A STUDY OF THE NOTIONS OF IMMERSIVE EXPERIENCE IN MUSEUM BASED EXHIBITIONS

RESEARCH THESIS FOR MASTERS OF DESIGN

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

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ABSTRACT

The thesis explores the notions of immersive experience in museum exhibitions, and examines whether the communication of the exhibition content can be transmitted more effectively to visitors through the creation of an immersive environment.

The study reviews the origins and changing interpretations of the term 'immersive experience', and draws upon the work of researchers including Heim (1998) and Bitgood (1990) to examine immersive experience in the context of museum exhibitions. The role of narrative in enhancing immersive experience in exhibitions is explored through the work of researchers including Hooper-Greenhill (2000) and the ideas of Joseph Campbell on myth, story telling, and the concept of 'hero'. Theories of effective communication and learning in the museum context are examined, as well as formal strategies that can be undertaken by museums to inform and facilitate communication and learning for the experience of the visitor.

The author employs the methodology of 'participant observation', using her experience as Senior Designer at the Powerhouse Museum in Sydney to reflect on the aspects of multi-sensory stimulation required for the communication process in an exhibition, and on what is achieved by the implementation of new technology into museum exhibition spaces. A number of exhibitions designed at the Powerhouse Museum by the author are used as case studies.

The major outcome of the study is a theoretical framework on immersive experience that may be applied by museum designers and curators to enhance communication experience for visitors to exhibitions, or may be used by educators to enhance learning experiences for groups who use museums as learning environments.

The thesis concludes with some ideas for further research in the area of immersive experience in the museum, including the development of a methodology for evaluating the effectiveness of immersive experiences created by museum designers.

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INTRODUCTION

This study explores the interpretations of immersive experiences in the context of museum exhibitions. While considerable research has been conducted on immersive experience in some contexts, there has been little research that addresses the link between immersive experience and the design of museum exhibitions. The thesis examines the notions of immersive experience and whether the communication of the content can be more effectively transmitted to the visitor through the creation of an immersive environment. It looks at technology not as a "must have" but as one of the techniques used for communication of the visual and textual narratives. It also addresses the convergence or connectivity in interpretive design practice that results when attempts are made to integrate new media seamlessly into the narrative structures of an exhibition. All exhibitions have similar problems when it comes to bringing the content to life, or attempting to make the exhibition memorable and accessible to the widest audience. However there are some significant differences in the needs of different exhibition types (science, history and design).

The theoretical framework developed in this thesis comprises a review of existing knowledge on immersive experience and ways in which this knowledge has been adapted for use by exhibition designers in museum settings, and provides a better understanding of immersive experience in the museum context. This framework can be utilised in a number of ways. For example, it may be applied by museum designers and curators to enhance communication experience for visitors to exhibitions, or it can be used by educators to enhance learning experiences for groups who use museums as learning environments.

The study relates directly to future practice in the design of museum based exhibitions, and what this means to the concept of the visitor experience. Immersive experiences in this context occur in real multi-sensory environments which appeal to the visitors' senses, encourage interactivity, and employ a transfer of knowledge and

the use of spatial devices to create a feeling of immersion. Other experiences of immersion, such as reading a book and filmic experiences, are also discussed in the study so that the wider frame of reference of immersion can be understood.

The last 20 years have seen a significant shift in the development of museums, both as forms of architecture and as places of entertainment, and they no longer fit the nineteenth century paradigm of places to learn. Architects such as Frank Gehry and Daniel Liebskind have redefined our view of a museum, both inside and out, by embracing new technology in their ideas, practice, and construction, and by giving the public a kind of experience that has been accepted with vigour and is dynamic, innovative and expressive. As David C. Levy explains in the forward to *Designing the New Museum*, museums (and, by default designers) in the early stages of the twenty-first century will 'witness a radical shift, and must accept the mandate to be in its vanguard' (2000 p9). For example, visitors to Liebskind's Jewish Museum in Berlin are able to immerse themselves in a symbolic experience where the message is carried through the architecture of the building, and visitors are invited to 'contemplate the destruction of Jewish life....' through personal visualisation and without a collection being displayed' (Fleming 2005).

Figure 1: Exterior View, Jewish Museum, Berlin (photo: Christian Richters)

In parallel with these new developments in museums, available technology has become smaller, cheaper, and easier to implement, providing opportunities for richer visual, aural and interactive experiences. Michael Heim (1998) points out that when these technologies are implemented into an exhibition so that there is a seamless integration of new technology, they can be considered to provide an immersive experience so long as three primary attributes, namely immersion, interactivity, and knowledge transfer, are present. Selwood (2003) argues that all this cheaper, easier-to-use technology has also raised problems. According to Selwood, museums implement these inter-active, multi-media based exhibitions in order to maintain their edge in the fiercely competitive environment in which they find themselves - the Governments that fund them want accountability and the public that visit them have expectations.

In some installations such as the Anzac Hall exhibition at the War Memorial in Canberra, the seamless integration of technology is very successful, and the visitor experience is enhanced by the multi-sensory presentation of the material. But not all interactive exhibitions satisfy the visitor's needs and often the outcomes, when evaluated, are not as expected, and the inclusion of technology and the desire to create a better visitor experience run counter to the actual experience of the visitor. Why are some exhibitions more immersive than others? What is it that in combination makes for a successful immersive experience?

Previous visitor studies provide much valuable material for analysis in this research, and help to build a real image of visitor behaviour, needs and responses to exhibitions. Since Melton's much quoted landmark visitor study in 1935 titled 'Problems of Installation in Museums of Art', it has become widely accepted that visitors explore the museum environment in a systematic fashion, and that specific features of a display or room setting, such as the location and visibility of exits in a gallery or the amount of objects to view and the identification of pathway preferences, affect those visitors' behaviour. Since the Melton study, visitor evaluations have continued to be undertaken in museums to further the understanding and behaviour of the visitor and to encourage best practice systems by museum professionals. These studies have included the work of behavioural scientists and educators including Loomis (1987),

Thompson (1986) and Bitgood (1990) who investigated in individual ways the feasibility of strategies to maximize visitor outcomes such as learning. Other studies, including that by Robillard (1982) have concentrated on the spatial aspects of public space design, and have evaluated visitor navigation within the public space. Additional to the outcomes of these studies is the abundance of information which has become available as museums encourage the adoption of visitor surveys and evaluation studies to measure visitor satisfaction and to ensure the provision of better visitor experiences.

The most widely quoted study in the area of immersive experiences in museum based exhibitions is that by Bitgood (1990), titled "The Role of Simulated Immersion in Exhibitions". In this study, undertaken in a natural history museum, Bitgood identified the basic premise of simulated immersion, explaining that it is the equivalent of a re-creation such as a diorama or realistic environmental re-creation.

The thesis demonstrates that the focus of these previous studies on immersive experience has been often exclusive of the issues specific to the collection or communication aims of the museum-based exhibition, and the studies tend not to explore how the total environment supports, interacts with and interprets the collection. For example, visitor focused studies such as Melton's that was conducted in an art gallery setting tend to ignore the curatorial issues of the "hang", while it is difficult to apply to museum based design the other research by Bitgood on exhibit design in a zoo, simply because animals move. Contemporary exhibition design practice has been able to specifically apply or address many of the findings raised in these past visitor based studies, and is now looking far more closely at the potential of interpretive design practice to address the greater knowledge which is available and the new opportunities associated with technological advances. These include the idea of immersive experiences and its potential not only for effective communication of the content, but also for creating enjoyable experiences for the museum visitor.

The development of exhibitions and the related design process in the modern museum are complex, and tend to the specific in that no two exhibitions are ever the same. The complexity for designers comes not just from the collection for display and its

communication aims, but from the number of environmental and operational issues that need to be considered in every installation. Because objects, as opposed to paintings or two dimensional objects, vary in their size and physical presentation, the specific dimensional requirements of each exhibition vary. This means that the dynamic interplay of visual narrative, spatial allocation, showcase requirements, interactivity, audio visual material, security and lighting all need to be reconsidered in the design of each exhibition. Additionally, the ambient presentation needs to vary according to the collection. For example, technological exhibits would be quite different to social history exhibits, in the same way that exhibits with high levels of interactivity and aimed at younger audiences would be different to exhibits with very little interactivity aimed at older audiences. This means that while visitor studies are useful, particularly in the areas of communication and learning, they do not in themselves provide enough information for specific spatial design outcomes of every installation or exhibition; they can only provide a guide.

If designers want to create immersive exhibitions in the belief that they can extend the visitor experience, then each component of the exhibition needs to be considered individually and also as part of a whole, because "immersion" is potentially experienced according to different levels or degrees. For example, using a very simple interpretation of immersion, we can probably state that a visitor can experience various levels of immersion in an exhibition visit. These can range from a single look of rapt wonder at one object that has special significance to the visitor, to an immersive experience associated with an entire gallery. In a simple gallery installation seductive low lighting levels, an ambient soundtrack, and textual narratives supporting spot-lit displays of some Egyptian burial objects could provide the context for environmental immersion. But importantly, if the designer also wants to ensure that each moment is experienced as part of the totality of the environment, more than the individual object displays need to be considered. Among other factors warranting consideration are the visitor orientation in the gallery, and the potential for the exhibition to not only attract the visitor, but to hold their attention and interest throughout. The study addresses, in Chapter 4, the typical learning styles of adult audiences, and this helps to broaden the understanding and scope of presentation methods available to designers and curators.

The thesis explores a range of interpretations of the term 'immersive experience'. The work of researchers including Bitgood (1990), Biocca & Delaney (1995), and Heim (1998) is used to construct a number of premises associated with the understanding of the term.

The first premise is that an immersive experience is a multi-sensory experience combining two or more of the senses such as sight and sound, or sight and touch. In an exhibition, the notion that objects can be interpreted using a sensory experience comes from the idea that the narratives [visual and textual] combined with the spatial qualities of the space can provide an element of sensory isolation from external physical associations, and allow the visitor to be 'transported to another time and place' (Heim 1998). According to Biocca, the intention of an immersive experience is 'like film and VR .... to stimulate the imagination by immersing the senses in information from illusory space' (F. Biocca, Levy, Mark 1995b p136).

The work of Falk (1992) is used to support the second premise, namely that there is interactivity or environmental feedback which refers to the participation of the visitor in an activity associated with the experience. This could result from a thematic presentation which provides the visitor with active participation rather than passive observation within an exhibition. Interactive experiences are used in exhibitions to facilitate learning, to change the cognitive focus of the visitor, and to provide feedback, supporting the idea that visitors are intrinsically motivated in leisure based settings by activities which provide tasks that match their ability, provide learning goals, and give feedback (Falk 1992 p105).

The third premise of an immersive experience in an exhibition is that it provides or delivers information to the visitor (Heim 1998). The communication of information via the exhibition narratives is both visual and textual, and supporting graphic material can be absorbed by visitors in many different ways. In any exhibition there is a need to balance the quality of the material against the quantity of information that a visitor can successfully assimilate. Studies in learning in museums and visitor

evaluations have provided a wealth of information in relation to this area. This study shows that not all immersive exhibition experiences are laden with high technology.

This thesis focuses primarily on interpretive design practice in museums that use the "discovery" or constructivist models as the underlying pedagogy for the content. The designers of exhibitions based on these models are more likely to use a variety of devices to communicate the narrative to the visitor. As indicated previously, a three-dimensional environment is complex, and can communicate to the visitor on many different levels, including the intellectual, visual, aural, experiential and emotional. When these multi-sensory environments are successful, the visitor can find the resulting stimulation both intellectually and experientially, "deeply satisfying" (Trulove 2000 p13). Interpretive design practice, discussed in Chapter 4 of the thesis, is essentially about the communication of the content of objects and their story or provenance to the visitor and involves interpretation of both textual and visual narratives. These interpretive structures/approaches are used to enhance the stories developed by curators, but their ultimate communication lies in the hands of the designers, who take the curator's brief and fashion it into a three dimensional reality. Interpretive designers collaborate with the curators to unearth all aspects of the curator's often extensive research, draw links between the objects, and take an objective view of how to best communicate the story or narrative to the visitor through the built environment. As well as the spatial designers, new media designers, audio-visual developers and others can provide elements that contribute to the interpretive process.

Discovery museums have also increasingly exploited the theories of educators such as Piaget, who argued that "learning through doing" was a successful medium for communicating the pedagogy of the exhibition, and that this was enhanced by the inclusion of interactivity, both mechanical, and technological (Hein 1998). Almost certainly, the decreasing costs of technology including digital media have encouraged museums of all sizes to experiment with these newer forms of communication.

How this media is integrated into the exhibition, though, and its role in enhancing the communication of the objects and the narrative has come under increasing scrutiny.

Harvey, Loomis, Bell and Marino in their article titled 'The influence of museum exhibition design on immersion and psychological flow', suggest that too much stimulation leads to distraction and/or anxiety (M. Csikszentmihalyi, Csikszentmihalyi, Isabella 1988; Harvey 1998). This study addresses the future of interpretive design practice in this context, and responds to the question: Is interpretive design practice responding to these issues and, if so, how?

Designers, including architects and museum designers are looking at the impacts on their practice of developments such as the convergence (or intersection) of new media, narrative and space. The designer has the skills and knowledge to create the environment, from conceptualisation to realisation, but this may have changed following technical developments in lighting, audio-visual, and interactive technologies? The study looks at these individual areas with a view to identifying not only their relevance and implementation, but understanding the opportunities for collaboration to create successful outcomes for the space, without losing the over-all vision.

The methodology that is employed in this study combines the review and analysis of the available literature on immersive experience and the use of case studies and 'participant observation' to reflect on the ideas emerging from the literature review. Museum records and other available data are used to link theories on immersion and contemporary museum based exhibition experiences.

Direct references to immersive experiences are not easily found in general historical reference material, but it has been possible to identify related and relevant information on the structure of experiences and the expected outcomes that individuals have wished to achieve. In contrast, contemporary literature sources contain frequent references to immersive experiences, but interpretations of the term are rarely consistent. Only two of the located references clearly articulated the elements that make up an immersive experience, and only one of these directly related to museum based exhibitions. The main source of information on immersion that applied directly to exhibitions came from journals.

The methodology of 'participant observation' has been employed in the study because of the author's 16 years of professional experience as an exhibition designer and current position as Manager of Design in the Powerhouse Museum. The author's professional experience is used to observe and analyse data including the design briefs provided by curators for designers, the design documentation for projects, and photographic museum references.

The use of participant observation as a research technique assumes that an understanding of the area being researched is enhanced by the observer's expertise and direct involvement in that area. The participant observer's access to primary data and a knowledge of processes being investigated, particularly when many different disciplines and complex inter-relationships are involved, can lead to a more rigorous evaluation of material intended for analysis.
(www2.chass.nscu.edu/garson/pa765/particip.htm)

Five exhibitions are used as case studies to explore issues arising from the literature review, and to provide an illustration of how the environmental concept can change the perception of both the content and the spatial or potential immersive qualities of an exhibition. Because an immersive exhibition is primarily a visual medium, photographic material is provided to support the information in this thesis. These exhibitions have been selected because the of the availability of various forms of data associated with them, particularly documentation in the form of CAD drawings with technical information, the curatorial briefs, as well as information on the new media and interactivity developed. The exhibitions has been selected because they represented different research areas, had specific audience reach expectations, and varied in their technological and environmental outcomes.

The ANZAC Hall at the War Memorial in Canberra has been selected as a case study because it employs the use of high level technological presentation to provide an immersive experience for the visitor which is termed 'object theatre' and is similar to classic son et lumiere presentations. '*Leonardo da Vinci: the Codex Leicester, notebook of a genius*' exhibition, held at the Powerhouse Museum in 2000, has been

selected because it is based on pure history, has limited interactivity and shows how 18 small notebook pages can be displayed in a gallery of 750 square metres.

The 'Circus! 150 years of circus' exhibition at the Powerhouse Museum 1997 was a social history-based collection displayed historic circus material from the late 19th Century as well as contemporary circus material, and was selected because the interpretive result presented a dynamic, abstract "theatrical" or immersive experience for the visitor. The retrospective exhibition of designer Marc Newson's career, titled *'marc newson, designworks'* and curated and designed at the Powerhouse Museum in 2002, is used as a case study because it is involved low interactivity but sustained narrative and environmental control through the use of audio-visual material, large scale graphics of sketches and products, and lighting control. The case study titled *'Star Wars, the Magic of Myth'*, an exhibition staged at the Powerhouse Museum in 2002-2003 and curated by the Smithsonian Institute in Washington using extensive material belonging to Lucas Films, is an example of popular culture and was selected because of its use of technology and narrative structure, as well as for its design qualities.

The secondary and primary research conducted in the thesis informs the development of the theoretical framework that enhances the understanding of immersive experience in the museum context. The framework will assist museum designers in their efforts to improve the meaning and appreciation of exhibitions for visitors. The thesis concludes by foreshadowing further research to develop ways of measuring and evaluating the impact of immersive experiences in museums.

CHAPTER 1

From cave to CAVE: a historical background to immersive experience

There is a human desire for physical transcendence

Biocca and Delaney (1995)

'Immersive' is a hip word. These days it is used to describe everything from a virtual experience to experiences emanating from advertising and even language schools. The term is used frequently in the Information Technology (IT) faculties of universities to describe cutting edge technological developments in either the virtual or pure IT experiences. Ironically, the creation of simulated environments, and the quest for sensory rich experiences are amongst some of the oldest continuous traditions known to man.

This chapter explores the origins and changing interpretations of the term 'immersive experience', and provides some understanding of how we have arrived at our modern understanding of the term and its applications. Immersive experiences are both old and at the 'cutting edge' of contemporary life, and an objective in this chapter is to identify the various ways in which humans have sought immersion, and to examine why they have done so. Among the concepts and themes addressed in the chapter that help to inform the investigation are those relating to narrative frameworks, architecture and the concept of space, and multi-sensory experiences. The historical examples discussed in the chapter are not exhaustive, and the immersive qualities of the examples vary, but what they have in common is that human beings seem to enjoy these sensory experiences and the way they stimulate their imagination.

The idea of immersive, multi-sensory environments has always appealed to us. As narrative animals, we have always enjoyed storytelling and myth, and these primary forms of immersion from very early Shamanistic practices to present day activities have helped us to create, in our imagination, emotionally satisfying experiences. To fire the imagination, the storyteller would use various devices such as the ritualistic chanting of the Shaman, dramatic control of the narrative in film and theatre, or even the use of mind altering substances, to enhance the emotional response to the experience (Heim 1998 p19).

We have sought refuge in these myths and legends, initially as a guide to understanding the universal truths, and the vicissitudes of life. According to Joseph Campbell (1990), who inspired the George Lucas film titled *Star Wars Trilogy*, the

first evidence of mythological experience arises in Neanderthal times when the practices of burial and worship become central to human life. The significance here was that, while death is finite in this world, people questioned whether there may be another world, and whether death represented a kind of transformation for rebirth, or eternal life.

Campbell's work suggests that there is a mystery of being and experience that people tried to understand even in late Palaeolithic times, for example through the creation of ritualistic practices in the caves of Les Trois Freres and Lascaux in the Pyrenees region of France. For early people, these caves would not have been habitable as they are cold and dark, but they are, however, dramatic in their physical access and the length and breadth of their structure. The cave of Les Trois Freres is a mile long and thought to have been used for the initiation of boys into manhood and the hunt. In fact the mythical motifs of both the 'threshold' and 'transformation' are evident here. The cave of Les Trois Freres has a transitional space between the outside and the inside, and is accessed via a long and very narrow tunnel with crawling room only. At the end of this access tunnel there is a large gallery painted with images of animals on the plain. The caves provided isolation from the real world for the boys who underwent ritualistic transformations to make them men of courage, possibly through the celebration of death and resurrection rituals. According to archival information from the Cyberworlds Exhibition (2005) at the Powerhouse Museum, these caves are considered to represent the earliest recorded example of a simulated, multi-sensory environment. They have visual (and aural) experience, sensory vividness, and information transfer, and could therefore be considered immersive.

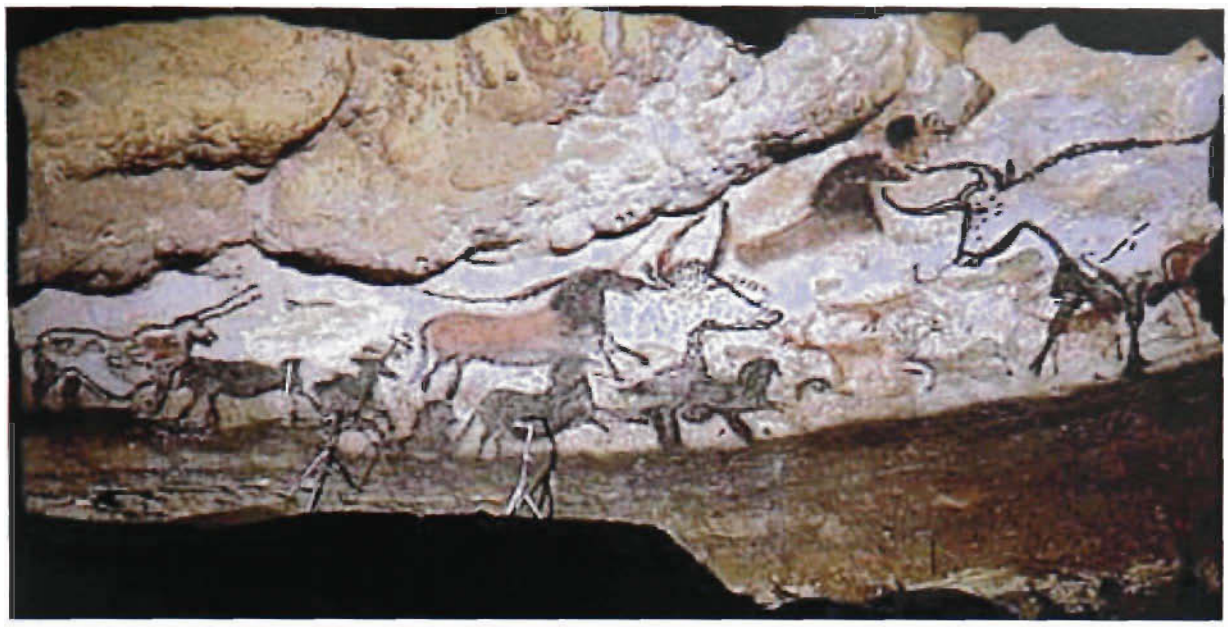


Figure 2: Great Hall of Bulls, Lascaux

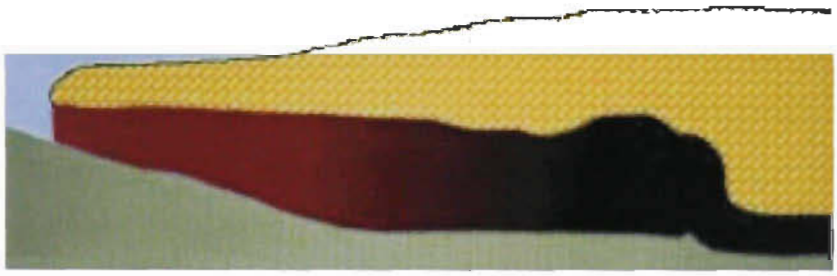


Figure 3: Showing compressed entry experience to caves of Lascaux

Similarly, the caves of Lascaux that were uncovered in 1940 are painted with representations of animals, primarily ox and horses, and are thought to have been used in male initiation rituals where boys were educated in a simulated environment into the arts and rituals of the hunt. Dating from Paleolithic times (15000-17000 BC) these fantastic cave paintings, particularly in the Great Hall of Bulls, appear almost to be painted in perspective, evoking the scene that would confront them as they hunted for the first time. Campbell (1990 p14) suggested that the sensory isolation from the natural world would have enhanced the mystical experience, while the Shaman probably evoked the hunt or the ritualistic ceremony around the kill as a creative act to invoke power and good hunting. Campbell thought that early forms of music or

chanting may have been used in these spaces, but acknowledged that there is no evidence of this (Campbell 1990).

By the time of the Greek philosopher Plato in 510 BC, human beings had developed the capacity to order their world, rather than be at the mercy of it. Ritual gave rise to organised religions and systems of government, while architecture was able to realise powerful aspirations of human endeavour. Theatre and narrative traditions during this time were still primarily religious, performed more as poetry in amphitheatres, and generally coinciding with religious festivals. According to Watling (1947 p9), the open air amphitheatres in Athens held audiences of up to 15,000 people who would come to witness the presentation of 'dramatic performances presented amid high civic splendour and religious ritual'. Watling pointed out that only comedy and tragedy were performed, and they were augmented by a chorus, dance and the commentator. The stage setting was fairly simple, with the actors using masks to define the various characters in the play. In all plays, the audience knew the basic plot line of the story, although there would be minor variations in each production. These plays were often based on the famous mythological works of the past, such as Sophocles' Oedepus Rex or Antigone. The works were performed with the view that the individual would be 'elevated to profound contemplation of the eternal truths' (Watling 1947).

With both the Neanderthal ritual and the Greek theatre audiences we start to see the bridge between a formalised rite, and narrative experience, combined with entertainment. The development of music, dance and narrative implies that the diversity of the experience in some way enhances the experience for the audience. We see also that the traditions of participation in a group are significant to the experience.

In Book Seven of *The Republic*, his idealised view of the world, Plato explored the notion of the 'cave' as an allegorical place of ignorance. Plato's story is well known for its evocative description of prisoners in a cave who are captive to a tableau of shadows projected on the wall. The story presents also the idea of a simulation of another world, the 'imagine if' scenario that humans, as narrative animals, like to

project. The primary aim of Plato's story was to evoke the idea of an environment and experience of ignorance leading to the development of knowledge and enlightenment through learning and education. The spatial quality of a cave was an essential device of the sensory isolation experienced by the participants, and there are parallels with the experiences from the caves of the Pyrenees.

As societies progressed, public buildings became more sophisticated in their intention and presentation. By the time the construction of the 'basilica' of Hagia Sophia in Istanbul was completed in 537BC, both the spatial and spiritual intention of the architect were conjoined to create spaces that could inspire worship while consolidating the power of the religion amongst the masses (Pevsner 1943).

In the Middle Ages, European architects, designers and craftsmen became adept at incorporating in their buildings an emotional or spiritual context that conveyed to those who entered them the authority and power of religion. The expression of emotion and illusion in architecture was nowhere more developed than in the baroque architecture of Germany. A most interesting example of this is the abbey church in Weltenburg designed by the Assam brothers in 1717, where illusion and spatial drama combine in the most visceral expression of religious theatre through the use of *"tableau vivant"* (Penguin Dictionary of Architecture p. 20). The chancel was designed with the figure of St George riding on horseback out of 'a background of dazzling light' which comes from concealed windows that illuminate a heavenly cloud scene behind, representing symbols of religious enlightenment and the glory of the church (Pevsner 1943 p265). The architecture, symbolism, music, incense, and the theatre of procession and incantation all combined to create a sense of illusion for the congregation, indicating that this probably provided an emotionally charged religious experience.

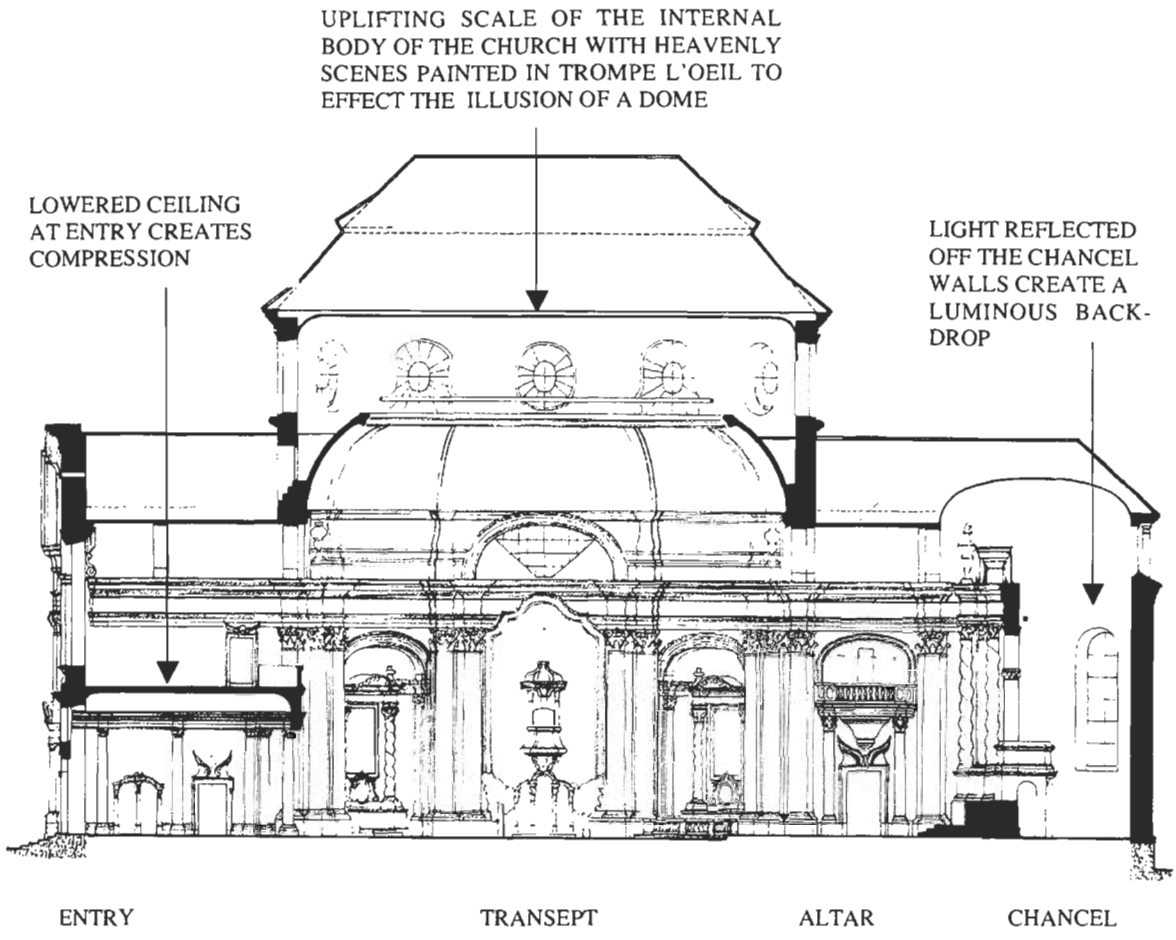


Figure 4: Section through Weltenburg Abbey showing compression, decompression and conceptual orientation.

Figure 5: St. George as hero defeats the dragon, Weltenburg Abbey.

Figure 6: A view of heaven, Weltenburg Abbey (1981).

Was it an immersive experience? It can be argued that elements of immersive experience were possibly present here. The potential for interactivity in the church setting was provided by the priest in spoken prayer, the congregation's responses, the singing of both choir and congregation, as well as the interaction with Christ through communion at the altar. There was also transfer of knowledge, as the religious experience is about learning, and a form of enlightenment through teaching. So all the qualities are here for an immersive experience.

The Baroque architects also developed a device to heighten the experience and convey a quite distinct impression on entry to cathedrals and other large architectural commissions, such as palaces. Their architecture contained a sequential rhythm which started just prior to entry to the cathedral, and it is apparent that it involves the following four steps:

- Arrival: generally at a piazza or forecourt, to admire the size and vertical scale of the building often followed by a flight of stairs;
- Compression: entry through the portico, the transitional space between outside and inside;
- Decompression: the other side revealing dramatically the internal scale, spatial grandeur, and often dramatic lighting (the visitor is impressed);
- Conceptual Orientation: they move into the building, the experience begins.

This entry sequence bears a striking resemblance to the entry sequence into the caves at Lascaux, so it is possible to assume that entry to an experience, has perhaps, some archetype principle attached to it. Pevsner notes that the Baroque architects were influenced by the theatre and spectacle of opera at the time, and that spatial drama, lighting, aspects of the opera, and painting in the Age of Reason were major influences. 'The Baroque does not want to keep the border-line visible between audience and stage (Pevsner 1943). This is an interesting reference to the idea of enhancing the immersive nature of the experience, and achieving the seamless integration of both the physical and environmental.

As immersive, sensory rich experiences, the religious rituals of the Christian church were in fact very well developed, and involved interactivity through the participation in prayer, sensory experience through the visual drama of the building, auditory attention stimulated by music, and olfaction through incense. Additional to the sensory, the intellectual was catered for by information provided through presentation or interpretation of religious texts. The playing of instruments such as organs and lutes to enhance a performance or experience is interesting in the context of this research, because these instruments represented the most continuously available 'technology' in most cultures, until the developments of the industrial age. Music is one of the few forms of expression which can speak directly to the senses and ultimately the emotions, and has been used specifically for this purpose.

The advent of the Age of Reason from the early 18th century resulted in a decline in the influence of religion, and the quest for knowledge uncovered new explanations for

old superstitions through science, physics and chemistry (Peressut 1998 p24). Against a backdrop of the growing middle classes, and less State and Church intervention, secular society faced less censorship and greater opportunities for expression and entertainment. This classical age also saw the spread of literacy in Europe, not just amongst the nobility, but also amongst women and the lower classes. A lack of common language was a limitation to the wide spread of different forms of literature across boarders and into the wider domain, music, however was 'translingual', and against this background of growing literacy and affluence, artists such as Hayden and Mozart travelled widely giving concerts.

