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Front cover illustration: Looking upwards through the rigging of HMS Victory during the evening reception hosted by Lieutenant Commander F Nowosieński MBE RN held on board as part of the 2005 GEM Conference on 7 September.

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Edited by Dr John Stevenson

The views expressed are those of the contributors and not necessarily those of GEM.
Editorial

For the purposes of this editorial, I have decided to borrow Nico Halberstma’s motto:

“beter goed geiat dan slecht bedacht”

This can be translated as “it’s better to steal a good idea than to invent a bad one”. So I am going to quote at length some of the good ideas which are contained within the pages of this Journal.

David Lammy, Minister for Culture at the Department of Culture, Media and Sport, in his video address to this year’s conference in Winchester said that he wanted,

“to recognise the work of the members of GEM who I know have been involved in a great deal of work this year that largely has gone unheralded.”

He pointed out that “our capacity for self criticism is inexhaustible” but he believes that “our curators, conservators, scholars and educators are among the very, very best to be found anywhere in the world.”

Also, he believes that the momentum towards placing learning at the heart of cultural organisations means a greater emphasis on the skills of museum education professionals. So the government can advocate, develop policy, strategise and provide funding for museums but it is up to us at the sharp end to deliver.

Since delivery is so important it was interesting that in his Madeleine Mainstone Memorial Lecture, Nico Halberstma of the Reinwardt Academy in Amsterdam describes how museology degree students are trained to become good educators in the Netherlands. He explains that the course emphasises practice rather than theory, and ends with the challenge that GEM should become involved in developing a common curriculum for museum educators across Europe.

In his opening address to the 2005 GEM conference, Councillor Ken Thornber said,

“It is only by understanding the challenges facing museums, and ensuring that we deliver real change with a real measurable impact on people’s live that we can truly hope to inspire people and enable them to understand the world around them better.”

Susie Chung in her paper “examines the relationship between entertainment and education, and the concept of absolute scientific knowledge as represented in dinosaur exhibits from the audience’s point-of-view.” Her study concludes, not unsurprisingly, that visitors both learn from and are entertained by the exhibits. However, her finding that visitors come with the notion that the museum portrays absolute scientific truth should make us all aware of the trust that visitors seem to place in us – a trust not to be abused.

In their paper, Tony Hall et al describe how many museums are using Information and Communications Technology (ICT) in order to enhance their educational programmes and encourage visitors to step beyond “browse mode”.

“However, rather than enriching visitors’ interaction with artefacts and exhibits, research has shown that computers can often have the opposite effect, becoming a distraction and an obtrusive influence in the exhibition or gallery space. When this occurs, it is problematic because it impedes one of the principal goals of museums, which is to focus visitors’ attention on material culture.”

Their paper goes on to describe a project in which the technology was hidden or merged into the background of a museum display and visitors interacted with it through gesture, speech and other novel interactive devices and sensors.

Philip Stephenson et al report on a project whose aim “was to synthesise two active learning approaches – learning from the investigation of ancient objects in a museum and learning through hands-on problem solving investigations in the classroom.” The authors felt that,

“The dynamic and positive impact on teacher and museum educator professional development alongside the reinforcement of the importance of incorporating museum education as a key element of teacher training broadens the success of the project.”

For over 50 years the Group for Education in Museums has been advancing learning through museums, galleries and similar organisations but it is now at a crossroads in its development. As most of you will know, the Board of Trustees have commissioned an independent review of GEM. At the time of writing the consultant, Hillary McGowan, is due to present her report to the Board. Obviously, I am unable to report her findings although I can reveal that the response from members to her request for comments has been remarkable. Members’ detailed and thoughtful contributions to the review are much appreciated.

So thinking about contributions, now is the time to plan your contribution to the next issue of JEM. Also, I am looking for some help with editing it. If you would like to offer your assistance, you are sure to be treated with a very warm welcome.

There are notes of this year’s conference in the journal, although early next year more conference material should be available on the GEM website. I am grateful to Diane Taylor for helping me collect and edit the conference material.

