

How Can Exhibits Support Richer Visitor Experiences?

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Introduction

How we describe learning or the range of possible outcomes from the exhibit experience has been sharply debated in this journal in recent months. The melee began when Ted Ansbacher suggested that the term “learning” had become so vague in application that it would be more useful to set it aside and instead formulate clearly defined “outcomes” for use in designing and evaluating exhibits (ILR No. 53, March-April, 2002). Bob Russell (ILR No. 54, June-July, 2002) found Ansbacher’s outcomes useful in describing and evaluating his own visit to the Cloisters in New York. Lynn Dierking *et al.* (ILR No. 55, July-August, 2002), reasserted the importance and currency of the word “learning”, suggesting their own framework for categorizing different realms of learning based upon the results they see in subjects they have studied. George Hein (ILR No. 57, November-December 2002) argued against trading “learning” for “outcomes”, suggesting broadened definitions of learning as a way of informing an ongoing debate over the purposes of education in museums and also in formal educational institutions.

In all this there is more disagreement over the semantics of the educative process of museum-going than over its goals. All of the authors agree that what visitors gain from the museum experience should be measured across broad criteria that allow for wide individual and cultural variation. In other words, many outcomes are desirable and the most desirable in a given situation depend largely on a context that includes the prior experience of a given visitor, the social context in which the visit occurs and the goals of the institution that is visited. At the same time, the debate has focused almost exclusively on visitor performance, both desired and measured. In the process, it has largely ignored the performance of the exhibit as an educative environment.

This statement may at first seem odd. If visitors are shown to achieve beneficial outcomes, however we name them, then doesn’t it follow that the exhibit is successful? I would argue that it does not; such logic accounts only for the capacity of a given visitor to extract meaning from experience, not for the capacity of a given exhibition to actually facilitate the process. Instead of asking “what has a visitor gained?” from an exhibit experience, I would ask “did the exhibit help the visitor gain everything from the exhibit material that she could have?” or “how well did the exhibit engage and support his curiosity, interest, inquiry and meaning-making?”

As soon as we ask such questions of our exhibits, our focus shifts importantly away from expectations we may have of visitors and toward expectations of our own work. Whether people learn in an exhibit becomes a less useful question than how effectively the exhibit facilitates their experience. This opens a re-examination of our purposes and methods in the design, interpretive methods and evaluation of our exhibits.

Judging Effectiveness

The debate over outcomes all too easily leads to an excess of focus on something over which we have little legitimate control—visitor performance—and a dearth of focus on the very thing over which we have a great deal of legitimate control—the performance of the exhibits we create. Focusing only on how well visitors recall messages or are able to describe their experiences largely ignores the role the exhibit played in the process and in my view offers an incomplete assessment the quality of the museum’s contribution to its public.

As an example in the recent debate, Dierking *et al.* assert that actual visitor engagement with an exhibit is not necessarily a measure of what a given visitor has gained from it, citing an evaluation of the Mitey Quarry exhibit at SciTech Discovery Centre in Perth, Western Australia. Their research indicated that children who actively manipulated the exhibit were less able to draw and describe the exhibit than a girl who barely manipulated it but had observed it at some distance. They interpret this to mean that “sometimes the individual who gains the most from a series of exhibits turns out to be the person who did not directly interact with any exhibits or spent what seemed to be a superficial amount of time.” While I would not dispute this interpretation, I would agree with Ansbacher (ILR No. 56, September-October, 2002) that this example also suggests that the particular manipulation (turning a crank) in the exhibit did not significantly add to the participants’ understanding of it. What the example further suggests to me is that the girl’s performance recalling details about the exhibit was completely independent of the activity foreseen by the developers, occurring perhaps even in spite of it. It is possible to imagine that the children who turned the cranks yet recalled less of the exhibit may have been so involved in that activity that they were distracted from observing the result.

Substantiating learning in an exhibit is not the same as attesting to the effectiveness of the exhibit. While this example suggests that a patient observer might recall many aspects of the exhibit, it also suggests that the actual activity planned for the exhibit may have been ineffective, irrelevant or even counter-productive. Just as some children are able to use poor classrooms in productive ways, some visitors will be able to extract something useful from almost any museum experience. As Hein (1998), Falk and Dierking (2000), Taylor (1986) and others have well documented, visitors in general will use museums for their own purposes and will extract from them a wide variety of meaning. But even so, I would argue that the capacity of people to use museums to build upon their own life experiences should not be confused with the effectiveness of museum exhibits in facilitating the richest possible experience.

