features or providing additional information through close up shots. A few of these comments include: “I would zoom in to see evolution and weather,” “Could one zoom in on various parts of the planets? Heavenly body anatomy from core outwards - possibly on display on walls as posters or diagrams,” “Zooming features - zoom in while rotating. Zoom out while rotating,” and “Any possibility to zoom in? That would be interesting. I like geography so continent identification is possible.”

Height of Sphere: A few viewers suggested placing the sphere closer to the floor. One explained that this would make the Northern Hemisphere easier to see.

Selecting Images: Only one visitor suggested including the ability of visitors to select images.

Content Suggestions: Visitors made a number of suggestions of additional images they would like to see. These included requests for additional planets, “How storms and other weather patterns develop, more detail of ocean depths,” “Ice cap melting and coastal changes,” and “real-time earthquakes.” Also mentioned were “global warming trends going back in history,” “images of life on particular continents,” “View of spacecraft in space near earth,” “more about U.S. geography,” and “projected continental drift.” Another visitor suggested that “It might be interesting to see how pollution travels around the globe and ozone depletion.”

One of the visiting teachers suggested she “would like to see pictures about under sea volcanoes and landforms, fish related to particular undersea landforms. Connect the Maryland curriculum and images they are used to with what they see on the globe. What would landforms actually look like?”

And several visitors indicated that there was “Too much to list.”

Other imaginative suggestions from viewers included “If the sphere could grow into 3-D...” and “Imagine an all-solar system built with spheres.”

Satellites and Imaging

There was a striking absence of mention in the surveys of either the satellites which had been used to collect data or the production of the data sets in use. This was despite the fact that the satellites were mentioned in almost every demonstration, and in some cases different satellites and kinds of data were discussed. Further, a handful of comments suggested visitor assumptions that real time data is accessible for weather and other displays. Visitors appear to take the availability of this data for granted. The realism of the images may contribute to this view. The only data set which visitors even mentioned was the entirely computer-generated animation of continental drift – one which visually looked like an animation rather than a realistic image.

These observations suggest some challenges for presenting the Sphere and possible content for accompanying kiosks or materials. Both the challenges to collecting appropriate data and the manipulation of the data to create realistic looking images could be addressed. During a 25-minute presentation for a school group, many of the students’ attention began noticeably to drift during an explanation of satellite and data collection. The images on the Sphere are so compelling, it will be a challenge to deliver information,

such as that about the satellites, that can hold up to the images on the Sphere. Visual images of the satellites might be one way of reinforcing their importance and developing a more lasting impression. In fact, a MSC staff member suggested hanging “a geosynchronous satellite at appropriate distance from Sphere.”

Presenters noted NASA’s Blue Marble inaccurately presents an image of Earth entirely in daylight, in contrast to the representation of the Earth in which one side is in daylight and the other in darkness. Information about the different kinds of satellites, photography, and imaging used in creating the images could all be addressed in ancillary panels or kiosks. For instance, supporting information might include examples of various forms of satellite photography, computer graphics (plate tectonics), color highlighting of topography, and discussion of the various ways in which models represent and distort the truth.

Conclusion

Comments throughout the surveys reflected visitors’ enjoyment of the experience and suggest that it was a rich and successful learning experience. Visitors described the exhibit as “cool,” “riveting,” “fantastic,” “fascinating,” “magical,” “phenomenal,” “informational,” “educational,” and as the “best in the museum.” Visitors appreciated the Sphere as an aesthetic experience, a piece of innovative technology, and as a compelling and versatile educational tool for children and adults. Visitor engagement in the presentations was high.

The Sphere powerfully demonstrated the different sides of celestial bodies, such as near and far sides of the moon; and Earth’s hemispheres in darkness and light. In all presentations, viewers were impressed by explanations of relative size, such as comparisons of the Valles Marineris on Mars, and the Grand Canyon on Earth, and of the sizes of the Earth and Sun.

The presentations were effective in conveying a range of levels of scientific ideas and facts, from big ideas about the Earth as dynamic, to memorable details such as the poisonous gases of Jupiter. Visitor responses to the presentation of scientific information on the Sphere suggests its strength for introducing global contexts for understanding local issues, understanding global interconnectedness of a range of social and natural phenomena, and presenting global transformations through time.

Visitors commented on the variety of data presented and the many possibilities for other presentations. Teachers imagined a number of possible uses of the Sphere, including conveying ideas in Earth Science, Chemistry, Biology, Astronomy, and Geography. And had novel suggestions from integrating animated characters to designing activities using global positioning systems.

Visitor expectations of what kinds of imaging can be shown are high. In several cases visitors seemed to assume that real time data is readily available. They could also easily imagine the representation of a wide range of geological and social images and processes.

Visitors greatly enjoyed the live presentation, praised the knowledgeable presenters, and the opportunity to ask questions. The presentations were well-crafted; information needed to explain the images on the Sphere was an integral part of the narration. Furthermore, elements like color were effective in highlighting topography, changes in sea

temperature, and other features. The only visualization which visitors continued to struggle with was the representation of altitude on the image of Mars. However, without a live presenter, there may be much more need for supporting information.

In all but a few cases, visitors did not seem concerned by their lack of opportunity to control the Sphere themselves. On a few occasions, when the group was small, visitors were privileged to a more interactive experience, and presenters pulled up data sets in response to particular questions and interests.

Science centers may want to consider automated demos. Depending on the complexity of the text, these would likely require arrows or boxes on the projected images to draw viewers' attention to local events and features. This would of course, take away from the aesthetic experience and sense of transport.

There were as well visitors who enjoyed the aesthetics of the Sphere and found it restful. If the Sphere is located where visitors are passing by it might be valuable to have data sets that are understandable and enjoyable without a presenter, and with no or minimal supporting information on kiosks or displays. This might also be a time to give visitors the opportunity to control the images on the Sphere in a limited way – selecting from a choice of easily understandable data sets, such as Earth's topography, and allowing visitors control of the speed of the images.

From comparisons of the 3-D view to those of ordinary 2-D views, to descriptions of seeing the view of an astronaut, visitor comments suggest that the Science on a Sphere's imaging provided a provocative and challenging experience. Viewers experienced a fresh perspective. A number of visitors further saw scientific and political significance in this global perspective.

Appendices

Appendix A: Questions
Interview Questions
Survey Questions

Appendix B. Data

- I. Interview Data
 - Visitor Survey A
 - Visitor Survey B

- II. Surveys
 - Survey A
 - Survey B

Appendix A: Questions
Interview Questions
Survey Questions

Science on a Sphere: Visitor Survey (Interviews)

Data Collectors: Complete this section during the presentation. Date _____

Check ALL of the topics covered in the presentation

- Human impact on earth Solar system
 Earthquakes, volcanic activity, plate tectonics Oceans and weather
 Earth's changing atmosphere, climate

Data Collectors: Ask visitors the following questions. Try to capture their words exactly.

Introduction: *Science on a Sphere is in the design phase. We'd like to get your feedback to help develop the permanent exhibit.*

How old are you? _____ Male/Female

How would you rate this exhibit? 1=poor 2=fair 3=average 4=very good 5=excellent

What did you like most about this exhibit? (*ask for details*)

Did you like the presenter and style of presentation? Why or why not?

What did you think of the content of the presentation? Was it too simple or too complex? Was the information new to you or did you know it all already? Was there too much or too little information?

Is there other kinds of information you needed to make sense/use of the experience?

Did you like the length of the presentation? Was it too long or too short? Did the images move too quickly or too slowly? Would you have liked more time just to look and watch the images?

Describe the image you saw that is most memorable to you.

Would you come back to see the Sphere again? Why or why not?

Science on a Sphere: Visitor Survey (Interviews)

Data Collectors: Complete this section during the presentation. Date _____

Check ALL of the topics covered in the presentation.

- | | |
|--|---|
| <input type="checkbox"/> Human impact on earth | <input type="checkbox"/> Solar system |
| <input type="checkbox"/> Earthquakes, volcanic activity, plate tectonics | <input type="checkbox"/> Oceans and weather |
| <input type="checkbox"/> Earth's changing atmosphere, climate | |

Data Collectors: Ask visitors the following questions. Try to capture their words exactly.

Introduction: *Science on a Sphere is in the design phase. We'd like to get your feedback to help develop the permanent exhibit.*

How old are you? _____ Male/Female

How would you rate this exhibit? 1=poor 2=fair 3=average 4=very good 5=excellent

What most impressed you about the Sphere and presentation? (*ask for details*)

Is this like anything you've seen before? How is it like other things, how is it different? How does it compare to seeing the same science presented on a map or a film or video?

Did you feel confused by what you were seeing at any point during the presentation? If yes, please explain. What kind of support could be provided so that visitors are not confused?

