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Objects of Learning, Objects of Talk: Changing Minds in Museums

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Objects of Learning, Objects of Talk: Changing Minds in Museums

In the increasingly fierce competition for leisure time and educational spending, museums are seriously challenged by edutainment, the Internet, CD-ROMs, and 500-channel satellite TV. For example, if a child is interested in dinosaurs, 20 years ago a parent would have been likely to take her to the museum to see some fossils. Today, many parents would probably begin by taking her to the computer to search the World Wide Web, where a quick search reveals thousands of dinosaur web pages.¹ If the family did not find a site among these thousands that satisfied the child's curiosity—or if the family found a great site that whetted the child's appetite for more dinosaur knowledge—the parent might decide to take the child to Barnes and Nobles to browse through several shelves of books about dinosaurs and one or two bins of CD-ROMs such as Microsoft "Dinosaurs." On the way home, the family could stop at Blockbuster to pick up one of the National Geographic videos or perhaps even a copy of Jurassic Park. There is no reason to wait until the weekend to visit a museum to find out about dinosaurs. It is easy to tap instantly into a flood of pictures, video, and text about almost any topic in art, science, or history.

Why should anyone bother to visit a museum to see the actual artifact when virtual copies are so easy to come by? The current museum research literature does not provide a coherent answer to this question. Many of the recent studies focusing on learning in museums have been conducted in the context of interactive exhibits, mostly in the domain of science and technology (e.g., Allen, 1997; Borun, Chambers, & Cleghorn, 1996; Crowley & Galco, 2001). These studies have correctly focused on the role of interactive hands-on activity, with either an implicit or explicit comparison to the passive learning of didactic instruction. While this is appropriate for hands-on science centers, it is less useful for artifact- and collections-based institutions, which, after all, exist to collect, to conduct research on, and to display pieces of art, history, and natural history that are far too valuable to put into interactive settings.

Studies that have been conducted in art and natural history museums have often been directed at understanding the effects of signage or other mediation devices on visitor content learning (McManus, 1989). These are valuable studies, but they are not directly related to the question of how artifact-based museums can provide unique educational experiences. For example, one conclusion of such studies is that layered text can be effective at providing appropriate educational context for an artifact (e.g., Blais, 1995). This may be important to maximizing the learning once a visitor is in the museum, but it directs attention away from what is the unique part of the experience: The artifact itself. CD-ROMs or web-sites are far more efficient vehicles for layered text or other structures that allow a presentation to adapt to varying levels of domain expertise. If layered text is the important educational element, museums are an inefficient way to present that information, and they do so to a much more limited audience than does a good web site.

So why *should* people bother to visit museums when virtual copies of most objects in museums are so readily available? In the first part of this chapter we consider four unique characteristics of learning from objects in museums and then trace these characteristics through two examples of visitor learning. The four characteristics are resolution and density of information,

¹ In early 1999, a Yahoo.com search on the word "dinosaur" revealed 32,727 web pages; two years later, in early 2001, the same search uncovered more than 224,000. Narrowing down these sites to just those that deal with "fossils" reveals a set of about 31,000 sites; narrowing those down to those that are for "kids" reveals a set of 2,830 sites. By the time this book is published, the number of sites, and probably the usefulness of the best sites, will have increased again.

scale, authenticity, and value. The two examples, drawn from our recent museum learning research, are teachers learning to plan field trips to a history center and groups of children interacting with autonomous robots in a children's museum. In the second part of the chapter we explore the conversations of a pair of visitors engaging with objects in an African art exhibition in order to see how conversation develops around objects.

Everyday Learning, Museums, and the Role of Objects

What is it about museums that makes them unique learning environments? Museums are places where the objects and messages have been selected as ones of high cultural value--whether one is referring to a specific art collection, historically salient artifacts, or a collection of bones or scientific findings. Sometimes objects are included in museums because they are unique examples of a category—the oldest, largest, rarest, or most complex of their kind. Sometimes objects are presented for the exact opposite reason—to be common evocations of an interesting or important group, time, or place. Objects are displayed in systems designed to encourage visitors to consider a particular take on a discipline and to encourage reactions such as amazement, mystification, realization, and personal connection.

In his role as a discussant at our Museum Learning symposium at the 2000 American Educational Research Association, Howard Gardner challenged the field of museum learning in general, and those of us in the Museum Learning Collaborative in particular, to document the genius of the museum" as a unique learning environment. First, consider what is not likely to qualify. In contrast to the systematic and extensive presentation of disciplinary argument and evidence in a textbook, museum exhibits are opportunistic and incomplete. The aspects of a topic that are addressed in an exhibit depend on the objects that can be conveniently assembled; in fact, curators often identify objects in the earlier stages of design and then work backwards to connect them to aspects of disciplinary knowledge in the final exhibition (Knutson, 2001). In contrast to the linear arguments that can be built up in textbooks or essays, museum exhibits cannot be based on strong assumptions about what visitors have seen or understood in an exhibition prior to viewing any particular element within it. Visitors choose their own path through exhibitions and, even when they follow what may be the desired flow, they rarely view every element (Serrell, 1997). Similarly, diverse paths through exhibitions make museums much weaker vehicles for narrative than are novels, movies, or television shows. Narrative is sometimes presented in museums (Roberts, 1997), but typically it is narrative in the broader, socio-cultural sense, meant to engage visitors in conversation and debate rather than story-telling in the strict dramatic or historical sense (DiBlasio & DiBlasio, 1983). Finally, in contrast to web pages or other media, museums are very slow to update their content in response to innovation and advance. Furthermore, while the web and the media, which can be accessed spontaneously at little to no cost when a learner questions, museum visits are special, pre-meditated, and relatively expensive events (in terms of time, organization, and money).

