Interaction in the museum: Observing, supporting, learning
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1. Introduction

1.1 The paradox of interactivity

Paul Valéry contends that there is no theory that is not a fragment of an autobiography.² Thus my own interest in museums stems from my work for the past eighteen years, of which much has been for, in, or about museums – often, although by no means exclusively, in museums of science and technology. The following anecdotes serve to illustrate a paradox frequently encountered in all kinds of museums, a paradox that prompted in large measure the work described in this thesis.

At the Palais de la Découverte, where I was attached in 1991 to the Laboratoire Jean Perrin de la muséologie expérimentale (LJP), we conducted an informal piece of research designed to discover the barriers to understanding in the Palais’ salle ‘Eurêka’, an area devoted to interactive exhibits, largely copied from those developed at the San Francisco Exploratorium in the 1970s. This research made extensive use of videotaped observations of exhibits in use, and attempted to gauge their effectiveness, both in terms of their desired use and their ability to convey new information.

In the course of these videotaped observations, it became clear that certain exhibits were designed with specific outcomes in mind. This is consistent with one of the guiding principles of Frank Oppenheimer, founder of the Exploratorium, the first ‘hands-on’ science museum, and an inspiration for many recent science museum professionals. Oppenheimer believed that in traditional museums of science and technology, the visitor was often denied the possibility of seeing real natural phenomena, and instead was given the end products of a scientific process, without having any tools with which to understand the phenomena, and therefore the scientific principles, involved. He therefore encouraged the development of standalone exhibits that allowed the visitor to create certain phenomena, and to explore these phenomena in certain ways. ³

As a consequence, many exhibits built according to this philosophy or borrowed more or less directly from the Exploratorium, have, as a starting point, the eliciting of a particular phenomenon. Thus the label of the ‘hands-on’ exhibit demonstrating the principle of coupled resonance, for instance, asks the visitor to immobilise one of two pendula joined by a spring, and to release the other. ⁴ The free-swinging pendulum then transmits some of its energy to its neighbour by means of the spring,


⁴ In the Exploratorium Cookbook II pp. 186
causing it to swing in turn, finally damping the motion of the neighbouring pendulum. The exhibit, when successfully used, can be intriguing, and this phenomenon can then be used to explain and illustrate important scientific principles such as resonance, frequency and the transfer of energy. However, the exhibit frustrates any attempts on the part of visitors at turning it to other uses, and is quickly abandoned by visitors whose interest in pendula and frequencies is minimal. Generally, when an exhibit proves to be uninteresting — when the instructions do not explain how to elicit the phenomenon, the phenomena difficult or time-consuming to elicit, or less than spectacular when finally evinced — the visitor is likely to move quickly to the next exhibit, often without stopping to reflect upon the reasons for the unsuccessful experience.

Nevertheless, one of the encounters we videotaped at the Palais shows clearly a young boy of about seven years old, having looked at and apparently read the exhibit label, spending the better part of ten minutes attempting to turn the Coupled Pendula exhibit to his own use. From his manipulation, it was clear that the phenomenon of coupled pendula and resonance was not of compelling interest. Instead, he carefully attempted, by means of methodical and repeated attempts, to discover how to make both pendula swing at the same rate. Moreover, the fact that he persisted in his attempts for nearly ten minutes suggests that he had a question in mind that was sufficiently important to warrant the investment of considerable time.

Many museums were attracted to Frank Oppenheimer’s approach, but it was not long before they noted the weaknesses of the type of exhibit described above. Partly as a consequence, emphasis was placed on exhibits that encouraged ‘open-ended’ exploration of phenomena. Soap bubble exhibits are a common example of an open-ended exhibit. This exhibit exists in many forms, but all of them let visitors explore the properties of thin soap films. In the exhibit at the former NINT (Netherlands Instituut voor Nijverheid en Techniek) for example, visitors stand on a platform in a shallow pool of detergent solution and use a metal hoop to create a soap bubble around them. Visitor behaviour with bubbles is strikingly similar, regardless of time of day or background of the visitor. Each member of the family will take a turn playing with the bubbles until they have exhausted the inherent novelty of the activity, then pass on to other exhibits. In soap bubble exhibits at other institutions, visitors use differently-shaped wire forms to create bubbles of different configurations, or create large sheets of detergent film with wands. No matter where one encounters play with bubbles, one encounters the limits of open-ended experiences. Without further external incentives, visitor interest collapses. Even in the rare cases where
activity continues, it is unclear what the overall value of the learning experience, a critique made tellingly by Michael Shortland in a landmark article in Nature.\textsuperscript{7}

