MAKING SENSE

MULTISENSORY INTERPRETATION AND THE VISITOR EXPERIENCE

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Illustration: after René Magritte, *The White Race*

Abstract

This study examines the effect of addressing other senses, principally hearing and smell, in the visually-dominated discipline of interpretation. With the current emphasis on education in museums and heritage sites, it explores the traditional word-based bias of notions of learning. It contrasts these with the views of educational and museum specialists who highlight the value of concrete experience, and reviews studies showing that addressing more than one sense can improve comprehension and recall. However, it finds no basis for frequently-quoted tables suggesting that recall can be drastically improved merely by changing the way in which information is presented.

An assessment of an exhibit created for a fragrance company shows that it encourages active engagement and thoughtful consideration of smells, to which we often give little direct attention. A survey of visitors to the Imperial War Museum's Trench Experience examines their reactions to the smell used in the exhibit. The results indicate that the smell is overwhelmingly regarded as adding to the visitor's experience of the exhibit and aiding their understanding of the subject matter. Those who find the smell unpleasant are shown to regard it as more realistic, and as making the exhibit more memorable and worthy of a repeat visit, than those who do not.

An observation of visitors using audio guides at the National Gallery finds that on average they spend much longer at a painting than visitors without them, and that their movements tend to be governed by the length of the commentary. There is a suggestion that the time spent reading the label governs the movements of visitors without audio guides. Recommendations are made for changes to audio guides to give visitors more choice and control over the information they receive. A group discussion with other students on the course shows that audio guides are preferred to guide books, but that flexibility, control and clear instructions are very important. Audio guides are seen as particularly valuable in helping build mental recreations of ruined sites.

Finally, a study of modifications to a museum gallery, which introduced multisensory elements, is reviewed. This shows that, without replacing the original exhibits, visitor time in the gallery is dramatically increased, previously unpopular exhibits gain new attractiveness, and visitors learn more information. Some of this learning is shown to come from non-verbal sources. It is concluded that multisensory interpretation can substantially enhance the visitor experience, but that multisensory elements must be relevant and based on sound research.

Contents

Introduction **4**
Methodology **8**
Literature Review 8
Reactions to a Smelly Exhibit – The Trench Experience at the Imperial War Museum 9
Audio Interpretation of a Visual Exhibit – an Observation Study 12
Audio Interpretation – a Group Discussion 14
Learning Theory, Psychology and the Senses **15**
Smell and Memory 18
The Cone of Experience 19
Figure 1 – Dale's Cone of Experience 19
Figure 2 – a variation of the Cone from the internet, incorporating retention statistics 19
Conclusion 22
Interpreting Smells – a case study **23**
Figure 3 – The Quest Exploratorium 23
Figure 4 – How Quest's *Lignes de Force* system would represent a feminine fragrance such as Chanel No 5 25
Figure 5 – Exploration One of the Quest Exploratorium 26
Reactions to a Smelly Exhibit – The Trench Experience at the Imperial War Museum **27**
Results 27
Discussion 28
Conclusion 30
Audio Interpretation of a Visual Exhibit – an Observation Study **32**
Results 33
Average times and percentages 34
Chart 1 – Visitor numbers plotted against time spent with painting 35
Discussion 35
Chart 2 – The expected general shape of visitor number curves against time 35
Chart 3 – *The Fighting Temeraire* – visitor timings sorted by overall time with painting 36
Chart 4 – *Whistlejacket* – visitor timings sorted by overall time with painting 36
Chart 5 – Overall time as a function of time spent reading 38
Recommendations 39
Figure 6 – Sample of proposed Audio Guide display 40
Conclusion 40
Audio Interpretation – a Group Discussion **42**
Guide Books 42
Audio Guides 42
Guided Tours 44
Conclusion 44
Multisensory Interpretation at Work – the New England Lifezones Study **45**
Conclusion **48**
Appendix A – Trench Experience Survey Results **50**
Appendix B – Observation Timings and Notes **52**
References **54**
Bibliography 54
Webography 56
Contacts 57
Discussion Group Participants 57
Illustration Sources 57
Index **58**

Introduction

We live in a highly visual culture. We are constantly surrounded by symbols, images and words – on signs, giving instructions; on hoarding, selling products; on notice boards and in exhibitions, giving information. Even the telephone, which once carried only speech, now transmits text and pictures as faxes, emails and web pages. Most people have at some time played the game of imagining that they had to lose one of their senses, and thought about which one they could most easily live without. It's a safe bet that vision almost always lies at the bottom of the list. It is not surprising, then, that visual sense dominates in the heritage industry, just as it does in society at large. Even the language we use is visually biased – the word exhibition is defined by the Chambers Dictionary as 'presentation to view; display;… a public show' (Schwarz, 1993: 590). Children are taken to 'see' the dinosaurs at the Natural History Museum – we go for 'a look round' a garden – both in spite of the fact that other senses are brought into play – as much as they are allowed to be. This is something of which Marista Leishman, former head of education at the National Trust for Scotland, is only too well aware:

> 'After all, culturally we are programmed to seeing at the expense of touching and feeling and smelling. This emphasis is no new thing, for it is to be found rooted deeply in everyday language. 'Oh, I see', we say when comprehension breaks. When we promise 'to take a look at' that situation, we are not necessarily expecting to scrutinise a topographical arrangement… But this suggests, in a misleading way, that seeing is the complete experience and in the Historic House we have to do an awful lot of seeing things which were not meant to be looked at exclusively… And so we look, stare, are partially informed, nudged by boredom [and] questioned by perplexity… And no touching. (Leishman, 1987: 96-7)

Part of the problem that Leishman identifies stems from our cultural assumptions about learning and information. When a parent asks their child 'What did you learn at school today?', they expect to hear facts – dates, names, and so on. A reply such as 'I learnt what deer smell like' or 'I learnt how whalesong sounds' doesn't fit the picture (a visual metaphor again) of 'learning' as we understand it. Nonetheless, information has been acquired and retained. Significantly, these are things than can only be acquired by direct experience – although they can be captured as perfumes or recordings, they cannot adequately be represented

except as smells or sounds. Yet although psychologists and neuroscientists speak of 'sense data', we are culturally programmed to regard 'information' as something that comes in the form of words, images or pictures.

Such attitudes have historically influenced the designers of museums, exhibitions and interpretive provision for heritage sites. Some exhibitions are so wordy that they have given rise to the phrase 'book on the wall', while books themselves can often be more of a challenge than an aid in exploring heritage sites. The guide books produced by the National Trust, in particular, could hardly be less congenially designed for the visitor who wants that extra information and enlightenment that will enhance their visit. After wading through chapters of background material about the building, the architect and the family, they eventually come to a section entitled 'Tour of the House'. Here, paragraphs of academic description and catalogue-style lists of furniture and paintings will leave them in no doubt about the precise date and geographical origin (often even the original cost) of the items in front of them, without giving the slightest idea of why they are significant or interesting (National Trust, 1993: 48-69).

But interpretation doesn't have to be like this. Indeed, some might argue that this is not interpretation at all. Returning to first principles, Freeman Tilden's definition of interpretation is notably free of that cultural bias towards the visual:

> 'An educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to convey factual information.' (Tilden, 1977: 8)

Perhaps the most significant aspect of this definition is that it does not draw a distinction between interpretation and objects – they are all part of the same activity. The phrase 'through the use of original objects [and] by firsthand experience' places concrete experience at the heart of the interpretive process, and yet that process is described as educational. The implication is clear – a label or book cannot in itself be interpretive – it only becomes so when it is combined with the object or place to which it relates. This returns us to those neglected items of learning – the smell of deer and the sound of whalesong – that can only be apprehended by the firsthand experience of which Tilden speaks. This need

for direct experience finds echoes in aspects of learning theory that will be discussed later.

Nonetheless, the visual sense, and in particular the written word, continue to dominate the field of interpretation. The writers of one of the most significant studies of multisensory interpretation sum up the problem perfectly: 'As educators and exhibit designers, we are conditioned to believe that conscious acquisition of information by visitors comes from written information' (Davidson, Heald & Hein, 1994: 193). Perhaps because of this, many museums and heritage sites have been slow to adopt ideas and methods from communication studies that can broaden the appeal and accessibility of their material (Hooper-Greenhill, 1994 a: 14). Learning theory, too, has had a hard time making an impression on the heritage industry – 'there appears to have been little thought given, in Britain, to how learning theory might improve exhibitions' (Hooper-Greenhill, 1994 b: 7). Nonetheless, the need for concrete experience of objects, in all it sensory richness, was apparent to Marista Leishman (1987: *passim*), while David Anderson (1997: 3) emphasises the variety of learning styles and preferred sensory modes that are now widely recognised thanks to the work of writers such as Howard Gardner. Ann Rayner, in *Access in Mind*, goes further, stating bluntly that 'if access is to be for all, the messages must be expressed simply and directly through more than one sensory channel' (Rayner, 1998: 43).

Clearly, then, there is a growing awareness of the role the neglected senses can play in interpretation. While in many ways museums and heritage sites are the ideal venues for multisensory learning (Anderson, 1997: 5), accommodating this range of experiences and modes of learning is a complicated business. Yet writers on exhibition design such as David Dean, while acknowledging the value of other senses (1994: 27 & 31), give little or no concrete advice outside the realm of the visual. With the exception of touch, multisensory approaches are likely to involve technology to a lesser or greater extent, even if it is just the installation of a cassette player and speakers. This demands specialist knowledge and expertise. Because of this, and the costs involved in executing such things well, heritage sites are often trailing behind commercial organisations that have already capitalised on the popular appeal of the 'experience' – most notably, of course,

Disney. This has led to criticism from those who assume that such approaches are there to mask a lack of content. Robert Hewison, for example, likens the Jorvik Viking Centre to a 'funfair ghost ride' and is scornful of its heritage odours (Hewison, 1987: 84). Peter Fowler, however, rebuts the criticisms, pointing out the solidity of the research that underlies it – research that is absent from some of its imitators (Fowler, 1992: 116-7).

So, smells, sounds and the other trappings of the 'experience' do not necessarily imply the absence of content. Do they, however, do anything more than make the exhibition or heritage site more superficially appealing? Can they actively assist the museum in its educational objectives by aiding learning, or are they merely distractions from the written information that is traditionally held to be the source of real learning? This study sets out to answer these questions through a combination of literature review in the fields of learning theory, psychology and exhibition design, and primary research at heritage sites employing sound and smell as part of their interpretation.

Methodology

This study concerns itself primarily with the senses of hearing and smell. The sense of touch, while still subordinate to vision, is relatively well established in a considerable number of museums and heritage sites, through handling collections and special exhibitions. This fact is in itself evidence that the need for direct sensory experience is recognised in the industry and that provision is being made to meet it. As might be expected, touch is likewise well represented in museum literature (e.g. Leishman, 1987 and several essays in both Durbin, 1996 and Fondation de France and ICOM, 1991). The sense of taste will not be considered as it is used very little in interpretation (certainly in this country) largely owing to health and safety considerations. Sounds and smells are considered here on the basis that they are deliberately added to an exhibit or heritage site, rather than being an intrinsic feature of the thing on display, as would be the case with, say, steam trains or animals. This is not to say that exhibits that are inherently multisensory are any less effective or interesting than those that have these elements added. Indeed, the opposite may be true. A visit to a working whisky distillery is full of sensations – the smell of the steeping mash and the fermenting wash; the heat of the still room; the sound of the steam in the condenser – even the taste of the dram at the end. At a redundant distillery such as Historic Scotland's Dallas Dhu, these things are absent. They could be simulated, but it is unlikely that the impression would be as vivid as the real thing. The distinction is made here simply because it makes the multisensory aspects easier to identify and consider in their own right.

Literature Review

Extensive use of the World Wide Web has been made in finding research material for the literature review aspects of this study. As universities were amongst the earliest groups to make use of the internet, there is a large body of material available across a broad range of subjects. Most of the academic work published in this way conforms to expected standards in terms of the citing of references and the provision of a detailed bibliography, but material which originates outside a university environment is less likely to do so. This means that web search engines often locate material which, while offering a tantalising lead in the investigation of a particular topic, makes it difficult to trace ideas back to their original source. (This problem is not unique to the internet – by no means

everything published in books or periodicals adopts academic standards of citation.)

An electronic 'paperchase' was undertaken to find the source of the table of retention statistics discussed in the chapter on learning theory. This is widely quoted in discussions of interpretive media, and a Web search revealed many references to it on the internet. Some of these cited its origin as Dale (1969), but this proved not to give any figures for retention. Many web sites and publications cite other sources for the table which are themselves clearly secondary[1]. With the volume of references generated by a search of this kind it becomes unfeasible to check those which appear to be secondary in the hope that they might cite an authoritative origin for the claims.

The reference to Dale (1969) did provide material which proved valuable to the study as a whole. The concept of the 'Cone of Experience', discussed below, finds later echoes in the work of writers such as Howard Gardner and Eilean Hooper-Greenhill. It is unlikely that the research for this study would have encompassed this without the use of the internet. Searching for references to Dale's work led ultimately to Spencer (1991), which provided the only direct link to an early, published version of the list of retention statistics. Spencer's book proved hard to come by, and was eventually accessed at the British Library. Only after this did it come to light that the relevant chapter is available – in its entirety – on the internet[2].