From the standpoint of how they best support learning, one might think of objects in museums as collections of examples. Learning, when it is carefully orchestrated in classrooms or when it emerges from spontaneous activity, requires examples. Examples are the evidence that needs to be explained by any acceptable concept or theory. As learners study examples, the examples are unpacked and connected to existing declarative, conceptual, and procedural knowledge (Atkinson, Derry, Renkl, & Wortham, 2001; Leinhardt & Ohlsson, 1990). The essential features of good examples are that they characterize the core structure of an issue or domain and, through their specifics, make the organization and application of domain specific knowledge more veridical and flexible (Leinhardt, 2001; Young 2001). Thus, when they are unpacked and connected, they carry the specifics that are most important to the pedagogical or practical goals of the learning situation.

We think of objects in museums as a special case of example-based learning. There are four features of objects that make them unique nodes for ideas and their elaboration.

1. Resolution and density of information. Real objects, as opposed to two-dimensional representations of those objects, maintain veridical resolution and density of information. Photographs and drawings can embody many important visual features of an object, but are abstractions for which the photographer and artist decided which characteristics to preserve and which to ignore. A photograph of a complete painting may allow viewers to appreciate composition, but subtle gradation of color and brush-stroke technique are lost. Similarly, the ragged edges of decomposing clothing or fine twists of rope from an unearthed mummy combine in especially vivid ways. Other features available only from objects are those that cannot be photographed-the smell and sound of standing next to an elephant at the zoo, the texture of a leaf at the botanical garden, or the heft of a cast iron colonial stew pot at a history center. Although many of these features could be described completely and perhaps even represented in closeapproximations of reality, the holistic collection of features for an object cannot be efficiently represented in the absence of the object. For example, a series of pictures from different zoomlevels might be able to address issues of both brush stroke and composition in the same painting, but the viewer sees these as separate abstract presentations rather than a smooth perceptual zoom as he or she moves from standing yards away to standing inches away from a painting.

2. Scale. In contrast to pictures, drawings, and photographs in which scale either is absent (it's the size of the book page) or requires a mathematical transformation (for example, a person standing next to a dinosaur bone), objects in a museum are in their actual scale. In many cases the smallness or largeness of the object is precisely the characteristic most worth noting. Clearly, being dwarfed by the hulking skeleton of a diplodocus is a powerful moment in the life of many children. Likewise, for adults, examining a recovered space capsule may often lead to stark realizations of how small and seemingly unprotected the cockpit is. In a culture awash with sport utility vehicles and minivans, most of us would feel vulnerable and naked driving to the store in a vehicle of that size, let alone orbiting the earth, re-entering the atmosphere, and splashing down into the Pacific Ocean in it.

3. Authenticity. Our third construct, authenticity, exists only in the interaction between specific objects and our history and culture. Thus, the Campaign Bed of Napoleon is authentic because we believe it is actually the bed that he slept in and we know that to be the case because someone who we call an expert has said it is. The response to this authenticity is that the visitor stands right next to, and in some sense shares, the object with Napoleon. In the Henry Ford museum, this concept expands out to the underlying belief system of Henry Ford himself, which was that objects have auras that are tangibly communicable. Although fewer people today share Ford's faith in psychic mechanism, we think many would acknowledge that there is a moment of awe and sense of historical connection when we stand next to objects connected to venerated or loathed individuals and events. We think many might also acknowledge the same sense of a personal connection with everyday objects of extreme age in museums—perhaps while looking at the scores and indentations on a arrowhead and imagining vividly the moment when an ancient hunter carefully chipped it out of flint, or looking at the worn, uneven threads of homespun garments, or perhaps thinking about the how many dinosaurs were ripped up and wolfed down through the jaws of a fossilized T-Rex.

4. Value. It is often the case that authentic objects of cultural import are also valuable, but it is not always the case that valuable objects are authentic as we have defined it. By value we refer to an object's uniqueness and, in many cases, its monetary value. Because generally we do not have in our possession objects that have value in terms of the larger culture, being in the actual room with the Crown Jewels invites us to imagine being the owner or possessor. Similarly, a recent exhibit on aluminum at the Carnegie Museum of Art included an aluminum car—the Plymouth Prowler. Although the car is somewhat expensive and exotic, it is certainly not culturally or historically

valuable. Yet it was one of the more popular elements of the exhibit, perhaps in part because most visitors would like to drive around in it, but will never get the chance.

We now consider how these dimensions play out in two examples of learning from objects in museum. Each of these examples is drawn from the on-going work of the Museum Learning Collaborative. Funded by a consortium of federal agencies, the Museum Learning Collaborative is exploring the role of conversation as a process and outcome of museum learning. Elsewhere we elaborate on aspects of conversation that serve to parse, connect, and explain aspects of the museum visit (Leinhardt, Crowley, & Knutson, in press). Like many other museum learning researchers who have explored connections between museums and everyday or classroom learning (Borun, Chambers, & Cleghorn, 1996; Falk & Dierking, 2000; Gelman, Massey, & McManus, 1991; Gleason & Schauble, 1999; Paris, Troop, Henderlong, & Sulfaro, 1994;), our approach has sometimes led us to focus on what makes museums similar to other learning environments. One of us (Crowley) has even gone so far as to term museum learning "mundane," arguing that, while some real insights and breakthroughs may occur in museums, the most common kind of family learning and the one that museums should design for is more related to families practicing habits of scientific literacy such as explanation and hypothesis generation (Crowley & Galco, 2001). Although considering how museum learning is like everyday or classroom learning is likely to account for a large percentage of the learning that occurs in museums, especially in interactive science and children's museums, it will not characterize the genius of the museum more specifically. We suspect the genius of the museum exists somewhere in an analysis of how unique and powerful objects support learning. In the Museum Learning Collaborative we think that that support is in the form of conversations (Leinhardt & Crowley, 1998; Schauble, Leinhardt, & Martin, 1998), conversations that get elaborated as small clusters of individuals engage with objects.