An exhibit which stands in stark contrast to the two exhibits described above is the Puzzle Table. In 1987 Drew Ann Wake conducted an experiment at the Ontario Science Centre that looked at the way visitors at a science centre approached the solving of topological puzzles.\textsuperscript{8} The exhibit provided a table with various wooden puzzles, a place to sit, in a quiet space that was away from active exhibit areas. To her surprise, she discovered that visitors were inclined to spend long periods of time concentrating on how to solve the puzzles. Moreover, the experience was intensely social, and visitors repeatedly made suggestions to one another in an attempt to solve the puzzles. Moreover, it became clear that people were attempting to solve the puzzles by building three-dimensional intellectual models and then testing them. The finding that puzzle tables generate a different kind of behaviour than other kinds of exhibits found in science museums and science centres has been corroborated in several institutions.\textsuperscript{9}

Traditional science and technology museums are generally considered to be unsupportive institutions, certainly when compared to ‘hands-on’ science centres described above.\textsuperscript{10} The Centre national des arts et métiers (CNAM) in Paris is France’s oldest technology museum, and has been the repository of France’s technological heritage since the late 18th century. In 1993 the museum opened its collections to nocturnal visits, prior to their closure to renovate their vast collection. As part of a theatrical presentation in which the spirits of former French inventors came to the darkened museum to explain France’s technological legacy, visitors were encouraged to explore the collections with the aid of small electric torches. Objects in glass vitrines, mute and ignored in daylight, were the object of close examination by visitors armed with a means of seeking out and examining what was of personal interest to them. Here a very simple object, the flashlight, became a powerful support, and gave visitors the means, in part, to unlocking the secrets of an otherwise quite resistant stronghold. The flashlight supports the visitor in making a decision about what is of interest to them, and, in the darkness, provides a tool for examining objects more closely.

If we consider the examples above they reveal a compelling paradox. The first example is to all intents and purposes an ‘interactive’ exhibit. The visitor is in principle more ‘active’ when engaging with the exhibit on resonance than with the objects behind the glass cases of the Arts et Métiers. The visitor uses his hands to hold the...
pendulum, and chooses the rate at which it swings. Nevertheless, the exhibit actually limits the visitor’s activity, and resists attempts on the visitor’s part to turn it towards his own ends. There is only one ‘correct’ way to make the exhibit work, and once correctly manipulated, the exhibit elicits only a single phenomenon. The museum had decided, long before the visitor arrived, that the visitor should be interested in resonance, and more importantly, how the visitor must be interested. The degree to which a visitor can be stymied in his investigation by the constraints imposed by the label, the extent to which the ‘interactive’, ‘hands-on’ exhibit did not support his activity, and in fact frustrated his questioning, is indicative of the weakness of our assumptions about the a priori effectiveness of these kinds of support. For this young visitor, despite its ‘interactivity’, the museum was not a supportive environment. Frank Oppenheimer often said the visitor cannot ‘fail’ the museum. However, by discouraging visitors from the use of their own intelligence and competence, by demanding that they conform to pre-existing norms, the museum often fails the visitor.

The second example shows a different kind of failure. In providing too many possibilities and too few constraints, the visitor is left to create new activities from scratch. With no indications of how to structure their activities around the bubbles, visitors quickly exhaust the possible outcomes of the exhibit, and walk away, leaving many others unexplored. In the absence of implicit rules or outcomes, the experience does not become self-structuring, and the visitor experiences a certain helplessness after having explored the experience as best she can. The experience is too open-ended, too unstructured, to engage visitors and reward them for an investment of time. In the case of soap bubbles, a great deal of possible variety is left unexploited due to a lack of constraints, and the overall experience for the visitor, beyond an undeniable delight in the bubble play, is confused and incoherent. In certain key respects, real interaction with the exhibit has not happened at all.

