The Anatomy of An Exhibit

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An educational exhibition center, whether it be a museum, zoo, aquarium, science-technology center, or some other type of informal educational facility, is an extremely complex environment. Unlike a formal classroom that is relatively barren of objects, most exhibition centers are packed with the sights and sounds of objects and media. Unlike the classroom where the learner remains seated and is exposed to one message at a time, the visitor to an exhibition center is free to wander through an environment rich in sensory stimulation, where attention to one object or message may compete with another. In addition, the motivation of learners differs. In a formal educational setting, people are expected to learn (enjoyment is rare and not a necessary condition); while in an exhibit center, one of the visitors' major goals is to enjoy themselves whether or not they learn anything. Given the complexity of the exhibit environment and the motivational goals of the audience, it is especially important to have an understanding of how these environmental components influence and are processed by the visitor. This article attempts to provide a detailed analysis of the exhibit environment – an important task if we are to understand how to design exhibits more effectively. Recognition must be given to the many previous researchers whose ideas have helped to shape the current analysis. In addition, many of the ideas presented in this article are the product of an ongoing collaborative project with Don Thompson (Bitgood & Thompson, 1992).

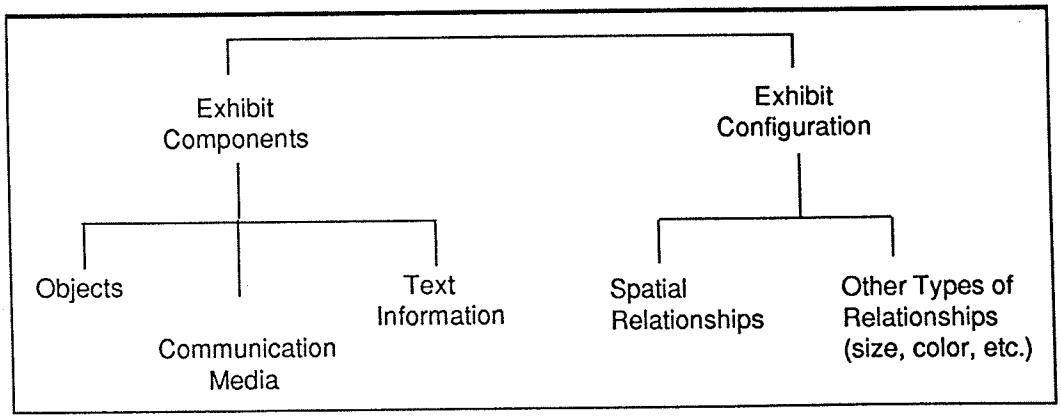
"Exhibit" Defined

Before proceeding further, the problem of defining an exhibit will be addressed. There is often confusion when the word "exhibit" is used. It is sometimes used to mean a single display, sometimes applied to a series of displays dealing with the same, specific topic (e.g., "How airplanes fly"), and sometimes used to mean a large collection of displays with a common theme (e.g., "Electricity"). In this article, a distinction is made between an exhibit unit (the display), an exhibit group (two or more displays on the same topic), and an exhibit area (a collection of displays with a similar, general theme) to differentiate among the three possible uses of "exhibit" described above.

In this article, the exhibit unit (display) is defined as a combination of two factors: exhibit components, and the configuration or relationships among these components. Figure 1 illustrates these two factors comprising an exhibit unit.

Figure 1

The Exhibit Unit



The Exhibit Components

An exhibit unit is made up of one or more of the following components: (1) exhibit objects; (2) communication (presentation) media; and (3) text information to be communicated (involving the use of language). Does an exhibit unit have to include all three of these components? Not necessarily! For example, a text panel alone would be an exhibit (although not necessarily a particularly effective one). Some exhibits include only media and text information (e.g., an interactive computer).

Exhibit Objects

Exhibit objects might include a painting, a sculpture, a piece of furniture, or a piece of china in an art museum; they might also be live animals in a zoo or mounted animals in a natural history museum. While science exhibit devices that attempt to illustrate a principle of science are not usually thought of as "exhibit objects," it can be argued that they are. For example, according to the viewpoint in this article, an electrical circuit which the visitor is required to connect to a battery is considered to be an "exhibit object." An exhibit object is defined as a visible or tangible thing that does not present text information.

Objects have varying degrees of importance in exhibits. Art museum exhibits place heavy emphasis on objects (paintings and sculpture) with media and text information often playing a secondary role (although visitors generally prefer more information if presented in a digestible manner). Other exhibits (e.g., an interactive computer) may contain a communication media device and information, but no exhibit objects.

While objects may convey meaning to visitors (e.g., "This is an important object because it is in the museum"), such meaning is not explicit and must be distinguished from the "text information" component of an exhibit which uses explicit language. It is also important to emphasize that the meaning that objects communicate to visitors may not be what is intended by the exhibit designers. In fact, it may be just the opposite!

To understand the impact of exhibits on people, we must understand which characteristics of objects have the strongest impact on visitors, *and* the qualitative nature of this impact. Table 1 provides a list of a few of the characteristics that are likely to have a significant impact on visitors.