Burning Bus

We start with an example of a powerful object located in a history museum, the Birmingham Civil Rights Institute in Birmingham Alabama. According to the museum's web site, the purpose of the Institute is to document the events and display objects from the Civil Rights Struggle:

"The Institute's historic galleries trace the footsteps of those brave men and women. The journey moves from the era of segregation to the birth of the Civil Rights Movement and the worldwide struggle for civil and human rights. Along the way, exciting multimedia exhibitions depict dramatic events that took place in Birmingham and other cities, events that stirred the conscience of a nation and influenced the course of an international human rights struggle"

The museum is located across the street from the 16th Street Baptist Church, which was bombed during the struggle resulting in the deaths of four young girls. Inside the museum sets the stage for the visitor who moves through a fairly prescribed set of displays, from early Jim Crow laws exemplified by a shop with various signs through Martin Luther King's jail cell and the March on Washington. There are several major sections that the visitor moves through after an introductory film: Barriers, Confrontation, the Movement, Procession, Milestones, Human Rights. Photographs, sound, and lighting all contribute to a sense of the visitor being there as opposed to just looking at objects and images. One of the most prominent features in the Movement Gallery is a burned out bus. The bus is a very precise replica of a Greyhound bus that had been bombed and burned.

Consider the bus in relationship to our object features. The most prominent of the features is scale. The bus is life-sized; one walks around it, feels small next to it, and feels enormously vulnerable when realizing that even with its enormous size it was not big or strong enough to

protect the riders. The density and detail of information, from the charred sides and interior to the shiny chrome of the areas not touched by flame, are both realistic and evocative: Here is where the fire spread; these seats, like those I might have been sitting in, were completely burned... those less so. These are personal evocations prompted by the scale of the bus and the density of information; that is, the association is dependent primarily on the relationship between the individual's historical experiences and the object. Both the constructs of value and authenticity, because they are social constructs, are more complex to determine. The bus is an actual Greyhound bus, so it is authentic in that sense; but it is not THE bus that carried the freedom riders and was bombed and torched. The value is in part that the museum got a real bus, but the value resides more in that visitors are prompted to consider their own experiences with buses and the assumptions of safety and protection we usually make while in a bus.

Our example of the burned-out bus is drawn from a study in which 50 pre-service teachers went to the BCRI as part of a social studies unit in their normal training program (Gregg & Leinhardt, 2001; Leinhardt & Gregg, in press). The student teachers had conversations in small groups before the visit and again after the visit. They drew semantic nets of their personal concepts about the Civil Rights Era before and after the visit, and they designed activities centered on the BRCI for their students. These young people had an average age of 22 and none of them was alive during the Civil Rights Struggle or the Vietnam War. As local residents of Alabama they had heard about the period but tended to view it as a part of the past or as an intensely personal struggle. Regardless of their own ethnic background they tended to believe that the conflicts and struggles associated with the time were between African Americans and European Americans.

<u>Before</u> the visit to the BCRI not one single student when talking in their small groups mentioned the Freedom Riders, the attack on the bus, or the bi-racial nature of the group of Freedom Riders. Nor did they talk about them when discussing what they might see at the BCRI or what might be emphasized. Only two student teachers included Freedom Riders or the bus in their webs of ideas before the visit. <u>After</u> the visit all but one of the groups mentioned the bus, and for the majority of the groups it was the first thing they talked about and they returned to it often. At the individual web level, the message is the same: two of the 50 students mentioned either the bus or the Freedom Riders in their pre-visit webs while afterwards all but eight did. Furthermore, many of the pre-service teachers frequently mentioned in their post-visit webs the fact that the Freedom Riders were both black and white.

The object of the bus with its vivid destruction and all that that implied served to anchor the other historical information about the Civil Rights workers, their ethnic make up, their physical route from Washington to New Orleans, and their abrupt ending in Birmingham. The small group discussions do not have elaborate examinations of the bus and its meaning but the conversations reflect our basic assertions of why objects are memorable and significant locations for mediating the "important part" of the story.

Here is the voice of **authenticity**:

- -I was surprised at the actual bus.
- -Yeah

-Was that the ACTUAL bus? I mean, I don't know.

-Yes, it was!

-It was? OK. Well it didn't say that it was, but it looked, like, like what I was reading,

-I'm only...it was

-OK. And that glass [from the broken windows]

-Yes. Yeah I was surprised to see that...

According the BCRI web site, this was not the actual bus but a Greyhound bus similar to it. Even though this group had a misconception about the authenticity, it is noteworthy that they had a bit of questioning and followed that up with a check from text. The main point here is that the vividness and strength of the impression was extended because they believed that to have been the real bus.

Here is the voice of **detail** or **resolution** from two other groups also discussing the bus:

-The bus, that bus. It was symbolic to see that stuff on the bus...

-The Freedom Riders

-Yeah, where they busted the windows and all that. And you hear stories about that kind of stuff but when you see it, it makes it more real.

.[Later in the discussion]

-I don't think I knew anything about the Freedom Riders. I don't think I did. I'd heard about the March to Montgomery and the speeches and the segregated water fountains and...but I didn't know anything about the Freedom Riders.

-Most of it, I had a feeling that I kind of heard about almost all of it but it was like a real surface knowledge about it. So, I guess the new stuff for me was the in depth

A second group has a slightly different take on the issue of **resolution** or **detail**:

-The bus. The bus

-Freedom...

- -Yeah the Freedom Rider's bus. That scared the crud out of me.
- -I felt like someone was going to jump out and attack me!
- -Everything was realistic. It looked just like I would have thought it. I was surprised but it's like, I would have thought it to be like that—

-UmHum

-Something like a burnt out bus.