Tell me what you think you learned in this presentation (about climate, plate tectonics, etc)

Do you think this is a good environment to view the Sphere? Is it quiet enough to focus? Too busy? Too many people in the group?

Would you recommend the Sphere to others? Why?

**Survey A
Visitor Survey
Science on a Sphere**

Check ALL of the topics covered in the presentation

- | | |
|--|--|
| <input type="checkbox"/> Human use of electricity | <input type="checkbox"/> Solar system |
| <input type="checkbox"/> Earthquakes, volcanic activity, plate tectonics | <input type="checkbox"/> Earth's weather |
| <input type="checkbox"/> Earth's geography | <input type="checkbox"/> Global warming |

Check your Age: Under 18 18-25 26-49 50 and over

Circle: *Male or Female*

How would you rate this exhibit? (circle one) *poor fair average very good excellent*

Describe the most memorable image you saw.

If you could control the images on the Sphere, what would you do? Would you slow them down or speed them up? What else would you like to see?

What do you think is the point of the Sphere? How is seeing things on the Sphere different from a map or on video?

Would you come back to see the Sphere again? Why or why not?

**Survey B
Visitor Survey
Science on a Sphere**

Check ALL of the topics covered in the presentation

- | | |
|--|--|
| <input type="checkbox"/> Human use of electricity | <input type="checkbox"/> Solar system |
| <input type="checkbox"/> Earthquakes, volcanic activity, plate tectonics | <input type="checkbox"/> Earth's weather |
| <input type="checkbox"/> Earth's geography | <input type="checkbox"/> Global warming |

Check your Age: Under 18 18-25 26-49 50 and over

Circle: *Male or Female*

How would you rate this exhibit? (circle one) *poor fair average very good excellent*

What most impressed you about the Sphere?

Was there anything you saw that was confusing? Explain.

What did you learn?

Would you recommend the Sphere to others? Why?

Appendix B. Data

I. Interview Data

- Visitor Survey A
- Visitor Survey B

II. Surveys

- Survey A
- Survey B

I. Interview Data

Interviews were conducted with groups of school students who attended Science on a Sphere demonstrations. Two fourth grade classes and one sixth grade class attended presentations. At each of these a handful of adult or family visitors also joined the presentations.

Visitor Survey A

Demographics

Visitor Survey A: Eight groups were interviewed using this survey, with a total of approximately 30 individuals. This included four groups of 4th graders; two groups of 8th graders; one group of young adults (one male and one female), and one family group with four children and two adults.

Rating

Three groups rated the sphere very good, three groups rated the sphere excellent and two groups of children didn't answer.

What most impressed you about the Sphere and presentation?

4th graders

- *night and day, Volcanoes, Earth movement, Dead volcanoes on Mars*
- *weather, looks real, old to new/current earth, learning the size of the earth and sun*
- *earth in real size, shows the planets in relation to earth, shows how earth looked 600 million years ago*
- *when the earth was breaking up, 600 million years – 5 ___ day, hurricane Isabel, pretty sun*

8th graders

- *weather, climates, different features, Mars and Jupiter, global warming, plate tectonics – gave them a better visual idea of lessons learned in class*
- *the images (Earths 600 million year storm – I like the sun) Warmer/Pangaea/The sun*

Family Group/Adults

- *El Ninos heat and what happened, earth changing 4 million years ago to now, visualizing, weather - 4th grade*
- *you feel like you're looking at the earths movement, colors, can see it happening, real time data but like data, would be bored looking only at Mars*

Is this like anything you've seen before? How is it like other things, how is it different? How does it compare to seeing the same science presented on a map or a film or video?

4th graders

- *TV weather, cooler rotation, see whole planet, more than weather, lots of stuff*
- *no. colors. When we look with our eyes we see a different image. It looks so small. Map – to show all colors and hear they change and move*
- *globe moves around, better on globe/can see it's not flat*

- *In books – in Social Studies book, the planet*

8th graders

- *no/changes in front of you, vegetation, 3D - lots of different information at the same time– 8th grade*
- *on the news - on the computers - a lot better - not too long - much better*

Family Group/Adults

- *no, yes at zoo, globe of earth 3-D but doesn't change, moves, can walk around, span of time, can see parts come together*
- *like an IMax – gives you a different view or scale – nothing like it before*

Did you feel confused by what you were seeing at any point during the presentation? If yes, please explain. What kind of support could be provided so that visitors are not confused?

4th graders

- *not confusing, answers were immediate*
- *Jupiter – had different patterns*
- *confused by different colors*
- *some of the words, continental drift, he used examples*

8th graders

- *No, he explained everything seen before in Science, might be confused if he wasn't here presenting*
- *No, no problem*

Family Group/Adults

- *explained well*
- *was pretty clear*

Tell me what you think you learned in this presentation (about climate, plate tectonics, etc)

4th graders

- *earth rotates, day and night changes, planet Mars has volcanoes and canyons, planets have volcanoes (dead)*
- *being an astronaut allows you to see these things, how it rotates, electricity at night – we use a lot of lights, volcanoes in the ocean*
- *how planets changed, land is not flat but 3-Dimensional, learned about the other planets in the solar system*
- *600 million year ago – that the world would look like that, making the dinosaurs, air on Jupiter was poisonous. The sun is bigger than the earth.*

8th graders

- *Jupiter – gases movement patterns, Mars – volcanoes, Sun – flares, didn't know how it affected the earth vegetation, effects of sun and meteor that killed the dinosaurs (Pangaea)*
- *learned how the earth's changed, explosions on the sun, earth temperatures*

Family Group/Adults

- *El Nino – how to read colors of presentation, storms come up from S to N, start in Africa. Didn't know there was continent before Pangaea.*
- *1st person - Didn't know where all the storms came from, where weather patterns come from. Also, changes of earth over billions of years, images of Mars and Sun. 2nd person - Temperature of water and global patterns, gulf stream. (This was in the context of a discussion of the popular film, The Day After Tomorrow.)*

Do you think this is a good environment to view the Sphere? Is it quiet enough to focus? Too busy? Too many people in the group?

4th graders

- *Liked moving around the globe, fun to look at*
- *yes. Lighting quiet, not busy, size was good*
- *ok*
- *[they liked] when it was moving and changing*

8th graders

- *too much light, announcements kept interrupting, should keep in the museum, another school group will change their experience, recommend keeping small groups together from start to finish*
- *needed to move around, about the right size*

Family Group/Adults

- *Saturday may be hard, lights – hard to see on side, will be distracting*
- *lot of activity to the employee lounge? But kids exhibit didn't phase them, background light is distracting, darker atmosphere – looks like it is floating. Love the blue marble*

Would you recommend the Sphere to others? Why?

4th graders

- *yes*
- *yes. learn about the earth, educational, weather, learn how weather moves, for example hurricanes came from Africa and go to the East coast.*
- *Two said yes and one said, I want to come for my birthday*

- *I'd tell my mom, tell my friends*

8th graders

- *Yes .I liked how it looked*
- *yes. It was awesome, coolest, the best*

Family Group/Adults

- *My kids held on for 30 minutes. The adults were OK with the length. (Would recommend images of the) Sun, Mars, Earth – millions of years ago*
- *Yes. It was very visual. I have visual friends, deaf friends. [The Sphere] is unique for getting a world wide perspective, though it's always good to point out particular places. [In the animation of continental drift] show Maryland not Indiana*

Visitor Survey B

Seven groups total were interviewed with these questions. These included three groups of 8th grade students and three groups of 4th grade students, with three to six children in each group. In addition, one group of adults (2 women in their twenties) answered these questions and a group of 4th grade teachers were interviewed.

How would you rate this exhibit? 1=poor 2=fair 3=average 4=good 5=excellent

Five groups rated the exhibit as excellent (though one member said poor), and one group thought the exhibit was very good. One group was divided, and 4 of the members said the exhibit was excellent, while three said it was very good. One group thought the exhibit was very good.

What did you like most about this exhibit? (ask for details)

4th graders

- *get more information than a book, glows and spins, the information changes [variety]*
- *NA*
- *seeing the weather – seeing the sun and planets – seeing earth like an astronaut – seeing how much electricity U.S. uses – land changes over time*
- *They were into it. Even some of the more active ones.*

8th graders

- *showed earth clearly, little things make sense, showed how planets look*
- *everything was detailed – colors; that it was accurate, especially plate tectonics. Get to see how the Earth looks– colors, storms, movement, and predicting [weather]*
- *revolving – different points of view – latitude and longitude –where storms came from and went, global look*

Adults

- *Educational, see things 3-D. Liked storm cycles; Paleo/evolution of earth; never knew it was one clump, never knew they broke apart. Good speed, but good to have it repeated. Good to get out of the North America – the storm systems begin in Southern hemisphere. It shows that what happens on other continents affects us.*

Did you like the presenter and style of presentation? Why or why not?