Dr John Stevenson
Hybrid digital-physical exhibitions: Creating new possibilities for education through novel computing in museums

Tony Hall, Liam Bannon, Luigina Ciolfi & Eamonn Murphy

In order to enhance their educational programmes and “encourage visitors to step beyond the ‘browse mode’” (Schauble et al 2002: 425), many museums are using Information and Communication Technology (ICT). However, rather than enriching visitors’ interaction with artefacts and exhibits, research has shown that computers can often have the opposite effect, becoming a distraction and an obtrusive influence in the exhibition or gallery space (Gammon, 1998; Ciolfi, 2001; Gilkes, 2001; Stille, 2002; Stevens, 2004). When this occurs, it is problematic because it impedes one of the principal goals of museums, which is to focus visitors’ attention on material culture. Stevens (2004: 23) describes the possible problem with multimedia in exhibitions and gallery spaces,

“They might divert attention from the viewing of authentic objects which in an age of digital reproduction remains one of the clearly unique functions of a museum.”

The problem with traditional or standard desktop computing seems to be characterised by a number of underlying factors. Firstly, a highly problematic aspect of the introduction of computers in museums and the design of interactive spaces generally has been the lack of consultation of key stakeholders:

“The teachers, pupils, and gallery and museum education staff who use existing creative spaces have a wealth of knowledge and experience about what works and what does not. And yet they have been and are being rarely consulted.” (Rogers & Edwards, 2002: 8)

Furthermore, the technology is invariably not integrated into the experience in a way that effectively complements museums’ other valuable interpretative techniques: handling, for example. The digital technology seems divorced from the physical experience of objects. And it is this separation of the digital and the physical that seems to be a root cause of the problems affecting ICT use in museums. Falk & Dierking (2000: 231) describe how:

“virtuality will never replace reality … although people might be thrilled to visit a museum web site and view objects through the electronic medium, our guess, as well as that of others more informed than us, is that if given the opportunity, most people will readily choose the real experience every time. The future [of technology in museums] lies in the blending, not the separation, of the virtual and the real world.”

**Background: The SHAPE Project**

In 2001, a consortium of research centres from universities across Europe, joined together, in an EU-funded project: SHAPE, to explore how digital technologies and physical museum spaces and artefacts might be innovatively combined or interleaved to enhance visitors’ interpretation and involvement with material culture.

This aim of combining the real and the virtual in innovative ways was made possible by advances in digital technology. New paradigms of computing enable computational power to be embedded in the environment and in items within that space, for example: furniture and other fittings. The technology can be made to recede into the background and new interaction mechanisms allow computing to be controlled through gesture, speech, and a range of other novel interactive devices and sensors, often without wires or physical connections, for example: Radio Frequency Identification technology (RFID).

The SHAPE project endeavoured to explore the possibilities of using these new types of disappearing computer technologies to enhance visitors’ interaction with artefacts in museums.

What further distinguished the SHAPE project was its commitment to key stakeholders, for example: educational curators and docents, and its consultation of these essential design informants throughout the process of designing computing. The project collaborated closely with, and held exhibitions at, three European museums: Nottingham Castle, UK; The Technical Museum, Stockholm, Sweden; and the Hunt Museum, Limerick, Ireland.

The project culminated in the Re-Tracing the Past exhibition in the Hunt Museum, Limerick. Throughout the project, extensive observational studies were conducted with visitors in museums. The design process also encompassed several design sessions with docents; interviews with visitors; and prototyping with novel computer technologies, both on-site in the museum and in university laboratory settings.

**Characteristics of Hybrid Digital-Physical Exhibitions**

As the project progressed through iterations of technology testing, observational study and so forth, a number of characteristics emerged for what an effective hybrid digital-physical museum experience should entail. These emergent features, combined with an extensive literature review, enabled the design team to make a number of key assumptions about hybrid digital-physical exhibitions.