In this last section the detail and authenticity merge with the very first idea in the previous quotation; the bus is iconic and symbolic, "something like a burnt out bus." This third group of pre-service teachers went on to mention four more times that they did not really know about the Freedom Riders, they did not know that there were white people involved, and they did not know that white people had been hurt or arrested. As they said later on, "I did not know how many white people stuck up for the black people…" The bus was the transport for that idea. The idea that both groups participated is very powerful. For this set of young prospective teachers, the comfortable cover that "it was how they were raised" (therefore they could not be expected to have behaved differently in the face of injustice) had been lifted by the presence of a few remembered white people on a bombed-out bus. If those people had worked to help right a wrong, why not others? The authenticity and explicitness of the bus carries that concept home:

- -The bus was... I mean, I knew a little about what that was but to actually see that and to read more about it. And didn't realize that there was so much violence that went on, you know the ride. When they were traveling.
- -I learned how brave people really were and now, I thought about, if this was happening today, would I be as brave as those people were to do the sit ins, to do the um, you know the bus boycotts do all those things where they were in risk of their lives everyday. I mean, there was just ... Hard to see how I would do it now..

Why is the burnt bus such a powerful object in the BCRI? We think there are several reasons. Buses are iconic. We can all conjure a mental picture of a bus in our mind and most of us even today can imagine a silvery sleek Greyhound bus. "Busness" is a construct, it is totally ordinary, we almost all see many every day. We can imagine ourselves climbing the steep steps walking back towards an empty seat, settling in for a long or short ride. What we can not imagine is our bus being blown apart by a bomb. Seeing the results of that shatters the safe, solid image. and it is that precise conflict that makes the bus so valuable.

We can consider what changed for the student teachers with respect to the bus. From a cognitive point of view we can assume that all of the pre-service teachers had a mental construct of bus, even a construct of Greyhound bus (as distinct from city busses). We know that they had a concept of the Civil Rights Era. However, the Civil Rights Era concept was less vivid, less real, and less specific than what we believe the concept of the original bus was. What happened was that a new concept with a vivid image developed--the concept of a bombed and burned bus. The bus concept became connected in a very powerful way to the original bus construct and to the concept of the Civil Rights Era. The object and its icon become a bridge between two abstractions. We believe that for some time into the future, thoughts about the Civil Rights Era will evoke a particular image of a particular bus, everyday thoughts about buses will be haunted by a particular bus in the BCRI and its evoked history.

That is our cognitive tale of the bus. Socio-culturally, what do we think took place? This is more complex. A group of European and African American pre-service teachers connected in quite different ways to their own historical past. The museum offered an affordance for its visitors to connect to the everydayness and the uniqueness of a bus. The impersonal historical record that had vacuous labels, such as struggle, injustice, prejudice, was enlivened by the appropriation of the meaning of an object. As a group, the pre-service teachers had seen, shared, and thought of ways to make active use of a particular object in the activities and practices of teaching that they were all trying to develop. For many of us, the Civil Rights Era is in our personal historical memory; for these students, it is not. We think that, for these students, the bus and what it symbolized altered their sense of identity. Because the bus provided a shared evocation of details that could be discussed in concrete terms and it connected the group members to the question: If I were there then what would I have done? European American students had, prior to this experience, excused themselves as being the products of their families-but the riders of the bus were also products of their families yet they stepped out of their historical contexts; for African American students the assumption that they would have been in the struggle, too, may have been shaken because the realism of the violence and the loss of life and injury became more palpable.

When the Object is "Alive": Autonomous Robot Playmates in a Children's Museum

Our second example is drawn from observations and interviews with groups of children and adults interacting with two prototype autonomous robots at the Pittsburgh Children's Museum. The idea for the prototypes was to program the robots to act like ducklings who attempt to engage children in a game of "follow-the-leader." The robots used sonar to detect objects in front of them and were programmed to back away from targets coming close to them and to follow targets that were moving away from them. When the robots detected no targets in front of them, they were programmed to move forward rapidly until they found another object. Only the front three sonar units were active on the prototypes, which meant that the visitor needed to be directly in front of the robot in order to be noticed. Because of the robots' relatively narrow "visual field," visitors had to move slowly to get the robots to track them. Mounted to the top of the robots were two speakers that produced quacks—specific kinds of quacks were associated with specific actions on the part of the robot.

From the moment they came rolling and quacking onto the museum floor, children and adults were fascinated by the robots. At one point a large school group had moved upstairs, leaving the first floor mostly empty except for the robots and the adults involved in prototyping them. It took us a little while to notice that, although the kids had all moved up to the second floor, they remained fixated on the robots, pressing their faces against the windows in the second floor railing. It's unusual, especially in a place that is as interesting as a children's museum, to see such sustained focus on a particular object.

We think a great deal of this interest in the robots relates to the dimension of authenticity and value. It might at first seem strange to the reader to think of robots pretending to be ducks as authentic. However, although robots have long been a part of popular culture, it is likely that these were the first real autonomous robots that the children had ever met. Thus, although children may think they are very well acquainted with robots and their abilities, they are at the same time almost completely without relevant authentic experience when they approach real robots for the first time.

The role of this extensive yet impoverished knowledge was made clear in an age-related difference we noted in how children related to the robots. Toddlers and preschoolers were more likely than elementary school children to spontaneously touch the robot. One boy, who appeared to have just mastered walking, toddled straight up to one of the robots and, without hesitation, grabbed onto it. The robot, programmed to avoid obstacles, tried to back away, but found its path blocked by an exhibit. Trapped between the exhibit and the child, the robot tried a series of small turns and forward lunges, looking for an opening to resume its wandering and get back to playing follow-the-leader. But the child, oblivious to the robot's predicament, began playfully pushing against it and touching a lot of the hardware. At one point he almost switched it off, prompting an adult nearby to tell him not to press that button or the robot would go to sleep. This boy, like other young children we observed, were applying the standard children's museum script to the robots: Run up to an exhibit, press and pull whatever is there, and wait to see what happens. The younger children appeared to encode the robot as just another machine—a vacuum cleaner or a remote control toy.