In the day-to-day process of exhibit-making it is vital to understand, however imperfectly, how the exhibit environment and everything within in it contributes to or inhibits the experience of those who use it. Considering and evaluating what visitors gain from the experience is an important part of the process, but I would suggest that a critical element missing from the development of most exhibits is a process that allows us to better plan and understand exactly how various elements contribute to those desirable outcomes and foster the multitude of other positive experiences visitors might have there.

Facilitating Experience

By more deeply considering the ways in which exhibits can uniquely affect experience, we can broaden our understanding of the value these places offer those for whom they are intended. In the process, we can also better understand how they differ from other media such as videos, location-based attractions, print media, or the Internet. In order to better understand how various elements of our work might better contribute to the visitors' experience, I will examine three spheres of visitor interaction that the finished exhibit can most directly affect.

The sphere of observation: Does the exhibit help visitors to see what is there to be seen (or heard, touched or smelled)? Museums can dramatically impact visitors' capacity for observation, aiding or inhibiting their ability to survey the scene for orientation, hierarchy or even a place to rest; affecting their ability to discover interesting materials or to explore those materials to whatever level of detail they desire; immersing them in the world of the exhibit so that its contours become more evident and immediate.

The sphere of significance: Does the exhibit help visitors to grasp the significance of what they see or do within it? Museums can enhance or inhibit visitors' capacity to discover the significance of what they observe, suggesting ways of discovering what is important, unique, novel or surprising in the physical or intellectual materials of the exhibit; providing background information as is appropriate to spark or fulfill curiosity; aiding visitors to extend what they see and do in the exhibit toward theoretical or conceptual generalizations.

The sphere of activity: Does the exhibit engage visitors in activity that enables them to draw meaningfully upon its material? Museums can enhance visitors' ability to actually use the materials of the exhibit in ways that are meaningful to *them* by providing individual or social activities that are self-motivated, purposeful, and that draw on the subject matter of the exhibit not as subject matter *per-se*, but rather as a means to engage a compelling interest born within the exhibit experience. In this way an exhibit can foster direct inference, understanding and very personal meaning-making.

These spheres are encountered in no particular sequence; indeed the activities described should be thought of as intertwined experiential strands that strengthen and echo each other in dramatically different ways depending on individual factors and personal preferences. Giving due weight to these experiential issues further suggests different success criteria from those most often employed. By this I mean to suggest that our exhibits do not necessarily need to directly communicate messages to those who participate in order to be considered successful. Instead, we may design for and measure success by the degree to which visitors *do* observe things in the exhibit, the degree to which their observations *do* reveal levels of significance in the things they see and do, and the degree to which visitors *are moved* to engage in activities that draw on the materials of the exhibit as a way of placing them into patterns, context and experience that are personally meaningful.

We may consider ourselves successful, in this view, when we see visitors engaged in a variety of rewarding individual and social behaviors substantially supported or enhanced by the materials of the exhibit. I will now explore these three spheres of interaction to suggest ways that exhibits may support more robust visitor experience.

The Sphere of Observation

Whether a detail of ancient pottery, the subtleties of a mechanical motion or the behavior of a fish in an aquarium, most of what there is to see in an exhibit goes unnoticed by the majority of individual visitors. The nuances of what is observable are largely inaccessible to naïve observers for a variety of reasons, including individual past experience, the brief time spent in the exhibit, and the way most exhibits make their elements apparent. What is observed is often highly opportunistic and largely accidental; a testament to a visitor's ability to notice, more than to the exhibit's ability to facilitate observation. For our purposes I'm going to focus on visual perception, but it is useful to bear in mind that for other forms of perception such as hearing or touching, the same considerations apply.

Most of us think of observation as a simple process of recording visual information from our surroundings, in much the same way as a video camera records information from the light which passes through its lens. In fact, what is known about the act of seeing shows that it is an intricate series of feedback loops between expectations that are fed by memory, and the raw visual data transmitted from our eyes to our brains¹.