Reactions to a Smelly Exhibit – The Trench Experience at the Imperial War Museum

This part of the study was intended to investigate visitors' reactions to an exhibit with a very prominent smell. The Trench Experience at the Imperial War Museum was chosen as it features an acrid blend of smells intended to help convey the horror of the First World War trenches. Although there are specific

[1] For example, Rayner (1998: 44) cites Veverka, J, (1994) *Interpretive Master Planning*, Montana, Falcon Press. Veverka also includes the table on his web site (*www.heritageinterp.com/interpre2.htm*), but gives no source. He was contacted by email and replied that the information had come from Lewis, B (1980) *Interpreting for Park Visitors*, Acorn Press. Veverka says that Lewis in turn cites his source as the National Park Service Methods Training Manual. As it is unlikely that the U.S. National Park Service has conducted primary research into learning and retention, it is almost certain that this, too, is a secondary source.

[2] *www.hull.ac.uk/php/edskas/edtech/c5.pdf*

odours to accompany individual tableaux, such as the smell of cooking bacon, the overall odour is a sweet, acrid smell which is hard to place. While it clearly contains odours related to burning materials, the smell is not 'like' anything that most people will have encountered.

Little material has been found examining visitors' reactions to the use of smell in exhibits. The Design and Production Office at the Imperial War Museum says that they have not conducted any specific evaluation of the Trench Experience, although their regular MORI visitor surveys often produce positive feedback about the exhibit as a whole. Given the lack of prior knowledge in this area, it was decided to conduct a very simple questionnaire survey with the aim of addressing three basic questions:

- Does the smell help the exhibit achieve its purpose?
- How do visitors react to the smell itself?
- How does the smell affect the way that visitors will think about the exhibit afterwards?

A questionnaire was drafted and submitted to the Imperial War Museum for their approval. Subsequently, following discussion with Julie Humphreys of the Department of Sociology at St Mary's, slight changes were made. Chief among these was the redrafting of the questions in the form of statements, with which respondents were asked to agree or disagree, or say if they could not decide. The statements were as follows:

1. The smell added to my experience of the exhibit.
2. The smell helped me to understand what life was like in the First World War Trenches.
3. The smell made me want to leave the exhibit.
4. The smell was realistic.
5. The smell was irrelevant.
6. The smell was unpleasant.
7. The smell made it more likely that I will remember the exhibit.
8. The smell made it more likely that I will talk about the exhibit.
9. The smell made it more likely that I will want to revisit the exhibit.
10. The smell made it more likely that I will tell others to visit the exhibit.

Respondents were also asked to look at a card listing three broad age groups, and say in which one they belonged. The age groups were *Under 25*, *25 to 50* and *Over 50*. The interviewer recorded the respondents' gender. The recording of age and gender was suggested by Julie Humphreys as variations in the responses might indicate some underlying differences of attitude or preference.

The interviews were carried out on Wednesday 4 August 1999 between 10am and 5pm. One hundred respondents were interviewed, some of which were in couples or groups. It was noted that there was a slight tendency for people interviewed in a couple or group to follow the answers given by their companions, although it was very rare for them to agree on every statement. Without conducting specific research on this point, it is impossible to tell to what extent respondents were being influenced by what a companion has said, or how much the similarity of their answers was affected by things such as personal taste, background, discussion while in the exhibit, etc. Given the time and resources, it might be better to always interview respondents individually to avoid any possible influence. However, the interviewer made it clear that responses from each individual were desired, and respondents did not debate their answers with their companions.

The original questionnaire featured a list of adjectives from which respondents would have been asked to choose those that they felt applied to the exhibit. These were: *accurate*; *artificial*; *inaccurate*; *irrelevant*; *pleasant*; *realistic*; *relevant* and *unpleasant*. In revising the questionnaire, this list was abandoned in favour of statements 4, 5 and 6: 'The smell was realistic', '…irrelevant' and '…unpleasant'. The selection of these three adjectives from the original list was perhaps not thought through carefully enough. Many respondents said they could neither agree nor disagree with the '…realistic' statement because they had no knowledge of the smell of the real trenches. 'Artificial' would have been a better choice as it would have encouraged respondents to think about whether they felt the smell was manufactured rather than something that might have been encountered in the real world. The originally proposed technique, showing a written list of adjectives, perhaps also has merit as it allows the respondent to choose only those that immediately present themselves as appropriate.

Hein (1998: 117) states that questionnaires become less reliable when people are asked about feelings or opinions as opposed to facts, and about the past or the future as opposed to the present. As statements 1 to 6 relate generally to feelings, and statements 7 to 10 relate to future actions, reliability could be in question. However, as the intention of the survey was to explore these feelings, this is hard to avoid. Conducting more thorough research into the effect of the smell would require controlled experiments assessing visitors' reactions to the exhibit both with and without the smell, and asking specific questions to test recall – these are beyond the scope and resources of this study. One possible way of assessing reliability would be to rephrase the statements to mean the opposite of what they currently say, and examine whether there was a switch from agreeing to disagreeing. This would help to address the phenomenon of 'acquiescence' (Oppenheim, 1966: 117), where respondents sometimes show a tendency to agree with a statement regardless of context. As it is, the results show such high levels of agreement with statements 1 and 2 that it seems entirely reasonable to draw conclusions based on the survey as it was administered.

Audio Interpretation of a Visual Exhibit – an Observation Study

This part of the study set out to examine how the use of an audio guide altered the behaviour of visitors to an art gallery, compared to the use of standard text labels. As it did not aim to examine visitors' attitudes or assess what they had gained from the exhibit, it was decided that simple observation would generate the required data. This took place at the National Gallery in London on Wednesday 7 July 1999. The observer was in room 34 of the gallery between approximately 11am and 2pm and again from 3pm to 5pm. The observer was visible to the visitors, but almost no one paid any attention to his presence.

Observation was made of the amount of time visitors spent in front of one of two paintings – *The Fighting Temeraire Tugged to Her Last Berth to be Broken Up* by JMW Turner and *Whistlejacket* by George Stubbs. To gain consistent timings, certain criteria were established on the day to determine the points at which timing would be started and stopped. For audio guide users, timing was started when they were seen to finish programming the item number into the player unit. As the decision to programme the audio guide can be seen as a definite decision to

learn about the particular painting, a similar sign of 'commitment' was looked for in visitors not using audio guides. This was defined as a definite stop in the visitor's movement through the gallery, often accompanied by a turn towards the painting or a movement towards the accompanying label. In both cases, timing was stopped when the visitor moved on or their attention was seen to have firmly transferred to another subject. Visitors who spent less than 15 seconds with a painting were disregarded. Otherwise, the only criterion for selection was that a visitor was seen to be approaching a painting when the observer was not already timing someone else. No timings were disregarded because something was observed to affect a visitor's behaviour (see the note on page 54). For both groups of visitors, the timings collected do not represent the total time for which their attention was on the painting – visitors often look at a painting as they approach it, and their attention may briefly transfer to other subjects while they are stood in front of a particular work.

No distinction was made between visitors without audio guides and those with guides who did not use them for the painting in question. For visitors not using audio guides, separate timings were taken for the periods where their attention was mostly on the painting and those when it was mostly on the label (a stopwatch with a split time function was used for this). The word 'mostly' is used as the majority of visitors would glance briefly at the painting while reading the label, and vice versa. For visitors with audio guides, only an overall timing was taken. While some audio guide users were observed to look at the label (other than to read the number to program the player), this was almost invariably brief and not significant compared to their overall time at the painting. Where two or three people looked at a painting together, timings were based on one member of the group and treated as a single measurement.

As well as taking timings, the observer made notes of movements made by the visitors while they were engaging with a painting. This provided useful information suggesting that the content of the interpretation for *The Fighting Temeraire* was encouraging 'active looking'. Although the choice of the two paintings was arbitrary, they proved to yield significant differences in visitor behaviour, as discussed in the relevant chapter.

This observation differs from many of those discussed in works on visitor studies as it does not set out to establish overall patterns of visitor behaviour, but rather to examine differences in behaviour in two distinct circumstances. As such it is similar to some of Arthur Melton's studies of time devoted to individual objects (Hein, 1998: 47), but it does not follow Melton's approach of only considering single visitors and excluding groups (*ibid*). While this may be a weakness, a consideration of how audio guides affect the social aspect of gallery visiting was an important aspect of this study, and could not have been included without consideration of couples and groups. If there is a serious weakness, it is that the sample size is small (99 visitors as opposed to the nearly 2,000 in some of Melton's studies (*op cit*: 49). However, the general effect of the use of an audio guide is clearly shown even by this sample.

Audio Interpretation – a Group Discussion

To examine further the issues surrounding audio interpretation and its effect on the visitor experience, a group discussion was held with five other students from the St Mary's MA course. This element had originally been proposed as a survey of visitors at a site employing guide books, audio guides and guided tours, to gain visitors' perceptions of their various strengths and weaknesses. This approach was rejected as it was felt that the subject required more in-depth, qualitative consideration than a survey would allow. Also, a survey at a particular site would only reveal aspects of the interpretation at that site, rather than of the media in general. Students on the Heritage Interpretation course were considered valuable subjects for the discussion as they have considerable experience of interpretive methods, but have not had professional involvement in interpretive provision that might give them a vested interest in any particular medium. The author directed the discussion by posing questions and ensuring that all members of the group took part, but did not join the discussion or offer direct opinions. The names of the students taking part are included in the references.

Learning Theory, Psychology and the Senses

Learning theory is not a precise science. It cannot offer a simple prescription that says 'Do A, B and C and people will learn X, Y and Z'. The variety of personal aptitudes identified by writers like Howard Gardner (1983) means that what is effective for one learner will of necessity make little impression on another. While teachers in a conventional classroom situation get to know their individual students and can plan for them accordingly, the provider of interpretation has no such luxury, as Eilean Hooper-Greenhill acknowledges in *Learning from learning theory in museums*: 'There are many different audiences, and we know none of them as individuals. Nevertheless, they are all individuals, with their own specific needs, interests and approaches to the world' (Hooper-Greenhill, 1994 b: 10). Here, learning theory can help by offering generalised ideas of good practice based on observation, solid research and simple common sense. These ideas can help create interpretation that will be more effective for more of those that use it – but how much more effective?

There is a widely quoted list that seems to offer a Holy Grail of learning to anyone concerned with educational provision. It runs along the following lines:

In general, people will remember:

- *10% of what they hear*
- *30% of what they read*
- *50% of what they see*
- *90% of what they do*

(Rayner, 1998: 44. It is also used in teaching by Andrew Robertshaw of *History Re-enactment Workshop*.)

A more common variation goes as follows:

People generally remember:

- *10% of what they read*
- *20% of what they hear*
- *30% of what they see*
- *50% of what they hear and see*
- *70% of what they say and write*
- *90% of what they say as they do something*

(A list of some of the Web sites quoting this table is included in the references. Several of these refer to Dale (1969).)

The appeal of this list is easy to understand. According to the second version, all one has to do is change from a written presentation to a verbal one, without changing any of the content, and the audience's retention will be doubled. It sounds too good to be true, and it almost certainly is. As mentioned in the methodology, only one reference has been found that cites an early source – Spencer's (1991: 115-116) reference to Treichler[3], which also includes the following table relating learning to the senses:

'We Learn:
1.0% through taste
1.5% through touch
3.5% through smell
11.0% through hearing
83.0% through sight' (*ibid).*

Spencer says that while these figures 'may accord with many commonly held beliefs concerning the relationship between our senses and how we learn and remember… they should be treated with caution because [Treichler] gives no indication of their basis' (*ibid*). The debate over the veracity of claims like these enters the realms of information processing – a complex area of study examining the way the brain receives and processes information from the senses. Spencer sums it up thus:

> 'On the one hand there are those who hold to the belief that direct, contingent experience, with multi-sensory inputs, is essential for intellectual development; and, set against these beliefs, are those which suggest that only a fraction of the total sensory information available at a given time is capable of being processed by the central nervous system and, therefore, that educators should aim to compress reality into a form most compatible with the central processing systems.' (Spencer, 1991: 118)

Experimental findings lend weight to the former view. There is some evidence from psychological research that hearing a list of words as well as reading them

[3] Treichler, D G, (1967) 'Are you missing the boat in training aids?' in *Film and AV Communication*, **1**, 14-16

can improve recall – Baddeley (1976: 248) describes how researchers found that hearing a series of digits helped subjects to remember them better than if they only read them. However, the improvement only affected the latter digits in the sequence, and, like most research of this kind, the study was only addressed at short term memory, not long-term learning. It is interesting to note that one of the experiments involved subjects reading the digits aloud. It was found that the improvement came from *hearing* the information, not speaking it, as the effect disappeared when the sound of the subject's voice was masked by an ambient noise. This finding is in conflict with the very high recall associated with speaking in the second version of the list above.

Spencer (1991) presents a very thorough review of studies that have looked at how the channel in which information is presented affects comprehension and recall. From this, the following points emerge:

- Recall and recognition of pictures is better than that of words (Spencer, 1991: 140).
- Combined visual and auditory presentation of the same text leads to more efficient comprehension than either one alone (*op cit*: 139). (The value of this duplication, or 'redundancy' has also been highlighted by writers on inclusive access (Davidson, Heald & Hein, 1994: 181; Rayner, 1998: 39-40).)
- Sound and related pictures are superior to either alone, but sound and irrelevant pictures are the least effective (Spencer, 1991: 139).