4th graders

- *explained very well, helped understand the content*
- *cool presentation, magic turning the earth*

- *Teacher: The presenter answered questions well and gave good information. It was clear. He respected kids' questions and had a good understanding of kids.*

8th graders

- *he was good, it was good, could ask questions*
- *good, clear*
- *cool – like presenter – explains it well – like ability to ask questions*

Adults

- *If more kids - more involvement. Some big words for kids. We explained, ok for her*

What did you think of the content of the presentation? Was it too simple or too complex? Was the information new to you or did you know it all already? Was there too much or too little information?

4th graders

- *Wanted to zoom in close to see me, see the moon, current weather. Already knew the information about planets/space. Information about weather, hurricane Isabelle was new.*
- *earth spin – no confusion; cool about volcanoes – didn't know they were dead*
- *Teacher: content appropriate and sufficient for age group*
- *NA*

8th graders

- *just right content [for the students]; some of the information was new, information was alright*
- *just right. Some information was new, such as that storms come from Africa. Would like to see more planets – Saturn, Pluto would be interesting.*
- *Fit what they talked about in school. Some was new, such as information on global warming. Knew about Earth's formation billions of years ago, but it was new to see it. Also new was how the earth looks at night, and how people use electricity.*

Adults

- *good info, just right, length ok*

Is there other kinds of information you needed to make sense/use of the experience?

4th graders

- *symbols – what different colors meant, direction. His explanations put information in context, for instance, explanation of Pangaea.*
- *too much information – want to come back for the presentation*

- *Teacher suggests more lessons/more information – lecture on all four oceans, harming continents. Make it more interactive, visual aids of dinosaurs etc for changing earth.*

8th graders

- *no, maybe show volcanoes when talking about volcanoes*
- *Organized, but would like to know more about the moon.*

Adults

- *could take some images and make panels to show what the graphics are*

Did you like the length of the presentation? Was it too long or too short? Did the images move too quickly or too slowly? Would you have liked more time just to look and watch the images?

4th graders

- *wanted to hear more, length was just right*
- *it wasn't long – but lots of stuff*
- *Teacher: the length was Ok, would have liked more time to watch weather and how specific continents changed*

8th graders

- *four said it was good, two said it was too long*
- *just right length, speed good*
- *length was just right - would like seats, really cool, yes would have liked more time just to watch the images, but the pace was good*

Adults

- *no fine, repetition good*

Describe the image you saw that is most memorable to you.

4th graders

- *Two liked Jupiter and noted the colors up close, and two liked the Sun. One said it was because they didn't know about Sun's gases and another that they like sunshine*
- *the sun has volcanoes and explosion – Jupiter (poisonous gas)*
- *mars – weather, astronaut view of planet -*

8th graders

- *Mars, Jupiter*
- *How plates move, how countries changed and split apart, how earth looked in morning and at night, how it looked millions of years ago, how they showed global warming*

- *storms and hurricanes, plate tectonics starting 600 billion years ago, global warming, lights at night*

Adults

- *way earth formed – formation of continents*

Would you come back to see the Sphere again? Why or why not?

4th graders

- *3 yes – want to hear more, go on longer, it was fun, learn more; 1 no – it made you sleepy*
- *Absolutely! # or longer time next time*
- *yup*

8th graders

- *yes - if I need to, no - kids won't be interested, only if they changed the content*
- *I liked how it looked, liked information, interesting*
- *yes – interesting, well explained, would recommend*

Adults

- *would take people to see it, cool to see weather up to the minute*

Additional Teacher Comments

- *For elementary students it's hard to visualize 3D when you are used to 2D. The Sphere made it seem real because it can tilt the earth and rotate. One of the children said its like I'm an astronaut.*
- *The teacher said she would like to see pictures about under sea volcanoes and landforms, fish related to particular undersea landforms. Connect the Maryland curriculum and images they are used to with what they see on the globe. What would landforms actually look like?*
- *It's amazing. It was helpful. You feel like you were an astronaut. You got the experience of a Jim Lovell or an astronaut looking out at the Earth.*
- *Particularly liked seeing the storm patterns – can see where the storm activity is. Parts of the world get more, I can't say enough about it.*
- *Good. Higher level for their kids, but good to get different type of exposure. The model of Earth and tracking storms is good for them. They'll remember the eye of the storm. It was a great experience.*
- *The visual is good for them. To see from the astronaut's view. What do they [astronauts] see? That's a question I've had in class... Seeing night time and day time is interesting.*
- *Seeing the structure of the US is good. This is neat.*
- *They were into it – even some of the more active ones.*

II. Surveys

Two versions of the print survey were distributed during **Phase Two** of data collection for the evaluation (June 18-30). Both surveys shared a similar format, with one closed question asking visitors to rate the exhibit followed by four open-ended questions.

Rating (combined totals from both Surveys A and B)

Across all age groups, visitors rated Science on a Sphere with extremely high ratings. Out of 326 visitors, 67% (219) rated the exhibit as Excellent. Thirty-one percent (100) rated the Sphere as Very Good. Sixty-nine percent of visitors rated the sphere as either Very Good or Excellent. Two percent (6 visitors) rated the Sphere as Average and less than 1% rated the Sphere as fair.

	Fair	Average	Very Good	Excellent	Total
Under 18	1	3	28	42	74
18-25	-	-	12	16	28
26-49	-	3	36	88	127
50+	-	-	24	73	97
TOTAL	1 (>1%)	6 (2%)	100 (31%)	219 (67%)	326

Survey A

Describe the most memorable image you saw.

Venus (5)

Mars (5)

The Sun. (2)

Indiana forming over 500 million years.

All of the images were fascinating.

Weather.

All of them were great. I really enjoyed the weather image.

The way the continents moved through the years and what happened to the life on Earth.

Global warming.

When he showed global warming over a few 100 years.

Lights at night and global warming.

The continental drifts. Just seeing them. This is 3-D. (vs. map) Books are books, you see it (passage of time). This is modern, advanced.

In darkness, the lights of the most populated areas on Earth. Also, how the current day continents formed.

The shifting of the land/water from millions of years ago to now and the 1 cm per year separation.

To actually see weather systems in real time.

Earth at night.

Earth's continental change.

Global warming - continental drift.

Continental drift.

El Niño

Plates moving - land forming.

Formation of the Himalayan Mountain.

Everything.

Weather on Earth

Hurricane Isabelle Plate Tectonics (boundaries, ocean trenches, and spreading systems) El Niño and La Niña were excellently displayed. Continental drift with vegetation changes!!

The earth at night and when the Himalaya's formed

Global warming.

Lots of scientific information.

The rotating Earth.

Plate tectonics. Mars. Hurricanes

Entire presentation was interesting.

Sphere spinning - 3-D image and also large.

The Earth.

Movement of structures over time.

Everything.

Creation of land masses over time - weather wealth of country - due to electricity, light, weather over time.

Today's weather.

Weather changes, Earth's geography.

Would like to see real time all around 3-D ball.

Satellite imagery with Hurricanes.

Electricity.

Night time and movement of continents.

Rapid onset ice age.

Use of electricity. Planet lights up.

Earth.

The global warming timeline and Mars.

Global warming.

Plate tectonic movement.

The loop of the continental drift over 500 million years.

Migration of tectonic plates.

Complete surface of planets in motion/Earth, Mars, Jupiter.

The warming of the Earth.

Geographic changes over millions of years.

Earth's geography

El Niño.

Cross between Earth and Mars. For earth, you get so caught up in your life - I live in MD. When you see the Earth so far away it puts life into perspective. You see the whole thing you think about all the wars going on and you say....Book is flat. This is 3-D and puts it more visually into perspective. When we look at Mars it's interesting because of the activity going on with the Rovers. Keeps up on the news, internet and paper.

Continental drift.

Plate shifting.

Global warning.
The continents separating. The different ages of the Earth.
Found them all interesting.
Earth as from space and cloud coverage.
Pangea's expansion.
The view of Earth from space.
Global warming.
Weather images.
Blue Marble.
The change of millions changes
Io and sun (x-ray)
Pangaea to present day.
Continental drift.
India crashing into Asia.
The weather image to predict hurricanes.
Weather model in near real-time.
Hurricane Isabel
The lights around the world.
Ocean void of human touch - man made objects.
The way it made facts and theories clear.
Storms forming in Africa.
Drift.
The heating of our planet. The movement of our continent.
Plates moving over 600 million years.
No - most - each was incredible for its uniqueness - making other contrasts more evident.
Global warming.
Temperature changes
Isabel - movement of continents.
The Earth forming - different countries.
Formation of continents. Especially India's movement to Asia.
Needs to be bigger - needs formal shows - chairs, more theatre-like setting.
Continental shift.
I think it becomes very tangible to see the actual planets rotating.