Table 1
Characteristics of Exhibit Objects

Size	Motion
Shape	Texture
Color	Dimension
Sense modality	Material

The visitor literature includes many studies related to these characteristics. A few examples will illustrate:

(1) Larger objects attract and hold visitor attention better than smaller objects (e.g., Bitgood, Patterson, & Benefield, 1988).
(2) Objects in motion are more attention-getting than static objects (e.g., Bitgood, et al., 1988; Melton, 1972).
(3) Multi-sensory modalities (e.g., visual plus sound) increase attention (e.g., Peart, 1984).
(4) Three-dimensional objects usually draw more attention than do two-dimensional (e.g., Peart, 1984).

These findings suggest that the major effect of exhibit objects is to capture visitor attention and to help sustain this attention. While objects convey meaning to visitors, that meaning is often personal, reflecting an interaction between visitor and exhibit object variables.

There are other object characteristics from Table 1 for which less data are available. For example, what are the effects of shape, color, and texture on visitor attention? To minimize confusion, an important distinction should be made here between object characteristics when the objects are in isolation versus objects in relationship to other objects. (In the next section on the configuration of exhibit components, the relationship among objects and other components will be discussed.) Thus, an

object that is relatively larger than other objects in a display may capture more attention because of its relational properties. These relational properties should be distinguished from the absolute characteristics. For example, a large object by itself will attract more attention than will a smaller object in isolation, all other things being equal.

Communication Media

Almost every exhibit contains some type of device or vehicle for presenting text information. In fact, exhibits that do not provide text information are frequently misunderstood by visitors (e.g., Borun & Miller, 1980; Shettel, et al., 1968). Text information can be presented using many different types of communication devices or media. A medium may be as simple as a label panel or as complicated as an interactive computer with a random-access laserdisc. Table 2 provides a list of many of the commonly used communication media.

Table 2
Examples of Communication Media

Label panels	Flip or slide panels
Diagram panels	Video disc
Video/movie	Slides
Computers	Hand-held exhibit guides
Audio tape	Museum guides
Geographic maps	

Communication media can be described in terms of their characteristics just as exhibit objects are in the discussion above. The list of the properties that make objects salient (e.g., size, motion, sense modalities as shown in Table 1) also apply to media. Thus, a large-screeen audiovisual display will be given more initial attention by visitors than will a smaller screen display.

Miles, Alt, Gosling, Lewis, & Tout (1982) have classified communication media into two major categories: static (those that do not change state) and dynamic (devices that change their state). Dynamic media include automaton (the change in state is automatically programmed), operand (the change in state is determined by the visitor), and interactive (a "dialogue" between visitor and device can occur). Consistently, dynamic (and especially interactive) media have been more effective than static ones in terms of gaining visitor attention.

Several useful discussions of communication media can be found in the literature.

(1) Alt (1979) and Miles (1989) have reviewed studies of audiovisual devices developed at the Natural History Museum (London). These articles provide useful guidelines for the design of such devices.
(2) Screven (1986; 1992) and Bitgood (1990b) have reviewed findings and/or offered suggestions regarding the design of text information devices.
(3) Bitgood (1991c) reviewed the literature and suggested guidelines for developing interactive exhibits including media devices.
(4) Screven (1990a) and Serrell (1992) have specifically addressed the use of interactive computers as a medium of communication in exhibits.

Text Information

Analysis of the text information component of an exhibit is more complex than that of objects and communication media. Since the educational messages of an exhibit are presented in either written or auditory format, the use of language is a critical part of the exhibit's impact. The "text information" component deals with language, both in terms of how it is presented and its meaning. Figure 2 provides an analysis of the text information component. (We use the word "text" to refer to both written and verbal information.) Text information can be analyzed into two components: text material and text configuration. Text material includes both physical characteristics and meaning/structure. Table 3 lists many of the possible physical characteristics of text. Some of these characteristics have been shown to be critical in getting visitors to attend to the information.

Table 3
Physical Characteristics of Text Information

Typeface	Point size
Word length	Sentence length
Line length	Print density
Background contrast	White space
Size of text unit	Headings
Numbering, lettering, bulleting	Mapping
	Print-background contrast

Some of the findings with respect to physical characteristics of text include:

(1) Small units of information are more likely to be read (e.g., Bitgood & Patterson, 1993).
(2) High contrast between print and background increase reading (e.g., Smith, 1991).
(3) Larger point size produces greater visitor attention (e.g., Bitgood & Patterson, 1993).
(4) Presenting the information in a manner that makes it easy to scan (e.g., numbering, bulleting, underlining) usually results in more effective communication (e.g., Hall, 1988; Kool, 1984).

While the physical characteristics of text are important for attracting and holding visitor attention, the meaning and structure of text are critical for communicating the exhibit's message. The reader is referred to Rand (1985) and Screven (1992) for more on this important topic. Some of the factors included in the "meaning and structure of text" category are listed in Table 4.