Spencer concludes that a multisensory approach can be beneficial, but with caveats: 'Although multi-sensory presentations do seem to facilitate learning on specific tests, they do so only in circumstances where audio and visual components are mutually supportive' (*op cit*: 147-8). From an interpretive point of view, this implies that providing a rich experience can be of value, provided that it is carefully planned and that the sensory elements are not there only for the sake of it. Here, experiences that are intrinsically multisensory may be at an advantage, as suggested in the methodology, in as much as their elements will naturally be in accord with each other. However, it is highly debatable whether the sound and smell of a steam engine provide redundancy with its visual aspects – they are providing complementary information, not the same

information through different channels. Nonetheless, they may serve to make the whole experience more memorable.

Smell and Memory

Olfaction is an area of growing interest to researchers. It is increasingly being used in merchandising (Martin, 1999 a; 1999 b), and the use of ambient odours has even been shown to increase the amount of money gambled in slot machines (Hirsch, 1995: 585). Many studies have looked at the effect of smell on memorising and retrieving information, in the same way that the experiments described by Baddeley examined sound. These have shown convincingly that the presence of a distinctive smell aids the recall of information, but with one important proviso – the same smell must be present when the information is both learned and recalled (Schab, 1990: 648; Herz, 1997: 375). This is in accord with work which shows that retrieval is better in the same context in which something was learned (Baddeley, 1976: 72-4), or in the same state of mind: 'what you learn when drunk is best recalled when drunk' (Baddeley, 1976: 37).

An interesting recent experiment showed that this effect is not confined to the short term under laboratory conditions. People who had previously visited the Jorvik Viking Centre (at least six years before the experiment, on average) were asked questions about the content of the exhibits in the presence of either the odour that accompanies the exhibit in the centre, an unrelated odour, or no odour at all (Aggleton & Waskett, 1999: 3). For the group that answered the questions in the presence of an unrelated odour and then repeated the test in the presence of the Jorvik odours, a significant improvement was found on the second test. This shows that the odours were aiding recall of the content of the exhibits more than six years after the subjects saw them. As well as the effects of context, Aggleton and Waskett postulate that one of the factors affecting recall may be the changes in affect, or mood, that the smells evoke. Pointing out that visitors to the centre often comment spontaneously on the smells (*op cit*: 6), they note that the odours in the Viking toilet area 'evoke a disgust response in almost all visitors' (*ibid*). What is implicit in this statement is that visitors are, albeit subconsciously, making mental links to experiences involving similar smells. This is a vital part of learning, as Hooper-Greenhill asserts: 'We need to find

ways to enable people to perceive the objects in relation to a pattern, to make connections between the object and their lives, their experiences, and their existing knowledges' (Hooper-Greenhill, 1994 b: 10). Thus, while an odour may not make it easier to recall the details of an exhibit unless you smell the same odour again, they may serve to help the visitor understand the material in its context, and to make it more intrinsically memorable.

The Cone of Experience

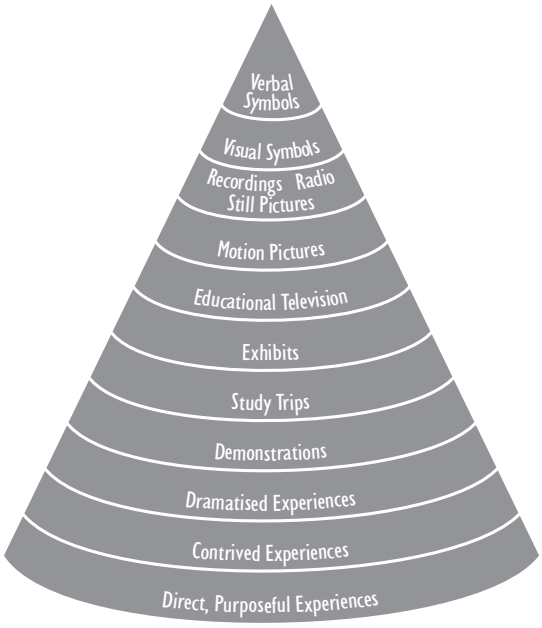

Figure 1 – Dale's Cone of Experience (Dale, 1969: 107)

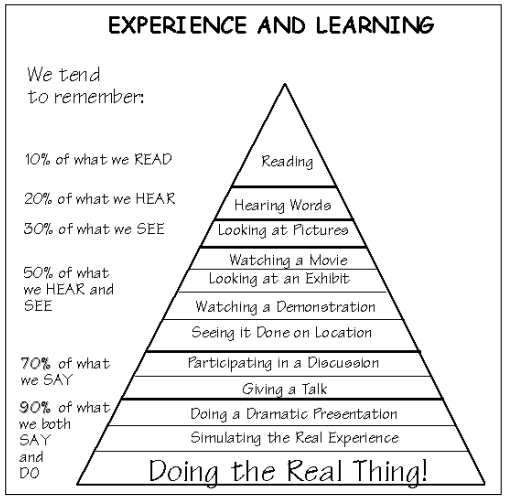

Figure 2 – A variation of the Cone from the internet, incorporating retention statistics (*interact.uoregon.edu/wrrc/IEP/PIAlearningcone.html*)

Edgar Dale's *Audiovisual Methods in Teaching* provides some useful ideas about the ways in which people learn with their senses. 'The Cone of Experience' (Dale, 1969: 107-135) is a visual analogy for the variety of ways in which human beings gain knowledge – from the most direct and concrete at the base to the most abstract and symbolic at the top (Figure 1). Several sources on the internet directly linked this diagram to the table of retention statistics discussed above – one example is in Figure 2. It appears that someone has interpreted the broader segments at the base of the cone as implying greater educational value and hence improved retention in the student. This was not Dale's intention – the broader segments simply denote more concrete experiences, the narrower ones those that are more abstract. The conical shape emphasises the general idea that learning often begins with the concrete and moves to the abstract (*op cit*: 108), and that

solid foundations of direct experience are necessary for abstractions to be meaningful to the learner (p 109). This is an idea echoed by contemporary writers on museums (e.g. Hein, 1996: 32; Benaki, 1991: 143-144) including Eilean Hooper-Greenhill: 'If we want to learn something completely new… where we have no working model, talking and reading is not enough. To learn something new, experience and action are necessary to build the model' (Hooper-Greenhill, 1994 b: 10). This is the great strength of the heritage site – providing opportunities for learning from original objects, in accordance with Tilden's definition of interpretation. Hooper-Greenhill is unequivocal about the importance of this: 'The real experiences that we offer, of objects, of buildings, of sites and of people, are essential to learning' (Hooper-Greenhill, 1994 b: 11).

But Dale is at pains to emphasise that no one sensory experience at any level of the cone is inherently more or less useful than any other (Dale, 1969: 129), and that almost all learning experiences involve more than one level of the cone (p128). Indeed, he argues that concrete experience itself forms part of a process of abstraction that takes place as we learn – the associating of names with the things they represent; the development of generalised ideas and concepts: 'Whenever you talk or even think about an experience, it becomes associated with abstractions, a phase in continuing growth' (pp112-113). This returns us to the object and its label – the concrete and the abstract together, helping to form a complete mental model.

Dale stresses too that the higher levels of the cone do not represent more advanced concepts: '*The basis of the classification is not difficulty but degree of abstraction*, the amount of immediate sensory participation that is involved,' (Dale's italics) 'Thus a still photograph of a tree is not more difficult to understand than a dramatization of *Hamlet*' (p110). It would be dangerous, therefore, if providers of interpretation were tempted to abandon text altogether on the assumption that this alone will improve accessibility and enhance learning. Rather, Dale's message is in accord with that of Rayner – that people learn with all their senses, and we should aim to appeal to as many as possible. Howard Gardner accords with this view when he describes how those with different types of intelligence will learn in different ways: 'the abilities used in an

intelligence can be used *as a means of acquiring information*. Thus, individuals may learn through the exploitation of linguistic codes, of kinesthetic or spatial demonstrations, or of interpersonal bonds' (Gardner, 1983: 334).

Obviously, the heritage site cannot offer direct experience of everything that it presents. Visitors to the Victoria and Albert Museum cannot try on fragile eighteenth-century corsets; the Imperial War Museum cannot transport its patrons into the terrors and danger of a real armed conflict. But just above direct experience on Dale's cone are contrived experiences and dramatised experiences – recreations that are at one remove from reality but retain much of its sensory richness. These, too, have found their place in the heritage sector, at all levels of complexity. At the Museum of London's *London Bodies* exhibition (1998-99), visitors could tighten the stays of a replica corset, fitted to an inflatable torso, and see and feel the effect on the body underneath (notably, the original corset was displayed in a case alongside). At the Natural History Museum, a platform recreates the sensation of an earthquake at a Japanese supermarket, while tins on shelves rattle alarmingly alongside and video monitors show security footage of the real event. In the Imperial War Museum's Blitz Experience, visitors sit in the dark confinement of a re-created Second World War shelter while the sound of falling bombs grows louder and the smell of smoke drifts into the room. Living history re-enactments, offering a full range of sensory experiences, are a regular feature of heritage sites of all types and all sizes – sometimes just for show, sometimes with serious educational intent. There is a danger that, like Jorvik, the more elaborate of such enterprises might be dismissed as Disney-esque froth, but as long as the academic basis is sound, we should not necessarily regard subjective experiences as less educationally valid than objective ones: 'Quite often, we remember something because it makes a strong appeal to our emotions' (Dale, 1969: 42). Going further, Eilean Hooper-Greenhill refers to Eric Sotto's assertion that there are two major forms of knowledge – verbal and felt knowledge (Hooper-Greenhill, 1994 b: 11[4]), and that the verbal alone is not enough for real learning to take place. Again, therefore, a mixture of approaches is required, one that is perhaps ideally illustrated by the work of Andrew Robertshaw's *History Re-enactment Workshop*. Robertshaw's approach combines

[4] Referring to Sotto, Eric (1994) *When Teaching becomes learning – a theory and practice of teaching*, London and New York, Cassell

the use of costumed characters with interpreters in modern dress who can act as catalysts for interaction between the visitor and the character, as well as answering questions and providing information that the characters, if they are to be true to their role, cannot pretend to know (Robertshaw, 1992: 18).

Conclusion

Learning theory is littered with suggestions that addressing more than one sense can have a positive impact on learning. While experimental data exist to support this view, there is no concrete evidence to support claims for massive improvements in retention. Karl Atkinson of the Centre for Environmental Interpretation has presented in his lectures a checklist of ideas for promoting learning. This includes the advice that 'people learn better when using as many senses as possible', but he dismisses the table of retention percentages as 'nonsense'. Similarly, Ken Spencer, in a reply to an email query, calls it baseless educational 'folklore' – disappointing for those searching for a quick fix to the problems of learning. Research of the kind described by Baddeley concerns itself with the effects of certain variables on rote learning – very different to the kind of learning that takes place at a heritage site. Here, factors such as the ability of the exhibit to arouse and engage the visitor's interest are likely to be far more influential than differences in the way data from various senses is processed in the brain. Apart from anything else, *enjoyment* is a vital element. Addressing more than one sense can greatly enhances this – if it did not, *The Jazz Singer* would not be one of the most significant films in the history of cinema, and we would still be watching silent movies. In this way, multisensory techniques can increase the visitor's motivation and the desire to learn (Dale, 1969: 150-151). Additionally, if they can help contextualise the content of exhibits, they can aid the visitor in creating the mental patterns and connections that Eilean Hooper-Greenhill recognises as vital to learning (Hooper-Greenhill, 1994 b: 10).

So, other senses can be combined with vision to aid effective interpretation. But how can interpretation address material that is specific to a neglected sense like smell? The next chapter examines one approach that has set out to do just that.

Interpreting Smells – a case study

The company Quest International, based in the Netherlands, has a research unit at Ashford in Kent that produces fragrances for everything from washing powder to perfumes. In 1995, it commissioned an interactive exhibit for the reception of the main building there to encourage visitors to think about their sense of smell and the way it interacts with the other senses. According to Public Relations Director Linda Harman, the company wanted to get visitors to use and be aware their sense of smell and how it can enrich life. The company's motives, however, were not entirely altruistic – the exhibit, known as the Exploratorium, collects data from visitors' responses which are used in developing and marketing products. The Exploratorium, which was given an award from the US Fragrance Foundation, has attracted interest from designers working on exhibits for the forthcoming 'Explore@Bristol' science centre, and so may be inspiring new work that will gain a wider public audience.

Figure 3 – The Quest Exploratorium

The Exploratorium consists of an abstract sculptural console housing three touch-screen computer displays. Each monitor presents a different 'exploration', so that three visitors can potentially use the exhibit at one time. The fragrances themselves are contained in elegant tubes housed in slots around the monitors. Exploration Two asks the visitor to associate various fragrances with different ambient sounds and pieces of music, while Exploration Three asks for associations with colours, shapes and 'lifestyle images'. These two sections are primarily concerned with collecting marketing data, and have little interpretive content beyond encouraging the visitor to think about the evocative and associative power of smell. Exploration One is of chief interest here – it explains

the structure of fragrances and the system used by Quest to represent them visually, as well as exploring the visitor's associations between the senses of smell and touch.