But it was Beethoven who was to have the greatest impact. Not only was he able to seduce with beautiful melody, and create a musical narrative unmistakeable to those who listened to it, he was also able to use instruments to depict non-musical subjects. Boorstin (1992) argued that Beethoven's symphonies gave the orchestra powers 'beyond words or even visual images – to express, to depict, and to narrate' (Boorstin 1992) . In Beethoven's concerts, says Boorstin, 'his audience would be dazzled' by the sight and sounds of the orchestra. As members of the audience were unable to have the sounds replicated outside the concert hall, the effect must have been both captivating and sensory. Beethoven liberated music to a level of communication later described by Wagner as 'the sounds, syllables, words and phrases of a language which could express the unheard, the unsaid, the unuttered" (Boorstin 1992 p464). This musical experience perhaps was not purely immersive, but it demonstrates the important development of musical narrative as experience in the later theatrical events of the late 19th and early 20th centuries.

This form of music, which involved a narrative derived from the real world, came to be known as 'program music' and influenced a generation of musicians, culminating in the development of the 'tone' poem 50 years later, probably by Liszt. Program music allowed the composer to 'get across concepts, such as dying, throwing objects, or fighting' in one orchestral movement (www.incompetech.com/music/poem.html). So by the 1850s audiences were starting to embrace musical experiences which involved narratives with a sensory underpinning, and these relied on the individual listener's imagination for complete interpretation.

Painting has also been significant in the development of illusory spaces. For the purposes of this study a conscious decision was made to limit the investigation of painting to forms that would have some relationship to the three 'i's of immersive experience and which focused on aspects of visualisation. As can be seen in the baroque churches of the Assam brothers, painting was used to heighten the religious experience and create an illusion of the [heavenly] space, and was combined with more than one sensory element. Scenic representational painting had been prominent, of course, well before this time. One only has to think of the paintings in the villas of Pompeii in 20 BC with their evocative garden scenes, or the perspective paintings (costruzione legittima) developed in the early Renaissance possibly by Piero della Francesca. This 'geometrical system for depicting the illusion of reality' (Hughes 1980 p16) must have been extraordinarily liberating for the artists of the time, even though it prescribed a way of 'seeing' and other associated conventions for the artist.

Of particular relevance for this study on immersive experience is the observation that perspective of itself is in fact an abstraction of the real, primarily because it supposes the single location of the viewer, and simplifies the relationship between the eye, brain, and object. Humans do not stand and look statically, the eye and the body move continuously. As Hughes suggested, 'reality, in short, is interaction' (Hughes 1980 p17).

By the 18th Century, painting was able to depict representational perspectives, and enhance them with shadow and lighting to the point of realistic simulation. Oliver Grau (2003) in his book *Virtual Art, Illusion to Immersion* has studied extensively the evolution of immersive visual spaces and the primary relationship that we as humans have with the concept of the image. His research into the panorama that was patented in 1787 by Robert Barker is of particular interest for this study. Barker's development of the panorama as an experience was first presented to the public in Leicester Square in 1793 in a large purpose built circular structure, with an interior two stories tall, and showing a 360 degree view on a painted scene. Barker had patented a drawing apparatus which enabled an artist to draw a 'completely accurate circular perspective' (Grau 2003 p58). The drawing presented in Grau's book seems to show light entering

through skylights located in the roof, and flushing the painting with a light that apparently made it look as though the image itself was illuminated. For this early age of tourism, the scenes depicted were of faraway locations and cities, although later they depicted battle scenes.

According to Grau, the initial response to these panoramas was mixed. The public seemed to enjoy them, but the critically informed were divided into two camps; those primarily concerned with the idea that illusion was a good thing, and those who felt that there was a danger in too much illusion. But it didn't matter, as the panoramas became popular with the public, and over a period of time commercialisation led to the development of standard canvas sizes and other installation requirements, allowing canvases to be rolled up and transported to other locations with ease. The essence of the panorama was the 'assumption of being entrapped in the real' (Grau 2003 p64). These panoramas became a particularly popular form of entertainment in Europe until the end of the 19th century.

There was no limit to the possibilities of these installations. By the end of the 19th century, these panoramas sometimes combined sound, lighting and, in one instance, smoke, in order to create from purely scenic images a complete illusion of faraway places and the slightly political presentations of battles. The panorama would remain a largely literal translation of scenic realism, even if it did strive to appeal to all the senses. Was it truly immersive? Yes, probably, for its time. From the first presentation to the later ones in the 19th century, the panoramas came to exhibit the attributes of sensory isolation and knowledge transfer. However, the level of interactivity could be considered limited.

The latter half of nineteenth century, of course, was a fecund time in terms of creative productivity. The avant-garde movements in the arts, the discovery and developments in industrial and scientific research, then in full swing, were to have lasting effects for more than a century. Technological developments such as the phonograph, photography, moving pictures, electrical light, and the car changed substantially the European way of life. The experimentation with these developments has parallels with the situation today, where those who implement these new technologies into

areas such as theatre or art are judged or criticised by traditionalists and theoreticians. This mattered little in the nineteenth century because the pace of change was so substantial, and life would never go back to its pre-industrial state.

For example, in the 1870s the composer Richard Wagner was refashioning the musical experience by building his own theatre at Bayreuth for his operas with the aim of creating a fuller experience. Beacham (1987 p11) points out that Wagner's theatre was based on an ancient semi-circular amphitheatre to give all of the audience direct sight lines to the stage and greater acoustic range. According to Beacham, Wagner also believed that people should sit, not according to their social hierarchy, but rather where they wanted to sit, in order to surrender themselves totally to the 'spiritual experience of the production'. He banished all decoration and ornament in the theatre to prevent any form of distraction from the production itself. The theatre was also darkened, and the orchestra hidden from view. Beacham quotes Wagner as saying:

> the spectator ....is actually in a Theatron, a room designed for nothing else but seeing. Between him and the picture, nothing definite, tangible exists: instead the architectonic device of the double proscenium gives to the stage picture the remoteness of a dream, while from the mysterious chasm mystic music arises akin to the ascending vapours from the tripod of the priestess of Apollo at Delphi.
>
> (R Wagner, Das Buhnenfestpielhaus zu Bayreuth (Leipzig, 1873) in Beacham 1987 p.12)

While Wagner was keen to create this mysteriousness in his production, the naturalistic scenery was part of the old routine of theatre, and it would take the designer Adolphe Appia and other anti-realists at the end of the 19th century to recognise that the slavish re-creation of 2D scenery on a painted backdrop was actually the hindrance to Wagner's vision of a totally integrated experience. According to Beacham (1987), Wagner was striving for a form of immersion with his musical narrative, regardless of the fact, that the interactivity with the experience was a limitation. But it was Appia, in his stage designs for Wagner's operas, who was to find the way in reforming the traditional theatre and strive for a form of immersive experience. He used early technological developments in lighting and projection in

combination with stage design and the knowledge that the audience needed active participation, the third requirement of truly immersive experience.

In the late 19th century, at the time when electrical light was new in theatre, Appia noticed that the quality of the lighting - the foot-lights with their ghoulish aim, and a single lighting frame above the proscenium arch - presented a 'uniformity' to the presentation of any production, thereby limiting any potential emotional relationship between the audience and the stage. It was Appia's contention that lighting was the soul of the *mise en scene* which gave the form to the set both physically and emotionally. He theorised that 'light, like the actor himself, was a medium capable of conveying both external and internal meaning' (Beacham 1987 p26). What he was after was a diffused light and flexibility in its location, quantity and quality. Appia experimented widely during his career to develop the potential of lighting, considered beyond its actual technical capability at this time. He was looking not for the purely external expression of the lighting or the putting on of a show, but for the opportunity to achieve internal sensory reaction in the audience.

Appia believed that art was not to be passively observed, but 'engaged in actively' (Beacham 1987 p58). This term resonates with contemporary writing on exhibitions which argues that the participant or museum visitor prefers active participation over passive observation (Edson 1994). By 1924, with his production of Wagner's Ring, Appia was seeking to establish the closest possible relationship with the audience and the production by using lighting to create a transitional effect between the audience and the stage, and using the actors to soliloquise directly with the audience. He was trying to achieve a form of sensory isolation or direct personal contact with each audience member.

Appia had an influence on many of the early German Expressionist artists, among them Oscar Neher and the designer Bertold Brecht. It was Brecht who would take the idea of immersive theatre into the zone that we are examining here, where interactivity is included making a space more than just a simulation, an immersive environment. Brecht's ultimate aim was for the audience to involve themselves just as much in the production as the actors, and be encouraged to call ' git ya pants off'.

In 1851, Paxton built the Crystal Palace in London, and the World Fair phenomenon, which was to last for more than a century, was born. At numerous international venues, huge halls were filled with manufactured products and commodities which were results of industrial innovation, and also flora, fauna, geological specimens, and often ethnographic material. In many instances, at the close of these fairs their contents were given to the city to form the basis for collections of museums. For example, the Technological, Industrial and Sanitary Museum, the grandparent of Sydney's Powerhouse Museum, was established with the contents of the Sydney International Exhibition of 1879. Progressively over time, these fairs showcased new and often exotic experiences to the public. In Paris in 1900 there were cinematographic panoramas of Madagascar and the Congo (Grau 2003). In London, the Imperial International Exhibition of 1909 was built to resemble an Indian palace. Records in the Powerhouse Museum show it to be an example of a simulated environment on a staggering scale that would suggest a similar desire for immersion as in the panorama, but also with the implied interactivity.

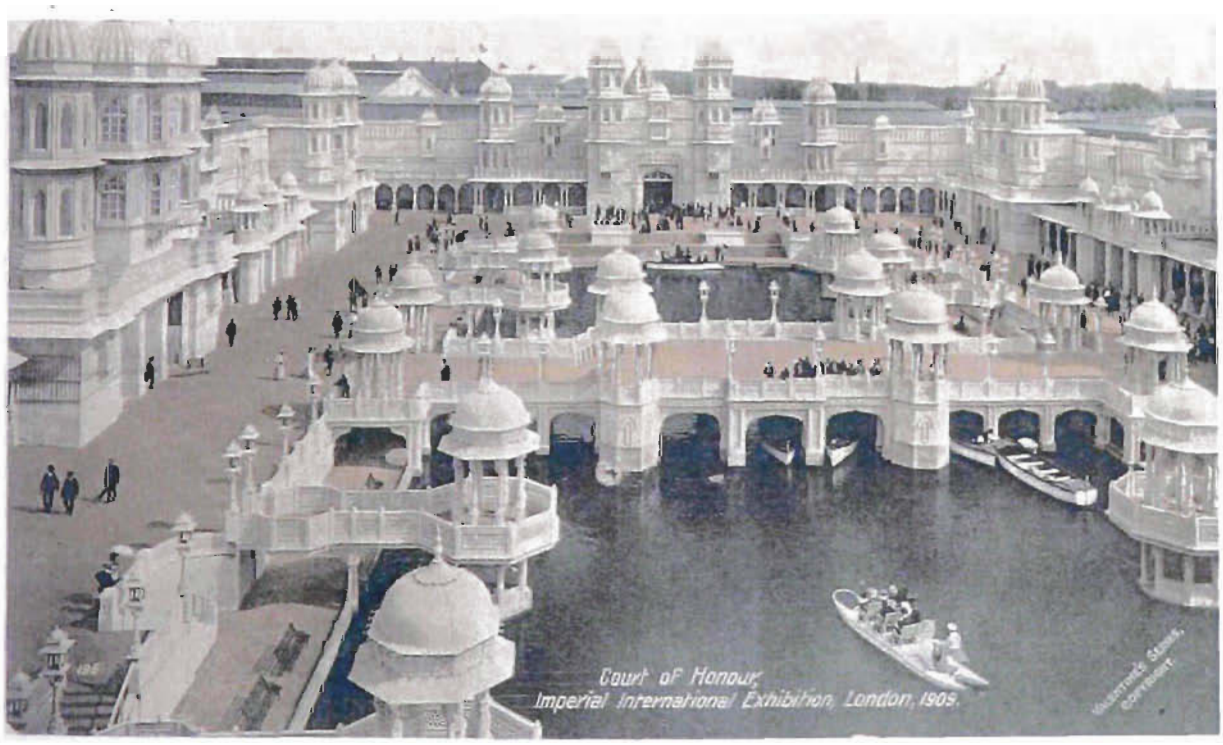


Figure 7: Postcard, London Exhibition, 1909 (Powerhouse Museum Collection)

With scientific discovery came the development of motion pictures, initially with news and documentary footage, and later with more successful narrative films. The invention of film stimulated a whole new area of entertainment in America – starting with the nickelodeon theatre - and the films were cheaper than most other forms of entertainment at the time. These theatres were often no more than a small store, converted by the installation of a screen and some folding chairs. In this early era of popular film from 1910 – 1930, European black and white films, and particularly those of the German Expressionists such as 'The Cabinet of Dr Caligari', were influential in their depiction of 'visual mood' through lighting and abstracted sets. An observation that has relevance for this study is that non-realistic environments can be just as successful as realistic environments in communicating to the senses. Expressionism's influence from this time in theatre and architecture has been significant, even if the term has been little used in the mid century era from the 1920's to the post war 1940's. The term 'modern expressionist' has been used since the late twentieth century in relation to the work of architects such as Gehry and Liebskind.

Popular culture was given an enormous boost with the development of both film and television after the 1930's. In post war America the entertainment industry was booming, communication and technology were also developing at a fast pace, with companies like GE and IBM developing products for the new lifestyle. In 1955, Walt Disney opened the first large scale popular culture experience or theme park, Disneyland. This enormous experience-based theme park presented larger than life characters from the Disney stable, such as Mickey Mouse and Snow White, in simulated environments synonymous with the famous cartoons that were shown on television and in the movies. According to Pine and Gilmore (1999) in their book *The Experience Economy*, Walt Disney is recognised as the innovator behind cartoon initiatives such as synchronised sound, colour, stereophonic sound, audio-animatronics and three-dimensional background.

By the mid 20th century, the experimentation with 'experiences' in art, music and theatre, which were closely associated with new strands of political expression, ran concurrently with the development of computers and the spread of influence of the

flower power generation. These experiences generally involved some form of interaction, liberating the viewer from the role of passive observer to become an active participant. In 1968 Tom Wolfe wrote about the world of Ken Kesey and his Marry Pranksters in his book *The Electric Kool-Aid Acid Test*, an interesting piece of documentary journalism from the time that explored the notion of 'spontaneous experience'. In referring to a form of experience as 'total identification', Wolfe used the following quote from *Childhood's End*, by Arthur C. Clarke.

> The history of cinema gave the clues to their action. First sound, then colour, then stereoscopy, then cinerama, had made the old "moving pictures" more and more like reality itself. Where was the end of the story? Surely, the final stage would be reached when the audience forgot it was an audience, and became part of the action. To achieve this would involve stimulation of all the senses, and perhaps hypnosis as well...When the goal was attained, there would be an enormous enrichment of human experience. A man could become – for a while at least - any other person, and could take part in any conceivable adventure, real or imaginary...And when the "program" was over, he would have acquired a memory as vivid as any experience in his actual life – indeed, indistinguishable from reality itself.
>
> *Childhood's End* (Clarke 1956 p128)

Michael Heim (1998) identifies the Jim Morrison 'Doors' concerts, held in the nineteen sixties, as having shamanistic qualities of immersive experience in which the audience participated in the 'Lizard King' performances and were invited to crawl inside their brains to play the game of 'go insane'. According to Heim, Morrison tried to create a deeper form of engagement and interaction with the individual through his music and performance, both physically and intellectually. The shamanistic quality of Morrison comes from the controlled use of his voice, the amplification of the music and the stage setting to concentrate on his performance. Like Morrison, a shaman had very limited tools at his disposal; a cave, a fire, maybe a primitive drum, and some psychology in how to use his story with each of these devices in a performance to create an accentuated sensory experience.

Heim's primary point of view is that the ecology of the human is so often forgotten in pure VR experiences, and it is the bridge between the human and technological which need further exploration. His point is that the relationship between the engagement of the primary and secondary senses, in which the intellectual intimacy and physical

engagement are combined or addressed, is pivotal to any experiences such as those of the Doors' concerts. Later rock concerts, such as Pink Floyd's concert version of 'the Wall' and later concerts by U2, also created similar experiences. However, their concerts adapted the latest technological and visual display to heighten the experience.

This almost ritualistic joint participation was named 'collective effervescence' by sociologist Emile Durkheim (1858-1917) who described the group experience as a feeling of real existence, and believed that it was at the root of religious experience (M. Csikszentmihalyi 1990 p110). In the late nineteen sixties the computer scientist Myron Kruger started collaborating with an artist and an engineer to create artworks that responded to the movements of the viewer, in real time. He was in the vanguard of the development of real-time, computer-mediated spaces or 'responsive environments' as he liked to call them. Kruger maintained his exploratory role in this area, which ultimately led to the term 'virtual reality' being coined by Jaron Lanier in the nineteen eighties. The concept of 'Plato's cave' became synonymous with Virtual Reality when in 1992 Myron Kruger created an installation at SIGGRAPH '92 in which graphics were projected on the walls of a room, and users donned stereo-synchronised glasses and used a light weight wand to manoeuvre through space. People were amazed by their experiences, 'virtual reality' (VR) was born, and from this point the term "CAVE" was adopted from Plato's narrative to describe this form of installation.

Figure 8: Myron Kruger's VIDEOPLACE Parachute Scene 1976.

Smith, Marsh, Duke and Wright, (1998) claim that it is possible to associate immersion with both the physical state (of baptism, full immersion in water, space etc.) and the psychological state (of thought). Smith et al argue that a state of consciousness is associated with both external sensory stimulation and internal sensory representation, or both the primary and secondary senses.

Chapter Summary

This historical review has revealed that through every era of technological and socio-cultural development there is a consistent determination by certain individuals to exploit and use the 'new' knowledge bases to create immersive experiences. For example, the shaman had only his voice, maybe some sticks or primitive instrument, and fire (his technology), to create an experience. He put these into a cave, created a narrative structure around the event to provide interest, and invited specific groups to attend the ceremony.

The Baroque architect used an understanding of the pattern of the suns tracking through the sky to create a lighting effect that would shine on a fresco of heavenly clouds, and by using the developments of architecture and sculpture, set up an experience that, combined with the high theatre of the church, created a transformative state in the congregation. Set designer Adolph Appia recognised that traditional fixed frontal stage lighting had limitations in the effects that it created for developing a story, and like the shaman before him, reasoned that lights could be situated at different points, flexible in their sequence of switching. New technology in the form of electricity gave him the opportunity to create a new experience through lighting for a different audience.

So there is evidence that every technological development provides new opportunities to create immersive experiences. Each experience is specific to its era but all have a similarity in that they provide some interpretive or intellectual challenge for the

participant, tend to the sensory, and challenge the existing sense of perception in some way. For example opera lovers go to opera and often see the same opera more than once, but it is often not presented in the same form as it was when it was written, and modern interpretations provide a different reading and context of the work for the visitor. In this way, the work is mediated by its presentation and staging.

As Marshall McLuhan wrote in the Medium is the Message:

> The effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance. The serious artist is the only person able to encounter technology with impunity, just because he is an expert aware of the changes in sense perception.
>
> (McLuhan 1964)

In this context, technology becomes entwined with the sensory to develop these immersive experiences. Therefore, it is not enough just to know how the sensory works, but also how to tickle it. While the historical examples explored in this chapter have provided some understanding of how we have arrived at our modern understanding of the term immersive experience, the next chapter looks at particular elements of immersive experiences in a contemporary context and explores the research that explains why people respond to these experiences.

CHAPTER 2

Contemporary interpretations and applications of immersive experience

The gut response to colour, the physical reaction to mass, the engagement with the visual that is both embodied and cerebral, remains mysterious.

(Hooper-Greenhill 2000 p4)

The term immersion is used most commonly in relation to the areas of art, film, theatre and, more recently, virtual reality (VR). As explained in Chapter 1, the term is as old as Plato and his treatise on the Cave, and as new as the latest virtual reality technology. The theories of philosophy, psychology and communication in the age of new media all provide relevant information on immersive experience as a construct. So what does the term actually mean? This chapter explores contemporary interpretations and applications of immersive experience, and examines a number of research studies that have informed the developing theory in this area.

The following definitions for the words 'immersion' and 'experience' are provided by the Concise Oxford Dictionary (1984):

> ***'immerse'*** – n.; cause (person) to be entirely below surface of water, esp. baptize thus; bury, embed, (in); involve deeply, absorb, (in debt, difficulties, thought, etc.).
> ***'experience'*** *n.;* actual observation of or practical acquaintance with facts or events; knowledge or skill resulting from this ... event that affects one *(an unpleasant experience)* ***;*** fact or process of being so affected *(I learnt from the experience);* state or phase of religious emotion.
> (Concise Oxford Dictionary 1984)

For the purposes of this thesis, the words 'immersive' and 'experience' are conjoined to provide a complete meaning, but the word 'experience' is sometimes used individually where it is not necessarily immersive or when it has limited immersive qualities.

As individuals, we generally accept that immersion is a state of internal sensory stimulation which aligns directly with externally delivered information such as a book, a film, or a theatre experience, to create an experience where a sense of time is momentarily lost. The level of immersion can be affected not only by the level of interest and predispositions of an individual, but also by such mundane external intrusions as background noise.

Jonathan Steuer (1995) claimed that one of the essential elements of immersion is complete absorption by a participant in the activity, or a feeling that time is

suspended. At this point the sensory stimulation is at its highest point, and the feeling of 'being there' could be considered to be the peak of the experience.

Why do we seek these sensory experiences? Some answers are provided by early research on human motivation, most notably the work of Abraham Maslow who in the 1950s determined that there was a hierarchy of five human needs. Maslow's needs, which are represented in the diagram below, range from basic or physiological needs (food, shelter, clothing) to needs relating to self actualisation, or the point at which personal potential and self-fulfilment is reached and the peak experience is achieved (Dean 1994).

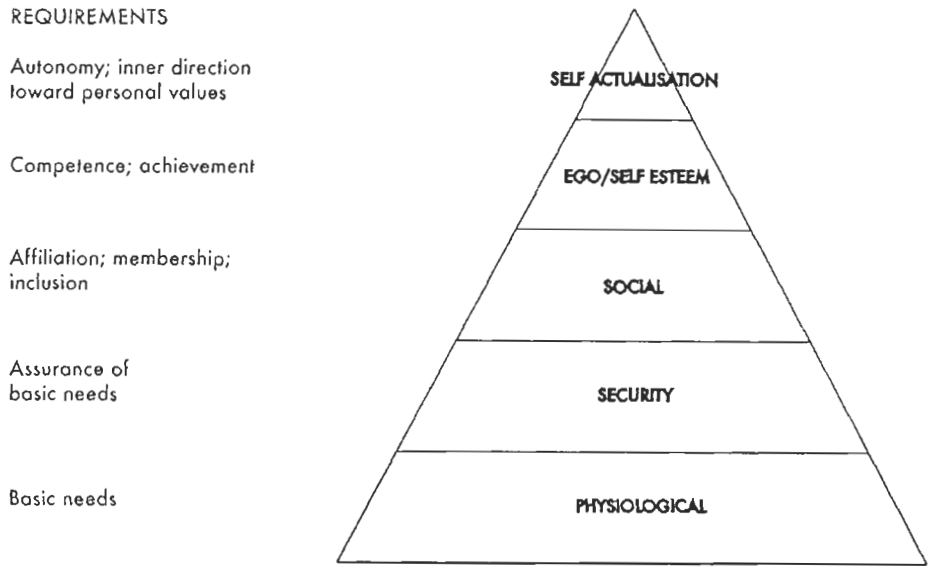


Figure 9: Maslow's Hierarchy of Needs (Dean 1994 p22)

According to Boeree (1998) it was Maslow's contention that peak experiences involve the 'continuous desire' to fulfil one's potential, and that the peak experiences become stronger the more they are experienced. Boeree pointed to Maslow's belief that peak experiences, in which there is a feeling of oneness or the feeling of 'being a part of the infinite and the eternal', were actually only experienced by a very small percentage of the population, that they left a mark on the individual and, as a result, people actively seek them out. According to Boeree, they can also be called mystical experiences, and are an important part of many religious and philosophical traditions. (Boeree 1998)

Dean (1994) in his book *Museum Exhibition* uses the example of Maslow's hierarchy of needs to illustrate that leisure based learning or 'free learning' can occur only after Maslow's first four needs are met, because otherwise the individual is incapable of devoting the time or energy to 'cultural enrichment'. Dean points out that Maslow was one of the first to study fully the idea of intrinsic motivation, at the time that most researchers were focusing on an explanation of behaviour in terms of extrinsic rewards. It can be argued that Maslow's conclusions on intrinsic motivation were not based on rigorous research, as he surveyed a very small and selective sample of people including historical figures such as Abraham Lincoln, Thomas Jefferson, and Eleanor Roosevelt. Dean suggests that because of the limitations in Maslow's methodology, only a limited number of people may have the potential to be intrinsically motivated, and that perhaps any process or activity could result in intrinsic awards (Dean 1994 p22).

This early work of Maslow provided an influence for the research undertaken by Mihaly Csikszentmihalyi (1988). A behavioural psychologist known primarily for his work in "optimal experiences" in the field of intrinsic motivation, Csikszentmihalyi was interested in understanding the underlying motivation for an activity when it is not derived from an external, or extrinsic reward or goal based system, but is an activity which produces 'its own autonomous positive rewards', during the process itself (M. Csikszentmihalyi, Csikszentmihalyi, Isabella 1988).

Csikszentmihalyi was initially interested in what he called the 'quality of subjective experience' and how it made a specific behaviour rewarding. Observing the behaviour of a range of people from artists to blue collar workers, he noticed there were times when individuals found certain activities extremely rewarding – so much so, that they could concentrate on an activity to the exclusion of other thoughts, a form of immersion, that was found intensely rewarding for the time they were engaged in the activity. Csikszentmihalyi called these experiences 'psychological flow', or 'optimal experiences' that occur

> when psychic energy – or attention – is invested in realistic goals, and when skills match the opportunities for action. The pursuit of a goal brings order in awareness because a person must concentrate attention on the task at hand and

> momentarily forget everything else. These periods of struggling to overcome challenges are what people find the most enjoyable times of their lives.
> (M. Csikszentmihalyi, Csikszentmihalyi, Isabella 1988)

As a result of his research on optimal experience, Csikszentmihalyi found that there were several elements that could be present to make an experience enjoyable. These were:

- a challenging activity that requires skills
- the merging of action and awareness
- clear goals and feedback
- concentration on the task at hand
- the paradox of control
- the loss of self-consciousness
- the transformation of time

(M. Csikszentmihalyi, Csikszentmihalyi, Isabella 1988 p32-34)

According to Csikszentmihalyi (1990 p49), these elements were present in various degrees in people, regardless of their age, culture, gender or social class. His work on flow was influential and has been applied in both formal and informal learning situations. As a 'participant observer' informed by the work of Csikszentmihalyi, I have observed that a better outcome can be achieved if the experiences undertaken are rewarding for the individual, and that the elements listed above can be applied to any number of activities pursued by an individual including visits to museums, painting pictures, or rock climbing.

Drawing upon the work of Csikszentmihalyi, Stephen Bitgood (1990) undertook research at Jacksonville State University on the 'Role of Simulated Immersion in Exhibitions' with the objective of identifying that immersion was a valuable part of the visitor experience, that it could be measured and described, and that measures of immersion could be correlated with ratings of exhibit design. Bitgood defined 'simulated immersive experience' as the degree to which an exhibit effectively 'involves, absorbs, engrosses or creates for visitors the experience of a particular time and place' (Bitgood 1990 p3). Most of Bitgood's research was centred around dioramas and natural history displays and, in this context, simulated environments related to the re-creation of real environments to create the illusion of time and place. It should be noted that Bitgood's research looked at forms of architectural or

abstracted environment that create immersion, rather than re-create it. Bitgood also applied the term 'immersive' to the following specific areas:

- Interactive immersion: occurs when the visitor is deeply involved in a "feedback" process, often involving a computer or screen based interactive;
- Media immersion: occurs when the visitor is deeply involved in an audio visual experience;
- Aesthetic immersion: refers to being deeply involved or absorbed in art works;
- Dramatic immersion: occurs when the audience is deeply involved in a play or theatre experience.

(Bitgood 1990)

While Bitgood was not the first to apply the term 'immersive' to displays (John Coe explored landscape immersion in zoos in 1985), his research provides a framework for identifying the characteristics of simulated immersive experience within a museum setting and encompasses:

- The use of the physical space;
- Interactivity which provides environmental feedback;
- The inclusion of multi sensory feedback or stimulation (visual and other);
- The use of object realism or authenticity;
- Social involvement;
- Use of tests to prompt mental imagery to encourage visitors to feel immersed;
- Artistic portrayal;
- Lighting effects / atmosphere.

(Bitgood 1990)

Characteristics one to four are consistent with the research of immersive experiences in exhibitions. However, object realism, social involvement, textual prompts and artistic portrayal are the constructs that Bitgood has applied in order to extend the meaning of simulation. Similarly, immersion is not contingent on visitor interaction or social involvement to experience immersion, particularly as immersion can be affected by things such as a visitor's age and cultural background. Immersion is a nice result for the visitor experience, but not a requirement of it.

Artistic portrayal and lighting effects relate more closely to the spatial qualities and the use of the physical space. When a space or physical environment is successfully designed and all of the elements and constraints are considered, the space becomes part of the multi-sensory component of immersive experience. It is assumed that by

'artistic portrayal' Bitgood means 'design', and this is perhaps indicative of the limitations of a behavioural scientist's understanding of design practice.

While Bitgood may have a limited perspective on the potential of 'design', its capability and its meaning, he clearly recognises the importance of immersive qualities of environments and their potential impact on visitor learning. And while he seems to recognise the impact of 'design', the scope of his interpretation of design is limited to quite simplistic descriptors such realistic, artistic, lighting, label and multi-sensory. Further, in the three studies referenced, the questionnaires use bi-polar descriptors such as 'beautiful-ugly'and 'gloomy-cheerful' to measure the environment, and do not ask substantial questions about what was 'learned', though this was the primary task of the study.

It is possible that at the time of Bitgood's 1990 study, visitor evaluation techniques to assess visitors learning were still evolving. Nine years later Screven (1999) identified the four frequently used approaches to evaluate learning in informal settings. These were: 1] observation of visitor's use of exhibit instructions, materials and way-finding cues. 2] Objective tests using multiple choice questions, sorting and matching tasks, discrimination tasks, fill in questions. 3] Three levels of behavioural indices such as the visitors ability to paraphrase a display's message, list key points and identify key messages. 4] Naturalistic observation using data from visitors in open ended conversation, semi-structured interviews, video/audio tapings to record attitudes, feelings, perceptions and misperceptions (Screven 1999 p154).

In summary, Bitgood's study has left a number of unresolved issues relating to role of simulated immersion in exhibitions. For example, the scope of his study ignores the connectivity of the individual elements that complement the entire exhibition environment such that the conclusions of the research determine its results around the fact that the visitor is specifically drawn to the re-creation in the showcase. The bi-polar rating scale used was not wide ranging enough to define the learning outcomes pertinent to the study. Instead the adjectives relate only to personal opinions of the ambient environment present. Bitgood is concerned primarily with zoos and natural history museums, and this clearly has some influence on the his research direction.

And interactivity associated with feed-back that is consistent with that provided in discovery based museums today was not evident in his descriptions. It is also feasible that Bitgood's 1990 study was conducted too early for the investigator to understand the wider impact of technology and interactivity in the museum setting, as well as the research in the areas of virtual reality based experiences and their impact.

Harvey, Loomis, Bell, and Marino (1998) carried out two concurrent studies on a redesigned exhibition at the Denver Museum of Natural History. The exhibition comprised eight original dioramas from the 1950s displaying Colorado mammals in recreated environments. The objective of the studies by Harvey et al was to investigate if the enhancements made to the dioramas improved the simulated immersion and also the effectiveness of the visitors' experiences. In the first phase the visitors were observed in the gallery, prior to any changes to the exhibits. Following this, additional textual and tactile labels were provided in more accessible positions, as well as some other items providing low level interactivity such as smell and flip panels. The dioramas were slightly modified and enhanced through the addition of specimens and the poses on the mammals changed to provide drama, and some scientific accuracy. A central seating unit was added with integrated electronic/digital interface interactives.

Once these changes were made, Harvey et al carried out a new observational study that was informed by the earlier work of Bitgood (1990). The three potentially immersing design features for assessment were:

1. Human factors information displaying design principles.
2. Features present in the virtual reality computer environment, and features theorised to create a sense of immersion in visitors.
3. Features theorise to induce a sense of immersion in visitors as documented by Bitgood in 1990.

Harvey et al proposed that an exhibition that used design principles to present a consistent format to interpret the content and was based around a central theme could provide consistency of representation through a variety of media [e.g. textual, AV]. This would prevent cognitive effort and overload in the visitor, and thereby reduce the

potential for visitor fatigue. The variety of presentation formats thereby provided the visitor with freedom of choice, with the aim of making them less vulnerable to fluctuations of attention.