What we actually "see" is heavily influenced by what we're looking for. What we are not looking for, we frequently fail to see, no matter that it may be directly in the center of our field of view. As an example, a classic perceptual test consists of two images flashed in front of a subject in a repeated sequence, each flash interspersed with a momentary blank slide. The two images are of the same scene, but with one detail altered. In one scene, the engine of a 747 appears and disappears repeatedly from the wing, exactly in the center of the frame. Yet for most subjects the change is imperceptible for several flashes. Once recognized (or called out by the person administering the test), the change is impossible to ignore; it is extraordinarily obvious. Such experiments dramatically illustrate the interplay between top-down processing—what we look for—and bottom-up processing—the visual data fed to us by our eyes—in determining what we actually see. This suggests that our ability to perceive what is before us is at least as much a product of our preconditioning, either through experience or through suggestion, as it is of our raw visual processing. To me this further suggests that there is much to be gained from a more specific understanding the interplay between expectation and perception in exhibits. How we prepare visitors to look at things, and how we facilitate their ability to do so, may significantly impact the effectiveness of the exhibits we create.

Those of us who develop exhibits perceive meaning in objects and text panels precisely because that meaning already exists for us. For a visitor encountering the material for the first time, however, that meaning is not yet present and as a result it is not at all unusual in a museum for those who visit to see only a portion of what is in the exhibit, to see only

what they expect to see (even in text), or to be unable to connect what they see to anything that is both meaningful to them and connected to the context of the actual exhibit. Clearly, more of our attention needs to be focused on methods that will broaden visitor's expectations and help them to use their senses more powerfully. We need to see what is working well and where we can improve.

For examples of success it is useful to briefly examine two exhibits from the Monterey Aquarium that clearly do significantly influence visitors' expectations and enhance their ability to really see the organisms on display. The simplest is a wonderful little exhibit of Burgess shale with large magnifiers floating on the water's surface. At any given time, several visitors will be found there, closely examining the beautiful but tiny life forms attached to, burrowed into, or slowly moving across the shallow bottom of the exhibit while several other visitors look on and wait their turn. The magnifiers are suggestions without words: there is something small and special to look for. The organisms of the shale beds, which otherwise might easily be passed over or missed entirely, are examined with intense interest. The magnifier's presence sets an expectation that there is something to closely observe, and then makes it possible for visitors to do so.

A contrasting example is Monterey's immensely popular exhibit of jellies, an organism not originally considered to be particularly interesting to show. David Powell, Monterey's first director of husbandry, notes in retrospect that the word "jellyfish," if it had any effect on the public at all, "conjured up a negative impression of something that stings or a disgusting-looking blob on the beach" (Powell, 2001). But Powell and his team were able to make the "beauty and grace of these gently pulsing animals" visible by setting them in portals where they glow as luminous objects against an infinite blue background. This is not a fake; it accurately reproduces the way these organisms appear in the open ocean. The exhibit makes jellies visible to visitors as they appear to divers who see them in the wild. Unlike the exhibit with the floating magnifiers, however, in which a top-down expectation of something to explore provides motivation for bottom-up observation, it is the jelly exhibit's startling bottom-up visual splendor that resets visitors' expectation and stimulates top-down curiosity and further examination.

It is not well understood how developers and designers can best create exhibits that mediate effectively between expectation and observation, fostering visitors' ability to see and perceive what is there to be experienced in the exhibit. But without a more energetic and thoughtful approach to exhibit development, and more focused evaluation of these aspects of the exhibit's role in a dialogue with visitors, it is certain that opportunities will be missed.

The Sphere of Significance

Observing something and understanding the significance in what is observed are different aspects of the same act. We may observe in order to seek something we expect to find significant, or we may notice something through observation which spontaneously sparks curiosity and whose significance we seek to ascertain. This mirrors the iterative process of exploration and genuine inquiry that museums, at their best, can foster.

The significance designed into most exhibits that are *about* something, whether history, anthropology or natural science, usually begins with a set of messages chosen largely or solely by the museum and illustrated with a selection of objects. The exhibit is most often considered a success if visitors are shown to have understood or remembered the museum's messages. The problem with this is that most of those messages are simply not particularly relevant for many visitors. What is significant to experts is not often even apparent to visitors, who in any case do not come to the museum for messages but rather to see interesting things, to have a day out together, or for a host of other reasons.