The structure of perfumes, or fine fragrances as they are known, is something to which most people have probably given little thought. Some fragrances are obviously floral or have another recognisable, dominant ingredient, but beyond that their makeup is often an arcane mystery. The Exploratorium demystifies fragrances by explaining the fourteen families of ingredients used in their creation, which are grouped into categories known as head, heart and base notes. These terms refer to the volatility of the ingredients – the head notes are those that evaporate first and will be most noticeable when a fragrance is newly applied. As time goes on, these will exhaust themselves and the heart and base notes will become more prominent. In the tubes around the monitor are examples of each family. The visitor chooses to sample a head, heart or base note, and the monitor indicates one of the tubes. Smelling the ingredient, the visitor is asked to try and place the ingredient in its family group – for example citrus, herbal or floral. If they guess incorrectly, the monitor indicates the tube containing a member of the family they chose, so that they can experience the difference. When they identify the correct family, the monitor displays pictures and names of different ingredients from that family (for example lemon, tangerine and bergamot from the citrus family), and the visitor is invited to identify which one they are currently smelling.

Having explored the families of ingredients, the exhibit goes on to describe how they are combined in different proportions to make up a fragrance. The method Quest uses to represent these proportions is called *Lignes de Force* – lines of strength. The coloured lines are shown as concentric circles, with the head notes in the centre and the base notes towards the edge. The greater the proportion of an ingredient family within the fragrance, the thicker the line. Here, then, is a visual representation of a smell – a symbol system that conveys the character, if not the precise composition, of a fragrance.

The development of such a system only in this highly specialised environment highlights how marginalised the sense of smell is within our culture – our

involvement with smell is largely on an emotional, intuitive basis, not an analytical, intellectual one. Culturally, then, we have not felt the need to represent smells except by vague, verbal descriptions, which usually compare one smell to another. In spite of this tendency to regard smells as incidental environmental factors, we spend large sums of money on perfumes, air fresheners and deodorants – a fact which creates a market for Quest to exploit. In this area, where there is financial advantage to be gained by the analysis and description of smells, the development of such a symbol system is not only likely, but, according to Gardner, essential: 'one of the features that makes a raw computational capacity useful (and exploitable) by human beings is its susceptibility to marshalling by a symbol system' (Gardner, 1983: 66).

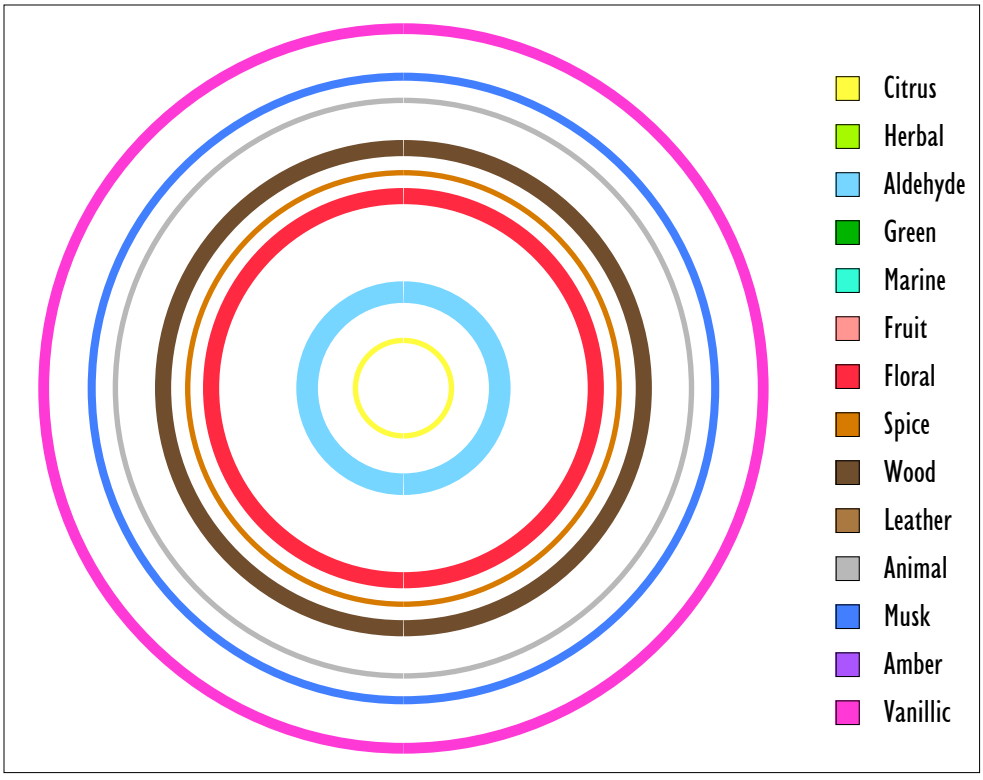

Figure 4 – How Quest's *Lignes de Force* system would represent a feminine fragrance such as Chanel No 5

Having explained this structural basis, the exhibit invites the viewer to smell three fragrance ingredients and choose the most appropriate touch sensations from three pairs of 'feely boxes'. The computer records whether the visitor thinks the ingredient matches rough or smooth, hard or soft, and cold or warm surfaces. It then reveals the name of each ingredient and displays the results from previous visitors. Although the point is not brought out by the display, the

implication is that perfumers use the general trend of such responses to develop fragrances which will have particular associative characters in the mind of the consumer.

The Exploratorium's success is twofold. Firstly, it encourages an active engagement with real materials – in this case smells. The visitor is drawn into an interaction which requires thoughtful consideration of the fragrances, constantly sniffing at the scent tubes while trying to identify the fragrance families or select the most appropriate textures, sounds and images. Secondly, it brings the associative power of smell from its usual place in the subconscious to the very front of the visitor's mind, and shows how fragrances can be quantified and represented in visual terms. Together, these aspects demonstrate both the process and the aim of fragrance development – the blending of ingredients to achieve a product that conjures certain associations in the mind of the person who smells it. While the Exploratorium is ideal for its target audience, its approach would be too sophisticated for a museum context where children would make up a high proportion of the visitors. However, the ideas of association and identification could easily be adapted into a simpler form for an exhibit interpreting the sense of smell and the ways we use it to change mood and atmosphere.

Figure 5 – Exploration One of the Quest Exploratorium

Reactions to a Smelly Exhibit – The Trench Experience at the Imperial War Museum

The Trench Experience at the Imperial War Museum opened in 1990 as part of a new permanent exhibition on the First World War. It depicts a trench on the Western Front in the dim, dawn light of autumn 1916, and features a series of individual tableaux representing officers and soldiers performing various activities – from cooking to setting off into no-man's-land on a raid. Sound is everywhere – the explosions of falling shells, telephone bells ringing, the subdued voice of a soldier writing a letter to his father. 'A very high degree of realism is achieved in these scenes – and we have added the smells of the trenches too; the only thing we could not achieve was genuinely wet mud, although it looks wet enough,' wrote the museum's then director, Dr Alan Borg. 'Everyone who goes through the trench comes out with a better understanding of what it must have been like to live and to fight in such appalling conditions' (Borg, 1991: 6). This study does not set out to examine the truth of this statement, but does aim to assess how valuable the smell is in achieving that goal.

Results

The full results are given in Appendix A. As well as giving the figures for the whole sample, the table also shows breakdowns by gender, age group, and by response to three of the statements. A brief summary of the most significant results is given below.

For all respondents:

- 94% agreed that 'The smell added to my experience of the exhibit'.
- 81% agreed that 'The smell helped me to understand what life was like in the First World War Trenches'.
- 86% disagreed that 'The smell was irrelevant'.
- 73% agreed that 'The smell made it more likely that I will remember the exhibit'.

In all the following comparisons, the difference between the groups being compared is at least 10 percentage points:

- More men than women rated the smell as realistic, but fewer said that it made them want to leave the exhibit.

- Those under 25 were most likely to rate the smell as unpleasant and as making them want to leave the exhibit.
- More people in the 25 to 50 age group said they were likely to remember the exhibit because of the smell than in the other age groups.
- Those over 50 were least likely to talk about the exhibit as a result of the smell.

The statement 'The smell was realistic' produced 45 responses agreeing and 45 who could not decide, with only 10 disagreeing:

- Those who agreed were more likely to rate the smell as unpleasant than those who could not decide.
- Compared with those who could not decide, a significantly higher proportion of those who agreed said they were likely to both remember the exhibit and revisit it.

The statement 'The smell was unpleasant' produced 64 responses agreeing and 32 disagreeing, with only 4 unable to decide:

- Those who agreed were, unsurprisingly, more likely to say the smell made them want to leave.
- Those who agreed were more likely to rate the smell as realistic.
- Those who agreed were less likely to find the smell irrelevant.
- Compared with those disagreeing, significantly higher proportions of those who agreed said they were likely to remember, talk about, and revisit the exhibit.

Only 10 respondents found the smell irrelevant. 70% of them disagreed with the last four statements, 'The smell made it more likely that I will…' etc. This is a far higher than the figures for the sample as a whole, except for the statement 'The smell made it more likely that I will revisit the exhibit'.

Discussion

The overwhelmingly positive responses to the first two statements clearly imply that the smell is making a major contribution to the effectiveness of the exhibit. Only two respondents disagreed that the smell added to their visit, with four

undecided. If the museum had been in any doubt about the value of the smell, this should dispel it. However, the figure for those agreeing that the smell helped them understand what life was like in trenches is slightly lower. This implies that some visitors felt that the smell added to the exhibit without helping their understanding, raising the question of what exactly they gained from the experience. However, it should not be assumed that everyone comes to a museum to learn – the experience of a day out may be enhanced by multisensory stimulation itself, regardless of a learning motive. The fact that 81% of those questioned felt that the smell *had* enhanced their understanding is a clear indication that, at least in the visitors' estimation, the smell is playing a valuable part in helping the exhibit achieve Doctor Borg's stated goal.

The high percentage of disagreement with the statement 'The smell was irrelevant' backs up this view, and provides some reassurance that the levels of agreement with the first two statements are not simply due to the phenomenon of 'acquiescence' discussed in the methodology. It could be argued that the statement is somewhat vaguely worded – irrelevant to what, exactly? The historical accuracy of the exhibit, or the visitor's experience? I would argue that, in an experiential exhibit such as this, what is relevant to one is – or certainly should be – relevant to the other. If something is added to the experience that does not reflect the factual basis of the underlying material, then the exhibit ceases to be valid and lays itself open to the criticisms that Fowler levels at Jorvik's imitators (Fowler, 1992: 116-7). Similarly, if something pertinent to historical accuracy is omitted from the experiential exhibit, it presents only a sanitised, inaccurate view of the past of the kind criticised by Lowenthal (1998: 142-3).

The response to the statement 'The smell was realistic' is an interesting one. As has already been observed, many people said they could neither agree nor disagree as they had no experience on which to base their judgement. Those who agreed with the statement were more likely to rate the smell as unpleasant than those who could not decide. Correspondingly, those who found the smell unpleasant were more likely to rate it as realistic than those who did not. The correlation between these responses may be due to an association of ideas.

Clearly, the trenches were an unpleasant experience for those who fought in them, so visitors who find the smell unpleasant may therefore be more likely to describe it as realistic, for that reason alone. In other words, an unpleasant smell matches an unpleasant situation. This idea is reinforced by the fact that those who did not find the smell unpleasant were more likely to rate it as irrelevant than those who did.

Also interesting is the relationship between perceiving the smell as unpleasant and the likelihood of the smell making the exhibit more memorable. Compared with those who did not find the smell unpleasant, a far higher percentage of those who did said that it made it more likely that they would remember and talk about the exhibit. This implies that the very unpleasantness of the smell is making the exhibit memorable. Perhaps surprisingly, those who found the smell unpleasant were also more likely to revisit the exhibit because of it. Based on this, an argument could be made for making the smell more unpleasant. Theoretically, this should improve its perception as realistic and visitors' likelihood of remembering and revisiting the exhibit. However, as a fifth of visitors already want to leave the exhibit because of the smell, this could be counterproductive.

Of the 32 respondents who agreed with both the '…realistic' and '…unpleasant' statements, 91% said that the smell made it more likely that they would remember the exhibit – considerably higher than the 73% for the sample overall. It is interesting that 72% of this group was male, as males were slightly less likely to agree with the 'remember' statement than women in the sample overall.

While there are noticeable differences between the age groups, it is difficult to draw any definite conclusions from them. There is no clear trend by age group for any of the statements, except 'The smell made me want to leave the exhibit', where people seem more likely to disagree as they get older.

Conclusion

It is hard to argue against a feature of an exhibition which visitors so overwhelmingly rate as adding to their understanding of the subject matter. Nonetheless, given that an exhibit of this kind can only ever be a pale shadow of reality, it might be argued that it would be best not to attempt it, and to leave the

portrayal of the horrors of war to the words of those who experienced it. However, this risks excluding those who do not learn well from words, whether written or spoken, and denies them the opportunity to have their imaginations fired by a presentation that is very immediate and immersive. It was noticeable that many of the respondents to the survey made comments (in relation to the smell) along the lines of 'I'm sure the reality was much, much worse'. We are culturally experienced in the dramatised and contrived experiences that lie just above reality on Dale's Cone of Experience, and we understand the differences between them and the real world. As such we are able to extrapolate from one to the other – we mentally scale up a model to envisage the object at full size – similarly we scale up the experience of the museum trench to imagine the horrors of the real thing. It is also worth noting that the Trench Experience is only a small part of the Museum's interpretation of the First World War. There is plenty of material presented in other ways – original objects, documents, film footage with narration, photographs and text panels. Thus the Experience does not carry the burden of conveying the reality of the trenches alone, but forms part of a whole which can appeal to a variety of learning styles. Without the Trench Experience, the Museum's presentation would be incomplete, just as without the smell the Trench Experience would be incomplete.