This reaction of the young children was in stark contrast to the way the school-aged children reacted to the robots. The older children acted much more like children do when they approach strange dogs on the street or when they approach sheep or goats at petting zoos. Older children approached the robot warily, moved their arms and legs slowly, and constantly looked up at the nearby adults for confirmation that they were doing OK. Even after they began playing follow-the-leader, most of the older children appeared to hold their bodies and faces more rigidly than normal. These older children appeared to us to be a little nervous and unsure, but intensely excited. The older children knew enough about robots to recognize that they were looking at one and that it really did appear, in least in some sense, to be alive.

Once the feature of authenticity is established, the features of scale and resolution and density of information become important to the kinds of learning that could be supported by the object. Sometimes this learning was accurate. As a fictional technology, robots are often portrayed as having quasi-humanoid form and often are human-sized or larger. The prototype robots were cylinders about two feet high with a lap-top computer and speakers on top. One girl at first was not sure she was really looking at robots, telling us: "Robots usually have hands and arms. I didn't think they would be this small."

Other times, the interaction of familiarity with resolution and density of information had unintended consequences. In an interview with us, a boy repeatedly talked about how the robot had an eye and could see him. Despite our assurances that the robot doesn't have eyes and navigates through use of sonar, the boy insisted he was right. He finally got fed up with us and marched over to the robot, pointing at a red LED that was the power indicator on one of the speakers: "See? Here's his eye." Another pair of children told us that the robot had been talking to them, telling them to "Wait, wait, wait." In fact, all the robots could say was "quack, quack, quack," but these children had interpreted "quack" as "wait," perhaps because they assumed the robot spoke English and perhaps because the robots kept falling behind the leader. In both cases, children might be portrayed as looking to the object to find evidence to support assumptions based on their familiarity with fictional as opposed to actual robots.

The way in which resolution of information was most important was in children learning that robots can be much less competent that humans at seemingly simple tasks. Fictional robots are often depicted as having abilities that equal or surpass humans. However, experience with the real robots quickly dispelled at least part of this notion. The natural way to play follow-the-leader would be for the child to walk forward facing away from the robot. However, because the prototypes could only track a visitor who moved slowly and stayed within the relatively narrow area covered by sonar, the main activity that emerged for children was to learn how to shape their behavior so that the robot could track them.

The most successful children either kept looking over their shoulder or learned that it worked better if they walked backwards, facing the robot. In addition to letting the child monitor the robot's progress, walking backwards had the added advantage of naturally slowing the child's movement and thus making it easier for the robot to track her. Other children discovered that it was much easier to control the robot if they walked towards it and had it back away from them. Pushing the robots was easier because the robots seemed to have a slower back-up speed, because it was easier for the child to monitor them, and because children naturally slowed down their walking so that they would not bump into the robots. Even so, the robots often got confused in the small, busy spaces of the museum. The fragile abilities of the robots to do something as simple as follow-the-leader led some children to tell us that they didn't think these robots were very smart. One boy said: "It like a little kid! It doesn't know how to play [the game]".

Reflections on Burning Buses and Quacking Robots

How did interaction with the robots change children's understanding? It is probably the case that the most important change was in calling the certainty of their understanding into question. As most of their prior knowledge about robots was probably derived from fiction, the modest appearance and severe behavioral limitations of real robots may have led to restricting certain aspects of the category that may have once been widely applied. For example, many children learned quickly that robot behavior was rigid and fragile, and that somewhat unnatural and exaggerated human behavior was needed for the robots to succeed in playing follow-the-leader. Any prior assumption about human-like abilities in children's understanding of the category "robots" was most likely challenged and pruned by these interactions with authentic robots. Children also learned that robots could be two feet tall and could act like ducks—we have subsequently interviewed children who have not seen the robot about this idea and most find it

initially to be preposterous. Thus, for the first time, many of the children had some hard specifics that they then needed to account for in their broader knowledge of robots.

How did the object of the burned bus change the student-teachers' understanding? In contrast to the case of the robots, the learners were very familiar with authentic examples of buses. They were also familiar with many elements of the history of civil rights in America. The encounter with the bus at the BCRI served to drastically alter the original concept of bus and to reify the "struggle" portion of the civil rights struggle. The vividness of the bus lay in features of scale and detail. Its power to change understanding rested with the ways in which clusters of student teachers used it to mediate their own concepts of the civil rights era and everyday bus travel. Thus, in this case, the object served to elaborate and instantiate familiar ideas as well as to connect two fairly distant and previously unassociated ideas.

In the first part of the chapter we have characterized museums as places where systems of objects exist that support learning conversations, and have identified four features—resolution and density of information, scale, authenticity, and value—that make objects unique. Each of these features draw visitors to the object and press the object into the experiential repertoire of the group. Thus, talk can refer to a simple label for the object; but it can also contain a considerable amount of descriptive detail, which in turn can lead to speculative explanations. This allows different members of a group to respond to different specific features of the object. We have argued that objects are best thought of as examples that create nodes around which existing knowledge can be restructured and into which new knowledge can be integrated.

Although we have referred to these four properties has belonging to objects in museums, it is important to note that none of these exists independently of the visitors. This is most clearly true of the last two properties, authenticity and value. Each of these exist only in the interaction between the object and the culturally specific identity and knowledge of the visitor. The first two of these dimensions—resolution and density of information and scale—might at first appear to be "objective" properties of objects. After all, regardless of who is looking at a dinosaur skeleton, the bones will look big and will have certain kinds of textures and colors. Yet it is important to note that not all visitors will experience even objective properties in the same way, and, even if experiences were roughly equivalent, the learning will not necessarily be the same.

In other words, objects do not speak for themselves. Particularly in the case of children, parents and teachers are the ones who need to speak for the objects. It is precisely the features that make objects most powerful that children will have the most trouble with, because in many cases they do not have the requisite prior knowledge to make sense of the example. Thus, parents and educators in informal learning environments are challenged by the problem of mediation. It is interesting to note that, for the student teachers visiting the BCRI, the need to mediate for children was a driving force in their learning. Their task was to use the visit to plan activities for students, and a challenge that drove much of the learning and conversation was around issues of how to highlight, intensify, and, in some cases, defuse the power of museum objects.