All.
Changing geography in time.
Moon craters from volcanic activity.
Weather.
Human use of electricity.
Formation of current Earth.
Pangaea
The million year formation.
The movement of the continents over time.
Global warming.
Continental drift. Weather/El Niño, Mars and Sun.
Plate tectonics, when we saw Indianapolis move over the time of millions of years.
Very good learning experience for my grandchildren.
600 million years to present! Time-warp - one of the best learning tools I've seen.
Seeing the continents change.
Earth 600,000,000 years ago.
Time change of continents
Formation and track of Hurricane Isabel.
Continental drift; global warming.
Formation of the continents.
Continental drift.
Formation of the continents.
Formation of India
Continental drift. Night view showing electrical use.
Global warming.
Earth - Pacific Ocean.
Global warming.
Changes of the land mass over the years.
Global warming - night skies.
Night lights.
The making of present day.
NASA view of daylight - Earth.
Jupiter, green sun.

Global warming.

The changing of the earth.

El Niño

Weather around the continents.

The green picture of the sun I saw.

All.

Seeing the formation of Earth crumpling and stretching until it reached present day.

The most memorable image was rather a series of images - the animation of plate tectonics and continental drift through millions of years. It gave an easily understandable, broad view of continental drift.

When I saw the continents forming.

The current weather and how the hurricanes come about.

The light brightnesses.

Indiana moving.

India crashing into Asia. The change in the continents.

The storms coming across the ocean. I also liked the lights across the globe.

That of global warming on the Earth.

Real time weather.

Hurricane Isabel.

The satellite picture, the Blue Marble.

The image of global warming.

El Niño

Global warming in 2250.

Mars Grand Canyon 5 times larger than the Earth's Grand Canyon.

Hurricane Isabel.

Mars, Hurricanes.

Nothing stuck out.

Hurricanes.

The earth changing over the years and the lights at night.

The Earth moving.

The moon IO.

The image of the Earth continent formation Pangaea - current especially Indiana's location.

The image on global warming.

If you could control the images on the Sphere, what would you do? Would you slow them down or speed them up? What else would you like to see?

It was good./alright/keep it the way it is (22 mentions)

Slow down.(16)

No (7)

Appropriate speed was demonstrated./Good speed. (6)

I would speed it up. (4)

It was perfect speed. To see what more the future will bring.

Replay them and include maybe some more pauses.

The images were shown at a good enough rate. (would like to see more about U.S. geography).
How things were formed.

Nothing - it's fine the way it is.

Excellent rotation speed. The remaining planets would be nice.

Slow down - show meteor impact 65 million years ago.

Keep it moving slow.

I would keep it the way it is.

The sphere should be lower so the northern hemisphere can be seen better.

Rotate the image so all sides are seen

Slow them down at some points but the person giving demo did this. She did a great job. Could one zoom in on various parts of the planets? Heavenly body anatomy from core outwards - possibly on display on walls as posters or diagrams.

Good speed - small group was able to repeat several functions.

I would slow them down. I would like to see the climate control.

Bring the poles to the side (so equator runs N to S) for some of the views

Slow down. Place the sphere lower to the floor.

Images of life on particular continents.

It was fantastic.

Real time weather.

Both slow and speed in different spots. Slow at the dinosaur killer.

Zooming features - zoom in while rotating. Zoom out while rotating.

Slow down - just right.

I would not change a thing - I found it fascinating.

Imagine an all-solar system built with spheres.

Speed up slightly, more on severe weather.

Neither, protected areas.

Slow them down especially the timeline.

More stable projector towers and sphere. Perhaps an automated demo. Plus more seating around the sphere (off the pods).

It might be interesting to see how pollution travels around the globe and ozone depletion.

If the sphere could grow into three D.

Would like to see weather patterns sped up. Too much to list. Best presentation/demonstration seen in a long time.

Could have different scenarios to look at. It could prompt you to go to other...

Speed was good, would like to see Jupiter.

Speed, as most of the audience will be nominal scientists.

Weather effects.

Time lapse.

Real time earthquake, weather patterns, etc.

Same darker room.

Global warming trends going back in history - warming in this century.

OK for what was watched.

Speed was perfect. Be able to tilt the images on the earth's axis for a different perspective.

Slow them down; ocean floor, SST hotspots, continents over time.

Speed is just right. How the temperature has changed from the past to the present.

I would like to see the images change over shorter time periods as it nears present day (i.e. - instead of 1 million year increments, go by 50K increments for past few million years, then 5 K increments, so can see effects of recent ice ages, human development, etc.

It was great. Would be neat to be able to select images yourself.

Slow them up. Different planets explained.

I'd slow and speed them up. You can learn from both.

Speed perfect - Images perfect.

Slow for some - fast for others.

Venus - Earth's weather.

It was excellent.

Slow down - the color coding helps perspective. Any possibility to zoom in? That would be interesting. I like geography so continent identification is possible.

Ice cap melting and coastal changes.

Forward past current time.

Good speed. Other evolutionary changes - such as shift from aerobic to anaerobic. How storms and other weather patterns develop, more detail of ocean depths.

The Earth transformation and cooling.

Change to the planets.

View of spacecraft in space near earth.

Other planets.

Ozone depletion. Fast forward in time.

Very well paced. Well covered.

Speed was OK - the outer planets.

Slow down and decrease remote delay to be able to see more detail.

Slower - seats around

Don't know enough to reply seemed fine to me as is.

Slow down Pangaea - continents movement.

Our moon. Projected continental drift.

Slow them down and get a view of my state.

I would show the major cities. I also would slow it and make it fast. I would also like to see a birds eye view of the world.

Nothing, same, and the same.

No comment.

I would slow them down. The labels of cities, other planets.

The images were fine as is.

I would zoom in to see evolution and weather. I would keep it the same speed.

I would speed it up and I would show every planet.

I would like to see how it was different along time ago to today.

Slow them down. The outline of plates.

I would like to see more information about weather patterns, more NASA images.

Pluto.

Same.

Well presented and informative. Loved it.

I would slow them down to see the effects on the Earth.

I would slow the sphere down a tad. I would also like to see other planets.

I would leave it the same, however I would lower the sphere.

Speed it up and see meteors in space.

Slow them down. A close up image of all the planets.

The Pangaea splitting. (He told me he didn't understand where the clouds went. He understands the concept.)

Perfect rate of speed. The moon.

Speed them up (as an addition to watching slow).

I would keep it the same, maybe expand a little more on each topic.

I would speed it up, especially the weather to see patterns or irregularities. It would be interesting to have more pictures to see different occurrences at different times.

Animal evolution.

What do you think is the point of the Sphere? How is seeing things on the Sphere different from a map or on video?

3-D (6)

3-D help to bring out visuals better.

To teach us learn so much more!

It is 3-D and more interesting than a book or map. Easy to see weather patterns, etc.

To show the Earth as it is.

Global perspective is new and important in a nationalistic society.

Realism.

It gives you a real look at the earth.

To show how the Earth has changed. It makes it much more interesting and it shows it in a way like no other. Very interesting.

It makes the images normally portrayed in a flat, 2-D manner more tangible, thus making them more real.

The point of the Sphere is to give the audience a 3D image of the information being relayed. It's more lifelike.

Brings it more alive.

Gives you the whole picture.

More realistic.

To give you a 3-D image of the Earth, etc. Easier to visualize.

To represent various interactions (weather, electricity, topography) involved with the planet.

Show the relationships of events on Earth.

Sphere more realistic - better perception of Earth.

It makes the images more relevant.

Things are in 3D, movement is realistic, gives true perspective.

See the whole world.

Gives a world view of geological phenomena.

This information.

Interactivity.

See world and universe from a different perspective - more 3-D!

Show movement of weather continents

The 3-D view. It gave me a new impression of the Earth.

Understand land formation, weather.

One is really seeing the true shapes and sizes of images opposed to flattened distorted images found on 2D maps and computer screens.

Very realistic - Can't possibly present this on a flat surface - i.e. night and day.

Education, on the Sphere - it's much more realistic and a great visual representation

La Nina

Easier to comprehend in 3-D model.

It brings the image to life.

It's cooler. More people can watch

It is much rounder.

Different perspective.

It gives a different perspective that you can't get from other media.

It reflects how alive our planet is.

Present Earth/planets/Sun as really exists vs. 2-D image.

More realistic. More 3-D. More details.

To show as close to actual what is happening.

Sphere was very helpful to understand. It felt like a real one/Earth.

You get a three dimensional view. It is visibly very stimulating.

Excellent visualization of changes in earth over time and many other ever-changing variables, such as weather patterns.

To give a more accurate perspective of the topics covered.

Yes. It's easy to understand.

Gives 3-D image, makes it more graphic.

How dinosaurs became extinct.