Audio Interpretation of a Visual Exhibit – an Observation Study

The aim of this study was to examine the ways in which the use of an audio guide alters the behaviour of visitors to an art gallery. Art galleries and museums are highly visual places. With the exception of some kinetic sculptures and installations, which are recent phenomena in the art world, galleries deal with visual art – usually either painting or sculpture. Although guided tours are occasionally used in some galleries, most visitors are self-directed, exploring the gallery at their own pace and following their own interests. Interpretation for these visitors is almost always in the form of text – usually written labels accompanying the works, occasionally guide books or leaflets.

This means that, as in many museums and heritage sites, the object on display and its interpretation are competing for the same sensory input. The visitor has to divide their attention between looking at the art work and reading the label. Under these circumstances, it could be suggested that the interpretive provision is actually working against its intended function – if it is diverting the visitor's attention from the exhibit, it may actually be impairing their appreciation of it rather than enhancing it. The situation is exacerbated in many cases in that the visitor will need to be close to a label to read it, while viewing the picture may demand that they stand some distance away. Thus the visitor, with four senses standing idle, has their vision working overtime – moving between exhibit and label, changing focus and switching between the processing of textual information and the analysis of form, line, colour and symbolism.

In this situation, the advantages of audio interpretation are self-evident, and the National Gallery was clearly well aware of this when it commissioned the guide now in use: 'Improving access is a key aim of the Gallery, and this new technology will for the first time allow visitors to find out more about pictures while they look at them' (Neil MacGregor, Director of the National Gallery, press release, July 1995). Access is certainly improved for non-English speakers, as the guide is also available in French, German, Italian, Spanish and Japanese, while the labels are only in English. An audio guide, however, is a very different kind of interpretation to a text label. A label immediately gives the reader an indication of its length, and can easily be scanned for significant words or

phrases. Also, the visitor can review any part of the text immediately if they wish to double-check a fact or opinion against something that they have observed in the exhibit. An audio guide, by contrast, is usually an unknown quantity – it is unlikely to give any indication of its length or the nature of its content. If the visitor is bored after the first 30 seconds, they have no way of knowing how much of the commentary is still to come or whether it will include a subject area that might be of more interest to them.

Additionally, audio guides can potentially reduce the social nature of visiting a gallery or museum. The National Gallery's model is a CD-ROM player into which the visitor keys the number of the work in which they are interested, and listens to the commentary on headphones. They are thus to some extent isolated from those around them. In any event, is it not feasible to listen to a commentary and discuss the work at the same time, so any discussion must be separated from the main experience of the picture.

So, how does audio interpretation alter visitors' interaction with paintings in a gallery? Do they stay with the painting for the length of the commentary, do they linger afterwards or move on before the commentary has finished? And how does their behaviour differ from that of visitors who are not using audio guides?

Results

Tables of the timings, together with notes taken during the observations, can be found in Appendix B. Graphs of the number of visitors staying at the paintings for a given amount of time are given in Chart 1. These are similar to the graphs first plotted by Arthur Melton in the 1930s, (Hein, 1998; 106), which typically show the majority of visitors staying for very brief periods. Also, graphs of the time spent by each individual visitor are given in Charts 3 and 4 – these show the separate timings for reading the label and looking at the painting that were recorded for visitors without audio guides.

Calculations were made of average times for groups of the visitors as follows:

- Visitors without audio guides who did not read the label
- Visitors without audio guides who did read the label.
- Audio guide users

For visitors who read the label, calculations were also made of the percentage of their time that they spent reading.

As Hein comments (1998: 106), average times can be unreliable, as the distribution of visitors over time does not fit a normal distribution curve. Median times, which can be more reliable, were also calculated, and are included in Appendix B. While these differ in absolute terms from the averages, the comparisons they reveal between the groups of visitors and between the two paintings stay broadly the same. As these figures will only be used for such comparisons, the averages are quoted here.

Average times and percentages

The Fighting Temeraire (times in seconds)	*Overall*	*Reading*	*Looking*	*Ave % Reading*
No audio guide, not reading label	28.6		28.6	
No audio guide, reading label	35.8	18.6	17.2	57%
Audio Guide Users	163.0		163.0	

Whistlejacket (times in seconds)	*Overall*	*Reading*	*Looking*	*Ave % Reading*
No audio guide, not reading label	27.0		27.0	
No audio guide, reading label	55.1	37.8	17.3	74%
Audio Guide Users	116.7		116.7	

The duration of the English audio guide commentaries was as follows:

- *The Fighting Temeraire* 3'35" (215 seconds)
- *Whistlejacket* 2'39" (159 seconds)

For comparison, it took the observer 18" to read the label for *The Fighting Temeraire* and 35" to read that for *Whistlejacket*.

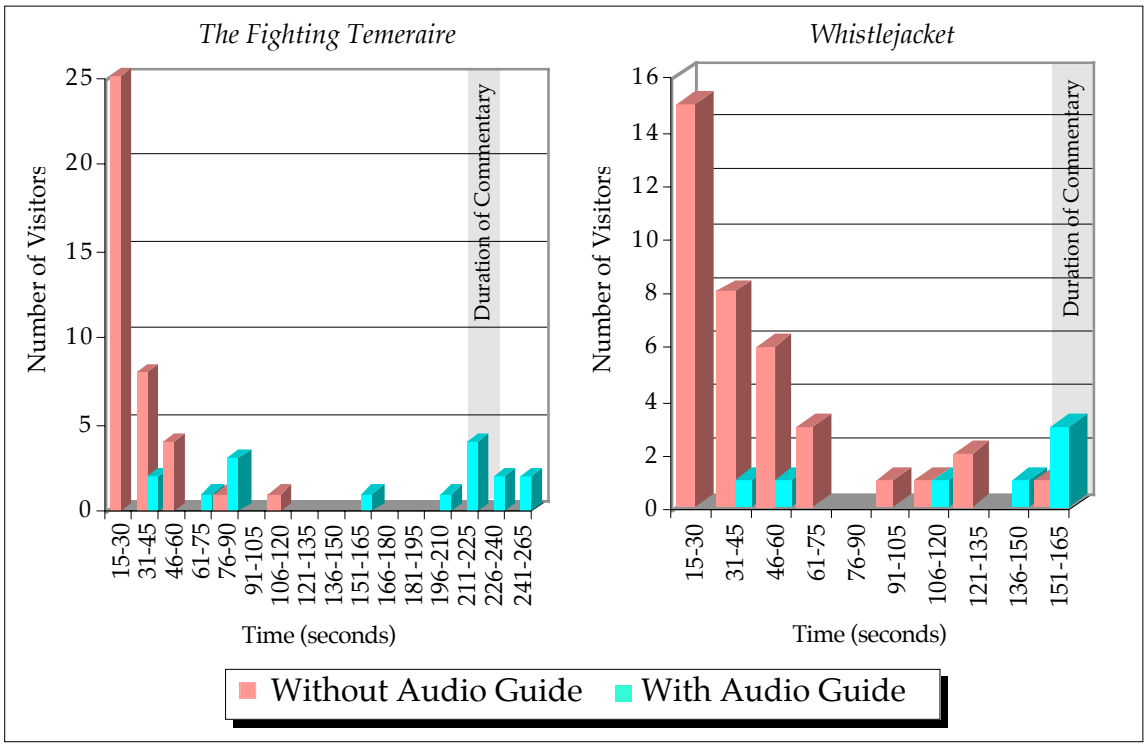

Chart 1 – Visitor numbers plotted against time spent with painting

Discussion

For visitors without audio guides, the patterns shown in Chart 1 are very much in line with those found by Melton (Hein, 1998; 106) – the peak number of visitors occurs in the shorter time periods. While the sample of audio guide users is small, it is clear that for them this pattern is all but reversed. Both the graphs and the average timings show that visitors using audio guides are generally spending much longer at the painting than those without, with the peaks in the graphs of audio guide users corresponding with the duration of the commentary. From this, it is possible to draw general curves of how one would expect visitor numbers to vary with time – these are shown in Chart 2.

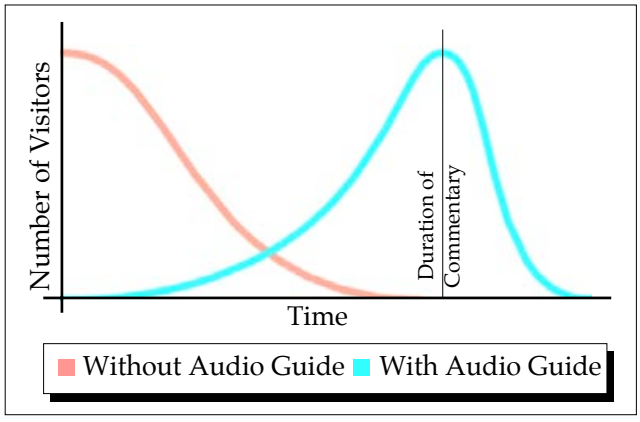

Chart 2 – The expected general shape of visitor number curves against time

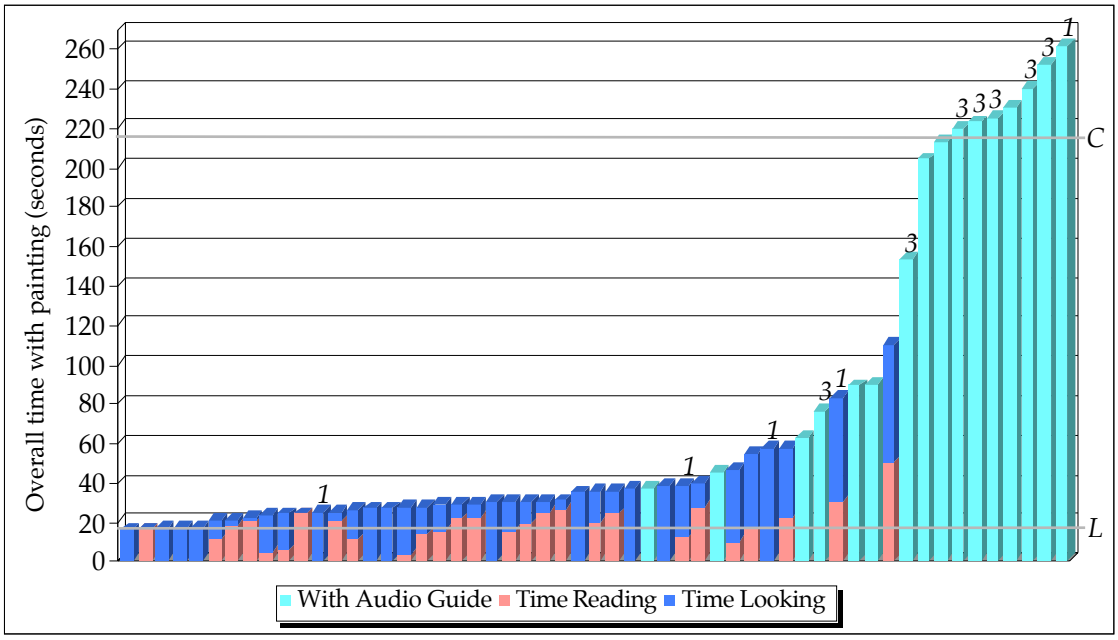

Chart 3 – *The Fighting Temeraire* – visitor timings sorted by overall time with painting

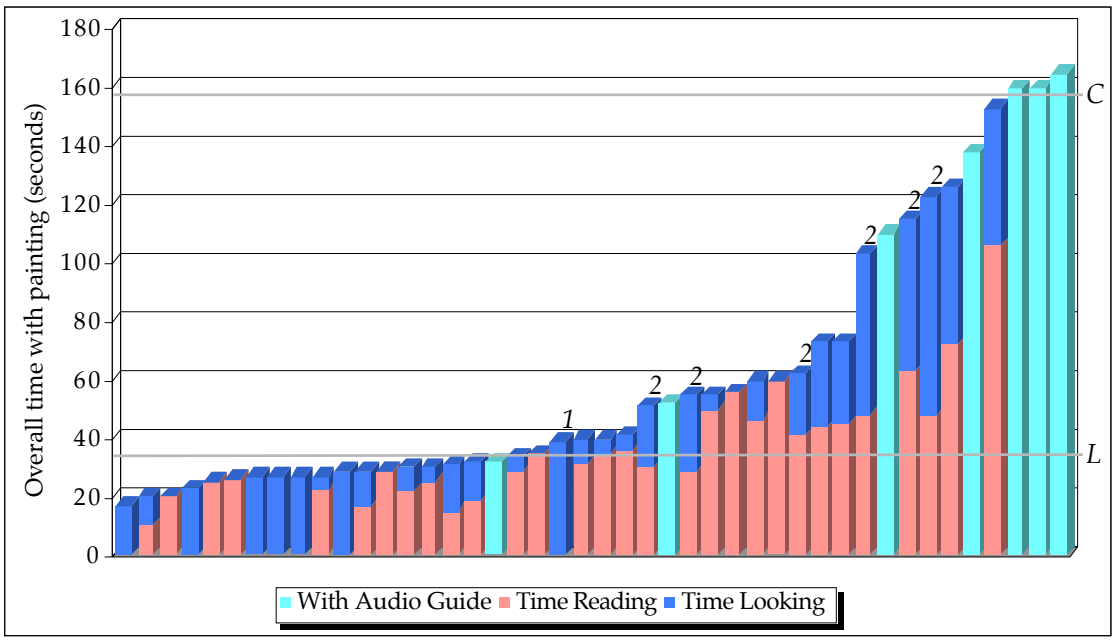

Chart 4 – *Whistlejacket* – visitor timings sorted by overall time with painting

Key: *(1)* Visitor discussing painting with companion *(2)* Visitor moved back after reading label *(3)* Non-English Audio Guide *(L)* Time for observer to read label *(C)* Duration of English Commentary

Two factors seem to be responsible for the number of visitors staying at *The Fighting Temeraire* for longer than the duration of the English commentary. It was possible to identify users of non-English audio guides by the different illustration on the CD-ROM disc that was visible through the transparent front of the player.