In order to prevent visitors becoming cognitively lost in a gallery of repetitive display systems, visual momentum, a device commonly used in film to lead seamlessly from one scene to another, was applied by the introduction of maps to the labelling system to orient the visitor in the gallery. The aim of applying human factors principles in the design of information was to reduce cognitive effort by replacing it with direct perception, thereby extending the time before the visitor experienced fatigue.

To test for features present in the virtual reality computer environment, and features theorised to create a sense of immersion in visitors, the researchers aimed to test visitor responses to neutral / de-contextualised environments for both objects and exhibitions, and then space-surround environments including the presentation of new media. In an exhibition where the visitors are interacting with the environment and are in control of their experiences, they were considered to be undergoing a 'space surround' experience in which visitors control the dynamic view of the environment by locomoting and scanning with their sense organs. This is a similar feature of VR experiences.

The final assessment undertaken by Harvey et al, was based on the features theorised to induce a sense of immersion in visitors as documented by Bitgood in 1990. These included interactivity which provided feed-back, multi-sensory stimulation, role-playing prompts to produce appropriate mental imagery, and lighting to provide atmosphere in the exhibit.

The results of the studies by Harvey et al confirmed that visitors responded positively to the experiences of interactivity, multi-sensory stimulation, and dynamic display, in that order. However, this study also found that one other exhibit which had not been updated and was also based around the narrative of a working mine was found by visitors to be immersive. It was assumed this was because it partly replicated the enclosed and meandering qualities of the mine experience that the visitors were

engaged in learning about. So an immersive experience for the visitor can be provided not only by simulated reality through dioramas, but also through the quality of the spatial experience, relative to the content presentation. This seems to indicate that the "external" spatial or architectural design of the environment or gallery is as important to the presentation of the content as visual and textual narratives, or potential inclusions of new media, and that all have to work synergistically to achieve true immersion.

Put simply, if the visitor is experiencing a correlation between the content in the showcase, the new media, and the external/gallery environment, then 'flow' or immersion are more likely to occur. Bitgood's research and the work of Harvey et al does not draw specific conclusions in relation to the role of interior architecture in immersive experiences in museums. They have evaluated what is in the showcases, not what is between or around them. Therefore, the question might be asked: how are contemporary environmental abstractions, modernist or expressive modernist designs able to support an immersive experience, and can they be as effective as simulations or better? According to Dean (1994), visitors prefer active participation over passive observation, but they also tend to access objects through orthographic imagination, identifying dynamic structures and using visualisation as part of their process.

A number of other researchers working in the area of virtual reality in the nineteen nineties also consistently used the term 'immersion' to describe certain attributes, in particular Michael Heim (1998) in *Virtual Realism*, and Biocca and Delaney (1995a) in *Immersive virtual reality technology*. They all describe immersion as the notion of sensory experience, interactivity, presence, and a certain amount of individual autonomy. Biocca and Delaney refer to 'vividness' which relates to the senses both visual and aural, to 'interactivity' which relates to the diversity of experience, and to some form of 'presence'.

For the purposes of this research, the definition provided by Michael Heim has been adopted, because narrowing the elements maintains the objectivity that can be applied to the term immersion, and avoids including general terms that can be part of any environment. Such terms include 'social involvement' which is an outcome of the

experience, not an essential component of it, or 'lighting and atmosphere', which form environmental effects directly associated with immersion and sensory experience.

Heim argues that contemporary immersive experience (virtual) should have three main components to be effective, and refers to these as the three 'i's. According to Heim,

- Immersion comes from the isolation of the senses sufficiently to make a person feel transported to another place.
- Interaction comes from the computer's rapid ability to change the scene's point of view as fast as the human organism can alter its physical position and perspective, the range and diversity of experience.
- Information intensity involves the notion that a virtual world can offer special qualities like tele-presence and artificial entities that show a certain degree of intelligent behaviour. Knowledge, content or communication transference

(Heim 1998)

Heim's idea can be appreciated more easily when expressed diagrammatically; the varying forms of the three elements intersect to effectively give the highest level of immersion.

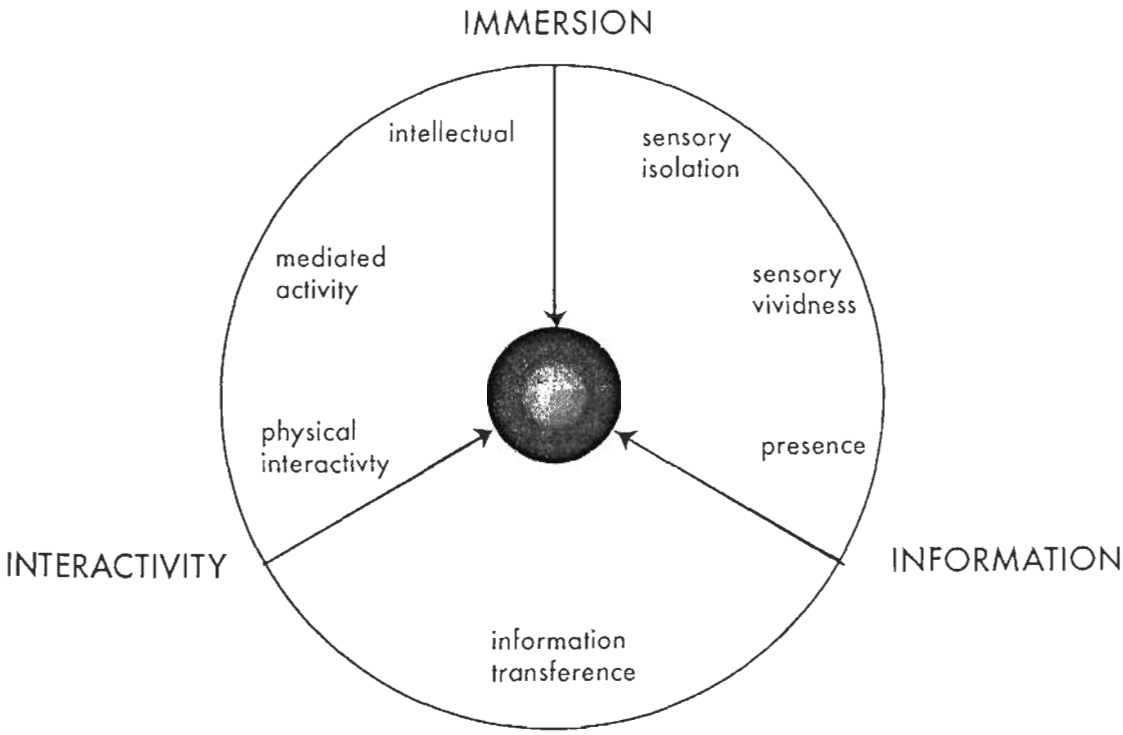


Figure 10: Authors diagrammatic representation of Heim's definition of immersive experience.

How can the extent and effectiveness of an immersive experience be assessed? Reality is the primary immersive experience with which humans are familiar, and it is reality that can be used as the benchmark for understanding the total quality of an immersive environment or experience. As humans, we interact with and within a multi-sensory environment, continually assessing information for use to negotiate our daily lives. In essence, we are 'there'. It could be this reference to reality that results in the mistaken belief that immersion is more likely to occur if the experience is a simulation or re-creation of an environment.

People have different perceptions of reality based on various developmental, environmental and cultural experiences, and this needs to be taken into consideration. As Heim suggests, 'One persons adventure is another's waste of time' (Heim 1998 p19). It is a complex task to try to assess or evaluate which particular aspect makes the experience more immersive or engaging to each individual. When creating these environments, therefore, we do not want to waste time on elements that detract from the experience. There is a lot of historical evidence indicating that it is the totality of the planned experience that makes it immersive, and that the immersive experience is achieved generally through the use of multi-sensory devices.

An important component of this research study is a search for evidence that re-creations inhibit the individual's immersive experience. Our knowledge, experience and perception tell us that the re-creation is false or ersatz. The mind therefore uses valuable time assessing this information. A quicker process involves subliminal access to the pure information; the memory is accessed to provide the correct framework.

Any web search on the term 'immersion' inevitably leads to sites about virtual reality, and it is useful at this stage of the study to clarify the link. Heim (1998) described VR as 'an immersive, interactive system based on computable information'. Biocca and Delaney (1995a) have pointed out that as VR technology has developed, the idea of virtual experience as a 'destination for the future, and not a technology' has become central to its discussion.

The view of Biocca and Delaney was shared by Myron Krueger, one of the first proponents of virtual space in the 1970s to take the ideas and technology of virtual reality and apply them to the real world, 'so they become part of life, or an experience, rather than an escape from it ' (Krueger in (Bertol 1999). In some ways, Kruger's vision is on the cusp of realisation as architects and designers embrace the opportunity to use technological innovations in live projects. VR technologies, on the other hand, are still developing their potential, often inhibiting the user experience through the heavy intervention of technology such as head-mounted devices. And there are still unresolved aspects of VR technologies, including the physiological limitation of motion sickness that can be induced through their use.

Virtual Reality uses different forms of digital or technological equipment to achieve a virtual or simulated environment. Individual examples of VR such as head-mounted devices, and other technologies including haptic gloves, are not explored in this research because of the parameters of the project. These VR experiences have some limitations: for example, those involving head-gear can last for only fifteen minutes at a time before physical and psychological disorientation occurs, and the user can suffer side effects from the loss of proportional perspective.

Figure 11: Heavy Technology, NASA Goggles and VPL Glove (Krueger 1991, Courtesy of W. Sisler and S.Fisher, NASA Ames Research Centre)

In 1995, at the height of early VR development, Biocca and Delaney wrote that virtual reality is 'a destination, and not a technology'. They argued that the importance of VR lay in its potential rather than its impact to that time, and that it would have significant effects on communication media and audiences. Biocca and Levy put forward the plausible argument that we are destined always to look for new sensory rich experiences, of which VR was the most recent development. They stated that in the ideal form of immersion, the body is 'wrapped in communication and pulsates with information' (F. Biocca, & Delany, B., 1995a p17).

Virtual worlds are exciting because the possibilities are infinite. However, they are also currently limited by the technical rendering of those worlds, and the way in which the technology intrudes on the experience. It may take a long time before VR can reach the idea of the 'holodeck' in Star Trek, where the worlds created are so sensory rich that they can be experienced as real. With VR, designers work from the out-side in, meaning that they look into the infinite digital space, creating digitally rendered environments in which technology mediates between the real and digital to create a feeling of immersion. These digital designers often use abstracted architectures to express these digital environments. Architects and exhibition designers, on the other hand, can use real spaces to express abstracted architectures, and they have the opportunity to implement technologies which can blur the boundaries of the digital and the real. Therefore, the research identifies that exhibition designers have the opportunity to create the environment and technology as one; this is the point, identified by Biocca and Delaney (1995a), at which the immersive experience becomes the VR destination.

Chapter Summary

The historical and contemporary examples explored in the last two chapters indicate that experiences described as 'immersive' have some common characteristics. Five desirable settings can be identified, and those experiences that can be called immersive usually have at least three of them. These settings, identified from both historical and contemporary examples, are:

1. Participants are chosen selectively for admission, either as neophytes who are to be admitted to a higher level, or visitors or members of the public who buy a ticket. While historical experiences reflect the selection of participants for particular reasons, contemporary experiences tend to be voluntary, and are generally shared amongst, friends, or family.

2. There is a threshold experience for the participant or visitor. The architecture of the experience often replicates the idea of a threshold, or transitional experience represented by the physical manifestation of a space which bridges the outside with the inside. Often ascribed to a portal, or passage, the threshold provides an opportunity for the individual to cleanse their mind of the space they leave behind in order to be receptive of the experience they are about to enter.

3. There is usually some narrative experience. Whether it be a shamanistic ritual, church liturgy, or curator, there is usually some narrative content or thematic presentation that provides a structure to the experience and stimulates the imagination. The narrative is particularly important in providing a framework in which a transformative state can occur.

4. It is a sensory experience. There are components such as music and visual presentation which support the narrative, but which also set the ambient environment and stimulate more than one of the senses, to encourage the feeling of telepresence. These components do not have to be realistic, and can be abstract in nature.

5. The experience is finite. In most of the immersive experiences, there is a limitation to length of the experience, in which the visitor has to return to "reality" by leaving the physical space of the experience.

Though this chapter has provided an initial link between immersive experiences and exhibitions through the work of Bitgood and Harvey et al, their research has

left a number of questions and issues that require resolution, and this leads to a more detailed exploration, in the next chapter, of how immersive experience can be applied in the contemporary museum environment.

CHAPTER 3

New Media, Multi-Sensory Experience & Exhibitions

...to touch people today you have to slip past their defences and involve them in an unfamiliar way.

Myron Krueger (1991 p84)

In the previous two chapters the notions of 'immersive experiences' were explored through different eras and settings, from simple environments such as the prehistoric cave to the more complex and structured theatrical experiences, most of which illustrate the human desire for better communication based experiences. Chapter 2 concluded with a reflection upon Myron Krueger's concept of the CAVE, in which technology is integrated into an interactive room installation. This emergence of new technologies in tandem with the so called 'human desire for transcendence' (F. Biocca, Levy, Mark 1995b), has helped to shape contemporary communication methods in many areas including museum based exhibitions, film and theatre.

The aim of this chapter is to utilise further sources from the available literature and case studies to reflect on the aspects of multi-sensory stimulation required for the communication process in an exhibition, and what is achieved by the implementation of new technology into museum exhibition spaces. The objectives in the chapter are to explore how communication is affected by receptivity, emotion, the senses, and the physicality of the exhibition space, and whether the application of new technology in the museum enhances the communication of ideas.

From the earlier chapters we can extrapolate that experiences are considered sensory because they can result in varied emotional responses for the individual. The nature of these responses depends on the length of exposure and the dynamic or structure of the experience. These responses can range from those that are happy or sad, to those that are uplifting and thought-provoking. In the entertainment industry, particularly theatre, staging experiences which appeal directly to the senses follow well known narrative traditions to appeal directly to the audience.

It seems likely that Walt Disney knew this only too well when he opened Disneyland to support his television and film industry. He added the dimension of the actual interactive experience to his product. Museums and museum professionals prefer not to associate themselves with theme parks or the 'Disneyfication' of their institutions, but they do recognise the importance of creating memorable experiences for the visitor which enrich their experience in some way and encourage them to return.

Because museums tend to be funded from public funds and are accountable to governments, they have a mandate to make their collections accessible to the public. As a result, museums have embraced increasingly a 'service culture' which helps them to maintain healthy visitor numbers and to compete successfully with other, more commercially-based leisure attractions. At the same time, these commercially based enterprises know that they have to provide more than just a service; that they need to add value to the experiences they offer by promoting a themed experience which impacts on the theme based exhibitions. The fact that museums have to differentiate what they offer from what is on offer from mainstream commercial enterprise is important in maintaining the leisure based market share.

The change in approach can be seen in the exhibition in the new ANZAC Hall at the Canberra War Memorial, which is marketed as 'object theatre'. This hall or gallery, designed by Freeman Ryan Design and curated by the War Memorial, contains three exhibitions which employ the use of high level technological presentation to provide an immersive experience for the visitor which, as mentioned in the introduction to this thesis, resembles classic son et lumiere presentations. The realism of the objects is supported by the atmospheric presentation of sound and light to create a multi-sensory experience relating to the objects history. In these displays, immersion is created by the combination of elements in juxtaposition; without the simulated realism, the imagination of visitors is activated, making the multi-sensory experience more complete.

This exhibition combines the idea of entertainment through the use of the word 'theatre', and maintains the context of the museum through the use of the word 'object'. Periodically, there is a timed show when the lights go down and the theatrical experience starts. Visitors don't interact with the display during the show, although it is a fully multi-sensory experience using lighting, AV technology, drama, real objects, and manipulation of the ambient environment. Visitors are still able to walk around, but most are observed to remain stationary as if in the theatre. This could be explained by their need to just 'immerse' themselves in the presentation with its surround sounds of war including planes flying and bombs exploding; to walk around could interfere with the sensory nature of the experience.

As a 'participant observer' of the ANZAC Hall exhibition, I have observed that this contemporary display provides an experience that is distinct from other exhibitions in the War Memorial which do not employ, to the same degree, the use of sensory immersion, interactivity or audio-visual material as interpretive devices. The ANZAC Hall exhibition is encased in a building that has been designed specifically for the display, and this adds value to the museum, providing an opportunity for the visitor to hear the real sounds and voices from distinct events of war in surround sound. The entry to the exhibition via a transitional space without objects creates a threshold experience for the visitor and sensory isolation from the previous displays prior to entering the gallery. There is an immediate visual impact evident in the size of the icon objects like the Lancaster B52 bomber named 'G for George', as well as the drama of the lighting and the design of the space. There is a narrative structure and sensory devices to create something that is different and dramatic, and it is intended to be an experience that will illuminate the visitor. The exhibition's separation from the main museum and the black box presentation, combined with strong content management, enables the War Memorial to present an experience which is thought provoking, reverent, and memorable.

According to Pine and Gilmore (1999) in their book *The Experience Economy* experiences, like commodities, goods and services, are an unrecognised economic offering. Pine and Gilmore trace the beginnings of the 'experience expansion' in commercial enterprise to Walt Disney and his development of Disneyland in 1955, and they include more recent examples such as the international chains of Hard Rock Café and Planet Hollywood restaurants (part of the 'eatertainment' industry) where in complete multi-sensory productions including sights, sounds, tastes, aromas and textures are combined to create a 'unique' and entertaining experience. According to Pine and Gilmore, a similar situation is found with 'shoppertainment' or 'entertailing' where multi-sensory productions are created in malls and individual shops. Pine and Gilmore point out that that these commercial ventures also wish to capitalise on the idea of engaging their customers and providing them with the 'personal and memorable experience' that has been traditionally the domain of the museums.

Pine and Gilmore (1999) examined the annual growth in employment in the 'experience economy' and compared the figures with those in the agrarian, industrial, and service sectors between the years 1959 and 1996. The highest annual growth rate in employment was in the experiences sector (5.3%), and this was almost twice the annual rate in the services sector (2.7%). As a result of their research, they proposed that companies should look at innovative ways of delivering their products and services to the market on the informed assumption that their clients are searching for an experience. Pine and Gilmore had twin reasons for including this dry marketing business material in the research. They asserted first that people are increasingly attracted to the idea of having an experience, and second that the experience market is quantifiable as experiences can be intrinsically measured in personal terms and occur 'within any individual who has engaged on an emotional, physical, intellectual, or even spiritual level' (Pine 1999) .

It can be concluded that both commercial enterprise and museums are using the same ideas to compete for customers or visitors. Therefore, it will become increasingly important for museums to ensure that they are able to maintain the differentiation of their experiences (exhibitions) from those of the commercial world (theme parks and retail to name a few). The objective of the museum would be to captivate visitors by presenting an experience, which generally would not be replicated in the commercial arena. The following table (figure 12) from Pine and Gilmore illustrates how they believe experience' sits in the traditional economic taxonomy.

Pine and Gilmore make no specific reference to museum-based culture in their book, though their work has obvious relevance for the general cultural sector including museums, and some references to narrative themes and theatre based production are taken directly from the cultural sector. Experiences such as immersion are highly subjective, and ultimately the success of the experience is linked to the way in which the individual responds to the experience. Additionally, experiences can be considered to have degrees of engagement and bias which would be dependant on the proportional presentation of individual aspects of the experience such as the level of participation and immersion in the experience, combined with the educational and sensory nature of experience.

Economic Distinctions				
Economic offering	*Commodities*	*Goods*	*Services*	*Experiences*
economy	Agrarian	Industrial	Service	*Experience*
Economic function	Extract	Make	Deliver	*Stage*
Nature of Offering	Fungible	Tangible	Intangible	*Memorable*
Key Attribute	Natural	Standardised	customised	*Personal*
Method of Supply	Stored in Bulk	Inventoried after production	Delivered on Demand	*Revealed over a duration*
Seller	Trader	Manufacturer	Provider	*Stager*
Buyer	Market	User	Client	*Guest*
factors of demand	Characteristics	Features	Benefits	*Sensations*

Figure 12: "Experiences" as economic units of demand. (Pine 1999) .

Pine and Gilmore argue that the four components of the realms of experience are education, entertainment, escapism and the aesthetic. The interaction of these areas is illustrated in figure 13, which shows that the levels of experience are affected by the

quality of active and passive participation, absorption, and immersion. According to Pine and Gilmore, the richest experiences are at the centre of the diagram, at the point they call the 'sweet spot'.

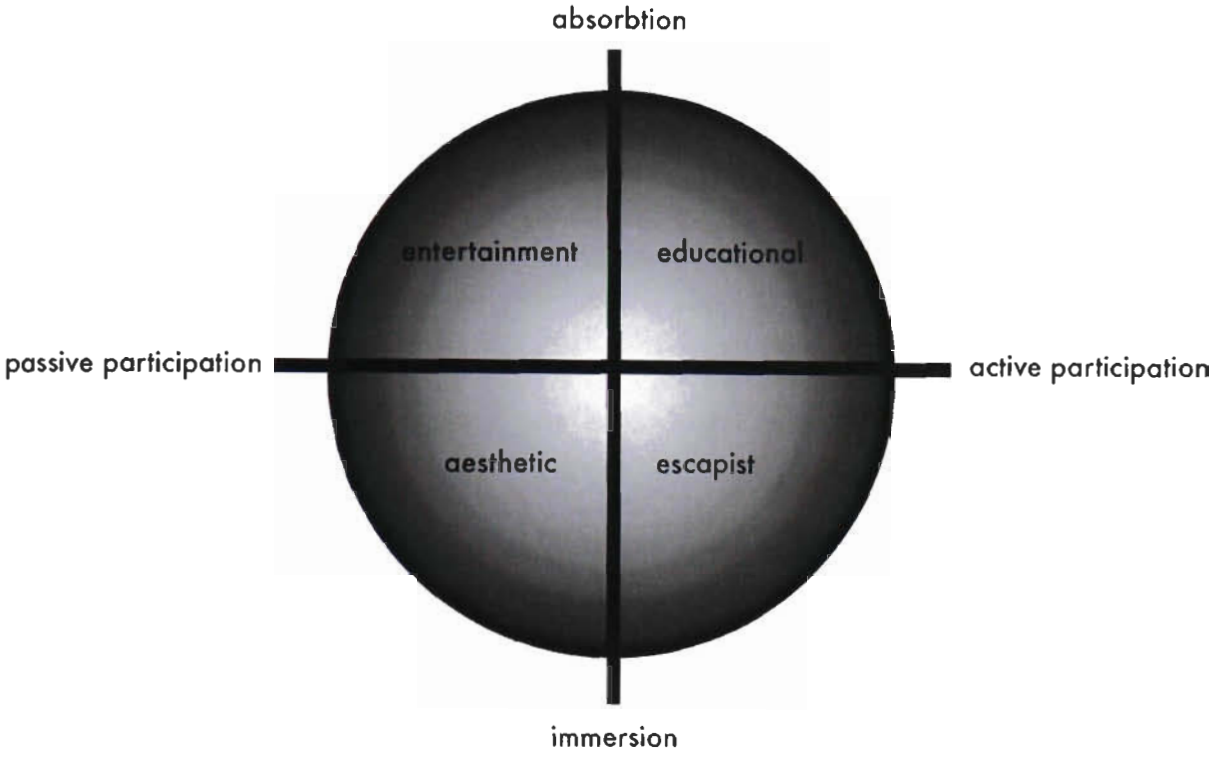


Figure 13: The Experience Realms, Pine and Gilmore 1999 p.30.

Pine and Gilmore draw the distinction between immersion and experience through the statement 'A student in the lab *doing* a physics experiment is immersed more than when he just *listens* to a lecture.' (Pine 1999 p31) . They suggest to design any experience so that it is 'rich, compelling and engaging', it is helpful to vary the use of each realm to prevent the totality of the experience becoming repetitive and boring. Accordingly, Pine and Gilmore suggest that creating some dynamic can be achieved by asking the following questions:

- ***'What can be done to improve the aesthetics of the experience?*** The aesthetics are what make your guests want to come in, sit down and hang out. Think about what you can do to make the environment more inviting,

interesting or comfortable. You want to create an atmosphere in which your guests feel free 'to be'.

- ***Once there, what should your visitors do?*** The escapist aspect of an experience draws guests further, immersing them in activities. Focus on what you should encourage guests 'to do' if they are to become active participants in the experience.

- ***What do you want your guests "to learn" from the experience***? The educational aspect of the experience, like the escapist, is essentially active. Learning, as it is now largely understood, require the full participation of the learner? What information or activities will help to engage them in the exploration of knowledge and skills?

- ***How can you make the experience more fun and more enjoyable?'*** Entertainment, like aesthetics, is a passive aspect of an experience. When your guests are entertained, they're not really doing anything but responding to (enjoying, laughing at etc.) the experience. Professional speakers lace their speeches with jokes to hold the attention of their audience, to get them to listen to the ideas. What can you do by way of entertainment to get your guests 'to stay'?

(Pine 1999 p39-40)

To provide a truly memorable experience though, involves more than just understanding and answering the questions above which barely address issues of sensory engagement that are identified as the 'factor of demand' in Pine and Gilmore's previous table of Economic Distinctions (Figure 12).

It is the staging and rhythm of the experience which are significant for exhibition designers to understand. The work of Harvey et al (1998) that was discussed in Chapter 2, reinforced by examples from case studies and personal observation, shows that designers, in order to successfully structure an interpretive exhibition, need to balance the location of objects and any other new media or graphic communication devices. At the same time, designers need to avoid over stimulation. To do this, designers and curators need to know that it is possible to control both attention and arousal in the visitor by understanding the key opportunities for communication of the narrative, and also by appreciating why there are limits to how much information can be presented. This assumes also that the curatorial brief has a good structure, and that the key thematic groupings and narratives are in place.

Several researchers including Ham (1994) have emphasised the importance of cognitive psychology in understanding how visitors interact with and interpret their experiences in the museum environment. Cognitive psychology is a large area of study which addresses 'information processing' in which information relating to an external stimulus is presented for internal processing by the individual.

Ham identified cognitive psychology, which involves the study of how external information is stored in the memory and how it can be utilized to direct attention and behaviour, as a potential area of knowledge for application in the development of interpretive exhibitions. The field of cognitive psychology includes the areas of sensory perception, pattern recognition, attention, memory, mental imagery, semantic organization, thinking and problem solving. For designers, the ability to structure an 'experience' would be enhanced by a basic knowledge of cognitive psychology to provide an understanding of potential visitor behaviour as it relates to the visitor's interpretation and reaction to the stimulus and information presented. This would be particularly relevant in the exploration of active and passive states which may be beneficial in the narrative interpretation of the exhibition.

The Experience Realms (see Figure 13) identified by Pine and Gilmore (1999) indicate that a sensory experience may utilise active and/or passive states in the guest, visitor or user. The designer therefore needs to be able to decide when these active or passive states are required to enhance interaction with the narrative, and how to facilitate these states. Active participation arouses the visitor's interest in the information being communicated to them, and improves their concentration and receptivity. For example, if a designer wants to ensure that the visitor is actively participating in the experience, some form of interactivity may be initiated, either through asking questions of the visitor, or the act of participating in a digital or mechanical interactive. However, an experience rich in active participation can also increase fatigue in the visitor. As a result, elements that allow some areas of passive observation may be of value in an exhibition experience. Therefore, if the aim is to elicit a passive or reflective state, a quiet ambient area can be created through the

sensitive isolation from adjacent areas, the control of sound, making the visitor comfortable by providing a limited amount of visual distraction.

According to Dean (1994), people in museums prefer active participation over passive observation, because while humans are essentially visual creatures, their non visual senses reinforce what is gained by sight. Dean identifies the three elements that the museum visitor would use to gather information for their museum experience as words, senses and images.

In an exhibition, words are generally presented in the textual and graphic information that is provided, although they can also be represented in multi-media presentations. According to Dean, text and language-based information requires the most processing for the visitor. Senses, such as touch, smell, hearing, (taste) on the other hand, are processed very quickly, and are immediate and associative for the visitor. However, images are described by Dean as the most memorable, as most information is reinforced by what is seen.

Dean refers here to only some of the primary senses, but it is recognised that there are also the secondary senses of proprioception relating to the musculature, and the vestibular nerves which help to orient the body or provide a sense of the body in space. According to Piera Scuri (1995), the visitor's perception of space is conditioned by all the senses including those of proprioception. The body is so complex, and all systems so inter-related, that while considering the senses in relation to experiencing an exhibition, these senses do not exist in isolation from the physiological body. Scuri argues that sight has the widest field of action, and looking at an object is very similar to touching it.

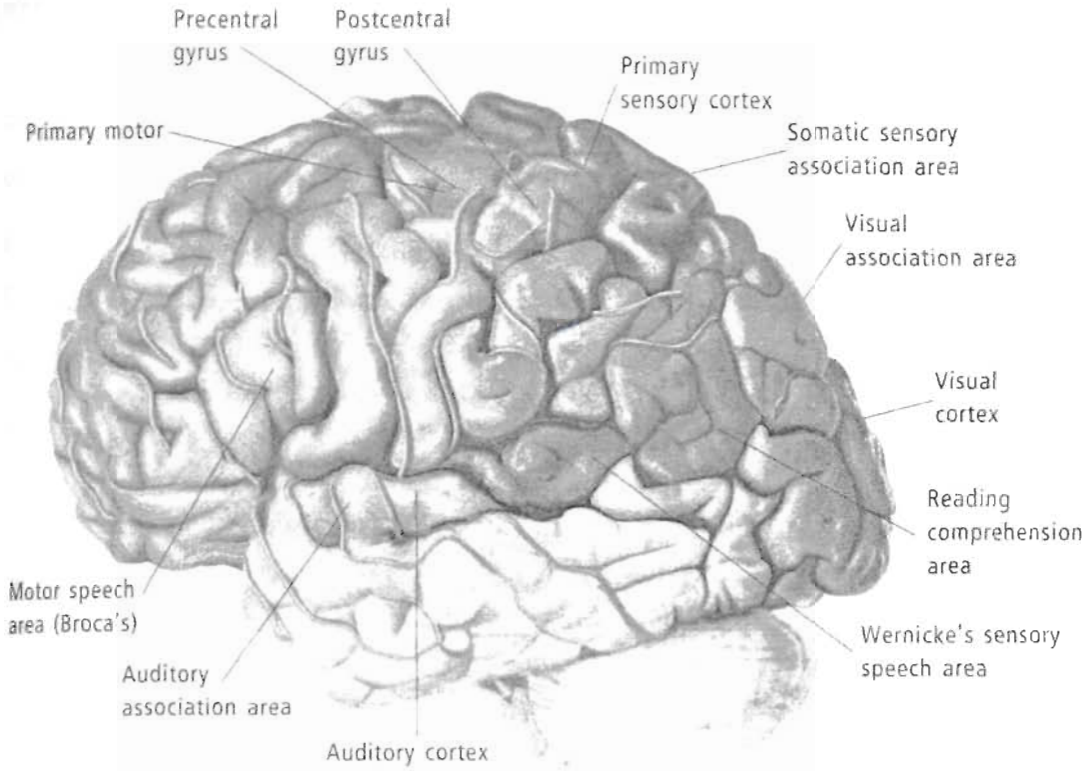


Figure 14: Sensory processing locations in the cerebral cortex (Etherington 2000)

Smith, Duke, March and Wright (1998), in their study titled 'Drowning in Immersiveness', explored the basic concepts of immersion that we experience as part of our daily lives. They examined how the physical senses impact on the state of immersiveness, and this informed their research into immersion in VR. Smith et al argued that a combination of both the primary and secondary senses is required for the purpose of experiencing an immersive environment and that, in some instances, the suppression of particular senses can add to the immersive quality of the experience. They investigated reality, dream states, cinema and book reading to create a clear picture of immersion.

Smith et al determined that in reality states, people mentally create a representation which is a direct replica of the environment. For example, the exhibition seen by visitors matches the exhibition they are in. In reality states, there is a high level of

cognitive input to translate and interpret the environment. In day dreaming, however, the internal representation is related to an internally derived input and not the external environment. Smith et al pointed out that in day dreaming states, for example, a person can still be relatively in touch with the environment such that they are able to react to incoming changes or stimuli, and cerebral vigilance remains high. Therefore, if a visitor is not engaged with the exhibition because they are day-dreaming and have lost concentration, they can return easily to reality if required. Therefore, the designer's ability to stimulate 'arousal' when considering the visitor experience is a key consideration.

In the cinema, according to Smith et al, a person is subjected to an environment where light, picture, sound and physical movement are controlled and the person relies on the two senses of sight and sound to increase their engagement of the film. In this instance the sense of immersion is variable, dependant on the person's state of mind, interest in the topic, extraneous noise etc. In exhibitions, a visitor may sit or stand to view an audio-visual and has the ability to immerse in the material shown, but the implication of Smith et al's work is that sensory isolation can increase engagement.

With book reading, they contend that the person can read the book and become immersed in the content and narrative using visualisation to imagine what has been written, or they can read text with an internal representation of the text [without visualisation]. Similarly, in an exhibition, the textual information may stimulate imaginative thought and visualisations, or be read as dry information.