The sphere gives you a more interactive experience (visual).

3-D and motion. Ability to show various directions of motion - creates real effects.

Much more comprehensive and tangible.

Sphere is a more realistic presentation of information therefore enhancing learning.

To show different areas of the sphere as it turns as opposed to seeing it on a map or video when it is still and not a three D form.

Total Earth perspective.

This is much better than a map - also stimulates discussions.

3-dimensional is more interesting.

To explain atmosphere changes in the Earth and land changes. As well as the environment on different planets.

To understand how connected the earth is; to demonstrate that to people. The sphere allows you to see the interaction of weather around the globe.

3D always gives a true life perspective to the demo.

More visual.

I think it is a great educational tool.

Gives full view of planet weather, plate shift.

More of a realistic educational tool.

Easier to understand.

The same.

It is very instructive to see 3-D images on a sphere, which cannot be accurately understood or appreciated on a 2-D surface.

Perspective and holistic experience and interpretation.

The sphere is more realistic - overall good presentation.

3-dimensional provides realism.

Makes it more realistic.

Realistic.

Sphere approach makes presentation much more actual - as the components of the solar system really are huge steps beyond flat screen approach which we've seen all our lives.

Educational. So much more graphic.

How much Earth was covered with water when the meteorite fell.

Shaped like Earth - realistic perspective of relationships. Shows human impact.

The forming of the Earth but I know that Mother Earth came into creation. Almighty God Jehovah is the creator of all things.

Speaker to have a microphone to better hear him.

Conservation!

Very much easier to understand.

More realistic.

Much more realistic.

You get a more global view (no pun intended).

Changes of Earth. Sphere more graphic/amazing.

It gives a more realistic impression of the planets, moon, sun, etc.

More real.

Gives you more of a 3-D effect.

Allow you to visualize with more perception.

More vivid.

The 3-dimensional effect makes it more real for you to understand the concepts.

A lot clearer.

Education.

More true images, much better perspective.

Much better orientation with sphere.

You can view the earth in its totality.

It adds appropriate perspective.

Yes, the narration.

In motion and shaped correctly made it easier to understand

I liked it very much.

It shows dynamism, complexity, weather and economic development. Very informative and insightful.

Very educational and historical. The sphere gives a great 3-D effect.

More realistic.

Yes.

A more realistic 3-D effect.

More accurate view.

To see the Earth as a globe.

3-D effect, use of motion.

Better and more realistic understanding of the formation of the planets and the systems - weather, geography, future, etc.

Realism.

To see the world in 3-D - more easily understood.

The sphere makes learning about the Earth's history much more interesting than a map or video. It's a great educational tool.

Great teaching tool!

Like sphere - didn't like having to move - wanted to sit down.

To show about the Earth look better and gives more information.

You can actually look up at it or see the details. It's better than 2-D.

To show what Earth looks like, maps don't show as much.

The sphere is like the diagram of the Earth with more detail than certain maps or videos.

Very good for visualization.

It's more like real life with the sphere.

Gas, clouds. Because you can get a view of the whole planet.

You feel like you're in space looking down on the Earth - more physical feeling.

Better visuals.

It's a lot easier and fun.

So the person can show all around the world. I like the sphere more because it moves. Second you can answer questions and ask questions.

On a map or video, you can not walk around the image and the image isn't distorted. The point of the sphere is to teach people about earth in a new and innovative way.

The sphere gives a 3-D visual of everything on the globe, not just a portion.

To understand how things have changed.

You don't have to use your hands to turn it around.

You get to see things like they are.

The point is to witness how different things are impacting the Earth in a positive and negative way.

Way cooler - more interesting.

The point here is to help you understand what we have to look for in the big picture.

You get some exercise!

It allows you to view the Earth as it is in 3-D. Not just on a map.

Seeing things on the sphere is different because you can get a better idea.

So you can understand.

The sphere shows you a lot more.

You can actually see all around.

Because it is turning.

The sphere makes it easier because it is how the image is meant to be viewed, not exaggerated on a map.

More realistic Earth picture.

It is a wonderful way to see the planets 3-D.

Because it shows actual size.

You get to see around object and it seems more real.

To teach people about Earth - it's kind of like the Earth so it teaches a bigger lesson.

To show changes on the Earth. The Sphere shows more details. The Sphere makes it easier to see where things happen.

It shows how things work on the world from a new perspective. The point of the sphere is to create a better image.

It looks more real.

Map doesn't show other ways around. Globe shows it better than a flat map.

All the ways to map things on Earth.

Would you come back to see the Sphere again? Why or why not?

Yes. (38)

Yes, because it is very interesting. (13)

Yes, very informative. (7)

Yes, just to keep learning, lots of information, and it was very cool to watch.

Yes, it was great!

Yes, excellent presentation.

Yes - excellent presenter - very knowledgeable - Expert.

Yes. It was very educational on a variety of related topics. Will bring family.

Yes, it was very modern and technology in science is always beneficial.

Yes, I learned a lot about the way the earth was formed.

Yes! I would recommend to others. I think you could do a simpler presentation for children.

Yes - I definitely learned a lot of information.

Yes. It was the most interesting exhibit.

Yes because it's interesting and covers several subjects in a short period of time.

Yes - a lot of information to absorb - would retain and learn more if repeated. Enjoyable to watch.

Yes. It is full of information you do not see anywhere else.

Yes! I would bring my Earth Science class to see this.

Absolutely - it's phenomenal.

Absolutely - amazing.

Yes - interesting facts well presented.

I'd come back if more images were added - other planets?

Yes. I would come back to see the sphere. I think it gives a fascinating vision of our other worlds.

Definitely, I will bring my family, out of town visitors.

Yes, to learn more!

Yes. Presentation was excellent.

Yes, I loved it.

Yes, superb instruction.

Yes, very informative and interesting.

Yes. Like to see more.

Yes. Could be expanded into more in-depth presentation, very informative.

Yes, missed first part. Always catch more if viewed more than once.

Absolutely. Brings science to life.

Definitely, yes. The 3-D images on a sphere are unique and explain and show effects that cannot be seen in 2-D.

Yes. I was extremely enlightened.

Yes, the amazing growth over time. The growth of the planet.

Yes - would like to see more data sets.

Sure, can always learn more about our world.

Yes, but not from here.

Yes. Much more can be done with this. Real time earthquakes, etc.

Yes. I think you should have a cocktail party around it. It's very engaging. It moves.

Yes. Too much to see in one visit.

Yes. It taught me a lot about how the shape of the world is changing.

Yes. To see additional projections.

Yes. It is much more realistic than a map.

Yes. To see other things while the presenter is pointing out the main features and to see if anything is new.

Yes, it's interesting and unique.

Yes, it was real great.

Loved the intimacy of the seating with sphere. Moveable platform floor.

Yes. Definitely. This time I would bring children especially, so that they could see how everything is connected.

Yes, very educational.

Yes, yes to learn more. I might be better to curtain it off from rest of exhibits.

Yes, if there is an excellent demonstrator such as we heard.

Maybe if I was here again.

If other planets were added as a different presentation which also included Earth and Sun maybe same are with addition of Earth's moon.

Maybe.

If we were local, we'd be back - from Connecticut.

Yes. Much to learn.

Would come back as often as possible. Wonderful learning experience.

The _____ education - movement/commentary.

Yes - bring my children and grandkids.

Yes. To show someone else.

It is entertaining but not factual.

Yes - not enough time.

Yes, definitely.

Yes, but would prefer home computer version.

Yes, I would. Information will be evolving as we learn more.

Yes. To absorb more.

Yes. Yes. Yes.

Yes - lots to learn. Our tax dollars at work well.

Yes, very informative, educational.

Yes. Fun and easy to learn from

If it's in my hometown California.

Yes. Riveting.

Definitely - makes history and general conditions of earth come alive.

Yes! Great.

Absolutely!

It was very educational.

Yes, I'd be interested to catch the entire presentation. This time I'd be able to formulate questions, as I'd have some knowledge of the sequence of the presentations.

Absolutely - it's a great teaching tool. Very realistic.

Yes - fascinating to see these things up close. A typhoon actually forming, land masses forming, differences among planets, etc. Great idea for presenting a lot of science.

Yes - the Earth is constantly changing.

Sure.

Yes - to see changes in the Earth's atmosphere, land, etc. due to global warming.

Yes! I only stayed a few minutes and loved it!

Yes, learning and humorous host.

Yes I would come back again if I could. I would come back because it's very interesting and you learn a lot.

Yes, to learn more.

Yes. It is very neat and it teaches a lot.

Yes, it was fun and cool.

I would because it was funny and educational.

Yes, it's just cool!

No, because I already know what happened.

Not just for the sphere but I would come back.

Yes, because it was totally great.

Yes. I think it's fun to watch.