It was determined that the German version of the *Fighting Temeraire* commentary was longer than the English by roughly 25 seconds. Of the seven audio guide users at that painting who stayed for longer than the duration of the English commentary, five were using non-English versions (see Chart 3), so it is highly probable that variations in the length of commentaries account for much of this extra time. The longest time at the painting was spent by an elderly couple using the English version, who discussed the painting for some 45 seconds after listening to the guide. This was the only significant instance of discussion observed among audio guide users, which suggests that this form of interpretation may indeed reduce the social nature of gallery visiting.

As well as affecting visitors' time with a painting, the observation showed that an audio guide can also affect their behaviour. The commentary for *The Fighting Temeraire* refers in detail to several elements in the painting, and users of the audio guide were often observed to move around the painting, peering closely at different areas. The commentary for *Whistlejacket*, by contrast, is more concerned with its history and stories relating to its commissioning and creation. Audio guide users at both paintings were observed to sit down and look at the work from a distance while listening to the commentary, but of the three viewers of *The Fighting Temeraire* who did so, two got up again soon afterwards and moved closer to the painting to examine details. This difference in behaviour can be explained in part by the references to details in the commentary for *The Fighting Temeraire*, and in part by the fact that *Whistlejacket* is a much larger painting which is best appreciated from a greater distance. Indeed, six of the non-audio guide users at *Whistlejacket* were observed to move back some considerable distance after reading the label in order to look at the painting – these people invariably spent a higher than average proportion of their time looking at the painting as opposed to reading.

However, it is not only audio interpretation that affects visitor behaviour – written interpretation appears to make a difference, too. Chart 4 seemed to show a correlation between the time visitors spent reading the label and their overall time at the painting. To check this, these two values were plotted on scatter graphs (Chart 5). (Data for visitors who spent all their time reading were omitted,

as obviously there is a direct correlation here – overall time is the same as time spent reading.) A spreadsheet was used to add a linear trend line and to calculate a correlation coefficient for the two sets of data. For *The Fighting Temeraire* this was 0.7, while for *Whistlejacket* it was 0.9.

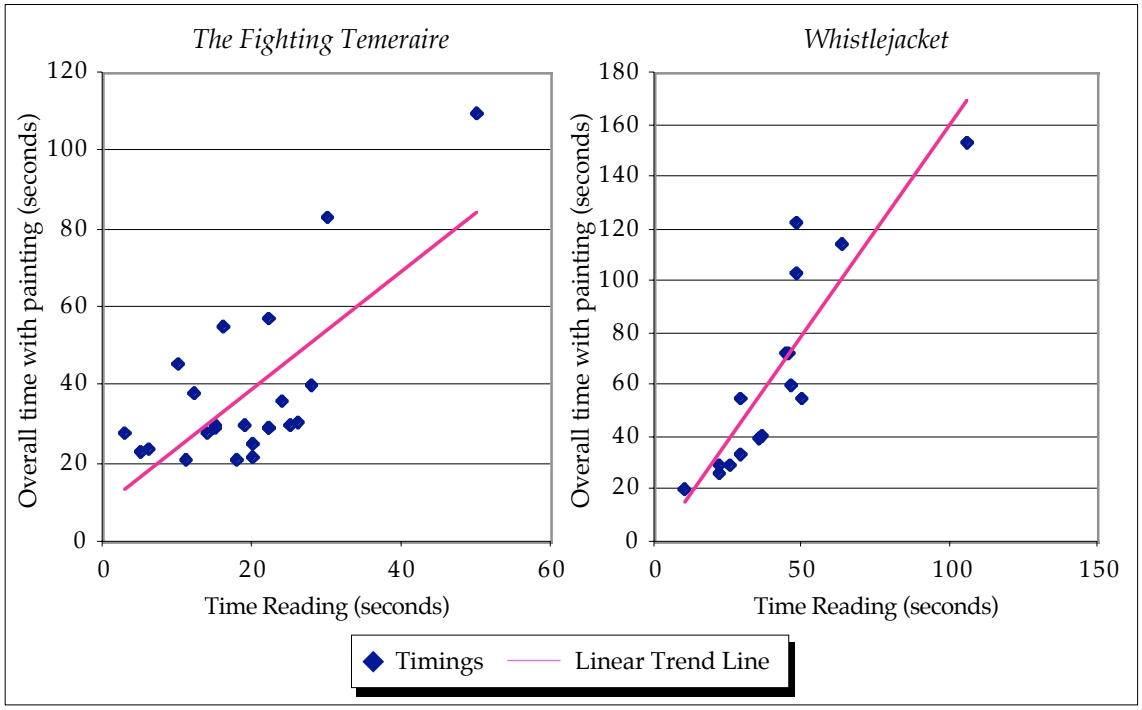

Chart 5 – Overall time as a function of time spent reading

It can be seen that the plot points for *The Fighting Temeraire* are widely scattered and often some distance from the trend line. For *Whistlejacket*, they are much closer. This, together with the coefficient of 0.9, suggests a very strong correlation between the time visitors spent reading and their overall time at the painting (the closer the coefficient is to 1, the more direct the correlation.) This can perhaps be explained by the longer, more detailed label for *Whistlejacket*, which may be engaging visitors more than the brief one for *The Fighting Temeraire*. It is interesting to note that the average times spent by visitors who did not use any interpretation were almost the same for both pictures. This suggests that the longer average time spent by those who read the *Whistlejacket* label is due solely to the difference in interpretation rather than anything intrinsic to the paintings themselves. Also, for those visitors that read the labels, the average times spent reading were very close to the time it took the observer to read the labels. However, those who read the *Whistlejacket* label spent on average three-quarters

of their time reading, as opposed to just over half for *The Fighting Temeraire*. Thus, while a longer label seems to increase overall time at the painting, that increase is only due to the greater time spent reading. It must be stressed that these ideas are only hypothetical – they require detailed testing. This could be achieved by timing visitors at the paintings with altered labels – a longer, more detailed one for *The Fighting Temeraire* and a briefer one for *Whistlejacket*. If the results showed longer times for those reading the longer label, with a similar correlation between time reading and overall time, this would strongly support the hypothesis. If not, it would suggest that other factors are at work that have not yet been considered.

Recommendations

One notable aspect of the audio guide commentaries is that they are not related to the interpretive content of the labels (compare the 3'35" commentary of the *Fighting Temeraire* audio guide with the label that took the observer 18 seconds to read). This is understandable in as much as the audio guide is a new feature to the gallery rather than part of an overall re-interpretation. However, there is some information on the label that is not part of the commentary (particularly in the case of *Whistlejacket*) which the audio guide user will miss out on if they do not also read the label, which they seem unwilling to do. As mentioned in the chapter on learning theory, writers on inclusive access have highlighted the value of redundancy and repetition in interpretation delivered through different sensory channels, and consideration should be given in long-term planning to the integration of visual and auditory interpretation.

Additionally, changes could be made to the delivery of the audio commentary to give the visitor more flexibility, choice and control. At its simplest this could mean the reprogramming of the CD-ROM player to display the duration of the remaining commentary, giving users feedback on how much more there is to listen to. The next generation of players might also include controls to allow the user to rewind the commentary and review a section, which is not possible at present. Beyond this, the commentary could be divided into a number of subject areas, such as the artist, history of the painting, subject matter, technique and so on. These could be accessed by providing a different index number for each, with one number accessing the whole set should the visitor wish.

The technology to deliver 'customised' interpretation to each visitor is developing fast. The National Museums of Scotland and the Human Communication Resource Centre of the Department of Artificial Intelligence at Edinburgh University are developing a system called Ilex, the 'intelligent label explorer'. This is designed to take account of a visitors' interests and education to tailor audio commentary to their individual needs and requirements (Rayner, 1998: 47). Compaq computers is reported to be working on a hand-held personal interpretation device that will combine images, audio and text with a 'virtual guide' that can be selected from a number of characters programmed into the unit. This is cutting-edge technology that will take time to find its way into general use. More immediately practical would be a simple development of the existing CD-ROM players to include a larger display that would offer options to the user, in their language of choice. These options could be sections of commentary under the subject areas mentioned above, with index buttons to allow the user to select the items of interest. A separate audio track could provide a spoken version of the contents menu for users with visual impairment.

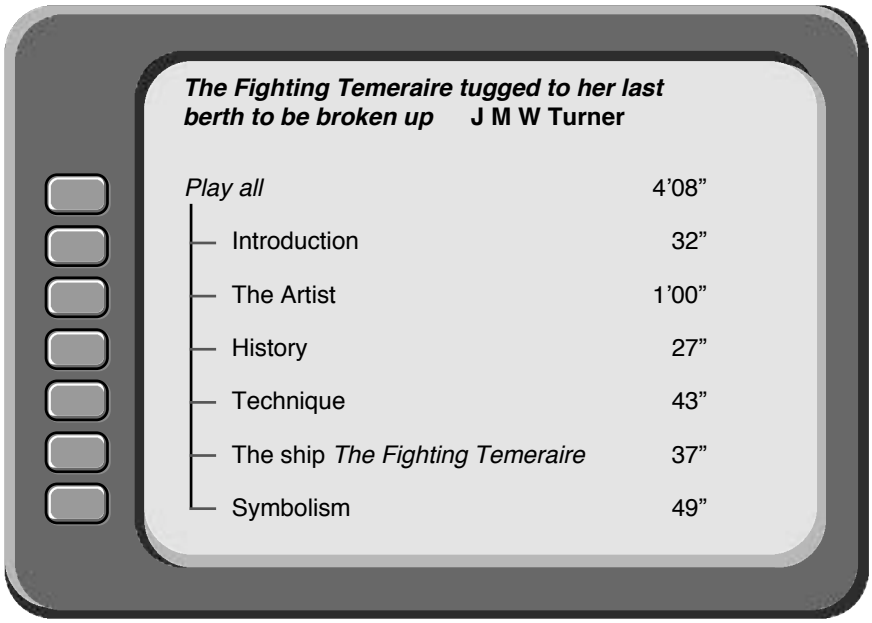

Figure 6 – Sample of proposed Audio Guide display

Conclusion

The use of an audio guide allows visitors to receive interpretive information at the same time as they experience works of visual art. This study has shown that those who read labels spend on average less time looking at the painting than

those who do not use any kind of interpretation, while those who use audio guides spend considerably more, and are often stimulated into active looking. This indicates that the guide is fulfilling the purpose outlined by Neil MacGregor in the July 1995 press release: 'Audio information is an ideal way to look harder and longer at pictures'.

In as much as the guide is achieving this, and in providing interpretation for foreign visitors, the guide can be said to be meeting the Gallery's aim of improving access. However, it is unlikely to aid intellectual access as it is clearly aimed at an educated audience that one would not expect to have difficulty with reading. The number keys on the guide are provided with a Braille legend, but this appears to be a feature of the player unit rather than a specific modification for the National Gallery – although the track numbers on the labels for each work are in relatively large print they are not provided in Braille. As discussed later, audio interpretation alone does not provide access for people with visual impairment (Davidson, Heald & Hein, 1994: 180), so again this area is unlikely to benefit directly from the provision of the guide.

People visit galleries to look at paintings, not to read labels. Audio guides can clearly help them to do this, and so can enhance the visitor's experience of the works of art and the gallery as a whole. Tailoring the guides to give the visitor more choice and control can only add to that enhancement.

Audio Interpretation – a Group Discussion

The group discussion aimed to look in more depth at the ways that audio interpretation affects the visitor experience, in comparison with written interpretation such as guide books or personal interpretation such as guided tours. The following sections summarise the main points that emerged.

Guide Books

The discussion confirmed the view that written interpretation such as guide books can monopolise the visitor's attention at the expense of the material on display. Some members of the group often found themselves buried in the guide book, feeling obliged to read everything for fear of missing an important point. Others were often happy for a companion to take the guide book, as they preferred to look rather than read and could ask for any information they particularly wanted. It was felt that guide books were often ineffective for touring a property – labels or paddle-type guides often provided more appropriate information. This may imply that the constraints of space of a label focus the writer's attention on the most relevant information, while the needs of a visitor touring the house may not be uppermost in the mind of a writer trying to produce a book which looks coherent on the page.

All members of the group valued the souvenir aspect of guide books. The provision of more in-depth information that could be read after a visit was also appreciated. Some members of the group liked to read some background information before touring a historic property if space and companions allowed.

In considering the social aspect of visiting heritage sites, the point was made that one member of a group being engrossed in a guide book can create a social barrier and preclude discussion just as effectively as an audio guide. This is perhaps another argument in favour of labels, which are more likely to be read by several people at the same time.