Indeed, in the museum community generally, combinations or hybrids of interpretive techniques and strategies are growing in popularity as a means of effectively involving and engaging visitors. One of the key themes to emerge in a review of the literature was how museums, science centres, heritage sites and so forth are increasingly using “integrated interpretation” (Franklin, 2002) to make visitors’ experience more compelling and educative. Curators at the Denver Art Museum, Colorado, US, for example, employ a combination of interpretive techniques to enhance children and general visitors’ experience of artwork in their galleries (Franklin, 2002).
Effective integrated interpretation is also exemplified by the innovative W5 (Who-what-where-when-why) exhibition in Belfast, Northern Ireland. The multi-level W5 exhibition incorporates different practical, themed areas and activities:

“The wide themes allow very wide subject areas so that future development is not restricted:

GO: An area focused on the physical exploration of the world – lifting, moving,

SEE: An area focused on the senses and the ways in which we perceive the world around us.

DO: An area focused on how we manipulate the world and create new things within it.

Within these three areas ... experiences ... cross all subjects, including but not limited to the original content themes, and underscore the interrelated nature of all areas of learning and discovery.” (Montgomery, 2002: 55).

The SHAPE project aimed to extend the notion of “integration interpretation” to the digital realm, and incorporate computing more sensitively within the museum. The features relevant for hybrid digital-physical exhibitions included:

- **Collaboration:** the hybrid exhibition can be used effectively by individual visitors. However, it also encourages and supports interaction between two or more visitors.

- **Materiality:** the focus in the hybrid experience is **hybridity**, or effectively combining the real and the virtual. Therefore, if practicable, in the hybrid exhibition, handling and touching of artefacts or replicas should constitute core activities. Furthermore, the design of the physical environment, its fittings and furnishings are crucially important in creating an exhibition space that is conducive to exploration and learning.

- **Augmentation and usability:** while the innovative computational aspects of the hybrid exhibition enhance visitors’ interpretation, they are unobtrusive and out-of-sight. They are furthermore easy to use. Visitors do not face the double-task of firstly having to learn interface features, (as they might with a desktop PC-based application), before they can access information related to artefacts.

- **Multi-modality:** the exhibition supports visitors’ somatic or multi-modal interaction with artefacts (particularly important for visiting children (Weier & Piscitelli, 2003)). This is unlike the standard desktop PC, which restricts the visitor to limited sensorial interaction through point-and-click on a screen.

- **Pedagogical discourse:** the museum is a casual or informal educational environment. Therefore, it is important that the hybrid experience encourages visitors to engage in *educationally important talk* (Wegerif & Scrimshaw, 1997): evidence of this discourse involves correcting misunderstandings; asking questions; and interpreting and reflecting on material culture. It is furthermore important, considering the museum is an informal or ‘free-choice’ learning setting (Hsi, 2004), that the pedagogical framing of the experience should support visitors’ exploration of artefacts in an open-ended, non-directive way.

- **Active interpretation:** like any effective interactive exhibition (Caution, 1998; Hooper-Greenhill, 1998), rather than presenting visitors with a catechism of facts about artefacts, the hybrid environment should support visitors in constructing and sharing their own interpretations of material culture.

- **Engagement:** finally, the exhibition should capture and maintain visitors’ curiosity and interest. The novel technical parts of the exhibition can also be used to enhance this dimension of the experience by bestowing the fittings and furnishings of the exhibition space with additional interactive properties.

**Re-Tracing the Past: a novel hybrid digital-physical museum exhibition**

Many compelling scenarios for the design of computing and the overall exhibition emerged over the course of the two years leading up to the final opening of Re-Tracing the Past to the public on 9 June 2003.

The final idea however was to construct two interlinked spaces that would embody the seven design characteristics of hybrid digital-physical exhibitions. The first space would be a reproduction study room, based on the secret study that John Hunt had at his home in Lough Gur, Co. Limerick. John Hunt, the archaeologist, was the original owner of the Hunt Museum artefacts; he bequeathed his extensive collection to the people of Limerick in 1974. Due to space constraints in the permanent galleries, the exhibition was installed in the downstairs temporary gallery space of the museum.