Yes, I enjoyed seeing the entire globe at once.

Yes, very interesting plus being able to see the Earth and the Sun. Very neat idea.

Possibly it depends on who I'm talking to.

Yes. It was very educational.

Yes, it's bitchin'.

Yes, it's really cool to see the Earth moving and to see the predictions of the weather.

I might because the presentation had lots of interesting facts and pictures.

Yes I would, because even though I knew a lot, I learned a lot.

Yes! Because it is so cool. Very good presenter!

Yes, because it is cool.

Yes. Way cool!

Yes I would, it was very educational, and the guide was great.

I think so, I think it's very interesting and I like the way it's set up.

Yes, because I really enjoyed the demonstration.

Of course, to see any additions or just to view it again, it's truly a spectacular idea.

No, because we do not need to know all that stuff yet.

Additional Comments

This is a compilation of the feedback from a group of 4 people who filled out surveys, but were not as detailed in the written responses than they were while talking to me. This group spent about 25 minutes speaking to Dr. Bendel and though it was the best exhibit in the building. They really enjoyed the personal instruction/explanation they received and would not have preferred a formal presentation. They also were very impressed with the new technology involved in this exhibit as well as the presentation of the sphere and how it seemed to float in mid-air. One man suggested that the sphere would be really effective in a theatre, such as the planetarium. They also enjoyed the interactive nature of the exhibit. (e.g. the presenter being able to call up images they wanted to see.) Personally, I think (and I have gotten similar feedback from others) is that the exhibit itself is great, the sphere is a unique way of presenting the information. What we can improve is the presentation of the information - more speakers, or at least a better way for the speaker to address more of the audience at once.

I didn't realize there was the large mountain on Mars or the big crater. You could have the Magic School Bus which just had an episode on Venus, for school presentations. - and to reach the age of kids like her 5 year old.

This is a wonderful exhibit and would be an asset to the MD educational system which focuses on Earth Science as well as biology and chemistry. If possible this would be an excellent addition to specialized (science/academic) H.S. that already contain in-house planetariums. I actually like this better because one could present these programs in addition to constellations.

Best in the museum.

Would be good if it was lower.

There were some terms that weren't explained.

Yes. To bring others to see it - it's fascination.

Great! Thanks - very up to date.

Phenomenal.

I did not view the entire presentation.

Survey B

What most impressed you about the Sphere?

Everything. (4)

Realism. (4)

Resolution explanation. The resolution is fantastic. This kind of globe in Terralink, but this is much better. Explanations were appropriate and informative.

Plate tectonics, hurricane movement.

The technology of the presentation. The rotation is very cool.

The video's.

The 3D demonstration, decent explanation, plate tectonics of global warming.

Video quality.

The ability to see everything to scale, the oceans, land, etc.

Amount of knowledge about all topics.

Watching the land mass change over 600 million years and the animation technology.

How it changed 600 million years ago.

The time lapse earth.

The continual global motion keeps the audience interested.

The way it showed the earth at night and how the light on earth can be seen in space.

The continental drift part and how the sphere accurately showed all of it.

Cloud cover, electricity.

The effectiveness of its ability to express data. 3-D presentation put the information in context.

The whole history of evolution.

Liked the day and night lights, moving land, pictures in general.

The way it could be used to show various data sets in their native global format.

The continual motion.

The realism of the various data sets as they were represented on the sphere.

Simply the idea of it - never seen anything like it! I'm not even much of a science person - it's just very cool.

The dynamics of setting it up and getting it perfectly placed to effectively show the presentation.

How it works! Very cool.

History of plates.

Yes.

Linearity of display.

Continents moving.

The presentation was very thorough. The human use of electricity was mind blowing.

Resolution was good. Very effective demonstration. Better seating and less light would prove helpful.

It's a great visual learning tool.

Color/active.

Seeing electricity use, plate tectonics, evolution of earth's surface, other planets and sun

Constant change of the different screens projected.

Great lecturer. (Will was giving demo - Geoff).

The time lapse visualization in 3 dimensions.

Indiana moving. Mars, sun information.

Clarity of detail of images.

Visualizing images 3D.

It was a neat way to present the data. Kids liked it too!

Clarity, the 3D aspect which is very informative.

We could see the earth millions of years ago and see how the earth changed.

The pictures.

Amazing technology, our beautiful home Earth.

The visual made the explanation very easy to grasp.

Seeing whole planet at once. Night scene - population location.

Graphics.

The electricity usage imbalance.

Variety of data sets.

Unique presentation, extensive databases, knowledgeable staff.

The real life feeling of seeing the areas of the earth all at once.

Different detail - like seeing it from space.

Real time weather phenomena around the globe.

Ability to visualize effects on a global basis. - The big picture.

Attention grabbing - stands out. Clarity of image - brightness of projections.

The presentation.

Gives you a very different perspective on weather and plate tectonics that is very entertaining and informative.

Everything. I'm impressed about the thing talk I wouldn't have even thought about. It's wild---

Much more dynamic than a flat presentation. e.g. noting side of storms. Who doesn't like looking at their home.

Representing planet earth in its actual.

Plates in motion! Excellent! I'm a visual learner. I didn't realize there was that degree of movement.

Extinction of dinosaurs. It was very photogenic in regards to how comet hit the earth. Easier to understand when you saw it on the globe.

The amount of scientific information that was presented.

Size and the movement.

Ability to switch views and interactively observe events and objects, planets, and their atmosphere.

With the Earth suspended in air it felt as if I was outer space looking in.

3-D view and interchangeable screen

The variety of information and data that was shown. The 3-dimensional spherical view was very enlightening, seeing weather, topographical, and continental shifting was most interesting and the presenter's knowledge and experience was extremely interesting.

The ability to show many different topics and time periods.

Computer technology brings 2 dimensional to 3 dimensional for children.

The multiple functionality. To see Isabel weather data. To see the sun and Mars.

Computer coordination to show the image.

Unique methods of visual display.

Beauty, reality, content, storytelling by the presenter. Comparisons. History. Scale. Simply awed.

Its movement and color and size.

Good discussion, interesting graphics, it's a great teaching tool.

I liked how it showed the movement of the earth's crust.

The images of the changing topics.

The historical background.

The picture of the earth.

The amount of water on earth, identifying countries by electricity.

The view, the suspended aspect.

Shows how earth looks from space and great facts about drift, Mars, Saturn and the sun.

It's so amazingly beautiful and we are SO small in the scheme of things!

The changes in time.

Visualization and time evolution of important events.

The change the sphere makes and how it can go back in time!!

It gave us a real feel for the shape and events happening on the surface of the planets.

Can't pick just one thing.

Movement.

Very good presentation.

Clear, concise.

Very knowledgeable.

The whole program.

Enjoyed the human element of a moderator. Clear presentation.

The beautiful colors like an abstract painting. The globe is gorgeous to look at.

Ability to show how the continents developed. Severity of global warming.

The technical aspects. Magnificent - how do they do it? Spent some time trying to figure out how it's done.

How the projections were done on a round object.

The commentator was excellent and knowledgeable

Excellent, easily understood visuals.

Easily understood concepts.

The gentlemen's presentation.

The perspectives over time and the spatial perspective (the big picture).

Versatility of what can be shown on the sphere.

Graphic, clarity.

Movement of the continents to create what exists today.

The graphics and ability to cover so many topics and make it visually clear.

That 2 thin wires could hold a sphere that size.

Animation, time tracks, color.

Versatility.

Detail.

Clarity and realism.

The presenter's knowledge and ability to explain to the audience.

Very impressive - operation of sphere - projectile.

The pictures and the explanations.

How it looks like it rotates.

Clarity, visibility.

Learning about how the world was like long ago.

How it showed the world and how it was 600 million years ago.
The accuracy and current weather forming.
How you project it.
It seems to be accurate.
Small reptiles turn in to big reptiles.
The accuracy.
A lot of stuff is shaped like a sphere.
Visual rotation/tilt/animation with a good explanation.
The 600 million years ago part.
How the pictures get on the sphere.
The part when he said the nickel is as big as the earth.
How it was exactly the same tilt as the earth.
Global warming.
It's size.
The graphics, and the continental drift.
Traveling into the future to see what would happen.
The way it shows how time evolved.
The second to last slide.
Going to other planets.
How you can project something onto a sphere.
How you are able to see the planet's rotation and geography.
How the earth moved over 600 million years.
That you could get a spherical view of all the planets which could mean that it is the most accurate map you'll ever have.
The facts were very accurate.
The technology is amazing!
The details in everything.
That it can cover everything you talked about. Different because it can spin around and show you the whole thing.

Was there anything you saw that was confusing? Explain.

No. (77)

Nothing. (3)

Temperature rise because of CO₂ over the next 140 years - but then he explained it more.