Hooper-Greenhill (2000) points out that in an exhibition, the senses are an essential component in the success or otherwise of the exchange between the object and the viewer. According to Hooper-Greenhill, the behaviour of the body cannot be separated from the mind and the emotions, and equally, mental activity [cognition] works in partnership with bodily responses. Hooper-Greenhill's observations do not, in themselves, provide enough clarification for the designer to work from. Edson and Dean (1994), however, are succinct in suggesting that museums generally try to provide experiences memorable for the visitor by combining the emotional and sensory with the physical and intellectual. According to Edson and Dean, they try to

achieve these memorable experience physically through interaction, physical and conceptual orientation, emotionally through social interaction, memories and pleasurable experience, and intellectually through narratives, learning and thinking.

The number of senses stimulated and the effectiveness of that stimulation is subjective, and it is therefore valuable to be able to define the quality of the sensory experience so that it can be objectively viewed. Steuer (1995) analysed the quality of sensory experiences in VR, and measured the 'breadth' and 'depth' of the stimulation as a way of determining 'sensory vividness'. For Steuer, vividness has a variable quality depending on which senses are stimulated and to what degree they area stimulated. The breadth of sensory stimulation refers the amount of senses aroused, while the depth of sensory stimulation refers to the quality or "resolution" of the stimulation.

An example of an exhibition which created a sensory experience in combination with the physical and the intellectual categories identified by Edson and Dean was 'Leonardo da Vinci: the Codex Leicester notebook of a genius' exhibition, held at the Powerhouse Museum in 2000 and designed by Jennifer Ison. Each of the original pages of the Codex Leicester was housed in a specific showcase unit that was designed in Europe to provide the highest level of security and conservation conditions, particularly those of light conservation. The showcases were then incorporated into a design infrastructure generated at the Powerhouse Museum. The audience for this exhibition could be described as 'anyone over 12'.

This exhibition could be seen to have low levels of physical interactivity, but high levels of intellectual interactivity through the opportunities provided by data base information and games. Physical and conceptual orientation were also well developed in the planning of the exhibition to combine integrated graphics and audio-visuals to create a journey for the visitor through the narrative. Visitors to this exhibition experienced a combination of active participation and sociability. Sociability, which refers to the visitors' ability to share the experience with family or friends through verbal interaction, was enabled through spatial management that created areas for social interaction.

Figure 15: A page of the Codex Leicester, *Codex Leicester, Notebook of a Genius.* (J-F. Lanzarone Powerhouse Museum)

This exhibition of original pages from one of da Vinci's famous notebooks is particularly interesting because it consisted of only 18 pages from a notebook, but was displayed in a gallery of 750 square metres. To provide an experience involving such small objects that would be memorable, the designer needed to address the following considerations and to incorporate them into the exhibition:

- The small size and location of the objects display within the total environment;
- The significance of the objects as historical items and the need to convey this through the design;
- Environmental and ambient control (light levels and drama through design presentation of areas light and dark and edge lit graphic panels);

- The designer's knowledge that the pages are published and in the public domain; the exhibition therefore had to provide some interaction with the object that was different and exciting.

Well-developed conceptual design, derived from the narrative information provided in the brief and around the content of an exhibition, is more likely to provide an immersive experience than is a formulaic design template repeatedly applied to different exhibitions. When conducting research for the exhibition, the designer found that Leonardo is credited with being the first person to correctly explain that a crescent Moon in the early evening often shows the shadow of the full moon because of reflected light from earth. The designer used this idea of the crescent moon in the floor plan to create a spatial narrative through the exhibition, and to provide visual momentum for the visitor. However, opinions on the worth of the concept by designer and visitor are subjective, and the designer's concept may be knowingly appreciated by only a few once it has been realised in the space. The success of the concept however, can be measured partly by visitor numbers and comments.

My observations as a practitioner have shown that the communication of information indicating how the visitor interacts or moves through the space should be achieved by the design of the architectonic space, and not by the accompanying signage. In the Codex Leicester (Leonardo) exhibition, the planning and location of all the elements was based on the sequential revealing of each area or element that required visitor interaction, in order that a subliminal message was sent about the direction and action for each area.

Another of my observations as a participant has been that the narrative in an exhibition is conveyed partly by the analytical approach to design of spatial communication devices which can make small objects important, and large objects recede. The curator's aim in the Leonardo exhibition, expressed through the design, was to show that the importance of the Leonardo notebooks was equal to that of his paintings, that his scientific contribution was significant for the era in which he lived, and that the legacy has influenced later generations. The importance of these individual pages was conveyed by the distance and isolation of each page from other

elements in the exhibitions which were there to support them. It was important that the support materials had prominence as information carriers, but that they maintained a lower importance in the hierarchy though location and form.

A variety of experiences are required to maintain a level of sensory experience in exhibitions, and to motivate visitors to engage with the material. In this monographic Leonardo exhibition, information was provided to give the context of the exhibition in textual, digital and audiovisual formats. However, the design and spacing of these individual elements is the key to the experience. For visitors to be engaged, the earnestness or worthiness of a subject needs to be offset in some way to prevent boredom; this can be done through the design.

Based on the Experience Realms identified by Pine and Gilmore (see Figure13), components of the Leonardo exhibition could be assessed as follows:

1. The main body of the exhibition could be considered as high aesthetic, high passive participation, high education, low entertainment, and low active participation. Personal levels of immersion would be possibly in the moderate to high level. The main body of the exhibition presented a sensory experience rich in its control of colour, light, space and acoustics. Prior to viewing the pages, visitors entered a transition area adjacent to the first pages of the Codex Leicester, where they were provided with a background audio visual and some textual information about what they were about to see. This provided an opportunity for visitors to engage more directly with the material. Having received the information, visitors moved through the main body of the exhibition.

Figure 16: Exhibition View, *Codex Leicester, Notebook of a Genius.* (J-F. Lanzarone, Powerhouse Museum)

2. The experience provided by two separate interactive data base areas would be considered to be high in educational content, with moderate entertainment values, and high in active participation but with low aesthetic. There would be personal levels of immersion, and some sociability for the visitors. The interactive data base areas provided by the exhibition design gave the visitors access to further in-depth information on the subject of the Codex Leicester and Leonardo da Vinci. Some of these were interactive devices in which visitors could navigate sites according to their interests, and some provided pure data or information.

Figure 17: Exhibition View, *Codex Leicester, Notebook of a Genius.* (J-F. Lanzarone, Powerhouse Museum)

3. Additional contextual information provided by the graphic material, including the illustration of an historic timeline and some small models of da Vinci's inventions, would be considered low entertainment with moderate aesthetic and passive participation. The educational content would have been of a moderate to high level. Graphic material such as this would have some personal levels of immersion, and in some instances the sociability generated through the comparison of information would have been high.

Figure 18: Exhibition View, *Codex Leicester, Notebook of a Genius.* (J-F. Lanzarone, Powerhouse Museum)

It is necessary for anyone conducting a study of sensory experiences to have a basic understanding of memory and its location within both the limbic system and the cerebral cortex (M. Csikszentmihalyi, Csikszentmihalyi, Isabella 1988). According to Csikszentmihalyi, memory is an essential element in the interpretation of experiences for the individual, assisting with learning and providing a context in which goal oriented behaviour occurs.

When this idea of Csikszentmihalyi is applied to exhibitions, it can be seen that memory plays a significant role in helping us to cognitively evaluate material against past experiences or knowledge that has been previously stored, organised and retrieved. It facilitates quick recall or association, making new experience less laboured. If a narrative is coherent, and builds sequentially without gaps, the memory

is open and stimulated, ready for the laying down of new information and for the senses to be stimulated. This supports the notion that the act of 'placement' in a narrative path must be particularly significant when the exhibition designer is trying to achieve an experience that is pleasurable. Additionally, if specific personal and collective memories can be stimulated through a sequential and simultaneous process of communication or revealing of objects, it is more likely that an effortless experience will ensue, and the sense of time and place may be suspended long enough to create immersion in the visitor.

Eysenck (2001) pointed out that the translation of what we see, hear, touch, and smell at any point in an exhibition happens at an astonishing speed, and involves the activation of billions of cells to create electrical impulses which flash through the nervous system to the brain, converting the information into something which we then decode into useable information. According to Eysenck, some of this information does not need to be translated, because it already fits a pattern laid down through previous experiences, but other information needs further translation, and the brain uses both the existing pattern and some educated guess work to evaluate and provide a response appropriate to the circumstance.

In the exhibition titled 'Star Wars, the Magic of Myth' held at the Powerhouse Museum in 2003-2004 and co-designed by Maria Briganti and the author of this thesis, objects from the popular film were presented within the curatorial context of the universal theme of myth and story telling. Because the Star Wars films existed prior to the exhibition, the sensory experience of the exhibition came from the immersion in 'real' myth-making through the sequential revelation of the visual symbolism and the narrative. This sequential revelation was aimed at the creation of emotional responses in visitors by adapting, pacing and revealing scenes of the development, action and climax in ways similar to those of the actual movies. For example, visitors did not see the character Yoda until they had been through the 'call' to adventure and an early journey with Luke Skywalker, and had reached the point at which Skywalker's quest for further knowledge from the 'wise and helpful guide' (Yoda) was appropriate. The character of Yoda in the exhibition was located in an area of quiet repose, supported by an excerpt (of Yoda's soliloquy) from the film.

Similarly, Darth Vader wasn't seen in all his menacing entirety until the point two thirds of the way through the exhibition, as in the climax in the film. His appearance in the exhibition was supported by an excerpt from the film including the sound track of the father and son in the light-saber fight, accompanied by full sound affects to create a cognitive shift from an ambience of warmth and comfort to one of tension.

By creating a staged and sequential revelation of the objects, the visitor accesses each memory item with a clarity that allows individual moments of wonderment and emotion that are stitched together and sustained throughout the exhibition and maintain the visitor's interest and engagement of the exhibition as a whole.

Figure 19: Exhibition view, *Star Wars, the Magic of Myth* (J-F. Lanzarone, Powerhouse Museum)

A contrasting approach that reveals all the objects and aspects of the sensory experience at one time would lead to sensory boredom in which the first moment of viewing and evaluating the sensory nature of the space is the last. There would be no surprise after this point except in the information conveyed in the object labels.

The sensory experiences in this exhibition were achieved by a number of design initiatives including:

- careful location and sequential revealing of objects;
- the use of interactivity to change cognitive focus from passive to active;
- lighting and dark moody colour themes that emphasised and made heroic the objects on display;
- the use of the simple lines of a non-intrusive modernist architecture to provide the landscape using spatial narrative device;
- the use of 3 large audio-visuals as vignettes with sound/acoustic control.

Each of these elements, combined with the experiences of 'hearing' the character while 'seeing' the character or object in three dimensions, enriched previous knowledge of the subject. Only three large audiovisuals and five small screens were used in this exhibition of 1000 square metres. The three large screens were positioned to allow the equivalent of a 3 act play scenario (beginning, middle and end) to unfold, with various sub-plots told by the 5 smaller screens to support and progress the story telling process. This strategy was informed by my participant observations that the controlled variety of emotional response to the narrative makes the experience rewarding, and that the use of technology can be paced to enhance and enhance this experience rather than overwhelm it. It does this by drawing the visitor's attention to information for further investigation through the process of visual attention, changing the visitor's cognitive focus from passive observation of text and object, to viewing a moving image and active listening, through the auditory focus. The visitor's attention experiences a shift, after which the visitor is more likely to attend to the experience and information being presented.

The curatorial aim of the exhibition was to use the objects from Star Wars to illustrate the idea of storytelling, using the universal images and symbols of archetypes found in all cultures. The role of the exhibition designer, as in all/most exhibitions, was to reinforce and help realise the communication of the curatorial aim to the visitor through the delivery of an experience which supports and extends the narrative into the visual, three dimensional space. In the Star Wars exhibitions there was limited textual information for individual objects, only the thematic breakdown of the narrative structure. In this context, the exhibition could be said to have an experiential base to the learning process. The Jungian archetypal underpinning aimed straight for the subconscious – a direct hit, as it were, of the senses. The creation of the Star Wars stories by George Lucas consciously used the knowledge that classic myth appeals directly to individuals young and old, because according to Joseph Campbell, it presents symbolically both the esoteric and the exoteric in our existence reference. Although myth and story telling structures are explained further in Chapter 4, classic myth can be broadly characterised by the following elements

- escape and illusory worlds;
- unifying ideals of the hero and his/her journey;
- triumph over adversity;
- transformations of the character(s) into a hero in thought and deed.

In the Star Wars exhibition an evaluation was not completed that would provide detailed information about the sensory nature of the exhibition. It is mentioned in the Conclusion to this study that proposed future research will involve the development of a methodology to evaluate the effectiveness of such sensory experiences in a museum setting. At present, however, this methodology does not exist, and the effectiveness of the Star Wars and other exhibitions can be assessed only through records of the numbers of visitors to the exhibition and some of their comments. In terms of visitor numbers, the Star Wars exhibition was one of the most successful ever held by the Powerhouse Museum, and this reflects positively on the way that curatorial and design objectives were developed and carried out.

Figure 20: Exhibition View, *Star Wars, the Magic of Myth* (J-F. Lanzarone, Powerhouse Museum)

The Star Wars exhibition, along with other exhibitions in which the author has been involved as designer, has provided ideas on how the aforementioned methodology for evaluating the sensory experiences of visitors might be developed. One way of measuring the success of the experience as an immersive exhibition in this context would be to ascertain the expectation and goals of individuals in visiting the exhibition, and to measure this against their responses and perceived outcomes. Their initial goal could have been to see and reflect upon the interpretation of objects in a museum environment. But the outcomes could have included:

- a better understanding of creating and developing stories and myths;
- a better knowledge of universal qualities of symbols and archetypes in all societies;

- a better understanding of the complexity of film and film making processes including model and set making, costume design and the story board process;
- an engaging and memorable experience of the content.

Ideally, if all the information provided was congruent with the individual goals of visitors, 'flow' or immersion as described by (M. Csikszentmihalyi 1990) and discussed in Chapter 2 may have occurred, because all of the visitors' thoughts, intentions, feelings and senses would have been focused on achieving those goals. A sensory experience in an exhibition needs to be enjoyable for visitors, because they tend to visit in their leisure time, and are unlikely to return if the experience is unpleasant. Enjoyment is therefore important to the experience, and is an implication of sensory processing. If the Star Wars exhibition was successful, we can therefore assume that it provided an enjoyable experience for visitors, and that the inclusion of interactivity and new media supported this experience.

3.1 Physiological Factors Affecting Sensory Experience

Scuri (1995) reinforced the view discussed earlier in the chapter that it is impossible to separate physiological and psychological aspects of the senses. According to Scuri, this is because the human reaction to an external stimulus results in emotions and actions which are a result of the unconscious physiology of the limbic system.

In an exhibition we access both the unconscious and the conscious aspects of memory to assist with interpretation of the experience as being pleasurable, enjoyable or rewarding. All media in an exhibition are received by the visitor in this way. Therefore it is useful to explore which aspects of sensory experiences can be controlled, and which cannot.

The behavioural drives and emotional states that visitors use to access an exhibition that includes narratives, interactivity, audio visual and other material including the space, are entirely controlled by the limbic system deep within the brain. According to the medical reference system *Anatomica* ((Etherington 2000), the limbic system regulates the basic primitive requirements of memory and provides useful information

to ensure survival on a very simple level. On a most basic level, humans rely on this memory to locate food, to identify danger, but also use this memory to remember pleasurable experiences such as a visit to an exhibition. The three primary structures of the limbic system are described in *Anatomica* in the following way:

- The hypothalamus is concerned primarily with regulating basic functions such as hunger, thirst, anger, and pleasure.
- The hippocampus converts short-term memory items in the mind into long-term memory. This allows us to make comparisons with past experiences or knowledge to enable decision making in the present.
- The amygdala is the centre of the brain for identifying danger, and plays an important role in the mediation of affective activities such as love, friendship, or dislike through the expression of emotions or moods.

Anatomica (Etherington 2000 p138)

According to *Anatomica*, the limbic system ultimately controls sensory experiences both conscious and unconscious. Some pleasurable sensory experiences in an exhibition can be those which activate the unconscious in subtle ways through the use of symbolic references such as colour, light, sound, or spatial devices. Additionally, this role of stimulating the memory can be controlled or enhanced through the content of the exhibition and its narrative (described in the next chapter). The sensory interpretations of environments can work to enhance the overall experience by consolidating what is seen, through sensory response.

By understanding the physiology of the limbic system it is possible to objectify the process of trying to structure experiences which rely so heavily on emotional or sensory responses. Researchers have been able to ask questions such as: what is it that makes an experience enjoyable and why is this important in the sensory realm? And they have had the relative confidence that they would find an explanation.

The ingredients identified by Csikszentmihalyi (1990) as essential for an enjoyable experience have been detailed in Chapter 2. Csikszentmihalyi's concept of 'forward movement', whereby a sense of achievement or accomplishment is reached, is

attractive for the exhibition designer because it is consistent with the visitor being engaged in the activity of interaction and knowledge transfer

Two aspects of Csikszentmihalyi's research have particular implications for the exhibition designer. The first is that he bases his idea of intrinsic motivation on the desire of individuals to actively seek an experience or task which is goal oriented, and the second is that that the outcomes during and after the task are completed include emotional or sensory reactions which cannot all be controlled, but which can be enjoyable. This means that the development of exhibitions needs to accommodate and structure carefully controlled goal oriented behaviour in the visitor which will lead to enjoyment. It also means that interactivity and new media in this context need to be developed with an accuracy and skill that accommodates both the goal oriented motivations of the visitor, and the ultimate sensory rewards that they are seeking. It is a challenge for the designer to actively control and assess sensory experiences, which are ultimately individualistic and subjective states. Interactivity and knowledge transfer in exhibitions need to be measured against both the cognitive process, and the unconscious sensory experience.

As mentioned earlier in this chapter, 'attention' is another significant component of the visitor experience, because without it a visitor is unlikely to attend to the information or experience being presented, and therefore is less likely to retain the memory and knowledge gained from the experience. According to Csikszentmihalyi (1990), through the process of attention the relevant bits of information can be selected for focus, the appropriate references from the memory can be retrieved, the event can be evaluated, and the process can then move forward. Attention determines what will or won't appear in the consciousness, including thinking, feeling and remembering. In this instance the term attention is referring to the ability to select the incoming stimulation or information for further analysis. Attention can also be interpreted as the ability to concentrate, or to focus on select objects in a visually complex environment. In both instances, attention is understood to mean the individual's ability to select which information will be processed. Csikszentmihalyi argues that this is determined by the individual patterns that people develop to structure their attention.

3.2 'Sensory Experience and Conceptual Organisation'

Ham (1994) recognised the significance of 'attention', pointing out that if the conceptual organisation of an exhibition recognised the visitor's need to continually self reference against the exhibitions thematic structure, and if this organisation was coherent, the visitor would continue to process information more efficiently. Ham argued that visitors, in order to be able to self-reference, would identify some part of the exhibit with themselves, their past, or knowledge gained from their interests. For example, in an exhibition with a 1920s train, a visitor might think of his/her grandfather, who was possibly a train driver, to localise the pattern of information.

This is because, as humans, we continually rely upon and utilise these patterns to construct frameworks in order to build information. If, in referencing back to the conceptual organization of the exhibition, too much information is out of context, or there is too much unrelated material, then the visitors become confused and switch their attention to other things. The conceptual organization of any exhibition needs to have clarity so that additional forms of communication can be added. Therefore, the quality of the design of an exhibition can determine whether the attention of visitors is attracted and held, or whether it is not. Additionally, it is necessary for the designer to capture the selective attention of the visitor so that individual attitudes to the visual or narrative environment are overcome.

According to Screven (1999 p142) 'dazzling graphics, participatory components and scholarly accuracy are not as important as the ability to connect exhibition experiences to visitors worlds....'. If Screven's observation is accurate, how can designers create or structure exhibition experiences to attract visitors to the objects and the relationships which are set up using spatial, textual and other media? Screven argues that identifying, interpreting and acting on information requires the visitor's attention, and that the visitor's ability to facilitate the cognitive function in order to process this information relates directly to existing patterns or structures in the

memory similar to the incoming information. The visitor is then able and to interpret and act on the information.

Ham (1994) refers to the findings of previous studies including that of Thorndyke (1977) to identify how humans understand and use patterns. Among Ham's conclusions are:

1. One pays more attention to information rich in association, while tending to ignore unassociative or out of context information;
2. A conceptual framework will add meaning and relevance to new information only to the extent that the new information is consistent with the conceptual framework;
3. Once established, the conceptual framework is used by the audience to judge the relevance of subsequent information;
4. Information not readily processed into the conceptual framework is lost in a relatively short period of time;
5. People can consciously control attention and often appear to do so on the basis of contextual clues and ease of processing.

(Ham 1994)

As Ham points out, the experiments of Thorndyke indicated that these conceptual frameworks when clear and with structured plot-lines were more likely to produce recall in the visitor. They showed also that visitors had difficulty with recall of random or non-thematic presentations. However, the research recognises that the opportunities for recall are also enhanced if the presentation in some way references personally significant information which is 'more deeply encoded' than other kinds of information, making recall more efficient (Ham 1994).

While there are many different theories regarding attention and pattern recognition, it is generally accepted that there are limits to the amount of information that we can assimilate at any one time. George A. Miller in his 1956 article titled 'The Magical Number Seven, Plus of Minus Two: some limits on our capacity for processing information', argued that humans can process 7 bits of information at any one time,

126 bits of information per second, and 7,560 per minute. To accommodate these limits, the individual needs to 'chunk' information into manageable amounts in order to increase the amount of information that can be processed (Miller in Ham 1994).

The amount or scale of the chunking is dependant on the memory specific to the familiarity with the subject. In other words, more chunks are required for less stored memory. In an exhibition therefore, information, objects and narrative material can potentially be organised in such a way that the exhibition not only attracts the visitor, but also has coherency of communication within its context. Structured experiences would specifically attend to the needs of visual and in some instances auditory attention, but they also need to take into consideration the thematic requirement of an exhibition. Ham (1994) identifies that a successful exhibition would probably therefore have 7 primary bits of information forming the thematic structure, with sub-thematic information encased with in this.

In summary, sensory experiences can be enhanced by the management of information in coherent structures and hierarchies which are provided for the visitor in an exhibition. This encompasses the narrative or thematic structures within which the information sits, and the amount of information which is made available for the visitor at any one time. The aim is to sequentially attract the visitor's attention to the material, and to facilitate further investigation by the visitor to other levels of information that support or enhance the object or narrative. In sensory experiences such as exhibitions, the information that the visitor encounters is taken on in real time, filtered and coloured by their own experiences and memories. What the visitor sees and hears also has an impact, and while cognitive function associated with information processing is important on one hand, the ability to attract and hold a visitor through visual and auditory attention is equally important.

3.3 Sensory Experience and Visual/Auditory Attention

Visual attention within an immersive exhibition environment is probably the most elementary of the sensory experiences that can be designed for the visitor, and without a doubt the most complex. Many theories on visual attention have been put forward,

and most agree that while they can theorise on the process, visual attention is just one of the cognitive processes that can occur simultaneously or in tandem. This may mean that it is difficult to create a multi-sensory experience with accuracy.

In an exhibition, colour, form, textures, and specific placement of the objects and new media within a visual field, can all be controlled by the designer. The system for control is based on an understanding by the designer of basic composition which can then be augmented by the addition of devices such as sound, lighting, audio or audio visual, and other technology. Dean (1994 p56) found that when these environments are created, visual impact, visual weight, visual direction, visual balance and visual mass can actually direct the visitor's attention and emotions in a particular way. Dean pointed out that dark colours, for example, can add to drama, weight, and sombreness, and that the location of objects, either in a group, en masse, or separately, can provide clues to their importance within the narrative. This indicates, for example, that the location of objects would become particularly important in an exhibition of six hundred objects where visitors need to be provided with opportunities for their visual fields to make contact with specific themes or stories without difficulty.

The challenge in an exhibition is to create a limited variety of experiences to prevent cognitive boredom. Posner and Petersen (in Eysenck 2001) contended that visual attention involves a three stage separate process:

- Disengagement of attention from a given visual stimulus
- Shifting of attention from one target stimulus to another
- Engaging attention onto a new visual stimulus.

Posner and Petersen (in Eysenck 2001 p123)

It follows from these findings of Posner and Petersen that change of rhythm and pace become significant issues, and directing focused visual attention becomes an important device for exhibition designers. However, one could postulate that if the visitor is unable to disengage from one visual or audio-visual stimulus because it dominates the local environment, the next or most directly adjacent visual stimulus, perhaps objects, may be affected.

Focused visual attention, according to Eysenck (2001), is directed to objects and not to particular areas. Eysenck's research indicates that there are particular ways in which the individual scans the environment through visual search, using a number of different components within the visual field. According to Eysenck, objects that don't share the characteristics being targeted are not attended to in the same degree the visitor. This idea is supported by Dean (1994) who postulates that visitors are not only drawn to large objects, but also give them a longer amount of viewing time. Generally, the larger the target, the greater the opportunity for attention. This indicates that large screen audio visuals or a large showcase with some isolated wall space would gain more attention earlier in the visual search process. In the museum, fatigue could contribute to visitors becoming involved in more rapid scanning without their attention being directed. In a visually cluttered environment, this would occur more frequently.

To arrest fatigue in the visitor, or to slow the visitor's desire for rapid scanning, a change of cognitive focus through the use of alternative communication media such as audio visual technologies can be implemented. Consistent with the earlier premise that the communication of the narrative needs to fit a coherent structure, any technology first needs to enhance the narrative as well as support the visitor experience. In the time of the playwright and theatrical reformer Bertold Brecht in the 1930s and 1940s, people were just starting to understand the opportunities that were available from the use of a projector and sound. Brecht's set designer Casper Neher used these devices only to further the narrative, because he recognised that stage sets also support the presentation. Today, the technological opportunities may have multiplied, but the same constraints are still evident when introducing material into a visual landscape.

Figure 21: Attracting power. A large audio-visual back-drop to a single object, *Marc Newson: design works*. (M. Kojdanovski, Powerhouse Museum)

The communication of narratives by audio visuals can be affected by the size of the screen, the location and the potential that arises in the content. Large screen audio visuals such as those using projectors have greater environmental impact, particularly on objects which are adjacent to them. The spatial allocation for large screen-based projections often mean that there is an opportunity to provide an area for the visitor to sit and relax for a short time before moving on. However, the effectiveness of these projections in supporting a feeling of immersion is dependant on the visual and aural strength of the content to support or enhance the viewing of adjacent objects and spaces, and the ability to create an element of sensory isolation to enhance the experience. For example, the ambient lighting around large projection can affect resolution and brightness of the image, or weak sound transmission can dilute the experience.

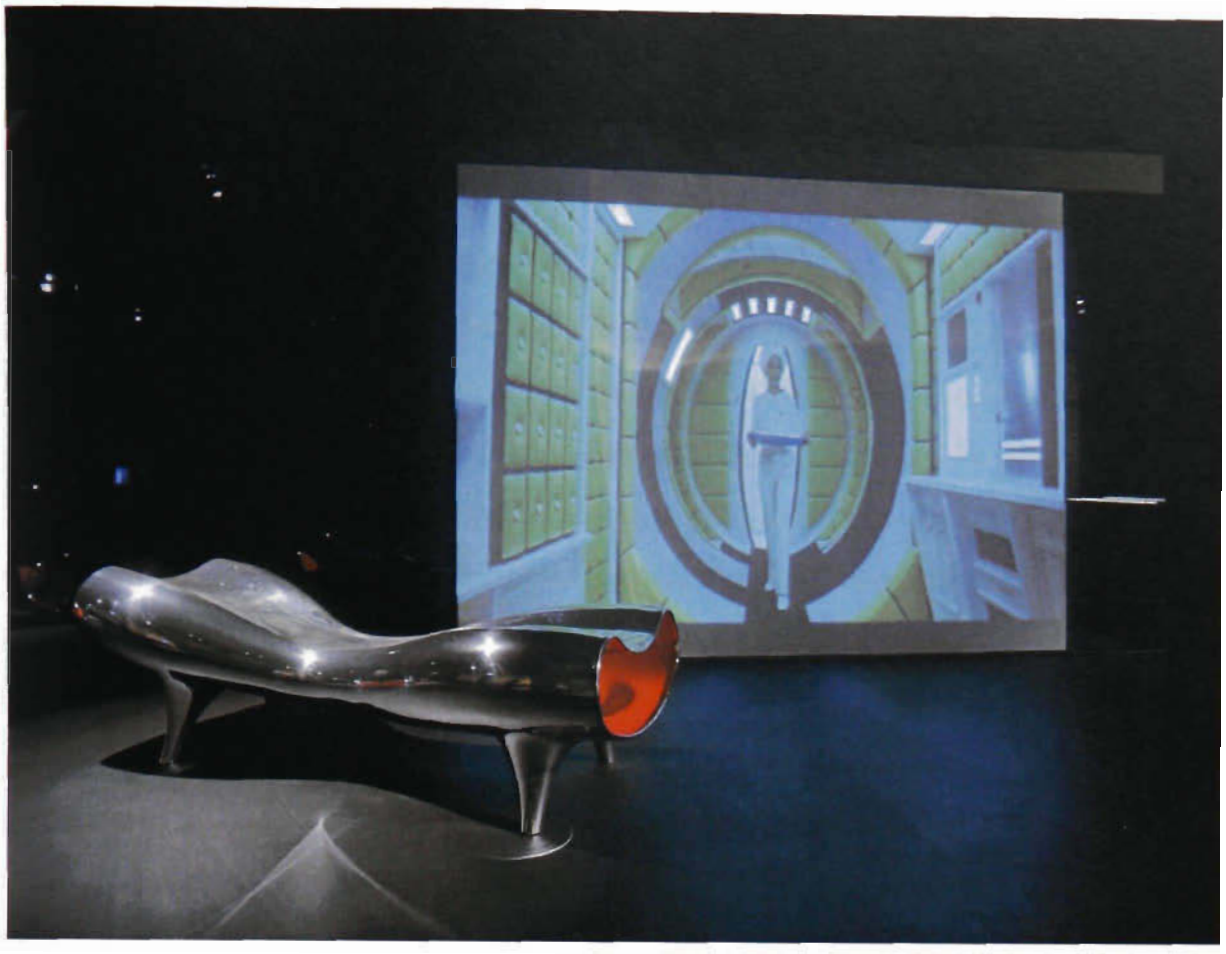


Figure 22: The inspiration and the object, *2001 A Space Odyssey* and Aluminium Chaise. *Marc Newson: designworks Exhibtion.* (M. Kojdanovski, Powerhouse Museum)

In the retrospective exhibition of designer Marc Newson's career, titled '*Marc Newson, designworks*' and curated and designed at the Powerhouse Museum in 2002, exhibition scenes were projected from Stanley Kubric's film '2001 a Space Odyssey' which had been a major inspiration for the designer. An early transitional scene from the film has no dialogue, and consists only of the signature sound-track and the long and graceful journey into space. In this instance, sound and images are used to increase the sensory nature of the environment and support the narrative by hearing and seeing, in context, an important influence on Marc Newson's career.

This example shows that in order to increase the immersive nature of an exhibition experience, audio visual installations can be used either to provide a strong or subtle ambient cue for the visitor, or to further a literal or abstract narrative. Large projections can accommodate more visitors in the experience, and based on earlier

observations tend to carry a significant message in proportion to size. Additionally, the visual and aural impact on the visitor influences perception of the ambient environment as a whole.

When the ideas of Eysenck (2001) that have been discussed above are applied to an exhibition, it is feasible to assume that the eye and optical brain pathways of the exhibition visitor scan the general environment for authenticity and consistency. Lighting is the first and most basic technology that is used in a space, but it is the most significant sensory element because of its direct associations with the perception of colour (as wavelengths) which has its own emotional and cultural associations. Lighting, from basic task lighting to the more expressive theatrical lighting, can affect perception by the visitor, and its effects can be enhanced through the architecture and effective modelling of a space. Turner (1998) argues that variations in the temperature of lighting affect colour perception, and can in turn significantly change the perception of a space giving it a particular character. When saturated lighting is used, the space can have a vividness associated with a sensory experience to influence feelings of emotion. Turner points out that lighting can be cold or warm, polychromatic or monochromatic. It is the quality of light and colour together that can successfully add value to an environment. Light can enhance visual textures, accentuate shadows and the modelling of a space; it can create harmony in a space as easily as it can enhance contrast.

Like visual attention, auditory attention in an immersive environment warrants consideration, because the sensory implications of sound can deeply affect our emotional responses or prevent us from attending to the space because of distraction. Sound can also directly complement the visual environment. Its control is significant and often hard to achieve, as sound travels through an environment in the form of soundwaves, leaking through any crevice that it finds unless it is absorbed by physical structure. Because of the sensitive nature of hearing, sound bleed from another area can be very faint, but if it carries the right message it can still be heard.