Audio Guides

All members of the group said that they reacted very positively to seeing that an audio guide was available at a site. The property of 'freeing the eyes' is clearly seen as one of the greatest benefits, but there were caveats. The lack of the ability to 'skip-read' was felt to constrain the visitor to the pace of the guide, and it was

suggested that there should be two versions of the commentary – a brief, introductory summary and a more in-depth version for those who desired it. (There can, of course, be no guarantee that this will not produce the same feeling of needing to hear everything that was mentioned for guide books – the only difference being that if this happens with an audio guide the visitor can at least still look at what is being discussed.) The audio guide at Down House (English Heritage) was cited as a good example, offering a main commentary for each room, with additional sections available on furniture, pictures, etc. (The importance of flexibility is highlighted by Ann Rayner in *Access in Mind* (1998: 46).) The idea of a visual indication of the remaining track time met with approval from the whole group. It was emphasised that instructions must be clear, and markers indicating track numbers for the visitor to key in should be prominent and unambiguous. Technical reliability was also cited as vitally important. Headphones were overwhelmingly preferred to 'wand' style audio guides, which were felt to be heavy and cumbersome.

The group was generally in favour of the use of dramatisation in audio guides, as long as it was well performed and executed. Together with the use of music, it was felt to be particularly valuable at ruined sites where it could help the visitor to envisage the location in its original state.

The group agreed that audio guides can tend to isolate the visitor socially, but this was less of a problem if the commentary was in short sections, allowing time for discussion in between. One member suggested that the loss of ambient sounds in historic properties caused by wearing headphones could diminish the sense of place for visually impaired visitors, who often rely on factors such as echo to gauge the size of a room. This has similar implications to Anne Pearson's comments about tactile exhibitions: 'many blind visitors have stressed that much of the pleasure of the visit derived from hearing the comments of sighted people around them about the objects on display' (Pearson, 1996: 102-3). Together, these factors argue strongly in favour of audio *guides* such as that at Down House, where the audio interpretation occupies only part of the visitor's time, as opposed to audio *tours* where the soundtrack is more or less continuous – the breaks in the commentary allow for discussion, reflection and appreciation of the ambient sounds of the site.

The group generally felt that audio guides were performing a somewhat different task to guide books. While books were better suited to giving detailed information, which would be very dull in spoken form, audio guides were good at providing a general overview and building mental pictures, especially at sites which have lost much of their original context.

Guided Tours

The group also considered guided tours and room stewards as providers of verbal interpretation. One of the main comments to emerge was the variable quality of guided tours, especially where volunteers are used. This was seen as one of the comparative strengths of audio guides – consistent quality. It was felt that, to be really effective, a guided tour needed either a personal or even theatrical element that elevated the guide from being simply a human tape recorder reeling off a list of facts. This echoes Tilden's second principle: 'Information, as such, is not interpretation. Interpretation is revelation based upon information' (Tilden, 1977: 9). Room stewards were felt to be useful adjuncts to a guide book or leaflet, but their security role was often deemed to make them less approachable than they might be. Guided tours could be a valuable enhancement to a visit, but members of the group said they would feel embarrassed about leaving a tour half way through if they got bored.

Conclusion

Asked which of the three forms of interpretation they would choose at a site, the group was unanimous that it would depend on a number of factors: the nature of the site; what they wanted to gain from the visit; whom they were with; their level of personal interest or prior knowledge. Some forms had strengths that suited them to particular types of site, such as audio guides at art galleries and ruined sites. Notably, though, while most of the group said that they were likely to buy a guide book as a souvenir, they were unlikely to choose it as a form of interpretation if one of the others was available. This is good news for managers concerned about revenue – providing more effective forms of interpretation need not signal a large reduction in sales of guide books. Audio interpretation is clearly welcomed by this group of experienced visitors, and, provided it is well planned and executed, can be seen as making a valuable contribution to a visit.

Multisensory Interpretation at Work – the New England Lifezones Study

The clearest evidence for the effectiveness of multisensory interpretation comes from a study undertaken at the Boston Museum of Science in the mid-1980s (Davidson, Heald & Hein, 1994). What makes this research so valuable is that it concerns the modification of an existing exhibition gallery, with detailed evaluation undertaken before, during and after the changes. The gallery contained a series of dioramas representing various habitats in New England and the wildlife that inhabits them. As this basic content of the exhibit remained the same after the modifications, the measurable changes in visitor responses that the researchers found can be clearly attributed to the revised interpretation.

The changes to the gallery came about as a result of an audit of physical and intellectual access at the museum in 1985, and were intended to make the gallery more accessible to all visitors (*op cit*: 179). Although people with disabilities were very much a target group in modifying a gallery that in its original form 'could provide them with little or no satisfaction' (*ibid*), the authors are at pains to point out that improving intellectual access benefits all visitors (p180). The need to provide both direct experience and verbal explanation to all groups was borne in mind in a co-ordinated programme of changes: 'Audible descriptions alone do not provide access for visually impaired people, nor do multisensory experiences provide access without audible explanations and interpretations of them' (p180).

The modifications included the rewriting and repositioning of text labels, and the installation of a multisensory console in front of each diorama. Each of these featured an audio track replicating much of the material from the labels and a 'smell box' that produced an odour related to the habitat or one of the animals displayed. Two of the consoles also featured tactile elements related to the dioramas, and four other tactile objects were added to the gallery. In addition, three separate hands-on exhibits were added, developing themes from the dioramas themselves. (pp180-181).

The evaluation took the form of observation studies of visitor behaviour, case studies with groups of visitors with special needs, and interviews which were aimed at assessing how much information the visitor had gained from the exhibits. These were carried out before, during and after the period over which

the changes were made (p181). From the observation studies, calculations were made of the average time different groups of visitors spent in the gallery, and the 'attracting power' of each diorama – i.e. the percentage of visitors who were observed to interact with it in some way.

The results are overwhelmingly positive. The proportion of groups containing children visiting the gallery increased dramatically (p182). Average time spent in the gallery increased by two-thirds (p183), and all six dioramas increased the percentage of visitors that were observed to interact with them (p185). Notably, while only 16% of visitors had been attracted to the deer exhibit before modification, afterwards the figure rose to 59%. One of the most interesting outcomes of the observation study concerns the movement of individual visitors within the gallery. It was noted, particularly among children and visitors with special needs, that one sense was preferred to the others. These individuals were observed to move from one smell box to the next, or from one audio commentary to the next, and so on (pp184, 191). This accords with ideas of preferred learning styles such as those discussed by Cassels (1996), and emphasises how important such sensory diversity is in providing access to a wide range of visitors.

Perhaps most significant, though, are the results of the learning outcomes interviews. Before the modifications, only one fifth of visitors could name at least one evolutionary modification that helped either the moose or the beaver live in its habitat. Afterwards, every visitor questioned could name at least one. (Davidson, Heald & Hein, 1994: 191). While the number of visitors who said that they had gained information from the labels increased dramatically (p186), the text was not the only source from which they had learned things. Questioning visitors about new information they had learned elicited responses such as "that beaver fur feels soft" (p187): 'When asked what they had gained from the exhibit, it became clear that visitors responded with information they had obtained from many sources: reading, listening, smelling, and touching' (p193). This clearly suggests that the improvement in learning that has taken place is not simply a question of improved recall. Rather, by increasing the number of sensory channels available to the visitor, the *opportunities* for learning have been increased. At the same time, appealing to senses other than just vision has

increased the level of interest and engagement in the visitor, as the increased times indicate.

What is encouraging is that this dramatic improvement in the visitor experience was achieved without removing the original exhibits: 'This suggests that traditional museum displays can be made interesting to a larger fraction of visitors with relatively minor modifications.' (p192). The authors go on to argue against the wholesale replacement of original objects with interactive materials (p193), a view in accord with Tilden's definition, Dale's Cone of Experience and Eilean Hooper-Greenhill's emphasis on the importance of real experience (Hooper-Greenhill, 1994 b: 11).

What deserves to be emphasised most of all from this study, however, is the universality of the benefit of multisensory interpretation (p193):

> 'A final point is the value of accessible exhibit design and content for all audiences. We think of making accommodations for people with special needs, but what we consistently saw is that these modifications constituted significant improvement in length of time spent and learning outcomes for all visitors. Multisensory learning opportunities not only provide a way to reach challenged audiences, but also provide an appropriate challenge for all visitors.'

Conclusion

Throughout this study, multisensory interpretive techniques have consistently demonstrated that they can improve the visitor's experience. They can increase motivation and comprehension (learning theory); encourage active engagement with, and thoughtful consideration of, the materials exhibited (the Quest Exploratorium; the National Gallery audio guide); help visitor's understanding of a historical situation (The Trench Experience); add atmosphere to sites that have lost much of their original content (discussion group) and improve both the attractiveness and educational effectiveness of exhibits (The New England Lifezones). However, in advocating the use of multisensory interpretation in heritage sites, one important consideration must always be borne in mind. If sounds and smells are to be added to an exhibit, they must be appropriate, accurate and based on sound research. Fowler's comments on Jorvik's imitators have been mentioned before, but bear re-emphasising: 'some would-be copycats have gone for 'the experience' alone, forgetting or not realising that behind Jorvik… is academic substance' (Fowler, 1992: 117). Similarly, the sensory elements must be relevant to the subject matter to be worthwhile (Thomas, 1996: 83), and reinforce one another to improve access and comprehension (Spencer, 1991: 139; Davidson *et al*, 1994: 181; Rayner, 1998: 39-40). Like the respondents in the Trench Experience survey who felt that the smell had enhanced their experience without increasing their understanding, there are bound to be visitors who are more motivated by sensation than sense. It is doubtful that museums will ever appeal to such visitors in the way that more overtly 'fun' leisure sites can, and it would be foolish to graft on inappropriate devices merely to try.

At the same time, the renewed emphasis on museum education (Anderson, 1997) should not confine itself to the to the traditional, word-based concept of learning identified by Davidson *et al* (1994: 193). Knowledge of a smell is as much knowledge as knowledge of a date, albeit a form that our society has traditionally valued far less. But the smells of the past are vanishing as fast as, if not faster than its more tangible (or rather, visible) aspects. While domestic artefacts are preserved behind glass in countless local history museums, how many people still know the smell of boiling soap on a Monday wash day? How has our notion of heritage been allowed to encompass only that which we can see, at the expense of the other senses? The value of sensory stimulation has at least been recognised

by those working with the elderly. Age Exchange at Blackheath is an organisation helping older people to share their experiences of life by triggering memories of the past. To do this, they created a 'reminiscence centre' that contains objects from the early to middle decades of the century. Authenticity was paramount, as the director emphasises: 'It was crucial to the success of the idea that everything in the Reminiscence Centre could be touched and nothing should be behind glass… It was also decided early on that everything should be real and not reproduction, so that objects would feel and smell right as well as looking right' (Schweitzer, 1995: 93). More recently, smells alone have been used for the same purpose, manufactured by Dale Air Products, the company that makes the odours used in the Trench Experience. An intriguing possibility presents itself – an entirely non-visual exhibition, featuring the smells of the past accompanied by the recorded reminiscences of those who experienced them.

For heritage sites to continue to rely so heavily on the written word makes little sense, regardless of retention statistics. As theories of learning expand to embrace the idea of 'felt knowledge' discussed by Eilean Hooper-Greenhill (1994 b: 11), common sense demands that we use more than one-fifth of our sensory capacity. Put more strongly, 'When museum education emphasises teaching and verbal communication, it does a disservice to the museum as a learning environment' (Braverman, 1994: 217[5]).

We experience reality with all our senses. We should experience our heritage the same way.

[5] Quoting Hicks, E C and Munley, M E (1984) *Museums for a New Century*, Washington DC, American Association of Museums

Appendix A – Trench Experience Survey Results

The table overleaf shows the percentage of respondent agreeing, unable to decide, or disagreeing with each of the statements in the questionnaire. The heading for each group of three columns summarises the statement to which the responses relate, e.g. 'Added' indicates the statement 'The smell added to my experience of the exhibit'. The ten statements were as follows:

1. The smell added to my experience of the exhibit.
2. The smell helped me to understand what life was like in the First World War Trenches.
3. The smell made me want to leave the exhibit.
4. The smell was realistic.
5. The smell was irrelevant.
6. The smell was unpleasant.
7. The smell made it more likely that I will remember the exhibit.
8. The smell made it more likely that I will talk about the exhibit.
9. The smell made it more likely that I will want to revisit the exhibit.
10. The smell made it more likely that I will tell others to visit the exhibit.

The right hand columns show the percentage of respondents in each of the three age groups, and by gender.

The rows of percentages show the responses for certain sub-groups of the overall sample, such as the three age groups. They also show the figures for those who made a given response to a certain statement. For example, the row headed 'Agreed with 'The smell was realistic'' shows the results for just the 45 respondents who agreed with that statement. Thus it can be seen that, for example, 69% of this group was male, with only 31% female.

It should be noted that the results are rounded to the nearest whole percentage, and thus the quoted figures for any one statement may total 99% or 101%.