Puzzle solving is difficult intellectual work, and requires a large investment of time. The activity itself is not dramatic or beautiful, and the solution often visually no more interesting than the problem. Many exhibit designers would consider this unacceptable, and would argue against developing anything so ordinary and uninteresting as oddly-shaped blocks of wood, or rings of metal. The third example shows how an exhibit’s implicit ‘rules’ can structure visitor behaviour, and encourage the investment of a considerable amount of time and intellectual energy. The very suggestion that there is a question and that finding the solution is a challenge seems to elicit visitor activity. Moreover, when grouped together, puzzle exhibits encourage
social behaviour and sharing information, both skills in themselves. The final example shows an activity whose constraints support the visitor's experience. There are no preconditions to participation in the nocturnal visit to the museum save that of purchasing a ticket. The 'story' recounted to the visitors as the structure of the visit (which is, in effect, the label) is open to all listeners, and, once armed with flashlights, the experience is open to all visitors regardless of background or previous knowledge. The museum provides a rich context of information and interpretation, which can be explored according to the visitor's tastes. Textual information is available if desired, as are exhibits and artefacts. The visitor determines the speed at which and the order in which the material is discovered. The support of the flashlight allows the visitor to select areas of interest with a beam of light, uninteresting elements staying shrouded in darkness. While the 'object' of the experience is not predetermined, by constraining the experience by means of the label, the visitor can increase his competence without recourse to expert evaluation.

The paradox of the above examples consists of the observation that neither the degree of physical interactivity, nor the number of possible outcomes, guarantees a successful museum experience. In fact, on the contrary, the exhibits in which visitors were prepared to invest the greatest amount of time and energy were often those that were the most severely constrained. This paradox presented me with a challenge that was to fuel my work for the next seven years. It also presented me with a problem: how could we begin to create environments in which the user was consistently supported? How could we identify the approaches that would make the museum setting into an effective support system? In short, a new theory of the museum, or at least for the museum, seemed to be called for.

1.2 The parameters of this study

For years, museum professionals have struggled with the challenge of making better exhibitions, and much time and effort has been spent developing guidelines for exhibition planners – how to write readable texts, how to make text panels readable, how to light readable text panels. Much of this literature has been aimed at improving the physical conditions under which information is presented – and received by the museum visitor. Accordingly, for the purpose of this study, we will assume that the physical conditions for the use of the label to be ideal, or that at least they can be optimised by means of good writing, effective design, and careful implementation.
The label can also be analysed in terms of how it helps to support and shape the visitor's intellectual experience in the museum. Most discussions about museum strategies, both within and outside the museum, have concerned strategies employed to directly shape the content of the label. What is the storyline? Should there be a historical parcours? What themes should be described? What is the information content of the exhibition, its communications goals? There is already a large literature on such structuring, and as a consequence these strategies will be given only a cursory examination in this study. Other kinds of structuring, aimed at conferring certain properties on to the visitor, have been largely ignored by museum professionals, and there is little literature about the ways in which strategies aimed at conveying information about an object, a subject, a period etc., are used, shaped, and constrained by other considerations. What assumptions does the storyline convey? What does telling a history tell the visitor? What rules shape the writing of the text, with what purpose? Only when these kinds of structuring are taken into account, do we begin to have a powerful tool for studying the way the museum label works, and how it might be improved.

1.3 The design of the study
This study is divided into three parts.
In the first part, Section 2., a problem is identified, and a research model is proposed. Several key concepts are introduced to provide a vocabulary for the study – support system, label, user-language. A theory is proposed in which the museum setting is studied, labels and their user-languages identified, and the properties conferred by the user-language examined. Improvement in the museum setting, it is argued, lies in better understanding how and when to use specific user-languages.

The second part, looks at the label in the museum setting, and is divided into three distinct parts. Section 3.1 looks at the user-languages most commonly employed in the museum, and examines several examples of current museum practice. Section 3.2 looks at three exhibitions that were developed employing user-languages less commonly found in museums, and examines in detail the effect of these exhibitions on user behaviour. Section 4. looks at the consequences of using the theory developed in this study to create an entire institution – newMetropolis in Amsterdam.

The third and final part, Sections 5. and 6. summarises the results of the research, and evaluates the effectiveness and usefulness of the theory developed in this study. Finally, several possibilities for further research are briefly examined.