Among the best known research on auditory attention is that conducted by Colin Cherry using the subject of a cocktail party. Cherry (Cherry in Eysenck 2001)

showed how we are able to follow just one conversation in a room where several people are talking at once, and how we activate the memory required for processing that conversation without being distracted by processing all conversations in equal quantity. Cherry found that we assess the physical differences of the speaker, such as their sex, their location in the room and the intensity of their voice in order to give that person priority listening. There have been various investigations of filter theories, including that by Broadbent (1958) who determined that the secondary or unimportant sounds are not attended to at all, and that a selective filter determines which information will travel on to the short-term memory for attention. Subsequent theories, discussed by Eysenck (2001), have found that it is difficult to ascertain how the selection of one sound over another occurs.

Music, as well as voice-over, is often used in exhibitions to provide an auditory ambience in a space and to assist in providing sensory isolation. The technology associated with the use of music, as with that of lighting, is very simple and economically feasible, and is therefore frequently incorporated into museum environments. Music is used to evoke a mood or place, and voice-over can be used to bring the human element back into the inanimate object. In technological terms, sound requires a disc or MP3 player with a set of speakers, and a licence to play the music is required. Generally, maintenance is straight-forward, and as a result the technology is used by museums large and small.

An example of the effective use of sound technologies can be found at the Fairfield Museum in Sydney, a small community based museum with an impressive collection of memorabilia from the surrounding area. In a courtyard behind the main farmhouse building, the museum has been able to create a small streetscape complete with general store and blacksmith's workshop, and supports this with sounds of the blacksmith hammering the steel and conversations in the small general store. The sound isn't intrusive, and it adds humanity to the displays while also helping to provide sensory isolation from the busy street not far away. While the noise from the street is not blocked completely, the sounds created for the exhibition help to focus and provide attention. There are many examples of museum exhibitions where the plan for the sound-scape does not appear to consider the visitors' needs. Different

exhibition environments have different challenges and needs in relation to sound technology, and exhibition designers confront different questions. For example, in a museum where there is more than one space, should there be sound in every gallery? Can there be more than one sound in an exhibition, for example music and talking? Musical taste is also intensely personal.

Based on the information provided by Eysenck (2001) and Dean (1994), both visual and auditory attention appear to be important in the immersive environment, but in order to bring the environment closer to the individual visitor it is also important for the visitor to be engaged in activities associated with the narrative. It can be argued that when staged throughout an exhibition, these activity-based items can reignite flagging concentration by directing cognitive attention to other areas of the brain, stimulating renewed interest. These may be as simple as touch panels in which replica material of an object can be touched and assessed for its tactile characteristics, or as complex as simulators. Or they can provide direct experience through electro-mechanical interactivity such as sitting on a bicycle and peddling to create enough electricity to turn on various lights on a sectioned car. All of these experiences are designed so that the visitor can build a memory directly associated with the object.

One can conclude from the work of Eysenck that visual and auditory attention can be facilitated in exhibitions by careful placement or implementation. Equally, visual and auditory clutter can be detrimental to the sensory experience, leading to an inability in the visitor to discern which information can be prioritised for processing, and ultimately creating fatigue and cognitive overload in the visitor. Hooper-Greenhill (Hooper-Greenhill 2000) discussed the significance of the 'master narrative', and it is extremely important for the designer and curator to manage the visual, textual and auditory information for processing through the structure of this narrative, particularly if interactivity or new media places further demands on the visitor for attention and active participation in the experience.

3.4 Interactivity and Sensory Experience

The term 'technology' as used in this research is linked specifically to those things that can enhance a space or communication process, such as sound transmission, projections of light or image, and interactivity. In an immersive environment nothing exists in isolation, and, as noted in Chapter 1, the growth and confluence of these individual technologies in the 18th and 19th centuries led to the development of illusory, multi-sensory environments and the rise of a popular culture searching for an experience.

In 1938 the playwright Berthold Brecht noted that the development of the gramophone industry allowed the introduction of 'real noises' to be used in plays to add to the audience's illusion of *not* being in the theatre (Willett 1964). Brecht noted that the first possible use of this ploy was by the theatre producer Piscator who employed the technique in a production of a play titled 'Rasputin' where he used a record of Lenin's voice. While commenting that 'theatres had fallen on them (gramophones) avidly', Brecht added a note of caution in their use, suggesting for example that in parable-type plays the sound effects should be used only when they further the message and not in order to 'evoke atmosphere and illusion'. Brecht also believed in the open location of the gramophone to the audience, similar to the orchestra pit (Willett 1964). At the same time, the growth in the use of projected images was used in the theatre and opera to great effect, supporting the narratives and adding additional layers to the experience.

Theatres are static environments where the captive audience is seated and the experience is largely fed to it without much real audience participation. In many ways this is a passive environment, whereas museum based exhibitions are active. Firstly, in museums the visitors are mobile and are able to make choices about where they go, how long they spend in any one place and what they look at. Secondly, visitor groups in museums tend to comprise a variety of ages and group characteristics. The study of visitor behaviour in museums by Screven (1999), and another study by Caban, Scott, Falk and Dierking (2003) on individual learning preferences in museum settings, have shown that each visitor will have a personal bias or predisposition toward some

display or environmental techniques, and will learn or absorb information in a distinctive way. This presents the opportunities for the designer to implement varied forms of technology (sound or image)) in tandem with design technique, though there are also high risks in alienating some visitors. As observed by Hooper-Greenhill (1994 p193), the technology needs to be appropriate for the narratives, both visually and textually, and needs to support the objects rather than overwhelm them.

Richard Toon in the chapter 'Black box science in black box science centres' (Toon 2005 in McLeod) explains that the experience of the visitor can be influenced by the inclusion of interactivity and new media in the exhibition environment. Toon cites the case where recent simulation technologies were implemented to enhance a visit to a planetarium but they resulted in the dissociation of the interior experience of the museum from the concept and language of the exterior building. For Toon, it is unacceptable to have a fully interactive experience if the technology does not work in synergy with its environment, including the building exterior and interior.

Michael Heim (1998) who has critiqued aspects of computer technology and new media, has argued that new media is often developed without reference to human ecology. Heim contends that often the technological interface doesn't act adequately as a mediation device between the content and the individual. The content transfer, rather than being seamless, lacks continuity for the receiver. Screven (1999) expressed the view that the ability of a museum display to communicate knowledge or information through the design of the interface between the visitor's pre-conceptions and the exhibit's delivery media and format is crucial to successful learning. This becomes more of an issue as the technology becomes cheaper, as it has over the past few decades. However, the danger is that the technology can fail to support the content, and therefore fail to achieve its main purpose. In some instances the technology overwhelms both the experience and the outcome for the visitor.

There have been significant changes in the nature and application of technological devices in museums since 1990. In 1994 the use of new technology in exhibitions was an exciting prospect. Museums embraced new communication strategies in exhibitions in the hope that they could transform the visitor experience into something

that was both meaningful and memorable. To do this, new technology, generally in the form of computer monitors, was incorporated throughout museums to enhance the traditional graphic and textual media used in communicating the exhibition content and its narratives. This enabled so-called 'discovery based' museums (Hein, 1998) to expand their role as educators by providing additional levels of information to stimulate participation and generate interest. As David Dean said at the time, the basic appeal of the actual object, or the 'real thing', will not diminish, but the intellectual curiosity engendered by exhibitions will find sustenance in information technology' (Dean 1994).

A few years later, however, Kevin Walker (2001) in his abstract 'The Museum as Information Architecture' wrote that 'information technology is being poured into museums, with the result that screens are filling the galleries, blaring at visitors who seek to escape the television and computer they see everyday (Walker 2001) (digital/web reference). The situation described by Walker eventuated largely because the novelty of the computer changed with the penetration of the personal computer (PC) into the domestic market during the 1990s. Many museum visitors who had access to computers at home and at work found that the availability of computers in the museum was no longer so different and cutting edge. So while the computer interface can carry deeper levels of information, games and other material, it is not seen by the visitor to be interactive but serves more as a data base. In the mid 1990s following technological advances in the area of virtual reality (VR), the term 'virtual' became fashionable in many sectors including the museum sector, and the notion of the 'virtual museum' emerged. By the early years of the twenty first century the virtual museum was a reality, enabling enhanced access to museum collections including individual objects and to specifically designed educational material through web sites and URLs, as well as virtual tours through museum spaces,

It can be argued that the haste to incorporate new technological devices in museums has often outstripped not only the understanding of the visitor experience, but also the context within which the actual content, or object, is meant to sit. This has presented challenges to the interpretive designers and curators who realise that technological devices should complement seamlessly the narrative structure of the exhibition. There

is some uncertainty among these designers and curators about the way to control and manipulate the use of technology to the exhibition's advantage. This uncertainty exists because both the major components of exhibitions, namely the narrative structure and the technology, are often conceptually developed by different teams, resulting in a divergent rather than convergent process. As an example, museum interactives that have an environmental impact because of their physical design and presentation in the exhibition are usually developed without consideration of the environmental or spatial development of the space. And audio-visual material is often selected for inclusion in an exhibition without recourse to the curator or consideration of environmental impact. This silo mentality produces a situation where the exhibition space consists of individual elements cobbled together without reference to a hierarchical communication structure that needs to be in place for the transfer of efficient narrative information.

Interactivity can also relate to the dynamic spatial experience of the visitors, in which they use visualisation to access dynamic structures. Visualisation is an experience where the visitor relies on memory and thought processes to internally process visual information meaningfully. It occurs when the experience of a new form of architecture or space creates a sensory response. All though somewhat low on the active/passive radar, it is still a significant enough concept to be considered. In today's hyped up world, children arrive at museums with buttons to push and panels to flip, and it can be argued that they are mindlessly doing exactly as required, without engaging the mind. The dilemma is to know what constitutes interactivity in the museum today, and also tomorrow.

The exploration of digital technology and human interaction as an experience started primarily with the work of Myron Krueger in the late 1960s and early 1970s and his exploration of an installation called METAPLAY. Krueger's work in the area of virtual space was introduced in Chapter 2, and warrants further development here. Although the technology was quite primitive at the time, Krueger was interested in a computer which could intuit the visitor or users movements or actions, such that they could interact seamlessly in producing a drawn line or playing with a Critter, thus, physical interaction with a digital interface. Kruegers' installations were at the

forefront of the developments of artificial reality and virtual reality. He recognised that artificial reality could be explored as an educational tool in 1976, well before digital interactivity became mainstream in the late 1980s.

In the context of this research Krueger is important, because he was searching ultimately for interactivity that was seamlessly applied to an environment, while other researchers investigated virtual reality that was mediated through the use of head mounted displays, haptic gloves and other 'encumbering paraphernalia' to create immersion in virtual worlds that 'merely imitate life'. Krueger searched for 'the ultimate experience' which he felt would be indistinguishable from real experience. His primary interest was 'the degree of physical involvement which would be the measure of immersion'. He argued for technology that reflected 'convenience, naturalness and obviousness' and which wouldn't cut people off from their peers (Kruger in Jeremy Turner 2002). His experiences allow people to interact freely and without a rigid or set behavioural outcome.

In exhibitions, an immersive experience with interactivity at its core would also consider the issues raised by Krueger if the idea of a seamless interface is the goal. In the initial stages of digital interaction in museums in the early 1990s, much of the material provided was considered linear in structure, providing and extending only the information which directly related to the material provided as a didactic experience. In exhibitions today which feature audio, video, plain text and non-linear hyperlinks the term 'hypermedia' has emerged to describe the breadth of media opportunities which are presented for the visitor to engage with and accumulate information. Hypermedia is synonymous with constructivist learning approaches in museum exhibitions in which the visitor actively 'constructs' knowledge, rather than directly receiving facts. Constructivist exhibitions, as explained further in chapter 4, are also non-linear expressions of narrative information which allow the visitor to explore and gather information at will (Peterson 1991).

Peterson (1991) recommended that designers, when designing or implementing interactivity in museums, evaluate their interactives against the four principles originally set out by O.K. Moore in the 1960s as part of his Responsive Environments

Program. The four principles, developed over forty years, provide standards by which digital museum projects can be evaluated, and are: perspectives, productivity, personalisation and autotelicity. Peterson's descriptions of Moore's principles can be described broadly as follows:

Perspectives: this is similar to the 'point of view' guideline that is used by writers of narratives. There are four perspectives regarding the users interface and role in the interactive process. (1) If the learner is in full control of the operation of the exhibit then he has the agent perspective.... of the scientist, a puzzle-solver. (2) If there is no control he is a patient ...in which significant elements are beyond regulation of the operator...the game of chance. (3) If the visitor can interact with another person in the course of the working presentation then he is the reciprocator.....it is a strategic context. (4) If the visitor is to make normative judgements, aesthetic or ethical, then he has the perspective of a referee (Peterson 1991).

Productivity: Interactivity should to some extent be of use to the visitor. It should aid the visitor's access to insights and processes that can be further related to the content of the exhibition, or used later in another context. According to Peterson,

> Hypermedia implies movement within an environment abounding in important information. If hypermedia is a mere shuttling of insights and sounds from one location to another then it becomes superficial chaos. If, however, one encounter in the exhibit leads to progress in competence or understanding, then there is productivity. The participant is enriched as well as entertained. (Peterson 1991)

Personalisation: The visitor is engaged by both 'responsiveness and reflexivity' through the presentation of a personalised experience. This includes:

- permission for exploration,
- presentation of immediate feedback,
- allowance for self pacing,
- promotion of discovery,
- provision for interconnectedness

(Peterson 1991)

Autotelicity: This measures the self directed motivation or goals of the visitor to participate in a responsive environment in which choice is provided. According to

Peterson (1991), 'when choice is provided, motivation and enjoyment increase greatly'.

Further evaluation of interactivity is raised by Cooper (1995) in his paper 'A comparison of interactive multimedia and face-to-face education in museums' where social interaction, physicality, directness and open-endedness in these two areas are explored. Cooper uses very limited views of multimedia to explore his idea, for example generally that multimedia is a computer monitor with a game on it. He isn't really exploring fully interactive immersive experiences, such as those that Myron Krueger or the thesis is exploring. However, the points raised by Cooper are still of interest within the context of evaluating potential visitor reactions to multimedia as opposed to face-to-face educational programs.

Sociability is a concept which arises in much of the literature relating to leisure based learning, particularly as visitors tend to arrive with a friend or family. The sociability of an interactive experience, according to Cooper, can vary according to the accommodation of the interactive to one or more users, leaving some visitors as interested observers, while others have all the fun. He contrasts the sociability of an interactive experience with face-to-face educational presentations in which visitors, although not always actively engaged, can be considered to be actively engaged in the group as a whole. This of course depends on the visitor's enjoyment of the group experience.

Physicality, according to Cooper, is not a generally accepted component of interactive multimedia presentations where visitors usually access the interactive through a mouse, joy stick or pressing a button to complete a task, and receive a reward from their action. With physicality, the interaction tends to be mediated in some way and is not a direct experience with the content. Additionally, not all visitors can be accommodated, so some visitors become spectators. In face-to-face education, however, the group walks and interacts through talking and 'can use their bodies to express and explore ideas and feelings' (Cooper 1995). Interaction with the group, however can also distract from the immersiveness of the experience and the objects that are being displayed.

Directness versus Distraction occurs when the outcome is determined by the interface experience that the visitor has with multimedia. Distractedness, according to Cooper, can occur in both multimedia and face-to-face delivery systems. The more intuitive the interface the better the outcome, as the visitor relates directly to the 'instructional' component to effortlessly find answers or information. A problem arises however, when there is no intuitiveness applied to the interface, either through poor design or poor information transmission, and the visitor is reduced to pressing buttons mindlessly in the vain hope that some result will be forthcoming.

Open-endedness in multimedia can be limited to the particular game or choice of information that is provided to the visitor, as these systems are not often linked externally to the net. Some data-base information is appearing in museums which allow visitors to access further information relating to a collection or object. Face-to-face education, however, has only the knowledge and experience of the educator to account for the limits to open-endedness.

If museum experiences are structured more carefully, and individual interactives are scrutinised more thoroughly for their effectiveness prior to installation, would that make a difference? Have the available technologies educated us to the degree that we need to create experiences which are more dynamic? One contention in this thesis is that we try to achieve too much in one space, exceeding the range of experience required and thereby creating stress in the visitor instead of rhythm and a dynamic which would be create a seamless experience. The study suggests that the developments in hypermedia often lead to divergent rather than convergent processes.

At this point, we have identified that exhibitions need to facilitate three things, namely, sensory isolation and vividness, interactivity, and information transfer. Also, it is desirable that the multi-sensory nature of a space contributes towards a successful visitor experience. However, it is also noted that implementation is dependant on the available expertise and the exhibition budget, each of which has varying degrees of influence over the final outcome.

This variability in outcome could become benign if the criteria of immersion could be evaluated against a measurement or scale of immersion in an exhibition. Biocca and Delaney (1995a) outlined the various technological developments available to enhance the VR experience from head-mounted displays to haptic gloves. To evaluate the technology against immersiveness. Biocca and Delaney determined that there were primarily two kinds of criteria for evaluation: "(a) social constructs of user-friendliness such as diffusability and cost, and (b) constructs emphasizing the level of "presence" such as sensory vividness and sociability" (F. Biocca, & Delany, B., 1995a p117). There is potential in future research to adapt these criteria to the museum context, as discussed further in the Conclusion to this thesis.

Chapter Summary

This chapter has reflected upon the documented rise of the 'experience economy', and the desire of individuals to seek experiences which are driven by a sensory quality and can be called immersive experiences. Immersive experiences can be considered as information rich environments which appeal directly to the visitor using an understanding of both sensory and cognitive processes to facilitate the communication of narratives, both textual and visual.

These immersive experiences can produce affects in the individual that result in varied emotional responses depending on the length of exposure and the dynamic or structure of the experience. Variability however, does not preclude the ability to structure an experience in such a way that it can achieve a feeling of immersion on a fairly consistent level. Research by Csikszentmihalyi (1990) into intrinsic motivation and optimal experiences is fundamental to understanding that individuals find the structure of some experiences more 'intrinsically' rewarding than others, and that these activities tend to be goal oriented, have a challenge associated with them, and lead to a feeling of total involvement or immersion. To create successful immersive experiences, however, it is necessary to acknowledge that some elements of variability exist in individual physiological responses which are primal and cannot be

totally controlled, but can be offset by understanding that it is possible to control both attention and arousal in the visitor.

Of particular importance are the observations by Ham (1994) and Screven (1999) that the communication of information in an exhibition needs to facilitate cognitive function by using conceptual frameworks that have clear thematic structures and plot lines. This is because there are acknowledged limits to the amount of information that an individual can absorb and process at any one time. Therefore, immersive exhibitions are not created by filling spaces with too much information (objects, text, new media), but rather they are controlled sensory experiences in which information is effortlessly absorbed. The exhibition designer can contribute to the success of the experience by analysing the key opportunities for communication of the narrative, and limiting the amount of information to manageable 'chunks'. The need for structures of manageable information also extend to visual and auditory attention, as evidenced in the work of Eysenck (2001) into visual attention and of Cherry (1966) on auditory attention.

Finally, it has been argued in this chapter that intellectual, visual and auditory stimulus through interactivity and new media has had a profound effect on exhibition communication for the visitor. In the context of immersive experiences, the designer and curator can apply an analytical process to its implementation by meeting the prior needs of the visitor's capacity and desire to engage with the material. The result should be an experience which is seamless, and requires enough challenge to make the experience rewarding, but not so intense that the visitor becomes fatigued.

The most elementary structure in an exhibition is the narrative or thematic structure that the curator develops for the exhibition. This chapter has explored the extent to which curators and designers can hope to understand the breadth of information that can be accommodated by the individual visitor. The next chapter looks at how narratives are structured, and how they form the basis from which all elements of the exhibition are referenced.

CHAPTER 4

Narrative, Meaning and Interpretation in Exhibition Design

Narrative is international, trans-historical, and trans-cultural

(Roland Barthes p123)

'People are narrative animals. As children our caretakers immerse us in stories: fairy tales, made up stories, favourite stories, "Read me a story" '! So starts a book edited by Michael Mateas and Phoebe Sengers (2003) called *Narrative Intelligence*, a collection of works written to discuss how we humans use narrative to make sense of the world. The aim of Mateas and Sengers was to illuminate the contemporary context of narrative, to explore how we use narrative structures to create our ideas of culture, history and place, and to examine how learning can appear to be influenced by the narrative process. According to Nick Lacey (2000), narrative is apparently one thing that sets us apart from other species; we are *homo narrans*.

It has been identified in Chapter 1 that immersive experiences involve some form of information transfer to the visitor or participant, the structure of which is generally imbedded in a narrative form. Shaman, musician, or theatre director all use narratives to present their stories, which can be classified as information. This chapter explores the relevance of narrative in exhibitions, and how the structure of narrative can enhance and influence the immersive experience. In museums, narratives are applied to the research that is undertaken during the planning stage to create a thematic breakdown of the exhibition. How well these narratives are applied to the visitor experience depends not only on the curatorial expertise, but also on the understanding of the designer that she/he is responsible for creating a visual narrative which in essence delivers added impact to the sensory nature of the experience. If there is an understanding of how a narrative communicates, it may be easier to create a three dimensional, physical manifestation of the emotional and sensory experience that is similar to that which comes from a good film or theatrical experience. In turn, this should facilitate or enable to the visitor to attend to the information that is provided with ease, and enable a level of concentration that is the hallmark of an immersive experience. Further to this, visitors may find the experience is more rewarding and memorable as information transfer would become subliminal and effortless.

The word 'narrative' is derived from the Latin *narre* which means 'to make known', and is the term used to describe the telling of a story in the sequence in which the

event(s) occurred. According to Kirstin Dautenhahn in her paper titled 'Narrative Intelligence Hypothesis' (Dautenhahn 1993 in Mateas and Sengers, p63) narrative, which is an extension of the early development of language, was used by primates to extend the amount of relevant information that could be transmitted, received and interpreted, and which enabled them to co-exist in larger social groups. Combined with memory, language was linked with the ability to interpret and manipulate information and speculate on outcomes (Dautenhahn 1993 in Mateas and Sengers).

According to Dautenhahm, 'it is possible that the evolutionary origin of communicating in stories was correlated with increasing social dynamics among our human ancestors and involved, in particular, our need to communicate about third party relationships' (Dautenhahn 1993 in Mateas and Sengers). Dautenhahn contended that the maintenance of social interaction through the telling of stories provided the opportunity to hold the interest of the other party while providing information relevant to the group as a whole. This information included the identification of behaviour in others, including potential enemies, that may threaten the existence of a group as a whole. The success of the information transfer depends, however, on the ability to interpret or organise the information and the process of cognitive function, and is similar to the ability to empathise or elicit emotional responses as discussed earlier in the section on immersion and multi-sensory experience.

Dautenhahn's research shows that humans use stories to create and maintain relationships, and regulate social behaviour and exchange information about a third party. For example, we apparently spend 60% or our time gossiping (Dunbar in Dautenhahn 1993). Dautenhahn contends that the development of human narrative intelligence is expressed through language or verbally based communication via a 'structure which uses sensual, emotional, and meaningful language' to provide the 'who, what and why' format. According to Dautenhahn, the narrative structure:

- introduces a character or characters;
- develops a sequence of events or a plot that can convey meaning [value, pleasure, displeasure];
- can provide a 'temporal horizon' for communicating the past or speculating on the future;

- can provide a high point or resolution [reinforcement or fracturing of relationships];
- and can present unusual events or situations.

(Dautenhahn 1993)

In an increasingly complex and busy world, narratives help to build information about such things as goal oriented behaviour and motivation in others, or to speculate on future based activity using previous stories as a form of role-play to determine outcomes. Traditionally, narratives are associated with oral storytelling traditions involving poems, songs plays, novels and films. Another way of telling stories about ourselves and others is via the museum environment.

Narratives have a long history of association for us and have been extensively studied and theorised about by some of the greatest minds in philosophy and literature from Aristotle to Roland Barthes. The traditional form of historical narrative described by Cebik (1984) is 'the means by which a story is told'. According to Cebik, a story is structured around an event, and involves a character about whom the story is told. This story is generally revealed in a particular way so that the events possess a meaning that they would not possess as a mere sequence, for example as a chronological list of historical dates or a list such as a bus timetable. As pointed out by Lacey (2000), 'the king is dead' is not a narrative on its own, but if the statement 'and the queen has died of grief' is added, the two events are seen to be connected and to be based around a character, and a chronology or aspect of time is present. There is always some metaphysical emphasis, whether it be time, memory or such like in a narrative. Therefore narratives are considered to be linear structures, with a beginning, middle and an end, with a series of sub-plots which form around the main event or character. The subjectivity of the narrative is defined by the absence of the narrator (Cebik 1984).

Aristotle is considered the first person to define and record the types of theatrical genre (comedy, tragedy) and the poetic (epic) (Lacey 2000). In Aristotle's view, a conventional narrative in a three act play consists of the following:

Act One	the situation [idea]
Act Two	the middle [the complications]

Act Three the end [conclusion or climax]

This is still the basic convention for many narratives today, although there have been changes in style often in response to political or social conditions of the time. According to Lacy (2000), Vladimir Propp developed in 1928 a way of identifying folktales by their common structure, rather than by their content. He called this technique the 'Morphology of the Russian Folktale'. He was not concerned with the psychological motivation of the characters, but with their *function* in the narrative and the consequences of this. Propp listed 31 functions in a folk tale, presented them in order, and determined that they were linked with the certain consequences as follows:

Functions	**Consequences**
1-7	Preparation
8-10	Complication
11-15	Transference
16-19	Struggle
20-26	Return
27-31	Recognition

(Lacey 2000)

Propp's Morphology, though devised in 1928, was published in the west only in 1958, and has been found to be useful not just for Russian folktales but for many other narrative texts.

Another aspect of narrative, named 'causal transformation' by Tzvetan Todorov (Lacey 2000) occurs when a conventional narrative structure is disrupted by a problem which allows the reinstatement of the original situation, perhaps with slight changes. This simple structure, still acknowledging the Aristotlian 'beginning middle end' scenario, is developed more fully to become: the initial situation; the disruption; and the resolution. Todorov suggested that there were five stages in a narrative structure to illustrate this idea of causal transformation:

1. a state of equilibrium at the outset;
2. a disruption of the equilibrium by some action;

3. a recognition that there has been a disruption;
4. an attempt to repair the disruption;
5. a reinstatement of the equilibrium.

(Lacey 2000)

The concept of causal transformation is interesting because of the impact of these five stages of narrative structure on the reader, viewer or audience, all in some way designed to project some transformative change outwardly.

The theory of causal transformation has particular significance for this study, as many immersive experiences have a transformative basis as a consequence of the narrative. Thus, in the past, narratives provided a way of objectifying the unexplained in life such as birth or the 'purpose' of existence. They reduced the audience's anxiety by presenting the problem, setting up an incident or disruption, but providing the final resolution so that the audience could be assured of a satisfactory outcome. It is possible to theorise that for the designer to utilise causal transformation, the same device in an exhibition requires the following:

1. The opportunity is presented in the curatorial brief where the narrative has a real and 'intended' disruption. For example, in an exhibition where there is a chronological progression which changes to present a factual knowledge base such as a practical, theoretical or manufacturing theme, which leads to a change in practice, thought or product.
2. The opportunity is presented by the physical presence of objects which exhibit transformative change.
3. The opportunity is created by the designer in the space to invigorate the experience through the use of spatial narrative.

Similar to the work of Propp is the work of Joseph Campbell in the area of myth and story telling. Campbell argued that all cultures throughout history have used similar devices and motifs to create and tell myths or stories. Apart from his observations mentioned in Chapter 1, Campbell (1949) in 'A Hero with a Thousand Faces' identified a cycle and utilised a typical sequence of actions which through story telling and mythology can be found in most myths. According to Campbell, the hero

typically needs to separate from the ordinary world of his/her life, and undergo a series of initiations or trials, before the hero can return transformed by the ordeal to share the knowledge gained through his/her experiences.

In Campbell's sequence, there is a first call to adventure, and the young and naïve (fool/hero) accepts the challenge, generally after a threshold experience which separates him/her from their original surroundings. After meeting a wise and helpful guide they go on their journey, during which they tend to gather either (mystical) knowledge or have (mystical) experiences, followed by a series of adventures, some dark and threatening and often punctuated by heroic deeds, with judicious amounts of self doubt. Finally, there is victory, and the 'fool' is transformed into the hero.

Campbell's hero's journey influenced George Lucas' 1979 film cycle titled 'Star Wars'. Henderson (1997) described how Lucas applied Campbell's pattern to the original Star Wars movie. It is useful to reproduce Henderson's description because it provides an understanding of the underlying premise of the devices present in myth as applied to a narrative, and also because this premise was incorporated into the exhibition titled 'Star Wars, the Magic of Myth' at the Powerhouse Museum in 2003-2004 which is used as a case study in this thesis.

The call to adventure	the hero Luke lives in anonymity on his aunt and uncle's farm until he accidentally finds a message sent to Obi-Wan Kenobi to save a princess. To deliver the message he must go on a journey;
Threshold Guardians	Luke must first get approval to go on the journey from his aunt and uncle (his threshold guardians);
A wise and helpful guide	the hero meets a (wizard/hermit/Merlin) called Obi-Wan Kenobi whose powers and wisdom can help him in his quest;
Refusal of the call	fearing for his family's safety, the hero refuses the call until he finds that all members of his family have been killed;
Passing the first Threshold	Luke leaves everything to embark on his quest;

Hero Partners	partners are found to assist in the quest. These are Han Solo and his side-kick Chewy;
Mystical Insight	Luke must master the spiritual path of the Jedi knights from which he will find 'inner strength, purpose, meaning and a sense of belonging';
The Labyrinth	to rescue the princess, Luke must make a difficult journey into the unknown;
Losing the Guide	Obi-wan fulfils his role by taking Luke to the princess, but dies fighting the evil Vader;
Hero Deeds & Dragon Slayers	and so war ensues and the hero and his helpers defeat the vile death star.

(Henderson 1997)

This ends the first movie in the Star Wars trilogy, but similar themes return in the subsequent movies. Transformation stories such as these form the basis of the most common form of storytelling or narrative structure in which the sequence of events is clearly articulated through the chronology. It can be seen that it is the connectedness of the sequence of events that make a narrative work.

In any story structure a rhythm of elements is wrapped around the structure, and these elements include sub-plots and other devices that advance the story. The interest of the reader or audience is therefore maintained by a series of complications, plot developments, reversals of fortune or obstacles that must be overcome. This aspect of the narrative tradition can be applied to a physical environment, such as a museum based exhibition, in the same way. Each museum visitor has a threshold experience that separates him/her from the previous space and experience, and through a series of spatial devices such as varying lighting and ambience, the journey and experience can be revealed in the same way as this particular narrative.

It was mentioned earlier that a narrative structure would enable the visitor to more easily access and be engaged by the content. To do this, a designer could use the

research on 'visual momentum' described in the study by Wickens (1992) to structure the physical experience of the visitor and enhance the narrative. Wickens adapted the filmic concept of visual momentum to address the issues of becoming 'cognitively lost' in visually complex environments. According to Wickens, display guidelines recommend the use of 'consistent representations', but when new data or information is presented, linkages should be used to show the relationships between the new information or area and the old by;

- using graceful transitions – by using threshold devices between different areas
- highlighting anchors – through the use of land-marks or icon objects
  using fixed forms of orientation both physical and psychological – in an exhibition this could be through the use of thematic textual information in the narrative.

(Wickens 1992).

Therefore, by the specific location of objects and provision of physical and conceptual orientation, the designer is able provide specific points of drama and presence in the narrative sequence. In the museum, narratives tend not to be fictional and can range from the autobiographical to the purely scientific. To provide interest for the museum visitor, the exhibition designer needs to consider the issue of visual interpretation as well as textual issues. To ensure that the visitor becomes immersed in the narrative, the designer aims to use the power of the visual, the sense that Descartes believed had precedence over smell.

Using the methodology of 'participant observation' I have concluded that there are two main narratives in an exhibition. These are the textual narratives derived from literary narrative and the visual narratives derived from the three dimensional presentation of objects, props and associated graphic material. There are, however, many other associations for narrative in exhibitions and specifically in immersive exhibitions. There is limited literature available on exhibition narratives as a construct, though there seems to be a general understanding among museum curators and designers of the nature of these narratives. This has become apparent during the planning and implementation stages of exhibitions in which the author as participant

observer has been involved. For example, it is understood by many exhibition designers that in a multi-sensory environment, aural narratives can be overlaid onto the visual narratives to create a multi-sensory environment. Similarly, it is understood that the narratives associated with audio-visuals should be developed and function as part of the visual, textual and aural narratives.

An exhibition narrative is commonly generated by the curator who researches a subject of interest, and collects objects and related information in the form of provenance [museum term relating to the history of an object] and other related material such as audio-visuals or photographs which are relevant to the topic. These are then developed into a structure of exhibition themes and sub-themes to create a document, commonly known as the briefing document which generally includes:

- A copy of the narrative or storyline, consisting of themes and sub-themes:
- lists of objects to be exhibited in their thematic groupings, and photos and other relevant material that support the narrative;
- additional material or technological support that may be developed such as props, audio-visuals or interactives.

The briefing document can also include, particularly in large museums, the results of investigations into audience reach and relevant educational syllabus issues.