In our examples of learning from objects, all of our visitors knew about the objects that they saw. The teachers knew about buses and about Civil Rights and the children knew about robots. What happened in the mediated encounter with the objects was that the objects grew into nodes of social value and salience with specific detailed features. The examples became enriched, attached, meaningful, and focused. This kind of learning is not unique to museums; as we mentioned at the beginning of this chapter, television, web pages, and books can also support the transformation of a vague concept into an anchor point for learning. However, we believe that the museum is unique in its capacity to provide situations in which those nodes (powerful object based examples) that can and will be usefully extended will be found.

Learning Conversations Over Time

So far In this chapter we have not acknowledged the tension that exists between the Museum Learning Collaborative's vision of learning as the accumulation and enrichment of the mundane and the implied assumption of Howard Gardner's remarks in searching for the genius of the museum – that learning is an act of sparkling insight. The deep consideration of objects – the topic of this volume—has forced us to try to resolve these differences. We take as our analog "punctuated equilibrium" from evolutionary biology. Punctuated equilibrium is the resolution in evolutionary theory between the pure, slow, natural-selection explanation of evolution, and the cataclysmic, sudden, environmental-shift view that imagines steady states with moments of rapid change. Punctuated equilibrium accommodates both the gradualist, cumulative, elaborative view and the sudden, insightful, unique view. We have come to believe that museums are places where the unique object – bus or robot for example – can have a powerful impact; but we also believe that the thousands of other objects present in the BCRI or the Pittsburgh Children's Museum, which were perhaps less noticed but helped to set the total stage for learning, were also significant.

We consider learning, in the MLC context, as *Conversational Elaboration* (Leinhardt & Crowley, 1998; Leinhardt, Crowley, & Knutson, in press). By Conversational Elaboration we mean that visiting groups to a particular museum exhibit may have a set of experiences that enable them to discuss the thematic and object based content of the exhibit in more complete, analytic, synthetic, and explanatory ways than they were able to do before or without the visit. This means that the conversations are elaborated in two ways: first, the structural form of the conversation can move from list-like identification or labeling to analytically engaged or explanatory one; second, the conversations move from almost aimless exclamations to thematically connected ideas. The idea here is that one of the benefits of going to a museum is that one can share that visit experience with friends in real time and in a later recounting and that it is the details of those conversations that both are the processes of learning and one outcome of it.

Is Conversational Elaboration the only outcome of museum visits? No. But it is one. And, we would argue that it is a valued and valuable one. We use our capacity for discourse in many ways: to manage our time and plan, to give directives and orders, to gain simple information, and to have conversations whose goal is social cohesion and appreciative sharing. White (1995) has suggested that this latter conversational aspect of our lives is of considerable interest and relatively rare. In the context of the MLC we focused on this particular type of discourse as an area where visiting a museum might have a positive discernable impact.

If Conversational Elaboration is something that occurs as a result of a visit to a museum then when exactly does that take place? Does it occur as a kind of summation? Or does it accrue gradually throughout the course of a visit and continue to grow even after the visit has ended? If Conversational Elaboration does develop then how does it develop? The purpose of the second part of this chapter is to examine one group's visit to a museum exhibition in a manner that helps us to actually see the growth of conversational detail and specificity over a short period of time and to help trace the moment-to-moment alterations in the conversations in a manner that permits us to speculate how conversation develops.

The pair of adults we focus on represents part of what we refer to as a coherent group—they are familiar with each other and have a pattern of interaction that stems from prior experiences together. They also have a particular task, to make sense of and to share in the experience of the visit to this particular exhibition. For each visit they must renegotiate the terrain. Because the purposes and layout of each exhibit is unique, a vocabulary for referring to objects, describing them, evaluating them and their display must be developed. The visitors need to establish a pacing of their tour as well as a path through it. They need to orient themselves with respect to each other and the content – What is familiar, what is foreign? Do they "like it"? Do they "get it"?

As the visit progresses, the work of orientation and stance is established and the visiting group find themselves freer to discuss the particulars of the material and to perhaps engage with the subtleties of the curatorial premises—Why is this object here and not there? Why do the labels give this information and not that? What exactly is the "message"? Occasionally they may take a moment to renegotiate the path or anticipated duration of the visit, but mostly they engage with each other and with the objects in the museum. As the visit ends they return to the management of the visit itself, where they will go next, establishing the time, general way-finding behaviors through time and place.

The Setting and the Methodology

Our particular example of a visit takes place at the Carnegie Museum of Art (CMA) in Pittsburgh, Pennsylvania. The CMA is located in a cluster of buildings all donated by one of the patrons of the city, Andrew Carnegie—the Carnegie Library, the Carnegie Music Hall, the Carnegie Museum of Natural History. All of these buildings are interconnected and are in sight of Carnegie Mellon University. The CMA is the most recent addition to the cluster, fashioned in the Modernist tradition of wide low stairs, abstract fountains, and slabs of glass; it fits and contrasts well with the neo-classical style of the adjoining buildings.

Inside the building there is a flight of deep, low, flat stairs. It is said that the stairs were deliberately designed to make fluid automatic movement up them impossible; the visitor can not stride up on alternating legs but must pause either every step or every other to insert an extra step. This feature is designed to force the visitor to slow down and look around. At the top of the stairs is a small landing area that divides the permanent collection (to the left) from the temporary and visiting exhibits (to the right).