Table 4
Factors Related to Meaning and Structure of Text

Vocabulary	Sentence complexity
Style	Subject matter and content
Use of questions	Clarity of writing
Density of information	Relevance of words
Connection between content & exhibit objects	

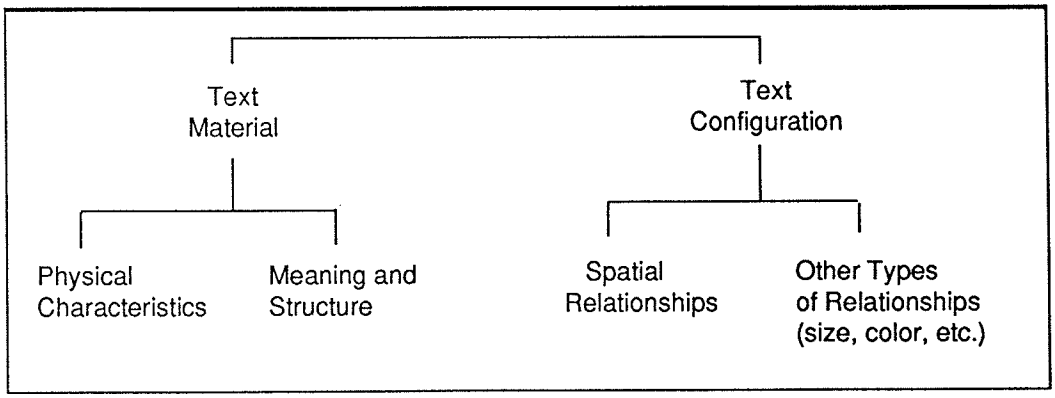
Empirical studies with visitors on the meaning and structure of text are rare. However, a few are available in the literature. For example:

(1) Visitors learn just as much when key ideas are presented as they do when given traditional paragraphs of text (e.g., Hall, 1988; Kool, 1985).
(2) Visitors are more likely to read when questions are used as headers (e.g., Hirshi & Screven, 1988).
(3) Subject matter that connects to the visitor in a meaningful way is more likely to be read (e.g., Bitgood, et al, 1989).

In addition to the physical characteristics and the meaning and structure of text material, one must consider how the text material is configured. As shown in Figure 2, spatial and other types of relationships among text material may be important. Some of the configural relationships that may be important include:

Figure 2

Analysis of Text Information



(1) The spatial relationship between the text and the visitor.
(2) The distance between one panel of text and another.
(3) The relative position of panels of text on a vertical plane. Does higher on the plane mean more important?
(4) The relative size of panels of text. Does larger mean more important?

Unfortunately, we have little empirical information on these possible configuration factors. There are some data available for the first factor (spatial relationship between the text and the visitor). Bitgood, Benefield, and Patterson (1990) found that visitors were most likely to read when the visitor is able to look at the exhibit objects and read at the same time.

Configuration of Exhibit Unit Components

As described above and illustrated in Figure 1, "exhibit components" (objects, media, text information) make up the first factor of an exhibit unit. The second major factor is how the exhibit components are configured (organized or arranged in relation to one another). We described configuration above as it applies to text material; now we will consider the role of configuration for all of the exhibit unit components. Figure 3 provides an analysis of exhibit configuration. In an effective exhibit, objects and media must be organized by exhibit designers in a manner that facilitates rather than interferes with the communication of the educational messages. Of course, aesthetic factors must also play a role in the configuration of these elements. However, what is aesthetically pleasing/displeasing to the designer is not always what is pleasing/displeasing to the audience and vice versa. For example, as many of us have learned during formative evaluation projects, designers are often unhappy with the unfinished look of temporary mock-up labels, while visitors do not seem to share this concern.

For purposes of discussion, relationships among exhibit unit components will be divided into "spatial relationships" and "other types of relationships." Each of these categories are described in more detail below.

Spatial Relationships

Relationship between exhibit space and visitor space. Visitor and exhibit spaces are defined in the following way: visitor space is the area in which the visitor is allowed to move; exhibit space is the area which bounds the exhibit components. In many (if not most) exhibits, the visitor is denied access to the exhibit space by being prevented from either touching or walking into the exhibit. The visitor is restricted to a path and often told not to touch objects. However, in some exhibits visitor and