Added			Understand			Leave			Realistic			Irrelevant			Unpleasant			Remember			Talk			Revisit			Tell others			Age			Gender	
Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	Agree	?	Dis	<25	25-50	>50	M	F
All Respondents																																		
94%	4%	2%	81%	8%	11%	20%	5%	75%	45%	45%	10%	10%	4%	86%	64%	4%	32%	73%	7%	20%	60%	13%	27%	25%	14%	61%	62%	13%	25%	45%	34%	21%	59%	41%
Male (59 respondents)																																		
97%	2%	2%	78%	12%	10%	15%	3%	81%	53%	42%	5%	10%	2%	88%	61%	3%	36%	69%	10%	20%	58%	12%	31%	29%	17%	54%	63%	14%	24%	53%	31%	17%	100%	0%
Female (41 respondents)																																		
90%	7%	2%	85%	2%	12%	27%	7%	66%	34%	49%	17%	10%	7%	83%	68%	5%	27%	78%	2%	20%	63%	15%	22%	20%	10%	71%	61%	12%	27%	34%	39%	27%	0%	100%
Under 25 (45 respondents)																																		
93%	4%	2%	84%	9%	7%	31%	7%	62%	44%	44%	11%	11%	4%	84%	73%	2%	24%	69%	9%	22%	62%	16%	22%	24%	20%	56%	56%	22%	22%	100%	0%	0%	69%	31%
25 to 50 (34 respondents)																																		
94%	3%	3%	82%	12%	6%	12%	3%	85%	44%	44%	12%	3%	3%	94%	62%	6%	32%	82%	6%	12%	74%	9%	18%	24%	12%	65%	74%	6%	21%	0%	100%	0%	53%	47%
Over 50 (21 respondents)																																		
95%	5%	0%	71%	0%	29%	10%	5%	86%	48%	48%	5%	19%	5%	76%	48%	5%	48%	67%	5%	29%	33%	14%	52%	29%	5%	67%	57%	5%	38%	0%	0%	100%	48%	52%
Agreed with 'The smell was realistic' (45 respondents)																																		
96%	4%	0%	84%	11%	4%	22%	4%	73%	100%	0%	0%	7%	4%	89%	71%	2%	27%	84%	4%	11%	64%	18%	18%	40%	16%	44%	69%	16%	16%	44%	33%	22%	69%	31%
Could not decide on 'The smell was realistic' (15 respondents)																																		
96%	4%	0%	80%	7%	13%	20%	4%	76%	0%	100%	0%	11%	4%	84%	60%	4%	36%	69%	11%	20%	53%	11%	36%	7%	16%	78%	60%	13%	27%	44%	33%	22%	56%	44%
Agreed with 'The smell was unpleasant' (44 respondents)																																		
94%	5%	2%	83%	11%	6%	31%	6%	62%	50%	42%	8%	5%	6%	89%	100%	0%	0%	84%	8%	8%	70%	12%	17%	28%	14%	58%	64%	16%	20%	52%	33%	16%	56%	44%
Disagreed with 'The smell was unpleasant' (12 respondents)																																		
97%	0%	3%	78%	3%	19%	0%	3%	97%	38%	50%	12%	16%	0%	84%	0%	0%	100%	53%	6%	41%	41%	16%	44%	16%	16%	69%	56%	9%	34%	34%	34%	31%	66%	34%
Agreed with 'The smell was realistic' and 'The smell was unpleasant' (32 respondents)																																		
94%	6%	0%	81%	16%	3%	31%	3%	66%	100%	0%	0%	3%	6%	91%	100%	0%	0%	91%	6%	3%	75%	16%	9%	41%	16%	44%	66%	19%	16%	47%	38%	16%	72%	28%
Agreed with 'The smell was irrelevant' (10 respondents)																																		
60%	20%	20%	60%	0%	40%	10%	0%	90%	30%	50%	20%	100%	0%	0%	30%	20%	50%	30%	0%	70%	30%	0%	70%	20%	10%	70%	30%	0%	70%	50%	10%	40%	60%	40%

Appendix B – Observation Timings and Notes

The Fighting Temeraire

Time Overall	*Time Reading*	*Time Looking*	*% Reading*	***Notes (Data sorted by the amount of time spent reading)***
Without Audio Guide				
16	0	16	0%	
17	0	17	0%	
17	0	17	0%	
17	0	17	0%	
25	0	25	0%	Discussing with friend
27	0	27	0%	
27	0	27	0%	
30	0	30	0%	
35	0	35	0%	
37	0	37	0%	
38	0	38	0%	
57	0	57	0%	Discussing with friend
		28.6		***(Average time for those not reading at all)***
		27		***(Median time for those not reading at all)***
28	3	25	11%	
23	5	18	22%	
24	6	18	25%	
46	10	36	22%	
21	11	10	52%	
26	11	15	42%	
38	12	26	32%	Couple discussing
28	14	14	50%	
29	15	14	52%	
30	15	15	50%	
16	16	0	100%	
55	16	39	29%	
21	18	3	86%	
30	19	11	63%	
36	19	17	53%	
22	20	2	91%	
25	20	5	80%	
29	22	7	76%	
29	22	7	76%	
57	22	35	39%	
24	24	0	100%	
36	24	12	67%	
30	25	5	83%	
31	26	5	84%	
40	28	12	70%	
83	30	53	36%	3 in group, discussing and pointing things out.
110	50	60	45%	
35.8	***18.6***	***17.2***	***57%***	***(Averages for those reading label)***
29	***19***	***14***	***52%***	***(Medians for those reading label)***
With Audio Guide				**NE indicates a non-English audio guide*
		37		With a friend who was not listening to her audio guide
		45		
		63		Spent 12" reading label while listening to guide
		76	*NE*	Sits, then stands and moves closer
		89		2 young males, both with audio guides.
		90		Couple. Viewing cut short by arrival of friends.
		153	*NE*	
		204		
		213		Made to sit but stayed, moving around painting.
		220	*NE*	Audio guide passed from companion who had already listened
		223	*NE*	Sits, stands at 32", moving around painting
		225	*NE*	Restive at 2'30"
		230		
		240	*NE*	Glancing around at 3'19"
		252	*NE*	German couple. Sit at 35"
		261		Elderly couple, moving around painting - discussion after commentary
		163.8		***(Average for audio guide users)***
		208.5		***(Median for audio guide users)***

Whistlejacket

Time Overall	*Time Reading*	*Time Looking*	*% Reading*	*Notes (Data sorted by the amount of time spent reading)*
Without Audio Guide				
17	0	17	0%	
23	0	23	0%	
27	0	27	0%	
27	0	27	0%	
27	0	27	0%	
29	0	29	0%	
39	0	39	0%	Discussing with friend
		27		***(Average time for those not reading at all)***
		27		***(Median time for those not reading at all)***
20	10	10	50%	
31	15	16	48%	
29	17	12	59%	
32	19	13	59%	
20	20	0	100%	
27	22	5	81%	
30	22	8	73%	
25	25	0	100%	
30	25	5	83%	
26	26	0	100%	
29	29	0	100%	
34	29	5	85%	
55	29	26	53%	Moved back after reading label
51	30	21	59%	Moved back after reading label
40	31	9	78%	
35	35	0	100%	
40	35	5	88%	
41	36	5	88%	
62	41	21	66%	Moved back after reading label
73	44	29	60%	Time looking extended while waiting for companion to finish reading
73	45	28	62%	
60	46	14	77%	
103	48	55	47%	Moved back after reading label
123	48	75	39%	Moved back after reading label
55	50	5	91%	
56	56	0	100%	
60	60	0	100%	
115	63	52	55%	Moved back after reading label
126	72	54	57%	
153	106	47	69%	
55.1	***37.8***	***17.3***	***74%***	***(Averages for those reading label)***
40.5	***33***	***9.5***	***75%***	***(Medians for those reading label)***
With Audio Guide				
		32		
		52		2 young females, both with audio guides
		110		Glancing around at 1'30"
		138		Glancing around
		160		Sits, looking around at 1'53"
		160		Couple, sit
		165		Sits, glancing around at 1'50"
		116.7		***(Average for audio guide users)***
		138		***(Median for audio guide users)***

Note: although some comments, such as 'Time looking extended while waiting for companion to finish reading', might suggest that certain timings are being affected by factors other than those being studied, these only reflect the observer's impression of the apparent reasons for certain behaviour. Without asking the individuals involved, the precise reason for any behaviour cannot be established, and therefore all data must be regarded as equally valid. There will be many factors affecting visitors' behaviour that are not discernible by the observer, so trying to take account of those that are would only distort the data.

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Illustration Sources

Sources for illustrations are as follows:

Title Page: Original, based on an unattributed photograph from http://www.abcgallery.com/M/magritte/magritte52.html

Page 20 (Figure 1 – Dale's Cone of Experience): Original, based on Dale, Edgar (1969) *Audiovisual Methods in Teaching (3rd Edition)*, New York, Holt, Rinehart and Winston, Inc: 107

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Pages 23 and 26 (Figures 3 and 5 – The Quest Exploratorium): Exhibit designer's photographs.

Page 25 (Figure 4 – Quest's *Lignes de Force* system) Original, based on displays from the Quest Exploratorium.

Index

Page numbers in italics refer to illustrations

access 17, 32, 39, 41, 45, 46
acquiescence 12, 29
adjectives 11
Age Exchange 49, 57
Aggleton, John 18
ambient sounds 43
Anderson, David 6, 48
animals 8
art galleries 12, 32, 41, 44
Atkinson, Karl 22, 57
audio interpretation 12, 13, 14, 32, 33, 35, 36, 37, 39, 40, 41, 42, 44, 45, 45, 46, 48

Baddeley, Alan 17, 18, 22
Benaki, Iphigenia 20
Blitz Experience 21
Borg, Dr Alan 27, 29
Boston Museum of Science 45
Braille 41
Braverman, Benjamin 49
British Library 9

Cassels, Richard 46
CD-ROM 33, 39, 40
Centre for Environmental Interpretation 22, 57
Chambers Dictionary 4
Chanel No 5 25
children 26, 46
Compaq 40
Cone of Experience 9, 19, *19*, 31, 56
correlation coefficient 38
corsets 21

Dale Air Products 49
Dale, Edgar 9, 16, 19, 20, 21, 22, 31, 48, 56
Dallas Dhu distillery 8
Davidson, Betty *see* Davidson, Heald and Hein
Davidson, Heald and Hein 6, 17, 41, 45, 46, 48
Dean, David 6
Disney 7, 21
distillery 8
Down House 43
Durbin, Gail 8

Edinburgh University 40
English Heritage 43
evaluation 10, 46
experience
  contrived 21, 31
  direct/concrete/real 4, 5, 6, 19, 20, 45, 47
  dramatised 21, 31
Exploratorium, The 23, *23*, 26, 48
Explore@Bristol 23

Fighting Temeraire, The 12, 34-39, 52
First World War 9, 10, 27, 31
Fondation de France 8
foreign languages 32, 36, 37, 41
Fowler, Peter 7, 29, 48

Gardner, Howard 6, 9, 15, 20
gender 11, 30
group discussion 14, 42, 48, 57
guide books 5, 14, 42, 44, 45
guided tours 14, 42, 44

Harman, Linda 23
Heald, Candace Lee *see* Davidson, Heald and Hein
hearing 16, 17
  see also audio interpretation
Hein, George E 12, 14, 20, 33, 34, 35
  see also Davidson, Heald and Hein
Herz, Rachel 18
Hewison, Robert 7
Hicks, E C 49n
Hirsch, Alan 18
Historic Scotland 8
History Re-enactment Workshop 15, 21
Hooper-Greenhill, Eilean 6, 9, 15, 18-19, 20, 21, 22, 47, 49
Humphreys, Julie 10, 11

ICOM 8
Imperial War Museum 9-10, 21, 27, 31, 57
information processing 16
internet *see* World Wide Web

Jorvik Viking Centre 7, 18, 21, 29, 48

labels 5, 20, 32, 33, 34, 37, 38, 39, 40, 42, 45, 46
learning 4, 6, 7, 20, 21, 22, 31, 46, 47, 49, 56
learning theory 6, 15, 22, 39, 48
Leishman, Marista 4, 6, 8
Lewis, B 9n
Lignes de Force *25*
Lignes de Force 24
living history 21
London Bodies exhibition 21
Lowenthal, David 29

MacGregor, Neil 32, 41
Martin, G Neil 18
Melton, Arthur 14, 33, 35
MORI 10
Munley, M E 49n
Museum of London 21

National Gallery 12, 32, 33, 48, 57
National Museums of Scotland 40
National Park Service 9n
National Trust 5
National Trust for Scotland 4
Natural History Museum 4, 21
New England Lifezones 45, 48

objects 5, 20
observation 12, 45, 52
Oppenheim, A 12

Pearson, Anne 43
pictures 17

Quest International 23, 24, 25, 48, 57

Rayner, Ann 6, 9n, 15, 17, 20, 40, 43, 48
redundancy (information presented simultaneously through more than one sensory channel) 6, 17, 39, 48
reminiscence 49
retention 16
  table of statistics (percentages) 9, 15, 19, 49, 56
Robertshaw, Andrew 15, 21, 22
ruined sites 43, 44

St Mary's, Strawberry Hill 10, 14
Schab, Frank 18
Schwarz, Catherine 4
Schweitzer, Pam 49
Second World War 21
short term memory 17, 18
sight *see* vision
smell 9, 10, 11, 16, 18, 19, 21, 24, 26, 27, 28, 30, 31, 45, 46, 48, 50
social aspect of heritage visits 14, 37, 42, 43
Sotto, Eric 21 & n
special needs 45, 46, 47
Spencer, Ken 9, 16, 17, 22, 48, 57
steam trains 8, 17
stewards 44
Stubbs, George 12

taste 8, 16
The Jazz Singer 22
Thomas, Gillian 48
Tilden, Freeman 5, 20, 44, 47
touch 6, 8, 16, 25, 46
Treichler, D G 16 & n
Trench Experience 9-10, 27, 31, 48, 50
trend line 38
Turner, J M W 12

US Fragrance Foundation 23

Veverka, John 9n
Victoria and Albert Museum 21
vision 4, 6, 16, 46
visual impairment 41, 43, 45

Waskett, Louise 18
Whistlejacket 12, 34-39, 53
World Wide Web 8, 9, 16, 56