The *Soul of Africa* exhibition was open at the CMA in the summer of 1999. The exhibit represents 10 percent of the 2000-piece Swiss collection of Han Coray. Coray did not himself visit Africa. He developed his collection between 1916 and 1928 because of his interest in and devotion to the particular artistic features of African Art. In particular, he admired the abstract and primitive feel of the material, which stood in contrast to the prevailing European artistic milieu. The exhibition consisted of 200 pieces of 19th and 20th century art: masks, sculpture, ritual furniture, jewelry, textiles, and musical instruments. The exhibition was organized around the curatorial themes of Art and Leadership, Rank and Prestige, Life Transitions, Supernatural World, Remembering the Dead, and Music. The objects themselves were placed in a decidedly artistic stance with wall colors and mountings designed to emphasize the aesthetic aspects of the pieces (Stainton, in press).

The exhibition was not "easy." While those formally trained in art could quickly see the similarities of line, form, and distillation that connect with modern art sensibilities and that pervade the collection, the less trained might tend to see an anthropological exhibition displaced into an art venue (see Stainton, in press, for an elaboration of this idea). Aesthetics were less easily captured than was a sense of craft and accomplishment, and throughout there was the tension between modern and primitive: the former encompassing simplicity by choice, the latter encompassing simplicity by circumstance. The visitors could, if they chose, float through the exhibition with their own preconceived notions intact or they could engage and be challenged by what they saw. What we are addressing here is how the engagement evolved and was reflected or not in the conversations.

The data are taken from a larger series of studies designed to validate the instrumentation and theory of the MLC (Leinhardt & Crowley, 1998). The specific data come from a sample of 12 groups of visitors to the *Soul of Africa* art exhibit. Camilla and Harold from Las Vegas, the group we focus on here, had come to the museum as a part of seeing the sights of Pittsburgh, not particularly to see the African art exhibition. Their interactive style was extremely pleasant and cordial. Camilla visited museums quite frequently and evidently saw it as what one did when visiting a new place. Harold did not go to museums often and had what might be described as a bemused tolerance for the activity.

Before touring the exhibition Camilla and Harold were wired with lightweight portable microphones. They were instructed to visit the exhibit as they naturally might and informed that the researchers would be noting where they were in the exhibit hall. As they toured, the researcher marked their stops on a map and noted phrases from the current conversation to help us later synchronize the stop with the ongoing audio recording.

The tape was partitioned based on a combination of location and talk. A segment consisted of a coherent set of talk about a particular object or grouping at a particular place. The total number of segments for the visit was grouped into five equally sized (in terms of number of segments) chunks. The five chunks were viewed as five phases of the visit. The chunks varied with respect to the amount of time and the actual amount of talk that took place within them; only the number of segmented "stops" stayed relatively constant. There was nothing magical about the division into fifths beyond the fact that it allowed us to view the first chunk as settling down and orienting, the second through fourth chunks as the main substance of the visit, and the last chunk as the process of disengagement and exiting. Thus, by contrasting the <u>second</u> and <u>fourth</u> chunks, we can see a bit of how the conversation evolved over the course of the visit.

Each segment was coded in terms of the structural and thematic features of the talk. The structural features of the segment included listing or identifying, synthesizing in a personal manner, synthesizing in an object manner, analyzing, and explaining. The thematic features of the talk, reflecting themes of the exhibit, were function, craft, beauty, and social meaning. We view analyzing and explaining as more complex than listing or synthesizing, and we considered discussions of beauty and social meaning as more challenging than discussions of function and craft. Each segment was coded for one and only one structural feature and for as many thematic features, if any, as were mentioned. Examples of the coding follow.

List:

- Hmm, used for hunting

- huh?

- *Ok*

- It's a hunting whistle

(function)

Synthesis:

- Storage boxes
- Cosmetic boxes, like what they use today 'cept they're different shapes, they have something like what you guys use now
- Elaborate (function)

Analysis:

- gosh, look! I love the way these figures have their hands positioned under their chins
- Look at that one, it looks like, let's see if there is a reason they're called bow figures
- Those have their hands right here on their stomach (beauty)

Explanation:

- Anthropomorphic cups
- Drinking cups
- For Palm wine
- Because it, well the more elaborate your cup is the higher you were in the ranking in the tribe, the more important you were
- Oh there is a double cup there. I guess you get this when you get married and drink stuff
- Or where they had a ceremony, maybe they were going to share
- Share drinks?
- You had to share with someone (social meaning)

Analysis and Results

In order to give the overall feeling for how Camilla and Harold's visit evolved, we give a brief numerical description. Second, to get a sense of the developing and social nature of the visit, we describe the overall visit in terms of the gradual evolution of explanations.

Harold and Camilla had 42 segments overall and nine segments in their second chunk, which comprised 77 lines of dialogue. Three of the segments in the second chunk were list-like, comprising 13% of the lines of talk; one segment included synthesis between objects, comprising 6% of the lines of talk; three segments were analytic, comprising 43% of the lines of talk; while two of the segments were explanatory, representing 35% of the talk. Thus we see in the early part of the visit that this couple devoted almost 80% of their talk to analyzing and explaining a few objects. Over the nine segments, Harold and Camilla discussed functional features on six occasions, craft aspects twice, and issues of beauty and social meaning once each.

Table 1: Harold and Camilla, Analysis of
Conversational Structure

Chunk 2 Chunk 4

	Segments	% lines	Segments	% lines
	(9)	(77)	(8)	(102)
List	3	13	0	0
Synthesis	1	6	1	8
Analysis	3	43	4	33
Explanation	2	35	3	61

In the fourth chunk of the data, Camilla and Harold had 102 lines of dialogue and 8 segments. None of the segments were lists. One segment was an object-based synthesis comprising 8% of the dialogue lines. Four segments were analytic and comprised 33% of the dialogue lines. Thus, explanatory discourse went from 33% to 61% of the discussion space while list-like behavior dropped out completely. With respect to the thematic aspects of the talk, two segments dealt with craft, two with function, and three with social meaning. When we consider the combination of structural and thematic features together, we can see that not only did the structure move from list to explanation, but also thematic discourse moved from functional descriptions to explanations of social meaning concerning the objects.