Figure 3

Exhibit Configuration

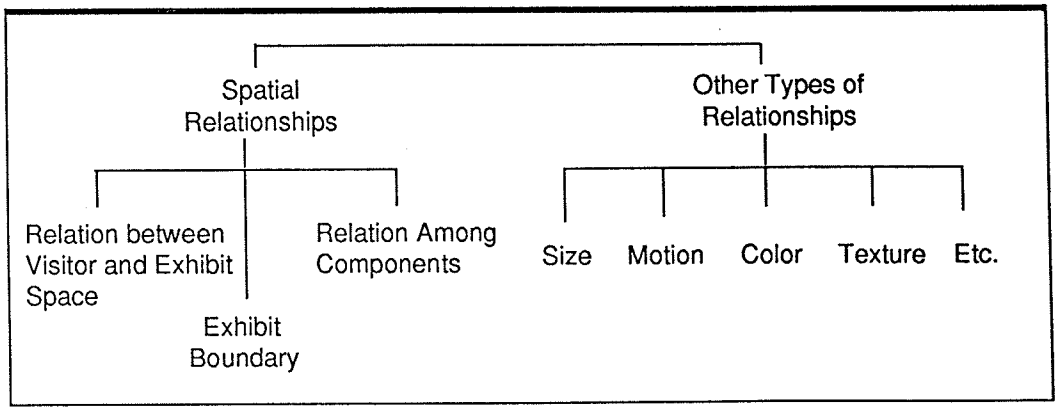


exhibit space may overlap. For example, in a walk-through exhibit, the visitor walks into the exhibit environment and is surrounded by exhibit components (such exhibits are sometimes called "immersion" exhibits). In "hands-on" and interactive exhibits the visitor may be invited to touch and/or manipulate exhibit objects and the communication device (e.g., computer). Exhibits that allow penetration of the exhibit space (either by walking into and/or by touching) seem to generate more prolonged attention (e.g., Bitgood, 1990a; Peers, 1991). Walk-through exhibits may be particularly effective in creating a feeling of "time and place" (Bitgood, 1990a). In addition, "hands-on" exhibits have proven particularly attractive to visitors (e.g., Gottfried, 1979; Koran, Koran, & Longino, 1986).

Relationships among exhibit objects. This includes the relation between primary and secondary (background) objects, the relation of one primary object to another, and the relation among secondary objects. A natural history museum diorama might contain a primary object (e.g., a mounted animal) surrounded by objects which make up the animal's natural habitat (e.g., trees, rocks, water). The goal of the exhibit may not be achieved if the secondary objects overpower the primary objects in some other way. The secondary objects in the case of a diorama may have two functions: (1) affective, i.e., they attempt to provide a more interesting context for the object (e.g., Thompson, 1993); and (2) cognitive, i.e., they try to provide some contextual information (e.g., what the animal's natural habitat is like).

The spatial relationship among primary objects is also important. Miles et al. (1982) have described ways of manipulating spatial relations in order to give emphasis to a particular object. For example, placing one object in front of others can isolate an object from others, or placing an object above others (on a higher plane) may help focus attention on the object.

In some cases, the spatial relationship among secondary objects could be important. For example in a diorama exhibit, the spacing of vegetation might communicate the aridity of the habitat's climate.

Boundary of the exhibit unit. The exhibit unit's boundary defines the size of the exhibit space and marks a transition between one exhibit and another or an exhibit and some other type of space. The boundary is often defined by an exhibit case, or the visitor pathway, or some barrier, or the wall.

Other Types of Relationships Among Components

Other types of relationships among exhibit components in addition to space must be considered. The perceived relative size of one object with respect to other objects and media is important in getting visitor attention. Exhibit designers, when exhibiting a small object, usually scale down the size of the entire exhibit so that the primary object is not lost in its surroundings. The relative size of an object may also communicate what the designer thinks is important. So too with the visitor, a relatively large object may be perceived as being more important than smaller objects. (Data supporting nor refuting this speculation could not be found when the visitor literature was reviewed).

Other comparative relationships among objects and media are likely to influence visitors. Miles et al. (1982) suggest that an object can be given emphasis by placing it with smaller objects, by placing it in front of a distinctive color, by placing it in front of a distinctive shape or texture for background, and by distinctive lighting of the object.

Extra-Exhibit Factors

Designing an effective exhibit is a juggling act. One must constantly balance the influence of the objects, the communication media, the text information, and the configuration of all of the components. In addition to the exhibit unit components and the configuration of these components, there is another set of variables that must be part of this

juggling act – extra-exhibit factors. Figure 4 summarizes the extra-exhibit factors. These factors include social and physical influences not specifically part of the exhibit unit.

Social influences

Both within-group and extra-group influences are important. Social influence within a visitor group will differ considerably depending upon the nature of the group (family, adult, school) and the type of social interaction (e.g., asking questions, giving information, showing how to use an exhibit device, etc.). This point has been documented in many studies of family learning (e.g., Diamond, 1986; Hilke, 1988; Rosenfeld & Turkel, 1982).

Family group influence. There is considerable information from the literature about how family members influence one another. Some examples of the findings include:

(1) Children usually dictate where the group goes, while adults tend to help children focus their attention on the educational messages (e.g., Diamond, 1986).
(2) Children tend to touch and manipulate, adults are more likely to be readers (e.g., Diamond, 1986).
(3) Children and adults maintain a high level of attention to exhibits (e.g., Diamond, 1986)
(4) Children are more likely to model other visitors' behavior than are adults (Koran, et al, 1986).

Adult group influence. We know less about adult group interaction. Studies are needed that apply the methodology of family group research to adult-only groups in order to better understand the processes that operate in such groups.