Yet it is undeniably important to provide visitors with tools for understanding the significance of what they see, do or otherwise experience in the exhibit. Only by providing visitors with routes of access beyond their everyday experience can we provide the means for them to extend that experience into new and more broadly meaningful areas of future experience. The problem with message-driven exhibits is not that they provide information but that a purely narrative approach can fail to activate a more lively give-and-take between the museum and the visitor. By overemphasizing what the museum wants to say, such an approach may deny the visitor's role as an active participant in a shared experience.

That role is marginalized in many information- or idea-based exhibits. Typically driven by text or media and illustrated by physical objects, many of these are as complete without their visitors as books or movies are without their audiences; they are total packages waiting to be consumed. They typically employ a narrative structure which is intended to impart a body of knowledge as fully as the medium will allow. The visitor is typically expected to absorb the significance of the exhibits as a consumer of knowledge, and evaluation typically assesses how much knowledge has been absorbed. Knowledge about visitor behavior is used to sharpen these exhibits' appeal and their ability to transmit their messages.

The role of visitors is more apparent in experience- or activity-based exhibits. Incomplete without visitors to manipulate them, they are potential waiting to be released. Until a visitor sets it in motion, a Newton's cradle is nothing more than five balls on strings. Once in motion, however, it becomes an intriguing, even mesmerizing set of interactions. Its significance ranges from a vivid demonstration of physical behavior to generalizable laws of Newtonian physics, and derives largely from what visitors see and do. It is fluid, based on the kinds of activities engaged in or observed. In these exhibits visitors are expected to engage in exploratory behaviors, to manipulate the exhibits and to benefit in many idiosyncratic and personally meaningful ways. Evaluation tends to be more open-ended as well, and success is judged not only by what is learned but also by the extent of visitor engagement and the degree of personal satisfaction visitors attain.

Yet the distinction between these approaches creates a false dichotomy which can distort the way we design methods of showing the significance of any exhibit. Visitors should be able to experience ideas as fully as they do activity; they should be able to explore history as vividly as they explore the motion of a pendulum; they should be able to access the

meaning of a physical activity as fully as they may access that of an exhibited ecosystem. We hear over and over again that exhibits should communicate messages and tell stories. To this I would ask: what messages? Whose stories? Messages and stories are great for media with narrative focus, presented in a setting which allows their audiences to comfortably concentrate and absorb. Exhibits are not great settings for that. They should, however, be great settings for non-linear, idiosyncratic experience, social interaction, unpredictable encounters with familiar objects or strange, new things and the opportunistic pursuit of spontaneous interest. All of these kinds of experience depend for their success on the *active participation of an engaged visitor*. And the significance visitors derive from such exhibits should be a product of the both the museum's ability to facilitate discovery and their own activity and interest.

To carefully consider the extent to which visitor participation is required to make an exhibit whole is to look at our work in a very different light. It refocuses our attention onto the way the exhibit stimulates curiosity and rewards inquiry. Text and media might suggest methods of observing, provide informational background as needed, point out what is useful to notice, and raise questions that might suggest further observation or exploration. Such techniques may be more effective and provide more opportunity for visitors to complete their own experience than labels that simply explain and stand as completed thoughts without visitor interaction. The role of the curatorial voice shifts from teacher to mentor.

As an example of how an exhibit typically thought to be information-based might be made more experiential, let's explore a slice of archaeological time represented by a vertical section of earth. Such stratigraphic cuts, allowing a detailed analysis of layers of earth and artifacts built up over time, can provide precise, sequential evidence of ancient cultures. Our sample, which might be either a reconstruction or a "peel" from an actual site, could be titled with a statement to the effect that each inch of earth records so many years of human occupation—an invitation to use the sample to construct a piece of history. The sample of earth could be equipped with a magnifier that slides vertically along it (if the slice is too long to make this practical, the slice could be made to slide past a stationary magnifier). The magnifier could further be supplied with an inexpensive optical device that allows the superimposition of text, graphics or interactive media over the magnified view of the earth and the artifacts embedded in it. These interpretive cues could pose questions, point out significant objects, and give clues to their meaning. The magnifier might also be equipped with a simple tracking device and a button that could trigger an appropriate sound track on demand. This would play the voices of field anthropologists who might ask open-ended questions, suggest observations and discuss what they find interesting about the sample.