Another way of tracing how the visit evolved is to examine one kind of discourse, explanation, over the entire visit. Explanations can be offered about the content of a display, the meaning of the display, or the intention of the displayer or curator. But to explain something requires both asking and answering a query (Leinhardt, 2001).

Harold and Camilla engaged in nine explanations. Their first explanatory segment occurred in the first chunk. It dealt with a functional theme and emphasized the composition and purpose of the "neck collars." Interestingly, Harold saw the collars as both old-fashioned "back then" and as unique to the African contexts. In contrast, Camilla immediately connected the collars to men's necklaces, which are still in use in the U. S. The second explanation occurred just two segments later when Harold tried to figure out "How does this tie in?" to the other objects they were looking at. He and Camilla were confused and puzzled by the relationship of groups to the dead–they wondered, do the living take care of the dead by doing the necessary ceremonies and gifts or do the dead take care of the living by watching over them? They understood the idea that the dead in some sense were to be appeased, but they were confused by the statuary for baptism of the dead. Again it was Camilla who clarified the two positions although she did not resolve them:

"But they expect the living to be in a position to take care of the dead or if they have <u>not</u> [they have] made that decision. But they have, there is also a belief that they are allowing the ancestors to control what's going on in present day life among the living. Cause the ancestors would, could be [ruffled] They considered them spirits which could punish, if something were going wrong... Whereas the religious practice you're talking about is baptism of the dead. The other is more to insure their salvation. Not a control of..."

In the next explanation, a part of Chunk 2, Camilla introduced the ambiguity once more. They were examining a variety of cups and noticed one was double—two distinct cups in the shape of back-to-back heads, joined at the neck. They discussed the social rank implied by the carving on the cups and then discussed why it would be a double cup. The explanation focused on both function and social meaning. Harold suggested it was a marriage cup – similar to our own customs -- while Camilla noticed that it might just be for sharing in a ceremony of social significance not necessarily marriage.

But it was two explanations later where Camilla and Harold engaged most deeply. They had come to "Nailman," a wooden figure of a man studded all over with large iron nails—it was a show-stopper of an object for most visitors. In their discussion it was Camilla who jumped to the conclusion that the figure was a voodoo doll, used to harm or curse others. Harold questioned whether that was really the case. They both then read the label copy. They discovered that "it's not voodoo dolls, it's different...because the reason for it was different. Like if you take some type of secret oath. I guess for contracts, legal decisions. I think it used..." Camilla concurred but noticed that there is implied power in the nails and the act of nailing. Thus the nails could heal or exact revenge if the contract were broken. Therefore the nailman might be, in Camilla's logic, a forerunner of the concept of voodoo dolls. She continued her reflection of forerunner by saying, "[S]ome practices were brought down from generation to generation. And they just changed, their *use* has changed."

Harold and Camilla have found a device to support engagement. The device originally was "them versus us" (as with the neck collar); but ,with the Nailman exploration, they shift and discuss "then versus now." Although the exhibition is in fact quite modern (20th Century) and the objects themselves not particularly old, this couple focused on time rather than cultural differences to act as a lens for interpretation. The advantage of their approach was that they could constantly construct a problem space of finding where a concept or artifact played itself out in present societies. Harold and Camilla made four further explanations of objects in the exhibition. All but one dealt with the thematic idea of social meanings.

Harold took the lead in one of these explanations, where he was trying to understand initiations for young men. He started by saying, "Secret societies. Good old forerunners of the Elks! ... I'm not going there, but once again what you are seeing, you had all these different tribes that had certain procedure they used for guiding the young boys to manhood...All of them had a way of teaching boys how to become men." From there Camilla connected these rituals to those of the American Indian and then circled back to comment on the lack of such guidance and training in the modern context of America. Both Camilla and Harold pressed to interpret the particular cultural constants that link the alien objects to their own American experiences. What they avoided, however, was any deep engagement in the aesthetics of the exhibit. They noted when things were pretty or skillfully carved or delicate or glittery, but they never commented on the artistry or form of objects – the lines, scale distortions, and mixed media that so captivated the artists of the early 20th century remained invisible to or unnoted by this couple.

Conclusions

We began this chapter by wondering why people should continue to come to museums and with a concern about the relative emphasis on the unique or the mundane as the best lens for research on museum learning. We have presented two conceptual frames to help us consider these issues. The first proposed four features of objects that make them unique and powerful kinds of examples. The second proposed a particular way of examining conversation as a mediating process for learning. Visitors come to expand on what they already know and to experience what they have only imagined, and to see beyond the mundane to the unique. Just as they can come for multiple reasons, visitors can learn in multiple ways. As we saw with the preservice teachers at the BCRI, the encounter with the bus challenged them to reconsider their understanding of the Civil Rights Era by attaching to a mundane concept (a bus) a vivid distortion (burned). As we saw in the case of children at the Pittsburgh Children's Museum, encountering a real robot prompted a revision of a fairly extensive but romantized knowledge base. In the case of Harold and Camilla at the Carnegie Museum of Art, we saw a couple finding a way to evolve a system for exploring, over a series of African artifacts, connections between the familiar and the alien.

In some ways these findings lead us to consider the very identity of museums themselves. When museum researchers document the rapt engagement of young children in science museums, one might conclude that museum learning must have a hands-on feature or no powerful learning can take place. This assumption is clearly false because museums are also places of quiet contemplation. Similarly, when we at the Museum Learning Collaborative focus on the social features of conversational elaboration as the mechanism of learning in museums, we do not mean to suggest that visitors must talk all the time in deep and meaningful ways. This assumption is clearly false because museums are also places of solitary exploration and of trivial chatter. So too, when a volume is devoted to objects in museums as the agents of impact, we must be cautious because the layered accumulation of multiple experiences, of multiple moments of contemplation, of multiple objects is essential to the thing that is a museum and the learning that takes place there.

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