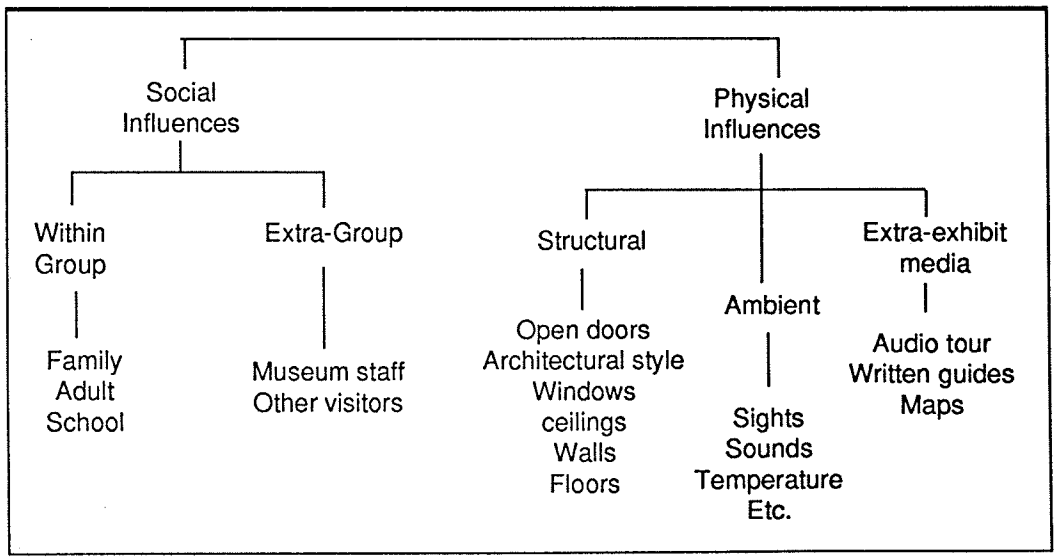
School field trips make up one of the most frequent types of visitation. The school field trip, however, is often very different from the family visit. Research evidence from school groups suggests the following generalizations (among the many that could be made):

(1) Students learn more when pre-visit preparation is given (e.g., Bitgood, 1991).
(2) A structured tour results in more learning, but students enjoy an unstructured tour more (e.g., Stronck, 1983).
(3) In a novel setting, students tend to make fewer cognitive gains, but seem to learn a lot about the setting (e.g., Balling & Falk, 1982; Falk, Martin, & Balling, 1978).
(4) While classroom and museum cognitive outcomes often show little difference, differences in affective outcomes are usually large (e.g., Borun, Flexer, Casey, & Baum, 1983).

Extra-group influences include those from other visitors and facility staff. Other visitors can provide models for "hands-on" use of exhibits (e.g., Koran, Koran, Dierking, & Foster, 1988).

Figure 4

Extra-Exhibit Factors



Physical Influences

Physical influences can be of three types: architectural, ambient, and extra-exhibit media. Structural influences include the mood created by the style of the building, the effects of doors and windows, etc. Some of these effects include:

(1) When other forces are not operating, visitors spend more time viewing right-hand walls of exhibit galleries than left-hand walls (Melton, 1935).
(2) Exit attraction: an open door is an invitation to leave the gallery; visitors tend to leave by the first exit they encounter (Melton, 1972).
(3) Exit gradient: visitors often follow the straightest line between the entrance and a visible open door (e.g., Melton, 1972).

Ambient distractions include the sights and sounds from other exhibit units and other areas of the facility. Ambient factors may also include temperature and other causes of physical sensation. Examples of research findings suggest:

(1) Exhibits on opposite sides of a visitor walkway compete for attention with one another (e.g., Bitgood, et al, 1988).
(2) Distracting sounds often pull visitors away from an exhibit to which they have been attending.
(3) Movement in one exhibit will often divert attention from surrounding exhibit units (e.g., Melton, 1972).
(4) Visitors spend less time viewing outdoor exhibits under aversive weather conditions such as extreme cold, extreme heat, and rain/snow (Bitgood, unpublished).

Extra-exhibit media include museum guides and general orientation information. These media might include an audio tour of the museum or a hand-carried museum guide. Such media are extra-exhibit if they are not associated with a specific exhibit. Unfortunately, only a handful of studies have been conducted on hand-carried communication media (c.f., Bitgood & Davis, 1991).

Where Does the Visitor Fit In?

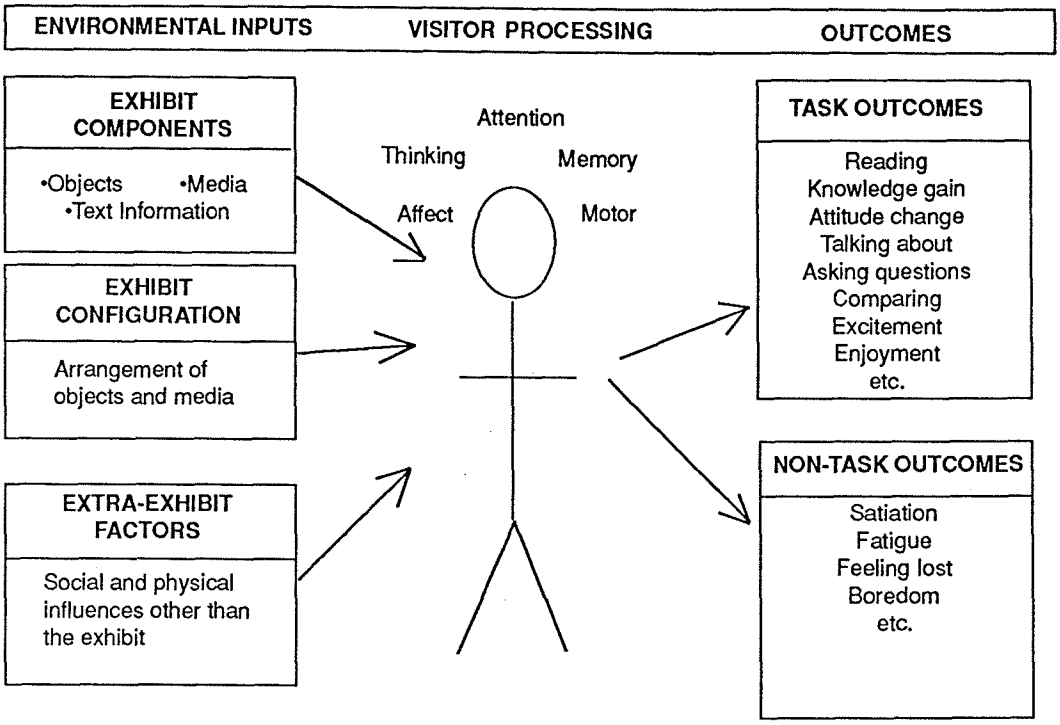
So far, very little has been said about the visitor. We are now ready to deal with the visitor who is, of course, the reason we are analyzing the anatomy of an exhibit. Figure 5 illustrates what happens when the exhibit components (objects, media, text information), the exhibit configuration, and extra-exhibit factors (social and physical influences) are attended to and processed by the visitor. Visitors respond to these exhibit and extra-exhibit influences based on many factors including their prior knowledge, preconceptions, interests, attitudes, physical abilities, etc. People arrive sometimes with little knowledge, sometimes with misconceptions, and sometimes with highly individualized ways of extracting information from an exhibit. Given the overwhelming range of ages, knowledge, cultural backgrounds, interests, attitudes, etc., it is not surprising that many professionals consider educationally effective exhibit design to be a difficult if not impossible endeavor.