By first inviting the visitor to look, then by suggesting *ways* to look and details to search for, and further by giving the visitor control over what is interpreted, such an exhibit is an incomplete gesture without the active participation of a visitor. Those who choose to participate in the exhibit would have the chance to personalize the experience, viewing what seems most interesting and then tailoring the interpretation accordingly. In the

process, they would have the chance to gain skills, knowledge and appreciation that might otherwise be passed over, unnoticed.

Whether through graphical labels, technology, enlightened use of framing and viewing devices, methods that encourage visitors to interact among themselves or with live interpreters in the exhibit, museums can do a better job of encouraging and amplifying visitors' direct experience of the exhibit. A measure of success will be the extent to which visitors engage with the material and are able to discover significance in what they encounter there.

The Sphere of Activity

A conundrum: for visitors to be motivated to explore an exhibit in any detail, they must perceive it to be relevant to themselves; for most, however, that relevance can only come through knowledge of the subject gained from having already explored the exhibit in detail. This problem, which so often vexes those of us who create exhibits, arises largely, I think, from the belief that the knowledge taxonomies so relevant to *us* are the best (or only) way to organize the exhibit, and that our first order of business is to make these taxonomies somehow relevant to visitors. Based in part on the work of John Dewey, I have recently argued for a more open approach to content organization derived from visitors' purposes as well as those of the institution (Hennes, 2002). This idea is rooted in the premise that the most valuable insights gained in an educative encounter are those that arise out of the immediate experience of spontaneous curiosity, interest or investigation. In this view, whether people "get" the whole story is less relevant than whether they are engaged by the museum's exhibit material sufficiently to pursue their own purposeful lines of inquiry to some personal level of satisfaction.

How exhibits foster the formation of purpose is central to their effectiveness at supporting meaningful visitor experience. Dewey saw this kind of interaction between institution and user as crucial to education:

There is, I think, no point in the philosophy of progressive education which is sounder than its emphasis on the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process, just as there is no defect in traditional education greater than its failure to secure the active co-operation of the pupil in construction of the purposes involved in his studying. (Dewey, 1938)

The same might be said for museum exhibits that fail to secure the participation of their users in the formation of those purposes which direct the activity within the museum. It is well established that visitors to museums have a variety of opportunistic experiences, that they engage in individual and social activities independent of the arrangement of exhibit content, and that many of those experiences are significant and lasting. What is not at all well documented is how well exhibits actually foster such experiences and what kinds of opportunities they provide for visitors to engage in purposeful activities of their own choosing that also have a solid connection to the exhibit's materials or subject.

By “purposeful activities” I do not mean activities that simply reflect the educative purposes of exhibit developers and curators, but rather those that stimulate visitors to form their *own* purposes for more deeply exploring the material of the exhibit. It is not that the museum should have no role in such considerations; to the contrary, as Dewey himself might observe, curators, developers, designers and educators all have expertise that can usefully and powerfully inform the activities visitors might engage in. What is critical, in this view, is that visitors be offered sufficient variety, stimulation and support to actively participate in the exhibit, based on aspects of the exhibit that have generated interest, on their previous experiences, on individual learning styles and on the social circumstances in which they find themselves on a particular visit. The most ready examples of such open-ended exhibits are to be found in science centers, where activity-based exhibits dominate. Yet even there, many of the exhibits intended to be visitor-driven explorations are in fact visitor-activated demonstrations in which the visitor merely initiates an inevitable outcome, rather than manipulating variables to gain a feel for the way the phenomenon actually works. And much of the interpretation provided remains unread or misunderstood, or is easily forgotten.