As outlined by David Dean (1994), once the briefing document is completed the curator and the designer generally collaborate to develop a narrative which is fully visual. This forms the basis of the communication strategy to attract the visitor first to what they see, and then through curiosity to the accompanying textual information. The objective is for both the visual and textual narratives to communicate the same message within their format. Narrative therefore impacts significantly on the design of the exhibition, in both the planning stage and the implementation of the final object display. In the next chapter of this study, which focuses on communication and learning in the museum, it is seen that the different narrative forms can be applied to complement and enhance particular visitor learning styles, and that this consideration

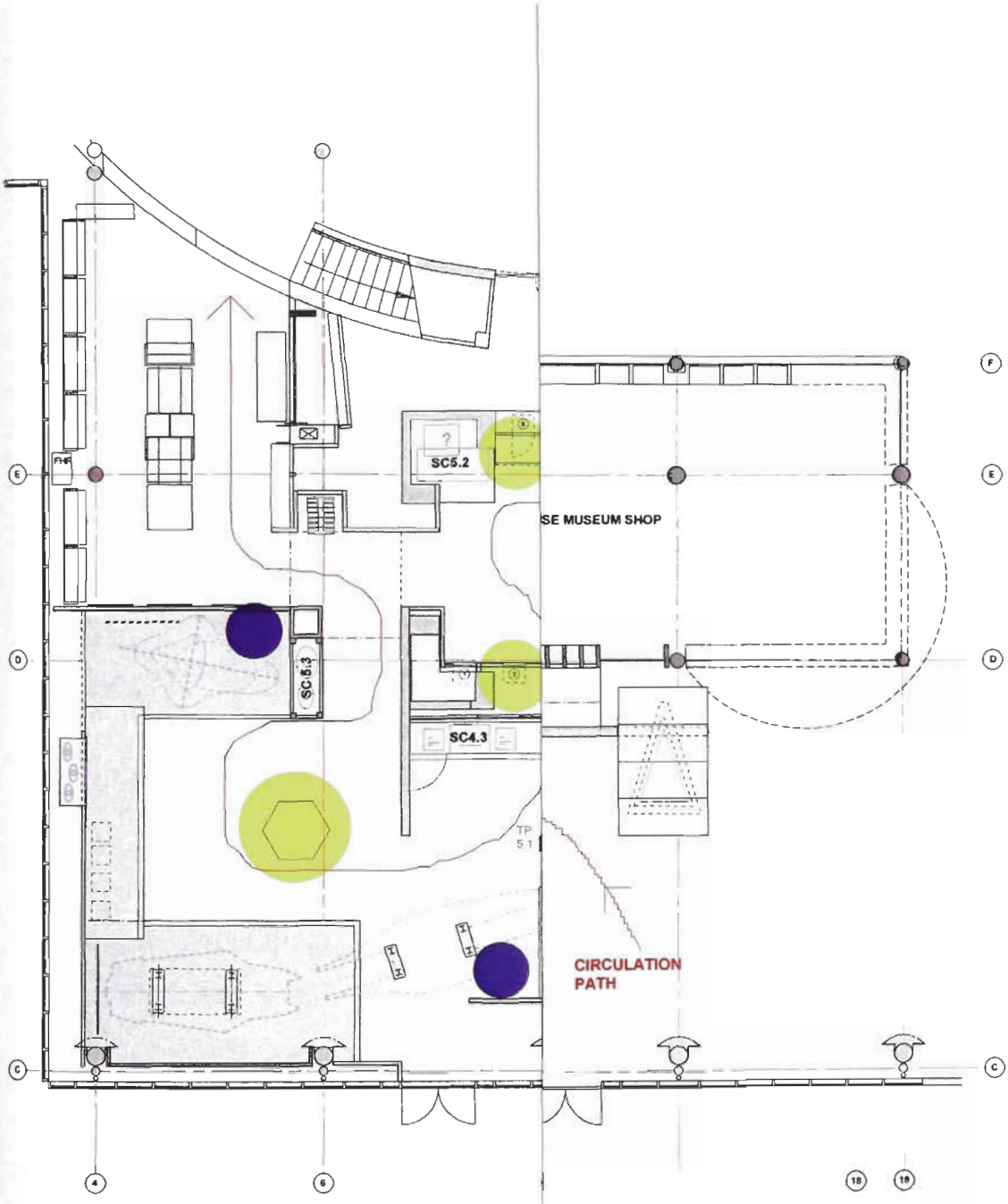
can influence the direction of the exhibition design. For example, a coherent traditional linear narrative style will suit the didactic or stimulus response learning styles, and will similarly be seen to result in a linear single circulation path or hierarchy through an exhibition. There are also narrative structures, such as those of dramatic narrative, that can be applied to the experiential and spatial (as in architectural) narratives of an exhibition design.

See figure 23 next page, Star Wars, the Magic of Myth floor plan, which shows a single linear path represented by the continuous ceiling piece through the space, with "sub-plot" thematic sections.

In Chapter Two of this study it was argued that one or more of the forms of narrative (oral, visual, textual or aural) is usually intrinsic to immersive experience. It follows that narrative is pivotal to both the process and to the success of exhibitions generally, and is an essential component of an immersive exhibition. In exhibitions, narrative development generally follows a basic premise of a chronology using around seven or eight main themes. An introduction is followed by the themes, with the final theme acting as a conclusion that is linked with relate to future visions or questions related to the subject matter. The visitors then complete or close the cycle of the themes themselves.

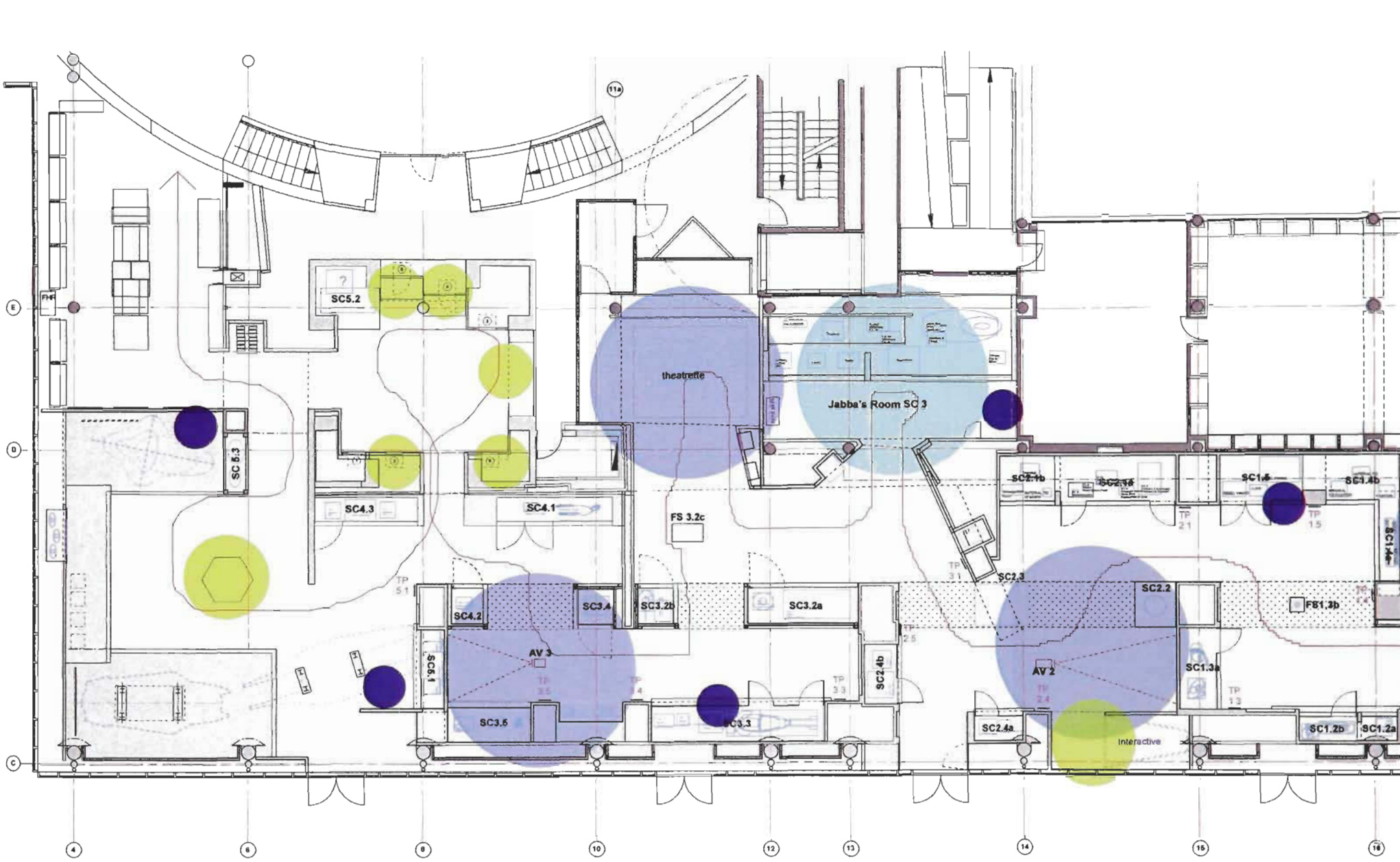
Because individuals move physically through the exhibition, they can be selective about the aspects of the narrative with which they wish to interact. So it is possible for visitors to create their own meaning from their experience even if they have not accessed the entire narrative. They can also return at a later time and see other components of the exhibition, and select further information to add to their existing knowledge. In this way, exhibition narratives can be read and reread, and the visitor can 'interact' with the material, whereas with film or theatre the visitors are part of a captive audience.

In museums, interpretive designers create visual narratives using a number of devices. An interpretive designer can be described as one who constructs meaning through the design of an exhibition, through textual and visual narratives, to enable visitors to



EXHIBITION DESIGNERS: DIANA LORENTZ & MARIA BRIGANTI

POWERHOUSE MUSEUM DESIGN STUDIO



Star Wars, the Magic of Myth

EXHIBITION DESIGNERS: DIANA LORENTZ & MARIA BRIGANTI

understand the ideas the curator wants to communicate, Hooper-Greenhill (2000) provides the following explanation of 'interpretation' in the museum situation:

> There is a major difference in emphasis in the way the word is used in hermeneutic (the science and methodology of interpreting texts) philosophy and the way it is used in the museum. In the museum interpretation is done for you, or to you. In hermeneutics, however, *you* are the interpreter for yourself. Interpretation is the process of *constructing* meaning.
>
> (Hooper-Greenhill 2000 p172).

'Exhibition interpretation' in a museum context refers to the way the exhibition is designed to enable visitors to understand the ideas it wants to put across, using visual narrative in combination with the textual information. Approaches to displays of objects throughout history reflected the extent of knowledge about the objects in each period. Foucault (1966) provided the following examples of ways in which objects have been classified and displayed in different periods.

- Renaissance objects were generally displayed using visual similarity as a form of classification. Therefore, all objects which had a similar physical appearance, such as a spiral or spatulate form, would be displayed together, and this could include diverse groups such as marine, botanical or mineral objects;
    - Classical objects were displayed according to systematic classification (analytical) based on the degree of knowledge of specific characteristics or functions;
    - Modern object groupings show a greater scientific and taxonomic knowledge that allows differing levels of complexity & relationships to be exposed in collections and display.

      (Foucault 1966)

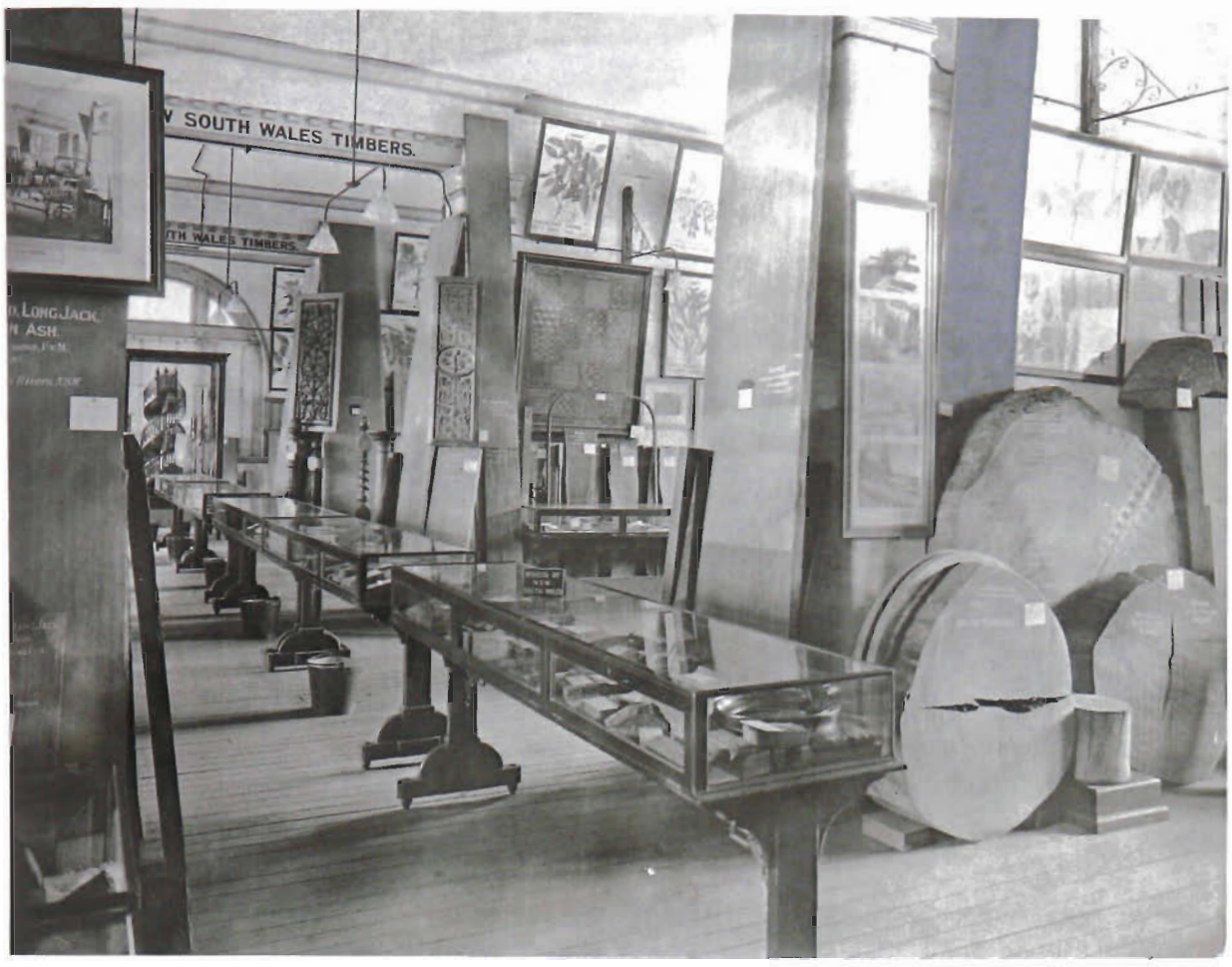


Figure 24: Taxonomic display, late 19th C, Museum of Applied Arts and Sciences now known as the Powerhouse Museum,

The following table, devised by the order of this study, shows how elements of visual narrative provided by the exhibition designer can be seen to complement Todorov's five elements of textual narrative that were introduced earlier in this chapter. For example, the provision by the designer of a visual threshold experience complements Todorov's first element of textual narrative, namely 'a state of equilibrium'. This visual threshold experience would generally be spatial and provide a title to describe the exhibition followed by some introductory or background text. This would be followed by the first thematic section which would outline the early scenario and development of the exhibition narratives using text and objects. By the middle of the exhibition there should be an opportunity to create a transformative change either through spatial presentation of the objects or thematic change outlined by the curator. This would create, in turn, an opportunity to change cognitive focus to realign the visitors attention, and would be followed by the concluding section and exit from the exhibition. In table form, it is adapted as follows:

Todorov's Textual Elements	**Applied Visual Narrative Elements.**
Beginning	
a state of equilibrium	**spatial/visual** threshold experience
a disruption of the equilibrium by some action	**textual and visual** introduction
Middle	
a recognition that there has been a disruption first	**visual** group of themes leading to counterpoint
an attempt to repair the disruption	**second visual** group of themes leading to mid-point return axis or axial pivot
End	
a reinstatement of the equilibrium.	**Final visual** exit statement/ re-entry experience.

Figure 25. Adapted table, Todorov's Five elements contrasted with the proposed Visual Narrative elements

Exhibitions in the museum context present objects for display, material things that exemplify or signify the attributes of a particular culture and time and, in this context, have some meaning attached to them. In contemporary 'discovery' museums this meaning is uncovered and communicated to the visitor, generally in some narrative form, through interpretive display. Similarly, visitors look for these narratives to provide a structure or framework for their observations, either consciously through their reading of textual material, or through the assembling of narratives using personal memory and experiences.

Hooper-Greenhill (2000 p24), describes museum narratives as being 'constructed through bringing together onto one site diverse objects from a range of different sources'. These objects are brought together, sorted, classified, and ordered through display into a visual narrative. As each object is placed beside another, its significance becomes more associated with the larger group than with its individual provenance or story. Hooper-Greenhill describes the narratives created in the museum context as

'master narratives', and this is because they enable the telling of stories which are 'direct and clear, eliminating the smaller sometimes complicating detail' (Hooper-Greenhill 2000).

Three exhibitions that have been discussed in earlier chapters can again be used as case studies to illustrate aspects of this proposed visual narrative. Both the Circus! and Marc Newson exhibitions at the Powerhouse Museum were housed in the same gallery space of 750 square metres, and both had two different circulation paths. One path meandered and provided the opportunity for many diversions, and the other was based on the notion of axial symmetry which meant that visitors went down one side of the exhibition and back up the other side to the exit. In the Star Wars exhibition, the axial pivot did not provide a structural end point to the gallery, but created an ambience and represented a complete change in presentation.

For an exhibition to have a beginning, a middle, and an end, three primary structural and/or ambient devices need to be integrated into the spatial environment to create immersion through the interaction with the narrative. Todorov's ideas can be used to argue that these three devices are:

1. The threshold: a device which creates the opportunity to provide some transitional space through which to enter. At the most basic level at least two or three metres are traversed by the visitor prior to entry into the first section of the exhibition. In most museums, this transition device is often the title wall, which introduces change through colour, lighting and text to provide a visual cue to the expected experience.

2. The counter point or climax to an exhibition: the mid point, or point at which the visitor experiences an ambient or environmental change, which is not the same as the experience before it or after it. Visitors should know subliminally that they have reached a point of change or point of view. This is the preparation for the last stage of the experience which leads to a resolution end point.

3. The resolution or exit sequence: the end sequence that continues the post counter-point narrative. This last section, by necessity, needs to culminate in either some conclusion or natural termination of the story.

An exhibition without these structural elements could have a 'stream of consciousness' style of narrative, or consist of a series of disjunctive themes grouped together. It is demonstrated in this thesis that these forms of exhibition would not have the same immersive impact, because the narrative does not have the structural links that provide continuity.

It is argued in this study that the structural devices necessary for the exhibition to be immersive were present in the three exhibitions selected as case studies. These elements existed as follows:

Circus! 150 Years of Circus in Australia

Designed by the author of the thesis and curated by Dr. Martha Sear, this exhibition at the Powerhouse Museum in 1997 presented historical and contemporary circus costumes as well as objects from the mid-nineteenth century to the present day, in combination with audio visual material and interactivity. The curatorial brief specified that the exhibition experience should be like the experience of going to the circus at night.

The Circus exhibition was presented in a 760 square metre black box gallery, and used sound-scape, dramatic lighting, and visual drama to create an exhibition that would both appeal and communicate to a specific family and under 8 audience. The interpretive result presented a dynamic, abstract, theatrical or immersive experience for the visitor, designed to enhance the presentation of the content. The environmental devices were applied in a very specific way, according to the principles of narrative structure, the idea being that an exhibition could use a story or plot-based structural idea (such as narrative) so that the visitor could experience the content in much the same way as when it is applied to a film or book. This structure was applied to control the visitors' concentration patterns to prevent fatigue and maximise their access to the content.

In the context of Toderov's ideas, the three structural/ambient devices were:

1. Beginning:

The threshold experience was provided by the entry of visitors through a transitional space at the end of which they can see curtains, as well as the view beyond the curtains and into the world of circus. This experience was enhanced by classic circus music sound-scape. The introduction beyond the curtain provided some explanatory text, but the visitor had not yet truly entered the experience.

Figure 26: Threshold entry experience, *Circus! 150 years of Circus in Australia* (photograph: Sue Stafford, Powerhouse Museum)

2. Middle:

'Clowning Around' was the first thematic area that visitors entered. It was designed to create a magical experience of the exhibition and provided a step back in time, with small vignettes and 19th century musical interactivity. An interactive area – a

transition space between circus performance areas – was provided to give the visitors an experience of classic circus tricks, and thus the visitor became the performer. The 'Performance' space provided the counterpoint/axial pivot of the exhibition. It presented circus as a classic mid 20th century experience involving sequins, animals, a trapeze and clowns, with vignettes interspersed with small audiovisual experiences.

Figure 27: Exhibition view, axial pivot, *Circus! 150 years of Circus in Australia* (photograph: Sue Stafford, Powerhouse Museum)

3. End:

A large audiovisual (AV) was used to provide documentary style information and background. This added not just further context to the story, but also an opportunity for the visitor to sit and change cognitive focus. This process can be seen as immersion through film. A Sideshow with some interactivity in surrounding areas provided a memory of activity at a circus. The New Circus Tent was the final tent in the exhibition and served as the current intersection of the visitor and the contemporary circus experience .

Figure 28: Exhibition view, the final theme, *Circus! 150 years of Circus in Australia* (photograph: Sue Stafford, Powerhouse Museum)

Marc Newson Exhibition

This retrospective exhibition of designer Marc Newson's work at the Powerhouse Museum in 2002 was co-designed by the author and Fiona Young, with input from Marc Newson. A specific objective was to encourage a younger audience of 15-35 year olds to the museum to engage with design practice.

The structural/ambient devices were:

1. Beginning:

The threshold from the museum into the gallery was via a transitional space, which was traversed by the visitor, with the visual momentum of a rotating Lockheed Lounge and a Madonna video projected behind it. Additional to this was the sound-track to the music clip, which was used to draw the visitors up the ramp.

The textual introduction at the top of the ramp was a point at which visitors could stop to view the Lockheed Lounge and read the introductory text, prior to turning to view the next section.

2. Middle:

The early career of Marc Newson marked the point at which the visitor entered a chronology showing Newson's journey through his student years to the production of

his first items of furniture. Large graphic sketches with personal comments from Newson created an impression of the designer in his early career. Furniture designed in London and Sydney was showcased in a classic museum setting and with limited interpretation, because the pieces provided the appropriate context through form, texture and colour. At that point, discernable music from the early sequence of the film '2001 a Space Odyssey' drifted into the local area with views of the cut from the film, and were sequenced to give visual momentum. This film was a major influence on Marc Newson and on the pieces that were on display. The gradual transition of the music into the space was important for the visitor in viewing changes in the designers approach.

The Metal Section was the counterpoint or axial pivot for the exhibition. The cut from 2001 etc. was slow and mesmerising, providing a back drop and inspiration for the furniture on show. The plinth treatment in black gloss with the matt white used in other areas of the exhibition. Small AVs were used as interior installations and showed the diversity of Newson's work and the influences that inspired him. These small AVs also provided a change of pace. The Marketing Marc AV portrayed the rise and careful choreographing of a designer's career, and gave the visitor not only a personal glimpse of Marc Newson, but also a chance to sit and experience one of his chairs called 'Bucky'.

3. End:
A large AV featuring Marc Newson's transport design posed the question 'what next'? This was the end experience. The presentation of current projects in the AV provided glimpses of the future; the designer talked about a car which could be so much different if car manufacturers thought laterally. The exit experience against a back drop of jet interior design connected with the 'take off' of Newson's career into the future.

'Star Wars, the Magic' of Myth Exhibition

This exhibition at the Powerhouse Museum in 2002-2003 presented material and objects from the Star Wars film series around the narrative of story telling. It showed

how George Lucas developed and used the themes created by Joseph Campbell's 'Hero with a Thousand Faces' to create the films.
The structural/ambient devices were:

1. Beginning:
The threshold experience was provided by the immediate impact of the large audio-visual showing the intro 'A long, long time ago...' . The AV included music by John Williams that is synonymous with some of the first quadraphonic sound use in movie theatres in the 1970's. The early showcases introduced the characters and the first premise of the story involving a captured princess.

2. Middle:
In the New Hope section, further action and potential for catastrophe were exhibited. Figures from the Imperial Army representing the Goliath were displayed with full equipment at their disposal, and their superior 'intelligence gathering' was conveyed through costume, models and showcasing, with small audiovisual support. These devices set up the rising action and drama for the unprepared 'hero'.

The Empire Strikes Back section punctuated the exhibition with the object 'Yoda', set to resemble a Buddha or deity, on a plinth. Directly adjacent to this object was the large audiovisual of Yoda's soliloquy. This provided a place of relative peace and contemplation before the visitor's journey through the narrative re-commenced.

The Return of the Jedi section introduced Jabba the Hut's cave, a room that visitors had to enter to get the feeling of being outnumbered in the context of the experience. This room, with an audio of the unpleasant laugh of Jabba, formed the counterpoint or axial pivot to the exhibition, or the point at which the journey must proceed to an end, regardless of the outcome. This was a place that was separate and had an ambience reflecting that Jabba the Hut is an ugly character representing all the excesses of capitalism; a corrupt and bloated figure with limited empathy and many hangers on.

The History Room was a small theatrette which showed the documentaries of the making of the Star Wars films, and provided some understanding of the history of myth and story-telling. This formed the 'learning' centre of the exhibition.

The next stages including the Return of the Jedi section carried on the presentation of objects and the rising action to the climax of the atonement of the father. This was conveyed through a large AV in which the hero fought his father and had to decide whether he would vanquish evil in the guise of his father, or join the 'dark side'. It was found that it is easy to design an emotional display on the theme of 'evil'! This point in the exhibition was the end of the initial trilogy of movies, and formed a natural end point.

3. End

The last two sections, Phantom Menace and the Attack of the Clones, addressed the history of the father from his days as a young and idealistic young man, his descent to the dark side, and his love for a young woman. The end point of the exhibition provided a 'happily ever after' narrative configuration.

In the Circus and Marc Newson exhibitions, the axial pivot of the exhibition appeared to be the point at which visitors had to turn around because they had reached the end of the gallery or a wall. Thus the axial pivot was determined by the physical presentation of the gallery. In the Star Wars exhibition however, the axial point was midway through the length of the gallery, so it could be said that the narrative was created by the design of the spatial architecture as well through specific change in sensory and ambient expression.

'Spatial narrative' is a term and concept that can be analysed in a similar way to literary narrative. The term spatial narrative has been defined, and semantic arguments relating to its meaning and significance have been made and explored. According to Mark Rakatanski in his paper on 'Spatial Narratives', it can be said that architecture contains narrative of some description as there has always been a discourse on architecture (Rakatansky 1991). The difference between spatial narrative and literary narrative could be described as the subjectivity which is implied through

the presence of the person who articulates the discourse. In contrast to this in literary narrative the objectivity of the narrative is maintained by the absence of the narrator).

For the purposes of this study, assumptions are made that there *is* an 'architectural narrative', that this is a form of spatial narrative, and that both architects and architecture do tell stories. In understanding literary narrative as a construct, interior architecture including exhibition design needs to fulfil the same criteria; that is, it needs to be linear, to be centred on an event, to have a structure, to be objective and to have some metaphysical qualities.

It is useful for exhibition designers to have an understanding of the concept of spatial/architectural narrative which, like literary narrative, is a construct. The development of this understanding should be assisted if the designers are able to contemplate and answer the following questions: Is architecture linear? Are buildings and/or spaces designed around events? Does the architectural/spatial narrative have a structure? Can architecture have objectivity? Is an understanding of spatial narrative less accessible than an understanding of literary narrative? Some reflections on these questions are provided in the following section.

Is architecture linear?

A primary aim of the architectural narrative is to provide a structure of meaning and interpretation for the users of the space, and to facilitate the access and other requirements. Rakatanski points out that the narrative can facilitate also an understanding of the ideologies relevant to that individual architecture, and potentially try to anticipate the behaviour of the user in that space. While there is ongoing debate on whether architecture is or should be linear, most built form is designed around a procession or sequential access through a series of spaces. However, within each form the user may select some spaces rather than others, and can take a self determined path through it.

Although architecture may not always be experienced in the same linear fashion as is classical literary narrative, it still has a narrative form. As pointed out by Rakatanski

(1991)'literary narrative can be read and re-read', and through this underlying meanings that are not initially appreciated become evident. Contemporary post-modern literature is clearly not linear, and yet still has a narrative form. An exhibition though, has *structure* vested in the content, and this can be interpreted conceptually by the designer into the exhibition as a spatial narrative. This is not the case with all exhibitions, however, as sometimes the designer chooses instead to create a repeating design element that has no sequential development for the visitor. This would translate into a passive interaction with the spatial environment.

The exhibition 'Star Wars, the Magic of Myth', vested the notion of a narrative into its planning, although visitors may not have been aware of this. The spatial narrative was signalled through the ceiling bulkhead that traversed two thirds of the exhibition. In early planning the floor reflected this with a change in surface, but the budget did not stretch this far. The visitor then moved in and out of this frame of reference in the way that a plot moves forward, but the sub-plots create a meandering path through the exhibition. This is the idea of a specific narrative path, in which the architecture is telling the visitor something about the structure.

Are buildings and/or spaces designed around events?

The conceptual origins of a building or of a museum exhibition tend to start with a primary 'object' which may also be the event. The object can be the site itself, which may have a purpose and a history that are open to interpretation. For example, the Jewish Museum in Berlin, designed by Daniel Liebskind, responds specifically to an historical event, namely the Holocaust, and this is reflected by lines drawn from the co-ordinates of Berlin residents who were exterminated during WW II. These lines give rise to the unusual shape of the building. Visitors, while given this as a precept, take on the meaning of the shape of the building through the knowledge of the event. The narrative in the Marc Newson exhibition was formed around his life as a designer, and his journey from student to practitioner. Science and technology exhibitions also have events to situate them in history, usually through specific inventions.

Does the architectural/spatial narrative have a structure?

The structure of architectural narrative is developed in the early stages of the design, and is representative of not just the physical presentation of mass and space, but of the reading/interpretation of the building or space. The sequential experience that comes from the size, proportion and hierarchical layout of the rooms, as well as the materials and form of the physical structure, all play a role in defining the structure of the narrative. As in literature, it may not be necessary for the visitor to be aware of the spatial narrative. The visitor may merely use the structure as intended and perhaps 'experience' the narrative on a subliminal level associated with its appropriateness and ease of use, or on some sensory or emotional level. An example was 'Cyberworlds', an exhibition in 2005 at the Powerhouse Museum about the development of computers and how they have affected people's 'values, beliefs, hopes and fears'. 'Cyberworlds' told the story of our interaction with growing cleverness and potential conflict. The narrative was vested in the architecture through the computerised vector lines represented as straight walls, and the curved walls represented the organic, human interaction with this technology.

Additionally, exhibitions have a thematic breakdown which can be addressed as part of the structural component of the narrative. For example, if one section has a completely different ambient presentation, as in Jabba the Hut's cave in the Star Wars exhibition, this can be seen to form part of the structure.

Can architecture have objectivity?

Architecture could be described to have metaphysical qualities such as existence, memory, reality, culture, and symbolism. However, time is the most complex metaphysical attribute to apply to architecture; it is significant that architecture exists in and reflects its own time. Therefore, all architecture and design reflects and relates to the reality, culture and symbolism of its time. Exhibitions, however, do present slices of time through the presentation of objects, stories, and experience. In this way, the neutral and abstract presentations of architecture and design can present a metaphysical slice of time, because they are experienced in the visitor as a

visualisation, and not as a simulated or didactic presentation. However, the metaphysical qualities representing the totality of the exhibition narrative could be said to exist if they are stimulated in the individual through the senses. But it is hard to see how these metaphysical qualities can be expressed if designers do not understand them.

Is an understanding of spatial narrative less accessible than an understanding of literary narrative?

This is a complex issue. If someone experiences a space and has a sensory response to that space, it could perhaps be said that the space has been 'read' or noted by that person. It is the visitors' limited knowledge of architecture, together with their individual predispositions at the time of the experience, that affects their reading of the space. For example, if a visitor had just had an unpleasant event (lost some money, crashed the car) before entering a building or space, the unpleasant experience may dominate all other experiences during the visit, and therefore the narrative may not be read as it might in other circumstances. However, according to immersive structure (see Chapter 2), if the experience is well structured and has a transitional entry space, then the previous experience should be mitigated.