Visitor variables can be divided into processing mechanisms (cognitive, affective, and motor) and outcome measures. Broadly conceived, cognitive processes include: attention, thinking, and memory. To a large extent, attention appears to be tied to the physical characteristics of things (e.g., larger objects attract more attention, moving objects attract more attention, etc.). Various types of thinking (e.g., comparing, relating information to previous knowledge, making logical conclusions) are more closely tied to text information. While an object may stimulate thinking in the absence of text information, it is as likely to stimulate affective responses ("Isn't that pretty!"), or it may generate erroneous conclusions. Cognitive memory would include retrieval of facts, concepts, and other types of cogntive information.

Affective processing is more difficult to study. It is often difficult to separate cognitive and affective (e.g., attitudes have both cognitive and affective components). Obviously, people process their experiences emotionally based on past history. A visitor might dislike a science exhibit because it reminds him/her of something that a third grade teacher said. Cognitive understanding of a topic influences affective response (interest, feelings, etc.).

Figure 5

A Summary of the Exhibit-Visitor Analysis



Motor processing is associated with the learning of motor skills. Examples include: using a microscope or telescope, operating a trackball on a computer, playing a Nintendo game, riding a bicycle, playing a musical instrument. Exhibits may fail because visitors do not know how to use a device correctly. For example, Alan Friedman (in Taylor, 1992) described the formative evaluation of a telescope in an astronomy exhibit at the Lawrence Hall of Science. The evaluation found that visitors had less difficulty using an inexpensive, more familiar, spyglass telescope than an expensive, complicated, high-quality one.

Outcome measures can be related or unrelated to the exhibit task. Task-related outcomes are those defined by the educational objectives of the exhibit – cognitive, affective, and motor reactions. Nontask-related outcomes are those independent of the exhibit's goals and objectives; for example, satiation, fatigue, and various types of off-task behavior (e.g., reading a novel, managing children's behavior, etc.).

Visitor variables have received considerable attention in the literature (e.g., Falk & Dierking, 1992). But, there has been disagreement over the importance of various types of outcomes (cognitive, affective, motor). The selection of outcomes for measurement should depend, to a large extent, on the goals and objectives of the exhibit developers. Problems occur when goals and objectives are not explicitly stated. For a detailed discussion of the exhibit development process from the visitor evaluation perspective, see Screven (1990b).

Applying the Exhibit Anatomy Approach

The analysis of the anatomy of an exhibit in this article might be used in several ways. First, it is hoped that an analysis such as is provided here will make it easier for professionals to conceptualize all of the myriad of variables present in the exhibit environment. A logical analysis and orderly conception of the environment should make it easier to keep in mind all of the complexities inherent in the exhibit setting.

A second way this analysis may be useful is to identify needed areas of visitor research. The current analysis reveals many potentially important variables that have received very little study. For example, how differently do adult groups interact in an exhibit setting compared with family groups? It is hoped that identifying some of the neglected areas will stimulate readers to engage in needed research.

Another way to apply the analysis described in this article is to use it to develop a series of summary tables and checklists to be used in the design and/or remediation of exhibits. For example, when label text is being developed, one might refer to a series of tables such as Table 5 on this page.

Research Questions

Shettel, et al. (1968), Koran and Koran (1986), andFalk and Dierking (1992) have been leaders in attempting to provide a framework for studying visitor learning from exhibits. Such a framework allows us to ask better research questions. Some of the questions raised by the current framework include:

(1) How do the characteristics of objects and media interact with the knowledge, interests, attitudes of visitors?
(2) How can exhibit media be used in the most effective way?
(3) What is the optimum way of designing text information.
(4) In what ways does a contextual background affect the visitors?
(5) Do the configurations of exhibit components influence visitors the way designers believe?
(6) How can family, adult, and school visits each be made more effective?
(7) How can exhibit design eliminate or minimize distracting influences?
(8) In what specific ways do exhibit components and extra-exhibit factors interact with visitor input variables?