An example is the simple but wonderfully visual “gravity well” exhibit in which visitors release a ball or coin onto a track that sends it rolling around a funnel with a curved slope. Having released the ball (or a coin), they observe it rolling around and around the funnel, appear to accelerate as it approaches the center and finally, in a spectacularly energetic spin, disappear down the hole in the center. As mesmerizing as this is, there is little for visitors to do other than to observe the predetermined outcome, as they have no control over the ball’s initial velocity or trajectory. If the exhibit were redesigned to allow visitors to manipulate these variables by shifting the angle and thrust of the launching device, the situation would change. Where the previous activity was simply to release and observe the result, the new activity could involve repeated launchings, each in a different way and with a different result. The way the various forces interact with each other to affect the ball’s path could become much more apparent as visitors become active participants in their manipulation.

I believe that visitors’ purposes in the modified exhibit would arise from spontaneous interest in seeing how their own actions affect the movements of the balls. Some would carry the activity no further than to launch a ball or two, gaining perhaps a sense of wonder at the strange motions and an intuitive feel for some of the effects of their actions. Others might be stimulated to see parallels in the way objects orbit the sun or the behavior of black holes, and be motivated to compare their assumptions with interpretive materials nearby. Still others might see parallels with extreme sports or a banked racetrack, later affecting their understanding of how skate boards on half-pipes or cars on high speed turns behave under similar conditions. Few museum educators would invalidate any of these outcomes, yet many exhibits hinder this kind of self-motivated, open-ended exploration by narrowly restricting the activity to a predetermined outcome or by focusing too narrowly on a subject as it is understood by an expert; others offer activity poorly connected to the actual phenomenon, interpretation poorly connected to the activity or no interpretation at all.

A multi-variable activity like this widens possibilities for interpretation. With many different physical phenomena more visible, interpretation by docents or in the form of graphical materials, audio, video or interactive media, could pose questions that encourage closer observation, illustrate parallels between the balls' behavior and that of objects in orbit or on a racetrack, or provide a variety of simple physics explanations arranged under questions a visitor is likely to ask². In this way, the activity is not merely an illustration of the concept important to the developers, but rather a means for visitors to formulate their own conceptions out of the activity provided by the museum. Interpretation in such an exhibit is not a hierarchical description of a set of knowledge, but a ready resource, standing by as curiosity demands it.

Such activity need not be restricted to observable phenomena in science centers. Exhibits which are more information-based can also benefit from this kind of purposeful activity in which visitors are drawn to the exhibit material not so much as subject matter but rather as a means to an independent end. The example of the stratigraphic section described above suggests a situation in which a visitor develops specific curiosity by experiencing the exhibit itself and pursues a variety of ends in which information and observation reinforce each other through the activity. Games and other similar activities that involve exploration and problem solving may provide similar opportunities.

We might reflect on the extent to which our own expectations, shaped as they are by our taxonomic understanding of the subject matter of the exhibits we create, may actually hinder the ability of our visitors to fully experience the resources available to them in a museum. For example, consider a typical historical narrative presented as a thematic progression or a timeline that steps through a period of history as summarized by an expert. How might that expert instead help visitors use the same set of artifacts and archival materials to shape their own, more personally meaningful historical narratives that sharpen their understanding of the present? Consider an archaeological exhibit that uses a set of artifacts to present a snapshot of a long-disappeared culture. How might those same objects be put to use in an exhibit that helps visitors to see and interpret patterns present both in that ancient culture and in their own? Consider a natural history exhibit that presents a collection of specimens classified according to their taxonomy or by their geographic origin. How might those same materials be employed to help visitors shape their own understandings of ecological or evolutionary processes, according to their own interests and priorities? Most importantly, how might visitors employ all of these materials together to shape and satisfy their own inquiries, not as different areas of subject matter but rather as different means of creating a fuller understanding of their world? To be sure, what is to be gained from such exhibits is not an exhaustive treatment of a given subject as defined by an expert. But it will most likely make a deeply memorable and meaningful contribution to the visitor's life experience.

Refocusing our Attention

I personally find the specificity of Ansbacher's outcomes useful in considering the ways exhibits might be designed to positively affect their visitors. But the exchange it has triggered has illustrated how controversial such shifts in thinking can be and how they

can inadvertently shift attention to the minutiae of definition. Focusing largely on the semantics of outcomes, the debate thus far has not extended to a more thoughtful consideration of how museums should support the kinds of multiple outcomes all the authors seem to agree are desirable, or how such support might be measured.