What was confusing was the thing of the hurricanes.

No, explained very well.

The deviation/depression scheme on Mars. (He asked about it)

No, very explanatory.

Forming of earth.

No, everything was coherent.

Not really, for an informal introduction to this information/data.

It's a lot of information but I felt I could absorb it at my leisure.

Outstanding presenter.

Interesting - easily explained for the non-scientist.

None.

No. Not really.

Plate tectonics would have been great in reverse!

South Pole has severe weather.

If we know about global warming why isn't anything done about it.

Weather patterns - but it was explained.

The information shared verbally was very geared to adult language and understanding. To make the exhibit more interesting to kids the information needs to be refined some to their level.

No. Explanations were clear.

No, it was all explained very clearly.

Some shimmering effects on the bottom of the globe especially when data was in motion.

No. The presentation was informative and engaging.

No, well some.

He explained everything well.

Scientific theory of continental drift reaching back more than 200 million years seems to be reaching too far.

No. More information?

No, everything that I saw was explained very thoroughly.

No - the presenter did an excellent job!

One image of Mars looked reversed. Meaning high areas looked depressed and low stood out.

Good explanation.

[The presenter] was very clear in his presentation.

El Niño- What is it exactly?

Yes. About as informative and simultaneously confusing as weather descriptions on TV. Too much, too fast, without making clear what is happening, what the causes/effects are.

N/A

The presentation helps focus your eye and mind. Even so, it is awesome even if you are just looking at it. I liked the complexity, whoaa NOAA!

No- all questions were answered fully.

No. Exhibition was quite explicit.

Weather (hurricanes).

None - the lecturer made everything very clear.

Although I didn't see the whole presentation, it was very clear.

I didn't know why the weather turn green.

None.

Nothing particularly.

What did you learn?

A lot! (8)

How the continents formed and a lot more.

Geography of solar system.

Even when you sleep the world still goes on.

Pacific Ocean covers nearly half of the planet.

I learned about the degree to which the Earth is getting warmer, which was the most impressive for me.

Formation of hurricanes, crusts, continents.

Global warming. Different rates of rotation [of the gases] in the sun. El Niño- what and why and many others. (This was fantastic. Never thought the results could be felt in such a short time frame.)

Too much to write here.

A lot - mostly as supplemental to a college and high school basic education.

N/A

What the changes look like continuously.

That the sphere is the first spherical movie screen.

About the solar system's highest mountain.

How the earth's land masses (continents) were formed.

Mars crater (Magellan?) is as wide as North America - was caused by volcano action raising crust.

Clear view of Pangaea and movement of plates through time. Weather near the South Pole is really turbulent. South Korea has a lot more electricity than North Korea. Denver was underwater around the time of the dinosaurs.

What NOAA does, what it researches, scientific theories of past and predictions for future of planet.

The presenter was an excellent teacher.

Continental plates and how they moved and a couple causes of extinction.

Explained dinosaur era, what earth was like long ago and prognosis to come and why.

The unfortunate impact of global warming and the plate tectonics data set was impressive.

Effects of El Niño, Mars topography, weather on earth.

That India crashed into Asia.

Maybe a prop(s) to help illustrate the scale - the earth is so large and the time covered so vast. It is a GREAT IDEA/exhibit.

Mostly the shifting and creating of the different continents.

That NOAA is interested in educational outreach.

Reality.

Seeing the continental drift and the million years ago countdown - it explained the concept to me, for once it was clear!

That the Earth got as cold as it did during the Perma-extinction.

Mars geography, sun rotates.

Global warming, surface of Mars, weather.

Too much to list here. The earth to sun perspective. Information on Mars. Formation of the various countries. Explanation of why the crust moves.

A lot of things I forgot since high school.

The movements of the lands.

What land masses looked like in prehistoric times.

I learned how the continent was changed. I learned the global warming. I learned Mars has a big canyon and some water. I learned that California may be separate from North America but connect again.

Plate tectonics in motion.

I learned more about how the continents actually moved about to form the landmasses we know today.

How the correct continents formed face of earth/sun.

I could easily follow the presenter over a widely different subject.

I learned about the planet Mars and its atmosphere.

Formation of continents and continual change currently.

Cool graphics.

My daughter learned about Mars and weather on earth. I learned about sun's weird rotation pattern.

Underwater crust, Andes Mountain, hurricanes

The more I know the less I know.

About sun, Mars, the height of the volcanoes - they length of the _____

Use of energy resources, movement of continents, weather movement.

About moisture and weather radar. About solar weather.

Lots - weather patterns, continental shifting, population/light density, and more.

Surprisingly a lot. Mostly about earth transformations, Mars geography, Saturn.

History of our planet and it's possible future.

Martian geography was great.

I never realized the degree of movement of the continents. That there's water on Mars - the Polar Ice Cap. Some of the details - long canyon, high mountains, hot spots.

Lots about the planets - very cool.

How weather is decided, different depths of world.

This is a great way to explain and show things to kids.

How clouds moved around Jupiter.

Indiana used to be underwater and the Niobra Sea was much bigger than I thought.

The weather how it can actually start in Africa and what is seen from space.

How the present continents formed over millions of years. The shape of the continents and weather information in relation to hurricanes, typhoons, etc.

Quite a bit too much to list.

Global weather patterns. Hurricanes develop.

A lot more about different aspects of life on the earth and some possible consequences.

History of earth.

A lot about our planet now and the future.

Past and present helping speculating future of planet earth.

The way weather patterns move from the equator to the hemispheres.

How earth moved. The 4 projectors give very clear view of how continents have formed. Better than reading, even 3D Imax. I really liked the formation of N. India, Himalayas.

Refresher course.

I was impressed by all of it.

I did not realize that the movement of the earth was so great.

How far the sun is from Earth. How the earth looked millions of years ago.
The lengths of the periods in time.
The earth is dynamic.
Information about Mars.
Too much to write.
Too much to say.
The earth is constantly evolving.
Earth movements over time have been much more dramatic than I realized.
El Nino, Continental Drift.
About dinosaurs and their extinction, mantle of earth, shifting of continents, climate changes over time.
Oh my - mainly visualization of creation of earth's current geography.
Movement of continents, seriousness of global warming.
Formation of the continent.
So much - absorbed like a sponge - will have to take time to decipher.
How global warming is a reality and will have scary consequences.
Everything was shown.
Why dinosaurs disappeared.
How the mountains were formed, why the continents move.
Visual explanations of how earth evolved.
Plate tectonics. That it got to -100 degrees in the Permian.
600 million years ago there was not anything green.
Plenty.
History and development of planet.
Too numerous to list and brought sense to all science classes learned in school and college.
I didn't realize how the earth is in _____ motion.
A whole bunch.
Continental shift, ice caps on Mars, weather patterns.
How the earth is constantly changing. Mt. Everest still growing.
A great deal.
How the continents formed - the movement was far superior to still pictures. The oceans are growing wider.
Too many things to list - this was great!

Dynamic earth. History. Plate tectonics. Vast changes. The eyes of science can tell great stories. Scale e.g. sun vs. earth. Changes over time scales e.g. Global Carbon Change, Pock-marking by _____, meteors.

About global warming and earth's geography.

That the weather changes in big ways.

How hot it would get in 500 years.

I learned how global warming will affect the earth in 500 years.

Too much to say. I liked seeing how the colors showed what he was talking about. The valley and 3 volcanoes and big volcanoes showed elevation.

I learned that Mars has a North Pole made of ice.

India and Madagascar had an affair. (Not real answer!) Mars' geography.

I learned where Indiana was years ago.

I learned about the drifting continents.

Why Mt. Everest is getting higher.

Planet and sun information, weather patterns.

Why tectonic movement is continuous.

How the earth is warming more and more.

I learned how big earth is compared to the sun.

I learned that the world won't stop changing in a couple of years, but not for a long time.

The Earth is always changing.

That the world is made of liquid rock.

Mars has a bigger mountain but we (earth) have more ice.

The world is liquid rock and how the world was long ago.

Lots - earth's geologic history was especially good.

Nothing.

How storms form, when and where.

I learned all about earth.

How the world was 600 million years ago and also where Indiana was located.

Everything presented.

How the earth evolved and the weather patterns.

South America, North America, and Africa were one big island long ago. Also, Mars has an ice cap at the very top of it and it is made of ice. I learned many other things like that Mars has the tallest mountain and it has the deepest and longest canyon.

In 500 years we'll have global warming.

About the earth.

Electricity can make the earth hot.

How electricity makes the planet hot.

How plate tectonics work.

Would you recommend the Sphere to others? Why?

Yes - extremely interesting./ very interesting. (8)

Yes, very informative and interesting. (6)

Yes, it was very informative. (4)

Yes, because it's awesome. (2)

Very much. It was very informative on different topics. I'd mention giant, 6' spherical projection, changeable globe that goes through different topics.