These questions, although not unique to the current analysis, deserve careful study if we are to achieve our quest for a science of effective exhibition.

Conclusion

While there are many ways to conceptualize the exhibit environment, few have been attempted. The efforts of Shettel, et al. (1968) and Koran and Koran (1986) to formulate a framework for studying visitor learning have generated limited systematic research. This is unfortunate because the anatomy of an exhibit interacts with visitor variables. If exhibit designers are not aware of the myriad complex exhibit factors and how they interact with visitors, ineffective exhibits are likely to result. If visitor researchers are not aware of the many complex interactions between visitor and exhibit factors, they are likely to misinterpret the findings of their visitor studies. It is hoped that the analysis of the exhibit environment suggested in this paper will stimulate more efforts to develop and test frameworks for visitor learning.

Table 5
Physical Characteristics of Text

Characteristics	Guideline
Typeface	Select typeface that is easily read (legible).
Word length	Keep the number of long words at a minimum.
Contrast between letters and background	Use high contrast color combinations
Size of text unit	Keep size of text unit (number of words) at a minimum
Questions for headings	Use of questions for headings increases visitor reading

References

Alt, M. (1979). Audio-visual presentations. *Curator*, 22(2), 85-95.

Balling, J., & Falk, J. (1980). A perspective on field trips: Environmental effects on learning. *Curator*, 23(4), 229-240.

Bitgood, S. (1990a). *The role of simulated immersion in exhibition.* Technical Report No. 90-20. Jacksonville, AL: Center for Social Design.

Bitgood, S. (1990b). The ABCs of label design. In S. Bitgood, A. Benefield, & D. Patterson (Eds.), *Visitor studies: Theory, research, and practice, Volume 3.* Jacksonville, AL: Center for Social Design.

Bitgood, S. (1991a). What do we know about school field trips? *ASTC Newsletter*, January.

Bitgood, S. (1991b). Self-guided handouts in museums and zoos: An annotated bibliography. *Visitor Behavior*, 6(3), 7-10.

Bitgood, S. (1991c). Suggested guidelines for designing interactive exhibits. *Visitor Behavior*, 6(4), 4-11.

Bitgood, S., Benefield, A., & Patterson, D. (1990). The importance of label placement: A neglected factor in exhibit design. In *Current trends in audience research.* Washington, DC: AAM Visitor Research and Evaluation Committee. Pp. 49-52.

Bitgood, S., Conroy, P., Pierce, M., Patterson, D., & Boyd, J. (1989). Evaluation of "Attack & Defense" at the Anniston Museum of Natural History. In *Current trends in audience research and evaluation.* (pp. 1-4). New Orleans, LA: American Association of Museum Evaluation & Research Committee.

Bitgood, S., & Davis, J. (1991). Self-guided handouts in museums and zoos. *Visitor Behavior*, 6(3), 7-10.

Bitgood, S., & Patterson, D. (1993). The effects of gallery changes on visitor behavior. *Environment and Behavior*, in press.

Bitgood, S., Patterson, D., & Benefield, A. (1988). Exhibit design and visitor behavior: Empirical relationships. *Environment and Behavior*, 20(4), 474-491.

Bitgood, S., & Thompson, D. (1992). An integrative approach to visitor learning. Unpublished Working Paper. Jacksonville, AL: Jacksonville State University.

Borun, M., & Miller, M.A. (1980). *What's in a name? A study of the effectiveness of explanatory labels in a science museum.* Washington, DC: Association of Science-Technology Centers.

Borun, M., Flexer, B., Casey, A., & Baum, L. (1983). *Planets and pulleys: Studies of class visits to a science museum.* Washington, DC: Association of Science-Technology Centers.

Diamond, J. (1986). The behavior of family groups in science museums. *Curator*, 29(2), 139-154.

Falk, J., & Dierking, L. (1992). *The museum experience.* Washington, DC: Whalesback Books.

Falk, J., Martin, W., & Balling, J. (1978). The novel field trip phenomena: Adjustment to novel settings interferes with task learning. *Journal of Research in Science Teaching*, 15, 127-134.

Gottfried, J. (1980). Do children learn on school field trips? *Curator*, 23(3), 165-174.

Hilke, D. D. (1988). Strategies for family learning. In S. Bitgood, R. Roper, & A. Benefield (Eds.), *Visitor studies – 1988: Theory, research, and practice.* Jacksonville, AL: Center for Social Design. Pp. 120-134.

Hirchi, K., & Screven, C. G. (1988). Effects of questions on visitor reading behavior: *ILVS Review: A Journal of Visitor Behavior*, 1(1), 50-61.

Kool, R. (1985). The effect of label design on exhibit effectiveness. *Muse*, Summer, 32-37.

Koran, J.J., & Koran, M. L. (1986). A proposed framework for exploring museum education research. *Journal of Museum Education: Roundtable Reports*, 11(1), 12-16.

Koran, J. J., Jr., Koran, M.L., Dierking, L., & Foster, J. (1988). Using modeling to direct attention. *Curator*, 31(1), 36-42.