There are buildings, however, such as the Felix Nussbaum Museum in Osnabruk, designed by Daniel Liebskind, where the building type is so different, the narrative so strong, that visitors have made an effort to understand the meaning underlying the form in the structure. It was the architect's intention that the 'experience' for the visitor provides some insight into the life of the painter. In this instance the building has a fractured floor plan representative of the painter's different stages of life, ending in a gallery that gets narrower and has no exit. This gallery represents the final stage of the artist's life hiding in a Belgium attic during Nazi Europe. In the attic he paints pictures in a confined space, and cannot step back to see them. In the Museum, the visitor see his paintings in this same context. Unfortunately, the artist's neighbour smells the oil paint and turps, and turns him in. Felix Nussbaum died in a concentration camp after being turned in by his neighbour who smelt the oil paint and

turps, and the end of the narrow corridor represented this idea of time through sensory expression of the architecture.

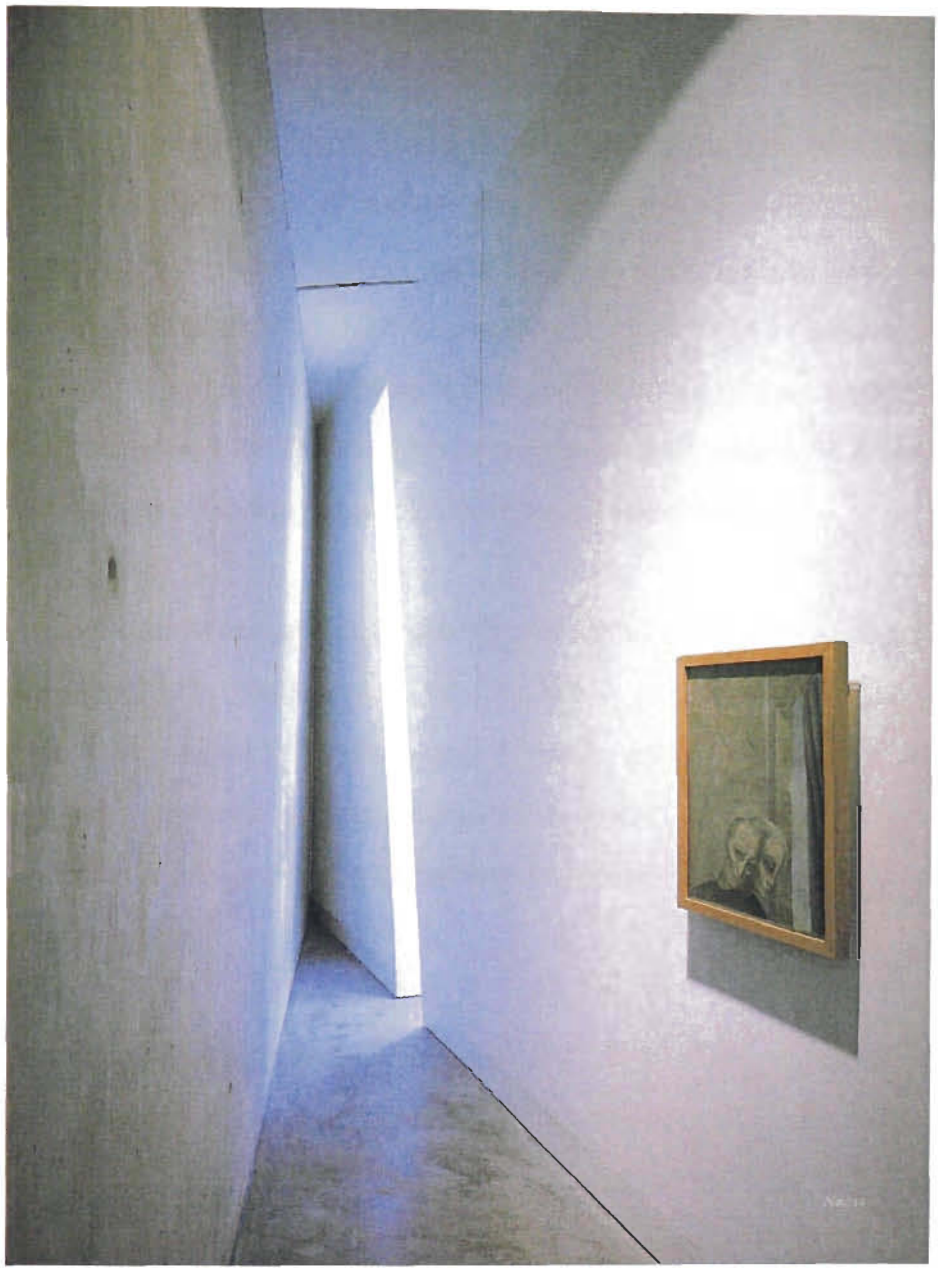


Figure 27: Spatially compressed to create a feeling of emotional compression. Viewing a painting at the Felix Nussbaum Museum, Osnabruk

Chapter Summary

There is evidence that narrative structures are used in many different ways to communicate to the individual. The individual looks to these structures not just as devices to enhance an experience, but as a real construct to order his/her thoughts, memories and sensory responses to a space, an event and daily life. This receptivity to structures of this kind, however, is often not a conscious or direct act in the adult, who has absorbed from the early stories of childhood an understanding that meaning can be derived from an experience. In today's world of visually dynamic presentation, people are more highly literate than in previous generations as they have been confronted with varied forms of information transmission including television, movies, and digital media. For exhibition designers to achieve a successful outcome for their projects and ensure a rewarding experience for the visitor, it is necessary for them to have an understanding of narrative and how it can inform.

However, as individuals are self-determining psychologically and culturally, the outcomes for the visitor cannot always be anticipated nor guaranteed. So, while the spatial narrative may strive to enhance cognitive processes in the visitor, not all visitors will choose to learn, or to be seduced into learning by the environment. Similarly, the sensory nature of the exhibition narratives may or may not reach each and every individual.

In the context of creativity, it is the combination of the experience and the knowledge of the designer that can directly affect the outcome for the visitor. How the designer sees and conceptualises the project may result in a varied response to the structure of the narrative. By understanding the individual's capacity to process information, the designer may be able to develop communication methods to enhance narrative communication in exhibitions, and this theme is developed in the next chapter.

CHAPTER 5

COMMUNICATION, LEARNING & THE MUSEUM EXPERIENCE

Effective communication of knowledge, as distinct from the creating of an experience, is a very difficult task within the museum situation.

Bitgood(1994 p6)

An underlying emphasis of this thesis is that effective communication in a museum based exhibition can be facilitated through the creation of an immersive environment. 'Communication' in this instance relates to the narratives, textual and visual and aural, that are created and presented for the visitor. These museum based narratives are derived from, or centred around, a collection of objects which a museum has assembled, and which it expressly decides to exhibit or communicate to the public for their own edification.

This chapter therefore examines the inter-related areas of communication as they are applied to the museum, and the formal strategies that can be undertaken by museums to inform and facilitate communication and learning for the experience of the visitor. It explores the view of Hooper-Greenhill (1994) that an understanding by curators and designers of these two theoretical areas (communication and learning) can enhance the visitor experience in exhibitions. This understanding relates directly to the information element that is required for an immersive experience, and also to concepts of immersion and interactivity.

According to Csikzentmihalyi (1988), for visitors to be intrinsically motivated, or for 'flow' to occur, visitors needs an element of complexity or the sense of a challenge in order to satisfy themselves that the visit had some success. Therefore, the target audience in any exhibition needs to be understood demographically, and the textual material needs to be structured and presented accordingly. While this research does not cover the issue of demographics, designers need to take into consideration that children and adults have different learning capabilities that depend on their developmental stages.

Throughout this chapter, the interplay of the visitor with the museum or collection is explored in order to provide some context within which communication is taking place, and how it can be measured/assessed. A distinction is made in the chapter between the terms 'education' and 'learning', though both terms are used for the process whereby the viewer of a display of museum artefacts makes 'meaning' out of

the objects that are displayed. Hooper-Greenhill provides the following interpretation of the word 'education' in the context of meaning.

> For some people, 'education' means the accumulation of facts and information. This is a very narrow view, and it is not appropriate in museums and galleries. Alternative meanings for education stress the process of learning rather than the outcomes, and include affective as well as cognitive elements. The emotions and feelings-responses which give rise to attitudes, values and perceptions are understood to underpin the acquisition of knowledge
>
> (E. Hooper-Greenhill 1994).

Foucault (1966), in his book *The Order of Things* investigates how truth, reason and knowledge are formalised into structures that tend to be specific to the time in which they arise. He discusses how the grouping, display and interpretation of objects are linked specifically to the era and specific knowledge of the period, and that this can be demonstrated by examples from the Classical and Modern eras of the Renaissance. These Renaissance eras reflect interpretation through similitude, the Classical through classification, and the Modern by analysis of inter-relationships.

The background to learning from collections is based on the acquisition of knowledge via collections and museums, and has been documented continuously since the 15th century when it became popular to collect classical objects from the Roman era and other objects for display in private houses and palaces (E. Hooper-Greenhill 1992). But the particular knowledge gained has varied considerably according to the political and socio-economic imperatives that exist at any one time. In the current environment, learning in museums can be seen as a leisure-based activity, where previously the acquisition of knowledge through collections was more earnest and rigorous.

Similarly, it is also possible to see changes in the communication strategies employed in museums, and in the expectation of the viewer regarding the experience. The democratisation of learning through the centuries shows that the activity of looking at collections as a leisure time activity has developed during the course of the last century. Whereas visitors of a century ago may have experienced initial wonder and awe when viewing didactic collections where interpretation was kept to a minimum,

now visitors want collections to communicate differently. They want to be challenged by what they see, they want 'experience' as an adjunct to the collection, they want to search their memory, they want to enjoy, and they want to feel fulfilled in their experience.

An appreciation of the historical foundations of the museum assists with an understanding of how exhibitions have maintained their importance as a medium for communication. Historically, the word museum is derived from the Greek word *mouseion*, meaning a temple of the Muses and relating to the goddesses of the arts and sciences who were worshipped there. According to Edson (1994) the first recorded *mouseion* was not a temple as such, and was located in Alexandria in the third century BC. Founded by Ptolemy Soter, it had some objects or artefacts but was primarily a university or philosophical community with scholars in residence, and was supported by the state. Following the period of this example, museums were not in evidence until the fourteenth century when the first European 'museum' belonging to the Medici family is recorded in Florence.

At this time in the 14th century, collecting was the preserve of a small group of scholars and artists who used earlier Classical material (from sculpture to coins) to inform their work through interpretation (E. Hooper-Greenhill 1992 p135). The early Renaissance collections of objects and specimens provided an opportunity to question existing knowledge. Foucault thought the knowledge of these objects was revealed through visible similarity (convenient adjacency, analogy, and relationships of antipathy/sympathy) and that it was informed largely by an understanding of previous systems of superstition, mythical and religious thought. The displays of objects were based on external characteristics, and not on their internal or physical relationships to each other. Collections were private, and accessible only to the privileged.

Hooper-Greenhill points out that by the 16th and 17th centuries, with the voyages of discovery and increased scientific knowledge, collections not only became more popular, but developed into more exotic and wide ranging areas. Galileo's experiments opened up the potential of space, and the elite, the intellectuals, and the growing and aspirant upper middle classes started to develop their own private

collections, often referred to as 'Cabinets of Curiosities'. At the same time, societies and institutions started to use their collections for teaching purposes (E. Hooper-Greenhill 1992 p137). The first public museum referenced appears to be the Ashmolean Museum at Oxford University which was opened on May 24, 1683 in premises specifically designed for the collection of the John Tradescants. The Ashmolean Museum was essentially a 'Cabinet of Curiosities' which had been amassed over the two generations; it was one of the earliest collections to have a published catalogue, dated 1656 (www.ashmol.ox.ac.uk/ash/amulets/tradescant).

By the 18th century, interpretation had become more analytical, and measurement and order including characteristics, functions, coherent underlying structures became fundamental to the classification of objects (Foucault 1966). Although collections were still largely developed by a small group of the elite and the educated, and were not intended for the general public, their popularity increased. At the same time greater literacy, and the development of democratic principles in France following the Napoleon wars, contributed to the growing perception in Europe that education should be for all, not for the few (E. Hooper-Greenhill 1992 p171). It is perhaps for this reason that there was an exponential rise in public museums in the latter part of the eighteenth century. as indicated by the following museum openings:

1750 Palais du Luxembourg, Paris [later to become the Louvre]
1759 British Museum, London
1778 Teylers Museum Haarlem, Holland
1793 Louvre, Paris
1794 Conservatoire National des Arts et Metiers, Paris
(Peressut 1998 p45)

The French ideal at the Palais du Luxembourg and later the Louvre was to share these collections with the general public, and not to show the public the extreme levels of excess maintained by the elite through their looted collections of decorative art, painting, and sculpture. According to Hooper-Greenhill (1992), these collections, in showing the egalitarianism of the new state by making these objects available for all to see, were thereby objectifying the state and the political imperatives of the time. An interesting example of the time, for the purposes of this study, is Le Musee des Arts et Metiers in Paris which opened in 1794 and is considered to be the first museum of technology, science and industry. In the premises of a priory with some buildings

dating back to medieval times, a collection of machinery was developed to teach craftsmen and workers (Peressut 1998 p45).

Hooper-Greenhill (1992) has inferred, from the development and interpretation of the early cabinets of curiosity owned by the elite in the Renaissance and Classical 16th and 17th centuries to the early public museums of the 18th Century, that the collections were used for the express purpose of understanding or learning about the universal truths. According to Hooper-Greenhill, access to these institutions was often controlled through tickets and rules of dress, but the general aim, in the early days of the museum as a public institution, was to educate and hopefully civilise the masses (E. Hooper-Greenhill 1992 p189).

Until the mid 19th century, many museums and their exhibitions were generally for the educated, knowledgeable and elite in society. The taxonomic displays were simple in their communication principle. The object carried the meaning, and this meaning was conveyed and interpreted through a label with simple information, namely a description of the materials and where they had been found. There were developments that ran in tandem with these displays, such as the large panoramas made possible by the technological advances of the 19th Century. Edson & Dean (1994) pointed out that as museums developed into public institutions, two innovations in museology were required to maintain their position and funding. These were public accountability and the development of museum education.

In the latter part of the twentieth century, the visiting of museums developed into a leisure based activity. However, a primary objective of a contemporary museum is to facilitate and enhance the process of learning, as well as to continue with an emphasis on research, collection, documentation, display and preservation of objects. The term 'learning' as understood and applied by the museum professional is not often used in the same context by visitors, most of whom come to the museum during their leisure time with family and friends to share the experience of the visit. These informal visitor learning experiences tend to be influenced by a number of factors including their motivation for learning, their companions during the visit, and the particular museum setting.

The role of the interpretive exhibition designer working within this context is to design an exhibition which communicates information in such a way that the visitor is attracted to learn, or at least to absorb information. We know from the work of Csikszentmihalyi (1988) that much of the museum visitors' behaviour is goal oriented, and that they like a challenge. The curator knows this too, and provides a narrative and objects which support the material. Any theories on how learning is applied, or how the exhibition is designed to facilitate learning, should be informed by consideration of how the visitor 'learns'. In an exhibition, ideas on what is to be learned are influenced by the curatorial research, the objects and the supporting textual narrative. Audio visuals and interactive experiences may support this information or provide a deeper level of information additionally, and some sensory elements may also support this process. So what compels a visitor to read the text provided or look the object for long enough to muse on its significance? Do visitors have a set of common attributes that can be objectively analysed to provide information for the designer? The following information provides a broad outline of learning 'styles' commonly referenced in this area, and assists with the responses to these questions.

George Hein (1998), in his work on formalised education and learning approaches in museums titled *Learning in the Museum*, identifies four primary learning approaches that have relevance for museum based learning; the didactic approach; the stimulus response model; and the two Piaget influenced approaches of discovery learning and constructivist learning.

Hein argued that museum exhibitions are usually structured to suit one of these learning approaches, and the particular learning approach therefore determines, to some extent, the physical presentation of the content and information in an exhibition. For example, both the didactic and stimulus response styles avoid interactivity but lend themselves to straight forward narratives, sequentially arranged with a hierarchical presentation of the subject and plenty of didactic material. In these instances, it doesn't serve to have multiple circulation paths which can draw links between different objects or thematic areas, or content that raises unanswered

questions. These learning styles are the antithesis of both discovery and constructivist learning styles, because they don't encourage a dialogue between the visitor and the content (Hein 1998 p29).

Discovery education, according to Hein, is based on the idea that learning involves an active process whereby learners undergo changes as they learn. The learning process is enhanced by the need for the visitor to reflect, often in the process of some activity. A discovery based exhibition generally provides opportunities for the visitor to explore the content by providing thematic groupings which do not require sequential access to the information. Interactivity is provided on a number of levels, and visitors are able to test themselves against this information. For example, an early exhibition at the Powerhouse Museum titled 'Information Machine' included a simple computer interactive relating to the engineering of an imaginary bridge. Visitors were invited to use acquired information to test themselves by constructing a bridge out of various materials in various structural styles. This was done with a series of visual representations, at the end of which a bicycle, car and eventually a truck would cross each other's path. If the visitor failed, the bridge would collapse, and the vehicle would land in the water; the visitor was expected to try again until the correct answer was derived.

Hein explains that constructivist learning is similar to discovery based learning, but the constructivist model requires active participation of the learner in both the way the mind is employed, and in the product of the activity, and results in the 'personal construction of knowledge'.

> The conclusions reached by the learner are not validated by whether or not they conform to some external standard of truth, but whether they "make sense" within the constructed reality of the learner. Constructivists museums present exhibitions similar to those of discovery learning, however will tend to have ways of validating the visitors conclusions.
> (Hein 1998 p34)

Constructivist exhibitions therefore provide a range of learning opportunities to assist in the learning process. These exhibitions don't claim to teach the objective truth of an individual subject area, but present instead a range of points of view. Additionally,

the visitors can connect with a range of objects and ideas through a variety of activities. There would also be a number of circulation paths that the visitor may take, when experiencing the exhibition (Hein 1998 p35).

It should be noted though, that while Hein's ideas provide a useful framework for these teaching/learning styles, there are always some limitations to the physical opportunities that individual galleries can offer when exhibitions are designed. For example, physical constraints may prevent the design of multiple entry points, or the opportunity in some exhibitions to design both sequential or completely constructivist exhibition circulation paths. Most museums have galleries which cross a wide range of shapes and access points, and this would affect the final positioning of individual thematic groupings during the design process. Additionally, when basic building codes are applied to an exhibition design, the experience of the narrative and the circulation paths would in some instances be predicated as much on the means of egress, or path of travel to the nearest fire exit, as on the opportunities to 'cross access' the content.

If these four exhibition learning theories were assessed in the context of Michael Heim's three 'i's of immersive experience (see Chapter 2), would Heim's three requirements (the sensory vividness of immersion, the interactivity or diversity of experience, and the information or knowledge transfer) be present). The didactic exhibition structure incorporates an implied evenness of experience which may not be present in discovery based or constructivist exhibitions. This is primarily because the idea of diversity of experience is absent as a concept, and learning structure implies a linear circulation path. If active participation is a necessary motivator for learning and experience, then is it more likely that the constructivist/discovery based exhibition is going to communicate more effectively to the visitor.

Another conundrum for the designer is that most contemporary visitors do not go consciously to museums for a specific learning experience. John Falk and Lyn Dierking, Directors of the Institute for Learning Innovation in Annapolis, USA, have pointed out that the individual museum experiences of visitors are influenced by a number of variables and that each visit outcome is unique to the individual. Falk &

Dierking (1992) have described these self directed, voluntary learning experiences as 'free-choice learning' experiences. They argue that free-choice learning is, by definition, directed by the individual according to their needs and interests. It is the desire or interest to find out more about something, particular to their personal requirements. It is individualistic, and personal, and can involve diverse activities such as going to museums or libraries, enjoying the movies, a book or outdoor activities (Falk 1992 p4).

In establishing that learning theories have been used to provide a structure for museums in both their organisational context and within the exhibition structure, it is important to see this form of communication from the visitor's point of view. This is because the visitor is generally seeking a leisure based activity, not a 'learning' based activity, so the design of immersive exhibitions, to be successful, must have visitor outcomes as a focus.

Falk and Dierking (1992) argued that the museum experience of the visitor is influenced by three contexts, namely the personal, the social and the physical. At the intersection of these three contexts, they place the interactive experience which would have a proportional representation specific to the characteristics of the individual visitor. As interactivity is one of Heim's three 'i's of immersive experience, this understanding in the wider context of the visitor experience is highly relevant to the design of immersive exhibitions. The diagram developed by Falk and Dierking to represent the interactive context is reproduced below (see Figure 28).

The 'personal context' of the museum visitor combines the unique cultural background, personal knowledge base, attitudes and life experience that will influence or motivate the visit to a museum, and the expectations which he/she would expect to be fulfilled. This uniqueness can be seen as the random element in an immersive environment that cannot be controlled by design. As Michael Heim noted in his book *Virtual Realism*, 'one person's adventure is another's waste of time' (Heim 1998 p19).

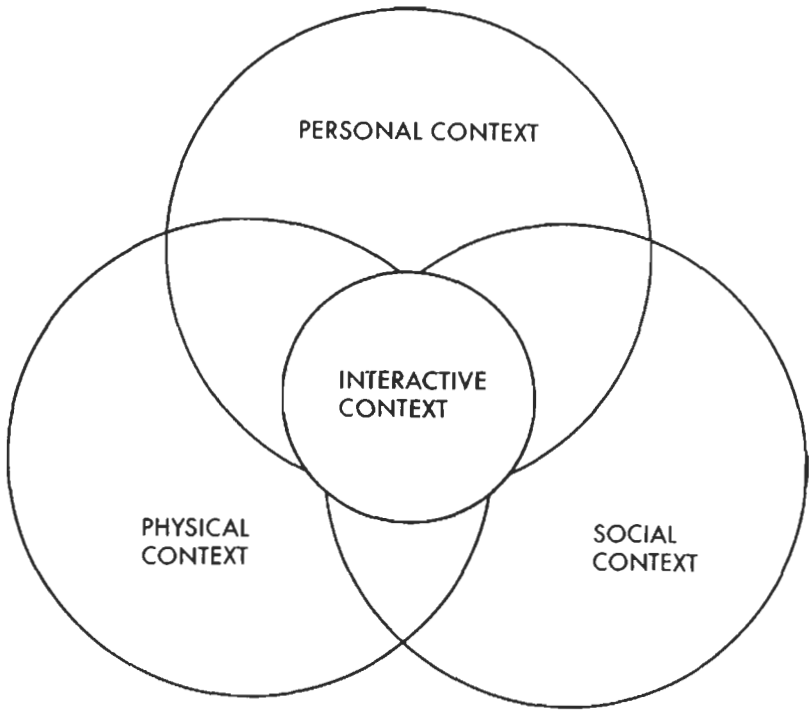


Figure 28: Interactive Experience Model (Falk and Dierking, 1992 p5).

Falk & Dierking (1992) explained that if the expectations of the personal context are met, learning usually will take place more effectively. They identified the following four primary factors associated with the personal context of the visitor:

- Motivation and expectations
- Interest
- Prior knowledge and experience
- Choice and control

According to Falk and Dierking, the socio-cultural context takes into consideration the fact that humans are basically socially oriented, and that a visitor will attend a museum in a group, or with another person, to share the experience that influences what and how we learn. Through this shared experience, bonds develop and 'meaning making' is shared and often enhanced. The three things that influence the socio-cultural context are:

- Socio-cultural mediation within a group
- Mediation by others
- Culture

(Falk 1992 p41-54)

Falk and Dierking suggest that although social interactions constitute approximately 20% of visitors' time, the significance of these interactions may be much greater than this. They argue that this social context is significant enough to influence the physical context of the museum experience, including the particular pathway that is taken and the exhibits that are explored.

In the physical design and organisation of the museum, the focus is primarily on visitors' interactions with the space and with each other. The visitor is affected by things as diverse as the ambient experience of the spaces, the design, and factors such as fatigue, and the visitor's knowledge base, acquired over time from many sources, can influence the experience, both immediately and well into the future. For example, Falk & Dierking (1992) note the perception among visitors that there is a lot to see in a large museum, and they point out that this often influences their allocation of time in particular exhibitions. The physical context of the museum combines:

- Advance preparation
- Setting design
- Subsequent reinforcing event and experiences.

(Falk & Dierking 1992 p55-66).

It is essential that museums achieve an appropriate balance of these three components if they wish to avoid visitor fatigue. Falk and Dierking noted that, based on Maslow's pyramid of self actualisation (see Chapter 2), visitors who might need food or water, or might be preoccupied with a problem at home or work, would find it difficult to focus on the content of the museum.

It was noted earlier in this chapter that an understanding of how learning takes place in museum exhibitions can be used by curators and designers to enhance the visitor experience. According to Bitgood (1990), whose work was introduced in Chapter 2 of this thesis, the experience of *simulated* immersion in an exhibition is important for visitors because it is more likely that they will engage or become immersed with the material on display, and the messages that support it, if the experience is enjoyable or pleasurable. This is because the learning associated with an immersive exhibition is experience driven, as opposed to information driven. Bitgood explained that

experience driven learning occurs when, 'instead of the primary function of the acquisition of facts, concepts, etc. a more pervasive understanding of the subject matter is sought – one that includes the feelings of experiencing another time and/or place, curiosity, excitement etc.' (Bitgood 1990 p3).

Bitgood claims that visitor immersion in an exhibition occurs when some or all of the following occurs:

- The exhibition involves or absorbs the visitor (immersion/engagement);
- The exhibit creates an exciting experience (e.g. an interactive);
- The exhibition creates a feeling of being in a particular time and place;
- The exhibit is realistic and natural;
- The subject matter comes to life;
- The exhibit focuses the visitor's attention (knowledge transfer]);
- The exhibit is memorable.

(Bitgood 1990 p4)

According to Bitgood, if the right conditions exist in an immersive exhibition, the four primary learning characteristics that may be engaged would be:

- Declarative knowledge (verbal or written/textual statements);
- Procedural knowledge (using skill and demonstration);
- Spatial knowledge (way finding, architectural, or objects);
- Affective or emotional reactions (personalised associative reactions to content).

(Bitgood 1990 p3)

The research undertaken by Bitgood in relation to immersive experience was based on the idea of a simulated environment, whereas the research for this study explores primarily the notion of 'abstracted' or architectural environments, on the basis that visitors are perceptive about artificiality. However, there are links and similarities between this research and Bitgood's criteria. It should be noted though that the 'flow' experiences, described by Bitgood as general experiences, were found by Harvey et al (1998) in *The influence of museum exhibit design on immersion and psychological flow*, to be much more significant factors in determining immersion.

While formalised learning theory underpins late 20th century models of learning in museum settings, there is also an understanding that 'meaning making' takes place as much through the observation of the object as through the textual and learning based structures that museums present. Objects have the capacity to carry meanings, and these meanings can be acquired from a number of perspectives. For example, objects have the ability to carry multiple meanings; they can materialise notions of the sacred, construct identities, and enable reflection and speculation (Hooper-Greenhill 2000). In this sense, it can be seen that learning is inevitable as visitors will construct their own meaning of something that they have seen or experienced in the museum context.

Museums use learning theory to provide a structure within which to interpret and communicate histories, technologies and cultures for the visitor. In the museum the visitor has a direct experience with the objects and forms of interactivity which carry learning based experiences. In this way, learning in the museum is considered experiential. The taxonomic displays of the 19th century are no longer enough for contemporary visitors who crave deeper meaning and experience, and they expect the museum to be not only an informative environment, but also a place in which they can enjoy their leisure time. For this to be possible, museums need to construct experiences which communicate directly to the visitor, who has been identified through the work of Falk and Dierking (1992) and Csikszentmihalyi (1988) as a goal oriented, intrinsically motivated individual.

The main issue involves the consideration of the wide variance of visitor behaviours that indicate that not all visitors are motivated to learn in the same way. McCarthy (McCarthy 1987 in E. Hooper-Greenhill 1994) adapted the simple 4Mat System of teaching-learning styles to museum visitors to determine that there are four identifiable learning styles in museums.

According to McCarthy, 'type one' learners ask the question *why?* and perceive information concretely and process it reflectively. They are social by nature and tend to learn through listening and sharing ideas. They enjoy direct experience from different perspectives, and are therefore *imaginative.*

'Type two' learners ask *what?* and perceive information abstractedly and process it reflectively. They like information which contains facts and details, and like to have the information reinforced by authorities in the area and dislike the subjective. They are *theoretical* or *analytical.*

'Type three' learners ask *how does it work?* They perceive information abstractly and process it actively. As practical and skills oriented individuals, these visitors look for information which they can see being applied and is useful. They have *practical common sense.*

'Type four' learners ask the question *if?* They perceive information concretely and process it actively. They are flexible learners, open to new experiences and enjoy variety. They are *dynamic/intuitive.*

(McCarthy in E. Hooper-Greenhill 1994 p290)

McCarthy argued that in order to appeal to all museum visitors, these four learning styles would need to be considered to ensure that all visitors were catered for. To achieve this he identified two common strategies. His 'perception based' strategy is based on the two premises that concrete experience is related to sensing or feeling, and that abstract understanding based on perception is related to thinking. His 'processing' strategy is based on the two premises that reflective experience is related to observation, and that active processing is based on 'doing'. (McCarthy in Hooper-Greenhill 1994).

McCarthy's system was based on the earlier work of Kolb (1984), who developed a theory of experiential learning which has direct links to the discovery learning discussed earlier. McCarthy's model presupposes that an individual is not assigned to any one model but that there this is a cycle that can be accessed at any point. However, the problem with McCarthy's 'perception based' and 'processing' strategies lies in the limit of the four identified modes of learning, when we know that the brain is a complex and multi-talented organ, capable of extraordinary compensations under difficult circumstances.

Howard Gardner (1985) in *Frames of Mind: The Theory of Multiple Intelligences*, proposed that there are seven intelligence predispositions, namely visual, aural, verbal, physical, logical, social and solitary. He called these 'multiple intelligences'. While Gardner has indicated his unwillingness for these to be used to delineate learning styles as such, many educators recognise the logic in what he has proposed and have applied his research to learning based activity.

Gardner argued that given the vast potential for individual difference through factors such as genetics and cultural diversity, it is possible that everyone's intelligence bias can be reasonably fluid. For example, everybody possesses the ability to process visual, aural or verbal information, unless there is some disability present. But some people, artists for example, have a heightened capability to recognise and interpret visually presented information.

Additionally, Gardner pointed out that information must be processed dynamically with other parts of the brain, otherwise humans wouldn't be able to 'multi-task' as we do, for example by walking/navigating with a friend in an exhibition, looking at the display, talking, yet still having the ability to read the information being presented.

When designing immersive exhibitions, the designer can take this information into consideration and apply it to visitor learning strategies for access to material. According to Gardner (1985), visitors with 'visual/spatial' intelligence dispositions would make active use of images and visual narratives to describe information and to learn. Visitors with a strong spatial understanding are probably not going to get lost, will remember in visual form what they have seen, and may actively use visualisation to understand the information provided to them. Visual cues (colour, form and presentation) will be important, as will issues of adjacency.

Visitors with 'aural/musical' intelligence dispositions relate easily to the use of sounds, music and rhythm. These individuals often find the emotion in music, and use music for visualisation techniques. Sound in this instance does not require visual imagery to support it. Those visitors with 'verbal/linguistic' intelligence predispositions have a preference for words, both written and in speech, and they will

most often use the textual structures of the exhibition to access information. Labels with dynamic wording or good stories will provide direct access to the visual context of the exhibition.

Visitors with physical/kinestheic intelligence predispositions use the body or hands for the sense of touch to access the world. Textures, constructing things and interactivity are important in this mode of developing information. In an exhibition, physical activity can be created through touch panels, or interactivity. Those visitors with 'logical/mathematical' learning styles use analysis and mathematics to categorize and classify. In an exhibition, access to useful information would be through the presentation of graphic and textual material. Generally defined as logical, visitors with this learning style recognise patterns easily and use this attribute to classify and group information to assist with processing.

Those with social/interpersonal learning styles prefer group activities when learning, and are the visitors most likely to attend with family or friends and to socialise or communicate during the visit. Visitors with solitary/intrapersonal learning styles prefer to work alone and will probably enjoy having moments alone in the exhibition (Gardener 1985).

In summary, exhibition designers could, if they wished, incorporate all of the elements that relate to Gardner's seven intelligence predispositions, including a quiet area of contemplation for the solitary visitor. But the designers need to decide how many of these elements should be incorporated. In this study it has been emphasised that visitors can easily be overstimulated and consequently their museum experiences can be compromised. As Gardner noted, individuals slide in and out of each area of intelligence disposition according to the information presented, so what is important is the accuracy with which each of the intelligences is aroused.

Accuracy of arousal is a difficult concept in a highly subjective area such as visitor experiences. As the design concept drives the museum experience, it is feasible that if the content and the narrative are considered first when the design concept is developed, the transfer of information to the visitor will be direct. In this way, an idea

for an experience should always be developed with reference to the greater environment. This is often difficult in museum based exhibitions, where teams without creative direction allow more than the core creative team to determine which elements are for inclusion. The greater the amount of people with ideas, the greater the fragmentation that occurs in the information transfer.