Yes, I thought this was one of the coolest things I have seen. Excellent.

Yes. (19)

Yes - unique way to see the earth.

Definitely - it was interesting, educational and in an intriguing form. It kept my attention - I'm a humanity's major.

Yes, easy conceptualization or abstract concepts.

Yes, you learn a lot about the past that make things the way they are now.

Yes. Visual learning.

Yes, because it was very interesting and you can learn many things.

Yes, it can be a very interactive experience to teach people about the earth they inhabit but don't know much about.

Yes. I think having a moving sphere and a person to explain is better than the static models.

Yes, I would because this is a great experiment to know.

Yes. It explains a lot and actually shows what happens.

Yes. Interesting to see.

Definitely, especially to high school students and middle school students.

Yes, very educational.

Yes - kids stayed interested - could understand easy.

Most definitely. It's an interesting, informal way to introduce various information about ours and other planets, moons, the sun. Would like to see more data sets.

Yes, because it gets you up and about to view the various quadrants of the sphere rather than just lectures you while you sit in one spot.

Yes. Please make this a permanent exhibit.

Yes. It makes information easy to see.

Absolutely, very educational.

Yes - very good information.

Yes, marvelous and intriguing display. Every planetarium or high school needs one of these.

Yes, great geographical description of continental drift.

Yes. It's also very relaxing to just look at it.

Greatly! It was enjoyable.

Yeah. It's great for teaching.

Yes, it's marvelous to see it all laid out before you.

Yes, so they can understand the weather channel a lot better.....I do.

Absolutely.

Absolutely. I think kids could be inspired and their curiosity piqued with these demonstrations.

Very impressive - unique view of the earth.

Absolutely - what a great format. It's an amazing way to image things. Young children may need some way more to interact with the lecture.

Yes! This is excellent material to understand the earth and Mars! I am not good at the science but it's easy to understand for me! You should show all children in the world. Everyone loves it.

Sure. It was cool to see what astronauts see.

Yes! What a terrific learning tool!

Definitely, yes.

Yes, awesome, simple enough to understand.

Yes, very interesting exhibit and presentation. Presenter was very knowledgeable about subjects.

Yes - more interesting to see spherical features on a globe instead of a flat panel.

Yes, a new way to learn.

Yes - an excellent teaching tool.

Yes - very detailed - see how our earth looks from a different perspective.

Yes, it's informative about the planets Mars and earth, etc. and weather.

Yes. Totally different than seeing in 2-D. Asks: So Europe is really a different continent than Asia. Provides grounds for theory of Asia as separate continent.

Yes - very different - I liked the sphere.

Absolutely. Best presentation I have seen in any museum in quite some time.

Absolutely recommend - I hope you make it permanent.

Very exciting exposition and educational too. Highly recommend it.

Absolutely yes. Because it's interactive. I thought it was good.

Very educational for all ages.

Absolutely! Very visually stimulating from a macro/God's-eye view of the world.

Yes, very educational. Helps people to actually feel the changes that planet has gone through.

Yes - extremely enlightening and educational. This variety of information is amazing!

Most definitely - you learn, and retain, so much more by seeing what you are learning.

Yes. Neat to see the whole world in many ways. To see whole world weather. Very detailed.

Yes, excellent tool for children. Brings all the data to life.

Yes, it's informative. The magnitude, the size of the globe is impressive. This is one of the best exhibits right now.

Yes. It is easier to view by a larger group of people. You can cover a wide variety of topics. I liked being able to walk around the sphere to get different perspectives. I like the global view as if from space.

Yes! Informative and interesting. Very good lecturer.

Yes - exact representation of earth.

Science class high school.

Yes - bring it back.

Yes, very informative and interesting.

Yes - very interesting. Educational.

Let it stay.

Awe inspiring. Nothing else like it. Reality is better than anything that fiction can invent. It's not in schools. And needs to be out in front of the public and school children.

Very impressive display.

Yes, it is much easier to understand complex ideas with visual pictures and a live explanation.

Yes - to give a good perspective of where we live.

Yes, very informative/enjoyable.

I think it's good to know.

Yes! Great Show and very informative.

The interpreter was excellent!! He is very knowledgeable and communicates very well. May be a waste of time with no interpreter.

Yes, I would. I feel this demonstration can help foster a greater desire in our youth, especially to study the changes in our world.

Yes. Generally interesting.

Yes, because it is very informative. This sphere that constantly changes, goes back in time, can predict the weather, changes from earth to Mars and I've never seen anything like it before. It's awesome.

Yes. Great background information.

Yes, very visually informative.

Yes! Explains so much.

Yes, because it is loaded with wonderful information.

Absolutely - for all ages!

Yes - the educational value.

Yes - fascinating - relevant.

All education can set you free.

Yes, very educational.

Most certainly - shame this is here after school's are closed - every age group - children through adults can learn.

This is the best exhibit in the museum.

Yes. It gives a new perspective on earth. I will tell my friends not to miss it.

Yes, because of its excellent quality.

Yes, very educational. Excellent presentation!

Yes - clear and comprehensible and broadly informative.

Yes - Interesting and educational.

Yes, fantastic source of information.

Yes, because it will help us to learn that we have to stop causing danger to the earth.

Because it's cool and factual.

Sure....why not.

Yes, because it's interesting and it teaches new things.

Yes, amusing and educational. Narrator....entertaining.

Yeah, it gives you a better understanding of our everyday world that most people don't understand.

Certainly, very educational.

Yes, because it was a really neat exhibit.

Yes, it gives you a better understanding of weather.

Of course! Because it was awesome to see the world and Mars fully. Also, how the land masses formed.

Yes, it's educational and adds to the center.

Yes, it's very educational and you can learn so much.

Yes, it gives a firsthand view of what the earth and solar system is like. Wonderful Exhibit!

Yes, our narrator explained things very well and the sphere can cover many topics. I especially liked that it had pictures of million years ago.

Yes, you can see where your home was millions of years ago.

Yes, it gives you a moving 3-D look at our planet and others.

Yes, because it was very interesting and fascinating for someone my age.

Yes. It is very knowledgeable.

Yes. It is interesting and fun.

Yes, I would. It is very fun and educational at the same time.

Yes, because you learn a lot.

Yes. Because it's cool.

Yes, because it explains a lot of things.

My son (12) was feeling bored when we were going through some of the rest of the museum. He didn't want to come today. He sat through the sphere exhibit spellbound.

Additional Comments

El Niño was very good. Illustrative. Weather topics. The thing on global warming was good. I didn't know that sun's rotation was different. Good to see earth, Mars, variety perspective - Mars vs. Earth. Second time he's watching this, came yesterday. Remembered everything he said yesterday. Weather - El Nino? Understanding how hurricane on storm can come in, bigger storm before it came on shore (changes in storm) how it happens. Had always heard of El Nino. This is the first good visual I've seen. Had general idea that it was tropical storm that effects our weather. Now I understand how water warming takes place and how it effects us. The 80's one vs. the 70's one. I really liked it very much.

At first you think the globe is moving. But it's not. It's definitely different. The only down side is that you have to keep moving. Good not to have distortion.

Interested in renting it for a student physics circus in Texas. We have inner city kids - possibility for using it - Outside of their world - help them to see beyond Waco. Someone would have to work the crowd. Need interactive show. This is just a beautiful tool. I love that its not flat. Its like the globe on steroids. Grant writer for school; Husband is physics teacher at Baylor. You could do a GPS data project. Work with HS through grad. Students in science programs. Big outreach program. When he held up the nickel, my daughter said, "Think how small we are." Inner city kids don't have perspective. They love anything that shows motion and time. There's a global information system curriculum in the technical college. To hook this up to geological and cultural systems data would be cool. In global information system, you can show whole civilizations growing. Could show it on this. Could combine this with global positioning system activities. Kids would make a cognitive leap.

There is so much there to learn. So much of presentation you could focus on - Mars, Sun, history of earth. The hard to believe theories of billions of years ago. Not sure how that helps us understand the earth today. Watching weather over AZ vs. other locations. Can see why AZ is desert. I would love to be able to take a group of 7th and 8th graders. You can see the earth. This would stimulate kids. To be able to walk around, cool to be able to move around and see things. Like seeing formation of storms. In AZ - we don't have weather. Will take my students there if AZ gets one. Color - so engaging. When you see weather on TV you've focused in on one portion - here you see globe. From IT perspective - it's cool. Could talk about satellite

tracks, orbits of satellites, what's where. - Former aerospace engineer - next year, will be high school teacher.

I loved it, it's great.

Absolutely incredible.

I wasn't present for all of presentation.

Sometimes you think you couldn't figure it out.

Excellent. I enjoyed it greatly, too. I'm a science teacher.