Koran, J.J., Jr., Koran, M. L., & Foster, J. (1988). Individual differences in learning in informal settings. In S. Bitgood, J. Roper, & A. Benefield (Eds.), *Visitor studies: Theory, research, and practice.* Jacksonville, AL: Center for Social Design. Pp. 66-72.

Koran, J., Koran, M., & Longino, S. (1986). The relationship of age, sex attention, and holding power with two types of science exhibits. *Curator*, 29(3), 227-244.

Melton, A. (1935). *Problems of installation in museums of art.* New Series No. 14. Washington, DC: American Association of Museums.

Melton, A. (1972). Visitor behavior in museums: Some early research in environmental design. *Human Factors*, 14(5), 393-403.

Miles, R. (1989). Audiovisuals, a suitable case for treatment. In S. Bitgood, A. Benefield, & D. Patterson (Eds.), *Visitor Studies: Theory, research, and practice, Vol. 2.* Jacksonville, AL: Center for Social Design. Pp. 245-51.

Miles, R., Alt, M., Gosling, D., Lewis, B., Tout, A. (1982). *The design of educational exhibits.* London: Unwin.

Miles, R., & Tout, A. (1991). Impact of research on the approach to the visiting public at the Natural History Museum, London. *International Journal of Science Education* 13(5), 543-549.

Peart, B. (1984). Impact of exhibit type on knowledge gain, attitudes, and behavior. *Curator*, 27(3), 220-235.

Peers, B. (1991). *Evaluation of the Mammal Hall at the Canadian Museum of Nature.* Unpublished. Ottawa, Ontario: Canadian Museum of Nature.

Rand, J. (1985). Fish stories that hook readers. *AAZPA 1985 Proceedings.* Columbus, OH: American Association of Zoological Parks & Aquariums. (Also available from Center for Social Design, Jacksonville, AL)

Rosenfeld, S., & Turkel, A. (1982). A naturalistic study of visitors at an interpretive mini-zoo. *Curator*, 25(3), 187-212.

Screven, C. G. (1986). Exhibitions and information centers: Some principles and approaches. *Curator*, 29(2), 109-137.

Screven, C. G. (1990a). Computers in exhibit settings. In S. Bitgood, A. Benefield, & D. Patterson (Eds.), *Visitor studies: Theory, research, and practice, Volume 3.* Jacksonville, AL: Center for Social Design.

Screven, C. G. (1990b). Uses of evaluation before, during, and after exhibit design. *ILVS Review: A Journal of Visitor Behavior*, 1(2), 36-66.

Screven, C. G. (1992). Motivating visitors to read labels. *ILVS Review*, 2(2), 183-211.

Serrell, B. (1992). Computers on the exhibit floor. *Curator*, 35(3), 181-189.

Shettel, H., Butcher, M., Cotton, T., Northrup, J., & Slough, D. (1968). *Strategies for determining exhibit effectiveness.* Report for the U.S. Department of Health, Education, and Welfare. Pittsburgh, PA: American Institute for Research.

Stronck, D. (1983). The comparative effects of different museum tours on children's attitudes and learning. *Journal of Research in Science Teaching*, 20(4), 283-290.

Taylor, S. (Ed.) (1992). *Trying it.* Washington, DC: Association of Science-Technology Centers.

Thompson, D. (1993). *Considering the museum visitor: An interactive approach to enironmental design.* Ph. D. Dissertation. University of Wisconsin-Milwaukee. □

Greenglass, D.I. (1986). Learning From Objects in a Museum. *Curator*, 29/1, 53-66.

Summarized by
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According to Greenglass, it has often been hypothesized that people learn in different ways, and that a given individual will be more likely to learn when information is presented in ways which match his or her particular learning style. A study was conducted in order to evaluate whether such a relationship between learning style and information type exists in museums.

For this experiment, the construct of learning style was determined by an individual's cognitive orientation. Cognitive orientation was measured in terms of each person's conceptual level (CL), "a measure of information-processing ability... (which) ranges from a 'low level', at which the person is dependent and unable to generate concepts, to a 'high level', at which the person is independent and capable of generating his/her own concepts." Greenglass suggested that the informational elements of exhibits can in turn be described according to their structure. In high-structure exhibits, the tasks to be completed and the information to be learned are clearly stated, while low-structure exhibits allow the visitor to determine his or her own goals and to participate in free-exploratory activities. It was hypothesized that low-CL visitors would learn more from highly-structured exhibits than from low-structure exhibits, while high-CL visitors would learn more from low-structure exhibits.

Procedure

Subjects were tested to determine their conceptual level, and then were shown a series of historical objects. Each person was then expected to solve certain problems relating to the people who had used those objects, and how they had been used. To simulate low structure exhibition, some subjects were given only an introductory text and a series of questions which they were to answer. For high structure exhibits, other subjects were also given a series of hints to help them determine the answer.

Results and Significance

Results showed that the hypothesis that low-CL individuals would score higher in response to highly structured tasks than for low structure tasks was supported. However, the hypothesis that high-CL subjects would perform better in response to low structure tasks was not supported, as these individuals performed equally well in either condition. It was suggested that these findings indicate that museum exhibits should be highly structured in order to achieve the greatest possible learning from all visitors.