Chapter Summary

The accuracy of the quote by Bitgood (1990) that was used at the beginning of this chapter has been challenged by the ideas discussed. The work of Falk & Dierking (1992), Hooper-Greenhill (2000) and Gardner (1985) indicate that the challenge of providing effective communication in a museum is clearly achievable. Bitgood was generally interested in simulations, or the re-creation of environments to communicate to the visitor. Natural history simulations, on which he focused, are more often than not a one-dimensional experience showing exactly the scene that the visitor is meant to view. But this experience represents, in essence, the creation of a picture as a three dimensional reference, or passive observation, it does not really involve the active communication of knowledge. If visitors feel the picture is complete, they probably do not engage in further enquiry. Such simulations do not make the most of the communication potential of the exhibition.

In discovery/constructivist museums however, the structure of information and presentation is dynamic, and is reliant on communication of information in various forms to captivate the imagination of visitors. If exhibition designers take into consideration Gardner's seven levels of intelligence and use different devices to illustrate the narrative for each intelligence, they are likely to achieve an effective communication of information as well as create an emotional experience. It can be argued that a museum experience is always going to communicate some form of knowledge, because the visitor generally learns something from the experience.

The issues of communication and learning that have been discussed in this chapter inform the theoretical framework on immersive experience in the museum setting. This theoretical framework, and its value for museum designers and curators, is summarised in the following and concluding chapter.

CHAPTER 6

CONCLUSIONS AND FUTURE RESEARCH

The main outcome of this study has been the development of a theoretical framework that provides an increased understanding of immersive experience in the museum context. The theoretical framework has been constructed from an exploration of evolving interpretations of the term 'immersive experience', and a reflection upon historical and contemporary examples of immersive experience that demonstrate its potential to enhance communication and provide experiences which are more engaging and memorable for the participant or, in this case, the museum visitor. The study drew upon a variety of examples of experiences that could be considered 'immersive'. In order to develop a more rigorous understanding of the constituent parts of the theoretical framework, the study also sought to provide and clarify a definition for immersion in a museum context.

In contemporary discovery based museums, a variety of communication strategies are employed to create a single exhibition experience, and these strategies sometimes including the use of new media or communication based technologies. Communication technologies, both primitive and advanced, have been seen to dominate many of the experiences discussed in the study, starting with sound based ritualistic practices. It has been important, therefore, to establish a definition for the term 'immersive experience' when used in the museum context so that it could be applied consistently and reflect experiences both with and without implementation of new media. The definition that provides the most consistent representation of immersion in this context, is that articulated by Michael Heim. Heim's three 'i's of immersion [immersion, interactivity, and information transfer] were found to provide the most concisely framed definition and to limit the amount of variables that could have an impact on the analysis of different immersive experiences.

In the analysis of the historical and contemporary examples of immersion in the study, each experience was found to be specific to its era, and the experiences were often found to have similarities in the provision of some interpretive or intellectual challenge for the participant. The experiences tended to the sensory, often challenging the participant's existing sense of perception in some way. Some of the experiences were of a transient nature, and were succeeded by new and more

temporary forms of communication, for example the development from theatre to film. Other experiences were found to have more enduring qualities, such as architectural works that had a more permanent base and were part of a cultural or social experience, such as the religious buildings at the height of the Baroque era.

A significant conclusion from the study is that there are were five primary elements that were consistently present in the immersive experiences explored. These elements were:

1. there was select access of individuals to the experience through an invitation or ticket;
2. there was a threshold experience to create sensory isolation;
3. the experiences were centred around narratives which generally included some intellectual challenge;
4. the experiences were sensory in nature, often using all the senses;
5. each experience was finite.

By clarifying a specific definition particular to the area of immersion being studied, and by identifying the five primary elements or an architecture of immersive experiences, it has been possible to create a theoretical framework that can effectively describe an immersive experience in the museum context. The definition and the architecture of immersive experiences relate directly to the externally generated aspects of an immersive experience that are created for the visitor, but it has been found that some understanding of the internal sensory experience of the visitor is equally significant in the creation of these immersive experiences. The framework needs to provide relevant data for the designer of an immersive experience to interpret the physiological and internal sensory requirements of the visitor. Areas of cognitive and sensory processes have therefore been explored in the study, and it is concluded that the designer of immersive experiences requires, ideally, some understanding of:

- multi-sensory experience that include, often but not always, the areas of new media to facilitate aspects of the experience;
- narratives, meaning and interpretation in design;

- communication and learning in the museum experience.

As a participant observer during the development of three exhibitions at the Powerhouse Museum, I have been able to analyse retrospectively four individual projects to assess the quality of immersion in each, and to determine if the criteria relating to the definition and the architecture of immersion had been met

Each of the exhibitions selected for this analysis had quite different and defined collecting areas and were produced over a period of seven years, between 1996 and 2003. They were selected because each was developed as a controlled 'black box' environment of a similar scale, and with a design language which was developed conceptually as a narrative architecture. Each of the projects had specific narratives related to their content, and required different communication strategies in which to create an immersive experience for the visitor. It was found that in each exhibition the definition of immersive experience (immersion, interactivity and information transfer) could be satisfied, and the architecture of immersion (the five elements of immersion) was found to be present. Through participant observation and using design plans, documentation and analysis of the final exhibition, I have made conclusions about the four exhibitions that can be summarised as follows:

1. '*Circus! 150 years of circus in Australia*', represented an historical collection of objects based on a performance medium of which human interaction was a primary element. The communication strategy therefore required the successful integration of elements that would suggest the presence and interaction of the circus performers. The study found that the definition (immersion, interactivity and information) and the architecture of the experience (the five elements of immersion) appeared to be present. The exhibition had a highly sensory backdrop, with a variety of different communication techniques including new media. Additionally, the exhibition had a deeper level of engagement through a variety of both open display and showcased elements evident. Having undergone a successful immersive experience, visitors would leave with an internal sensory representation that they had 'been there' or 'seen' each of the different circus types.

2. The '*Codex Leciester, Notebook of a Genius*' exhibition had at its core only small notebook pages in a mirror writing script that no-one could understand. This exhibition represented a different form of immersion, in part because the significance of these Renaissance objects had a resonance with visitors that may have existed before they arrive; the fact that they could not read or readily access the information without interpretive material provided an added layer of complexity. Unlike the irreverent and lively environment of 'Circus!', the ambience of this exhibition presented a calm, almost religious atmosphere, in which the visitor went on a journey of discovery and enlightenment. For immersion to occur, visitors would view each notebook page, involve themselves in the new media experiences, and leave with the internal sensory representation that they had been so close to Leonardo da Vinci's writing they had actually been 'near or in the time of Leonardo'.

3. '*Marc Newson, designworks*', involved a retrospective and chronological presentation of Newson's designs for furniture, sketches and industrial design. Accompanying this presentation was a viewing of media material that provided an insight into Newson's process and his professional development as a designer including the influences on his approach. The communication strategies in this exhibition were aimed at a younger, design based audience, and elements of rock music and cult film created a variety of quirky but cutting edge experiences for the visitors to create states of immersion with the content. Ultimately, the strategy aimed to communicate to visitors a richer, deeper and more engaging experience, a state of 'understanding the man behind the designs'.

4. The exhibition '*Star Wars, the Magic of Myth*' presented the structure of archetypal story-telling, or myth, through a collection of objects, models and props that was synonymous with a contemporary popular culture movie. Through their interaction with the exhibits, visitors underwent an internal sensory experience as they would with the film 'Star Wars'. To convey the sense of a journey through the film, and to be ambulant and not static, the exhibition revealed sequence objects or scenes from the movie to provide a sensory experience that was dynamic and which could be as exciting and as immersive as the film. In terms of immersive experience, it was possible for visitors to feel they had been 'in the environment/story'. The characters in

the movie inhabited a form of pure VR presence because all of the elements were in place, and the definition, as in the other exhibitions, was found to be complete.

Each of the exhibitions had some form of interactivity or new media as part of its communication strategy or presentation. The design process was the same for all of the exhibitions, though the emphasis on particular presentation techniques used in each exhibition was quite different. It is concluded that while technology is not an essential component of an immersive experience, it can enhance the experience if the information or the strategy with which the technology is used considers the range of visitor needs.

The increased understanding of immersive experience provided by the study has implications for a range of museum stakeholders including designers, curators, educators and those who provide additional forms of interactive media in exhibitions. It has been postulated in the study that 'immersive experiences' are verifiable experiences that can be created by designers, and can thereby be experienced by the museum visitor. While most museum based designers generally have a full understanding of the broad context of exhibition production and its constituent parts (narratives, education and display) including visitor behaviour, the recent developments and availability of new media and communication technologies have radically changed visitor expectations. The theoretical framework developed in this study establishes the potential for the creation of experiences for the museum visitor which are more meaningful, provide a more positive level of satisfaction, and translate into successful delivery by the exhibition team.

The contention in this study has been that the museum designer, in creating an 'immersive experience', is aiming at a deeper level of engagement, a more lasting memory of the experience with a potentially higher level of satisfaction. Some of the issues that have arisen with regard to immersion are related to the attendant subjectivity and potential variability in outcome depending on individual predisposition. However, this research has found evidence of objective/qualitative markers against which exhibition content can be assessed in all the strategic areas of immersive experiences, including the work on immersion, intrinsic motivation, multi-

sensory experience, interactivity and narrative interpretation and learning. These may be implemented at different stages of the exhibition development process, or used as benchmarks.

The historical examples used in the thesis demonstrate that immersive experiences have been sought continuously by individuals over the centuries, that they are often expressions of the era within which they are created, and that they are used as an escape to another reality, much of which is generated as an internal sensory representation. This confirms that today and in the future these experiences will continue to be popular, and that their development will be facilitated generally by the inclusion of ever smarter technologies to create a seamless integration of all the constituent parts of an exhibition. This study indicates that an underlying element of these experiences is the general willingness of the exhibition visitor to accept the exploration of new forms of experienced based communication.

The study, by elucidating the diversity of environmental conditions that can lead to immersive experiences, extends the knowledge provided in the original studies by Bitgood (1990). For example, the study has:

- established a definition of immersion according to Heim's three 'i's, namely immersion, interaction, and information;
- provided the constituent parts for the creation of a contemporary museum based immersive experience; and
- created through its theoretical framework a formal relationship between the textual narratives and the spatial/visual narratives of an immersive experience in a museum based experience.

The study posits that immersive exhibitions need not be pure simulations or recreations as proposed in previous studies, as the quality of immersion is directly related to the ability to stimulate internal sensory responses in the visitor, rather than provide pure externally generated environments.

Designers wishing to create exhibitions which explore the potential of immersive experiences in museums will need to draw on a wider knowledge base to be able to

implement the best outcome for an experience. This means that they will need the capability, not only to interpret the curatorial narratives and create well designed exhibitions, but also to enhance those experiences for the visitor beyond the showcase-object-label paradigm. This means that a designer, when conceptualising an exhibition, may adopt a more open and experimental process by exploring and extending contemporary communication forms in the same way that theatrical and art based installations can be used to re-interpret social or contemporary comment. This approach would still need to be mediated against the museum's communication objectives, and the need to ensure that the experience was still defined by the presentation of its collection.

The quality and depth of the content (objects and text) and narrative information differentiate museum experiences from other forms of entertainment experience, and it is the curatorial research that generally drives these experiences and ensures that the authenticity, or the 'stock in trade' of museums, is maintained. An immersive experience, however, creates the opportunity to use this information rich content to create an enjoyable interactive and sensory journey. Technically, it is easy to design an environment to showcase objects, put in some didactic elements such as labels or graphics, and invite visitors to attend. But to do so and to create an immersive experience for the visitor and deliver outcomes which satisfy the visitor, the designer needs to adopt a process that requires a deeper understanding of the internal human physiological processes while also maintaining those issues of authenticity with which museums are primarily concerned.

Further, the quantity of information, and the diversity of its presentation within a space, are also fundamental to the success of an immersive experience. The work of researchers cited in the study including Harvey et al (1998) and Ham (1994)has indicated that a visitor has a capacity limit for the amount of information that can be absorbed in a single moment. This knowledge of potential cognitive or sensory overload is the most complex area of exhibition development. While there is a limit to the amount of information that can be absorbed by a visitor in a single moment or exhibition visit, the knowledge of how much and how complex that information can be can be gauged only through visitor analysis and evaluation once an exhibition is

open. Evaluation would also have to take into consideration the size of the institution, whether the exhibition is viewed earlier or later in the visit, and other influences on the visitor such as time of day. In some instances, however, curators and designers with previous experience in developing these exhibitions may be able to provide an earlier indication of what is feasible through spatial analysis.

In addition to the creative, analytical and technical knowledge that a designer would bring to the development of immersive experiences and the quality and depth of the 'content' or information provided by the curator, the use of exhibition narratives is an important consideration. This content or information which is provided in the form of narrative frameworks has been shown to provide structures for visitors to access the information in a coherent pattern. This thesis has outlined the broad historical narrative frameworks used for story-telling, as well as those used by the designers and architects to create and generate the spatial solution. It is concluded that the interactive and audio-visual media provide another form of supporting narrative in an exhibition, and that their effectiveness depends on the clarity with which they are conceived and applied to support the primary or master narrative.

Therefore, an understanding of the area of narrative is one of the most potent components in the curator-designer collaboration. The textual narratives that the curator generates to support the collection of objects are intrinsic to the exhibition, but equally important are those that the designer creates as a sensory journey incorporating dynamic structure, visually coherent object presentation, as well as paced new media presentations, both visual and aural. These layers of different narratives need to be intertwined, to maintain the authenticity of the content, and to add dynamism without increasing the complexity of the experience. It became obvious during the course of the study that the various narratives form an inter-related information spine for the visitor undergoing an immersive experience. It is not just the didactic text and object display that provides this; it is the interaction with the other elements - the collection, the technological, and spatial - that complete this spine.

If we assume that immersion occurs in an information rich (rather than information dense) environment, then the capability of the creative team to evaluate and determine

the location of all the elements in an objective way becomes intrinsic to the outcome of the experience. Each element needs to be assessed against criteria centred on visitor behaviour, and the capability of the designer to visualise the environmental conditions and the potential for effective communication in that location/space. Therefore, this theoretical framework emphasizes that greater importance should be placed on the conceptual organization of the exhibition experience in the early stages of development to ensure a 'top down' or 'big picture' process. This process needs to encourage full analysis of all the components as a seamlessly integrated experience, and not as a complex mutation or aggregation of many small constituent parts. For an exhibition narrative to be engaging, it would still have to start with a good idea, as with good books and good movies. It is the knowledge that visitors will continue to seek new and exciting sensory experiences, as outlined in the work of Pine and Gilmore (1999), that provides the incentive to set new bench-marks for exhibition and design practice.

The study's theoretical framework provides the designer with information on potential elements to be explored during consideration of the constituent parts of a curatorial brief, and on potential areas which might be considered in the early conceptualisation of the project. It can help the designer to create or find links and patterns that occur in the material and can be used or enhanced for communication purposes, and enables the designer to develop a list of objectives and outcomes for the exhibition including its communication strategies. In particular, the ability to objectify outcomes for the visitor, as described by Cszikszentmihaly (1988) in relation to the goal oriented nature of the individual, would greatly assist the designer and the curator in assessing elements against various visitor outcomes.

Designers draw on a wide variety of individual influences and knowledge when working on the design of exhibitions. As with many design problems, museum based exhibitions have a complexity built into them. No two exhibitions are ever the same; each varies widely in terms of the final selection of narrative concept, object collection, graphic elements and potential communication media. The design problem is therefore multi-dimensional, and relies on solutions which incorporate a number of elements that should be inter-related in order to be cohesive.

When conceptualising an immersive experience, designers and curators could view each of the narrative elements as sequential and interacting elements, rather than as hypermedia linkages. In the early stage of exhibition development, four main areas of the information spine can be assessed against qualitative criteria to ensure the integrity of the immersive experience. These can be summarised as:

1. the 'outcome driven' elements that need to be present for "flow" to occur as observed by Csizkazentmihaly (1988);
2. the 'planning driven' elements including narrative(s) which have aspects of organisational or conceptual planning associated with them;
3. the elements of interactive development as described by Peterson (1991)
4. the range of sensory experiences being offered.

In the middle stages of exhibition development, when the planning process is further advanced, elements of sensory stimulus and cognitive response can be further evaluated against the experience realms of Pine and Gilmore (1999) to ensure that elements of active and passive participation, and those of absorption and immersion, are being considered adequately.

The preferred approach identified in much of the literature about exhibition design in museum involves the creation of prototypes of exhibition elements and, prior to commencing the design construction phase, the preliminary evaluation of some elements for feed-back. As Screven (1999) noted, this approach is followed particularly in the development of inter-actives, where prototypes and visitor evaluation are used to determine the effectiveness of communication, design and usability. On their own, these elements may communicate effectively, but as Harvey et al (1998) have indicated, it is important to find appropriate locations for all exhibition media, including the objects and didactic material, in order to avoid cognitive overload.

While visitors may have little or no understanding of immersive experiences, they will benefit from the outcomes generated by the designers and curators of these experiences. Well-designed experiences should engage visitors for longer and with more depth than other exhibitions, and should result in a longer memory retention of the experience. Information transfer, interactivity to engage and immersion in the

narratives should all speak directly to the visitors, in an effortless sensory expression minimising visitor fatigue or distracted attention.

This study has not aimed to provide a complete account of the information available on sensory processing, due to the complexity of the area and the fact that it is subject to much on-going investigation. It does however, create a picture from which designers and curators can develop an understanding of how content or information is received and processed by the visitor. One conclusion from the study is that the application of knowledge of both sensory and cognitive behaviour to the structure and pace of these exhibition-based experiences, and to the spatial and narrative environments, is intrinsic to the level and success of immersion for the visitor.

If all the objectives of an immersive experience are aligned, the visitor should benefit through an enhanced experience, one that stimulates sensory responses and appeals to the visitor's goal oriented needs. However, one aspect of variability in visitor responses to an immersive experience is associated with the size of an individual institution. As Falk (1992) pointed out, visitors to museum exhibitions tend to determine the length of their visits, and the time they give to an exhibition, by averaging the size of the exhibition or museum against their allocated time. Large museums tend to provide a number of competing attractions for the visitor including a large selection of permanent and temporary exhibitions, along with performances, public programs and a café for refreshments. If the exhibition has around 400 objects, and text to support these objects, it is apparent that the visitor must scan for only the most important information. Objects, textual support, audio visual footage, and interactives, like all the other material in the exhibition, must therefore capture and communicate that which is essential for an effective experience.

The study has discussed historical and contemporary interpretations and examples of immersion, uncovered common spatial/physical manifestations of immersive experience, and examined the role and application of narratives as well as the sensory and cognitive responses to immersive states. While this research has provided a theoretical framework that can be utilised immediately by museum designers and

curators, there are opportunities for further research that will enhance further the understanding and effective application of immersive experiences.

There are at least two possibilities for useful future research in this area. One involves the development of a methodology for evaluating the likely level of immersion based on a summary of elements in the exhibition, and the other is the development of a methodology for measuring the quality of each immersive experience, based on a qualitative analysis of visitor experiences.

The first methodology for measuring the quality and range of immersive experiences in museum settings could be developed from research by Biocca and Delaney (1995a) that evaluated VR platforms and software. By taking five of Biocca and Delaney's criteria for evaluation, and measuring each against a level of low, mid and high level variability, it may be possible to identify the potential level of immersion in an exhibition at an early stage. The five criteria are;

- sensory vividness
- interactivity
- sociability
- information intensity
- cost

By translating Biocca and Delaney's virtual reality (VR) focus on sensory vividness, it could be extrapolated that sensory vividness in the exhibition context relates to the qualities of a space and the potential to create sensory isolation from preceding experiences, and enables subjective states or 'flow' to be experienced. Sensory vividness would be determined by measuring a range of factors including the number and nature of the senses that respond to the environment, the quality of the stimuli, and the level of coordination between sensory displays.

Interactivity in exhibitions and VR relates to the level of active/passive participation that a visitor experiences with regard to elements such as dynamic spatial access and new media and other interactivity. The degree of interactivity can be assessed by

measuring elements including the amount and range of interactivity, and the level of responsiveness or feedback. The degree of difficulty provided for the visitor and the sense of achievement are also active components in the assessment process.

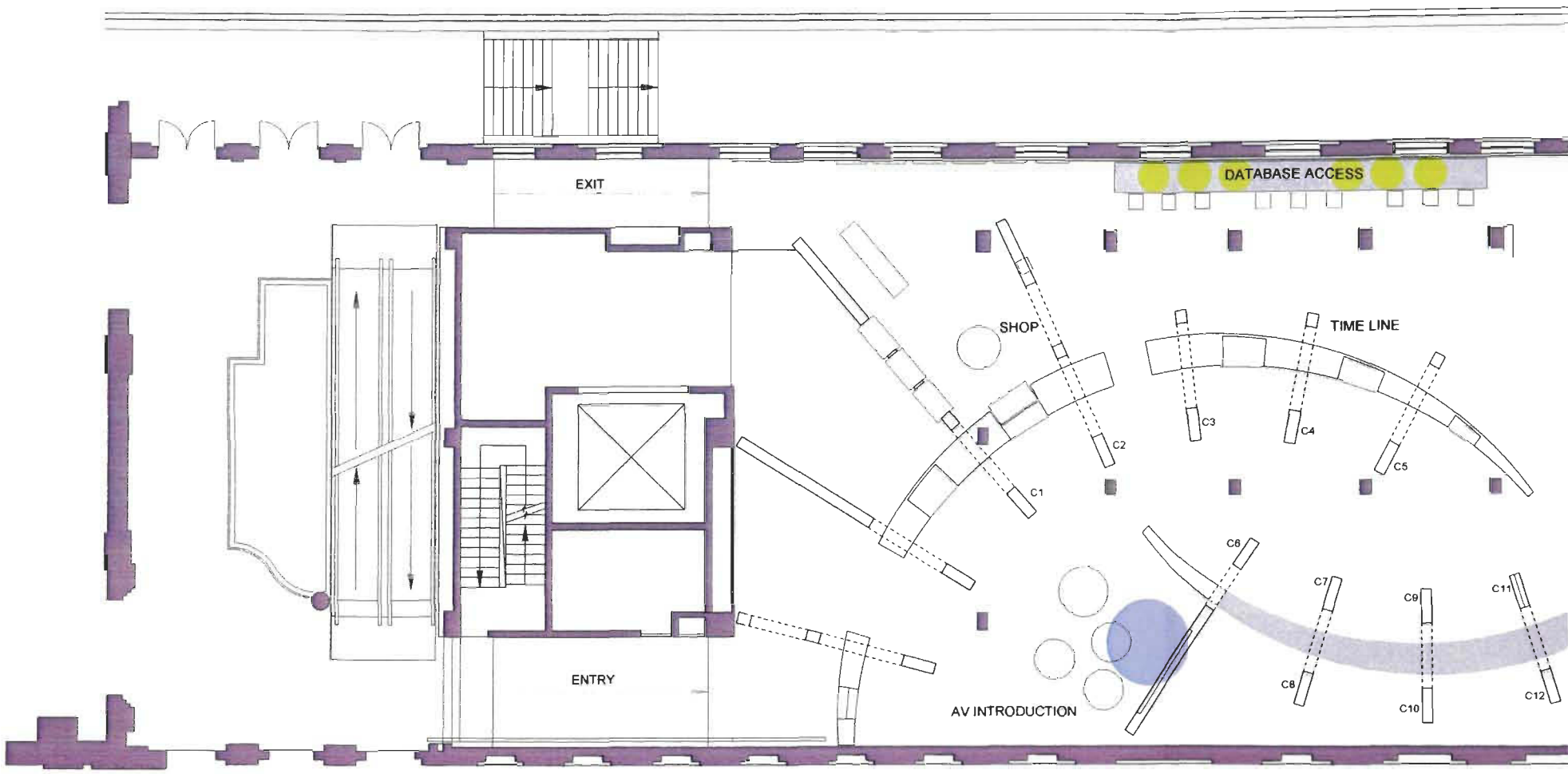
The level of sociability is significantly different in VR, as VR experiences tend to be solitary and the sociability can include not only other participants, but 'avatars' or digital representations of sociability. In the museum, the quality of the visitor experience as a social event can be assessed by measuring the visitor's ability to relax while completing the experience and associated tasks and still finding elements of escape. Physical/spatial access for groups or individuals to view the content, and multiple access to information, would also be indicators of sociability.

Information intensity in VR involves the ability for technological devices to provide support for the communication of the content narrative, thereby enhancing cognitive processes. This is much the same as in an exhibition, where the level of information intensity can be assessed by measuring the level of implementation against the level of diffusion (F. Biocca, & Delany, B., 1995a p119).

The second effective form of evaluation or testing would be the development of a polar diagram to measure the experiences of visitors through each of the elements that are known to contribute to an immersive experience. Polar charts are effective in showing the range of activity in specific areas, while allowing a certain amount of variation to occur. Though exhibitions tend to be completely different from each other in terms of concept, content and design, the development of a polar diagram format would enable the range of experiences, both intellectual and sensory, to be plotted and read effectively.

Ideally, one outcome of further research will be a model for testing and documenting visitor responses to a particular experience, so that success or otherwise of the immersive nature of the experience can be gauged. It may become feasible over time to document the responses of visitors to a range of immersive exhibitions and to make more wide ranging conclusions on the effectiveness of immersive experience in museum settings.

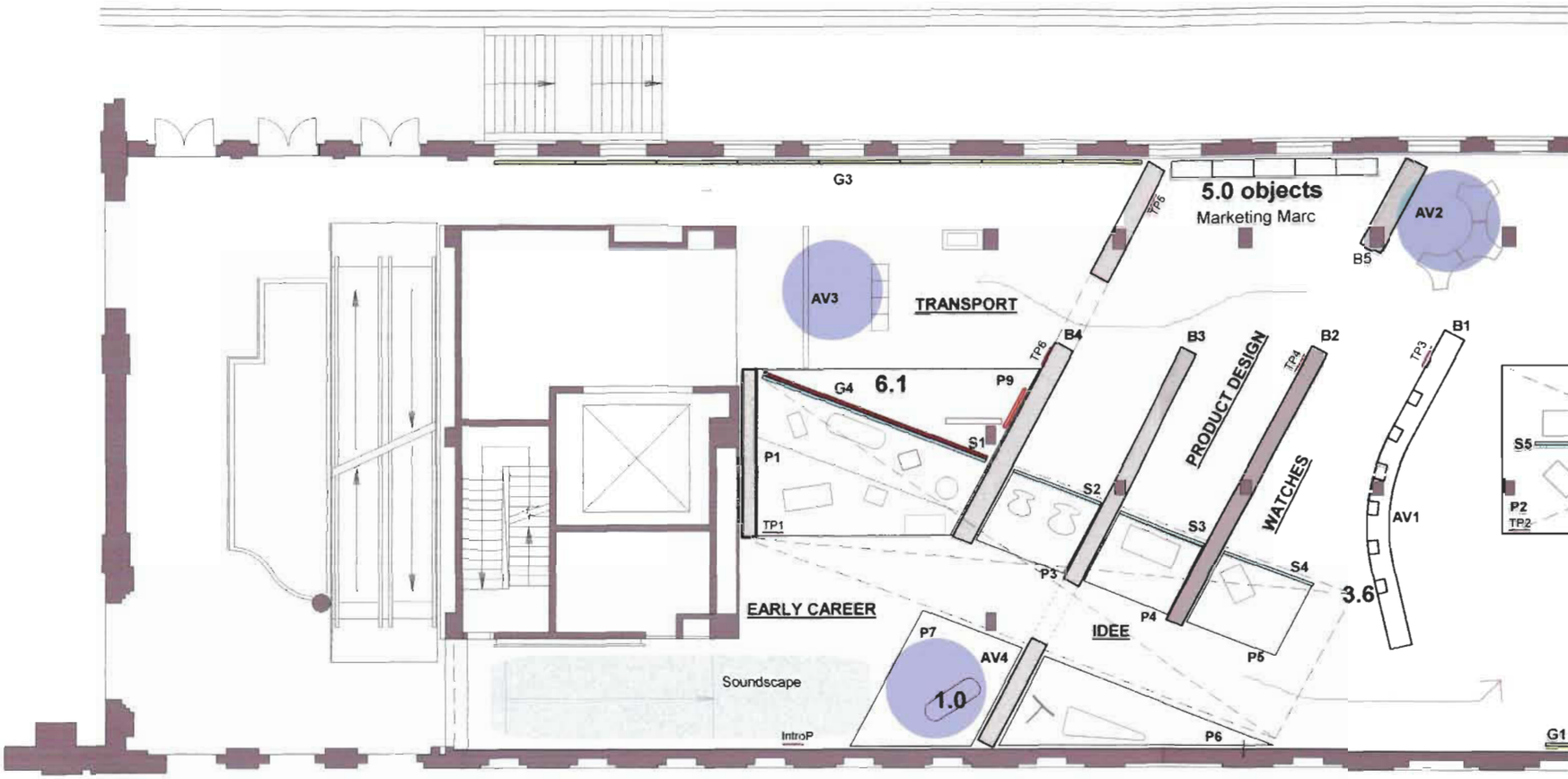
APPENDIX



GENERAL EXHIBITION PLAN : NTS

CODEX LEICESTER - NOTEBOOK OF A GENIUS

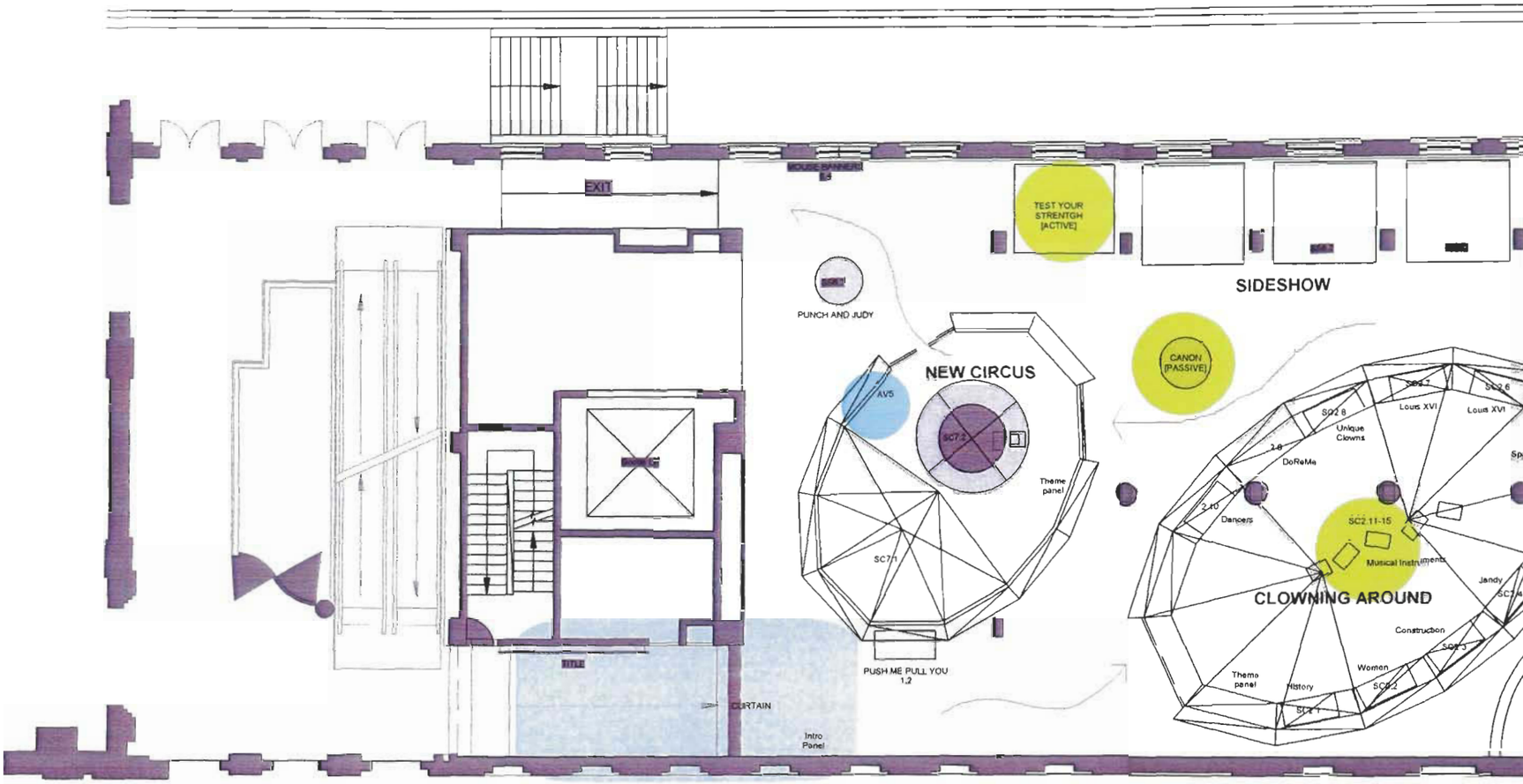
EXHIBITION DESIGNER: JENNIFER ISON



GENERAL EXHIBITION PLAN : NTS

*MARC NEWSON : **designworks***

EXHIBITION DESIGNERS: DIANA LORENTZ & FIONA YOUNG



GENERAL EXHIBITION PLAN : NTS

CIRCUS! 150 YEARS OF CIRCUS IN AUS

EXHIBITION DESIGNER: DIANA LORENTZ

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