In this article I have suggested that focusing only on outcomes may lead us to confuse a visitor's capacity to extract meaning from the experience with the exhibit's effectiveness in supporting the process, and have proposed a closer examination of the ways exhibits can actually affect the way visitors experience them. We have examined three interrelated spheres of interaction in which exhibit elements might directly foster experience: observation—ways that exhibits help visitors to see or perceive what is there; significance—ways that exhibits help visitors to grasp significance in what they observe or perceive (and likewise how such significance might lead to further observation); and activity—ways that exhibits provide for visitors to actively engage with the exhibit materials for a variety of individually-defined purposes in a variety of ways that form personal meaning.

A focus on these considerations emphasizes what is special about museums and the kinds of active experiences they can uniquely support. Unlike theme parks, where the outcome is pre-packaged and the goal is a uniform experience of the attraction, museums can offer their visitors an infinite number of individual experiences based on what they find meaningful and useful about the real things they explore. Unlike films, television or books, they can support non-linear inquiry. Unlike the Internet, museums can directly engage through physical experience. And unlike the real worlds and phenomena they represent, they can support a highly concentrated form of activity and inquiry through mediated experience. When planned with such considerations specifically in mind, I believe exhibits can more effectively encourage visitors to participate in the formulation of educative purposes and to carry those purposes toward more meaningful experience.

¹ A look at “seeing” from a completely different perspective reveals largely unexplored terrain. Rodney A. Brooks, director of MIT's Artificial Intelligence Laboratory, has approached the way humans see in order to build intelligent robots that see. The difficulty with developing processing algorithms that turn digital images into ‘seeing’ as we would understand it appears to be connected to the fact that humans don't actually see photographically; that is, taking in an entire image and processing it as a whole. Instead, “people actually search for and store information relevant to some task” (Brooks, 2001). Processing images involves recognition and perception loops that are still not entirely understood, but it appears clear that what is sought, and what is seen, are closely intertwined. Expectation has an important role in perception.

Brooks cites the pioneering work of the Russian psychologist Alfred Yarbus, who studied human visual response to a variety of stimuli in the 1950's and '60's. He designed a system that was able to precisely track subjects' eye movements, and discovered, among other things, that the patterns in which a subject views a picture—that is, the specific eye motions and the elements focused upon—is heavily influenced by suggestions or questions raised by the researcher in advance of showing the picture. Specifically, before showing the picture to a subject, he would ask a question about a picture, such as the ages of the people in it. What he discovered was that each kind of question would elicit a completely different scan of the picture (Yarbus, 1967).

For Brooks and his students, Yarus' and others' research into the ways the human brain processes images has led to increasingly effective computer processing networks that distribute the multiple tasks involved in recognition across different computers in a series of interconnected feedback loops that together have begun to approximate human vision. For the robots, vision is a process of constant cross-referencing between the raw incoming visual information of individual pixels and what amount to mental maps of present and stored information that give meaning to what is "seen" as well as further directing the robot's cameras toward what is considered meaningful.

Using related logic, Rose and Meyer (2002) examine visual processing from the perspective of education. They look at the interaction between "bottom-up" and "top-down" processing—that is, the effects of raw visual stimuli on recognition, and the corresponding effects of visual meaning stored as memory on the processing of new stimuli—for clues into learning processes and ways of tailoring education to individual students who process images and information differently. They place equal emphasis on teaching techniques that influence the way students process raw data as well as how they form context and meaning, citing for example reading instruction that "incorporates both the top-down whole language method and bottom-up phonics". The top-down techniques shape patterns of expectation which facilitate the bottom-up processing of raw visual data. They further extend the process to other, non-visual forms of perception.

²How we are to develop exhibits that fully engage and support such active visitor participation most likely depends on how we engage visitor participation in the creation of our exhibits. Current models of formative evaluation are instructive but still are primarily concerned with visitor reactions to proposed exhibits; they are typically used to set or validate the development team's assumptions, rather than to actively involve visitors in the process of developing an or its interpretive materials. Nearly two decades ago, Taylor (1986) suggested using visitor inquiry in early development to formulate the primary direction of interpretive materials, and some institutions do actually develop exhibits in collaboration with groups of visitors, but this is not a widespread approach. A more aggressive investigation of such an approach would seem a logical step in the kinds of exhibit development I'm suggesting here.

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