The replica **Study Room** contained four interactive fittings: an interactive trunk; a virtual touch machine (using a Polhemus Fast-Trak device, children and other visitors could virtually strike or

The two interlinked exhibition spaces of Re-Tracing the Past.
While the Room of Opinion was darkened and made to appear mysterious, to help evoke visitor curiosity, the Study Room was dimly lit and fitted with authentic furnishings; many were sourced from local antique shops. RFID-tagged keycards, representing each of the four mystery objects were used as the mechanism for visitors to interact with the trunk, desk, recording station (Room of Opinion) and virtual touch machine (interactive mirror).

**Evaluating the Re-Tracing the Past Visitor Experience**

The analysis of the exhibition in the Hunt Museum was essentially qualitative although some “dwell-time” measurements were also conducted. Dwell-time is considered by some researchers to be problematic as a means of analysing museum educational activity:

“Analysing learning in museums settings is fraught with methodological difficulty. In traditional research in museum education, learning outcomes have often been assessed through structured interviews and visitor behaviour through some kind of quantitative estimate of frequency of visit to an exhibit and ‘dwell time.’ However, if one views learning as an inherently collaborative and social activity, particularly in informal settings, this becomes inappropriate.” (Stanton et al., 2003: 296).

Notwithstanding this, if considered in the proper context, dwell time can be a useful indicator of the degree of engagement of visitors within exhibitions. If visitors are interacting, as intended, and they are continuously active then dwell time can be useful as an indication of the attractiveness of an exhibition (Jones, 2003). Dwell-time was used as part of the analysis of visitors’ degree of engagement within Re-Tracing the Past.

Over 900 visitors attended the Hunt Museum exhibition, including 326 schoolchildren and their teachers. Over sixty hours of video data were collected plus other supplementary evaluation materials including children’s sketches and short essays. The essays and sketches were collected during post-visit sessions in schools. Some children also completed video testimonials describing their experience of the exhibition. The design team wanted to determine a number of things about Re-Tracing the Past.

- Did it help to focus visitors’ attention on the interpretation of artefacts?
- Was it engaging?
- Did it encourage and support collaboration?
- Did the technical features blend with the physical environment in an effective way, creating a compelling experience for visitors?
- Did the exhibition support somatic learning, where visitors’ different sensory modalities are engaged?
- Did the exhibition encourage visitors to actively interpret and question artefacts?

In summary, the seven characteristics of hybrid digital-physical exhibitions came out strongly in the evaluation of the visitor experience. Firstly, visitors responded very positively to the design of the experience, and the authentic material properties of the space. Peter is a good example of how visitors, especially children, reacted on seeing the Study Room for the first time. As he enters the space with his classmates, Peter gasps, “Wow, this is cool!”

Children and other visitors’ reaction to the materiality, the fittings and physical features of the hybrid exhibition was not only evident in their positive behaviour in the space but also in the sketches and essays children completed in the class-
In their sketches and video testimonials, the children described the furnishing and style of the rooms, the Study Room and the Room of Opinion, and expressed their appreciation for them. In their drawings, the children also included not only the main interactive elements, but also detailed representations of the lamps, chairs and other decorative elements scattered around the Study Room.

In a short essay written by one of the children during one of the post-visit sessions, he expresses his appreciation for the authenticity of the space. The essay also conveys his appreciation of the interactive elements of the experience and how he enjoyed his visit to Re-tracing the Past:

"I liked the way they tried to make it as real as possible. The interactive stuff was cool. My favourite bit was the phone where you told messages about the stuff. Then you would listen to yourself on a radio. It was very enjoyable."

Among the most important material resources in the exhibition were the reproduction or replica artefacts, which were placed on plinths in the Room of Opinion. These helped to enhance the visitor experience in a number of ways. Firstly, it engaged visitors that they could actually handle the objects, or at least a very good reproduction of the artefacts. Furthermore, handling the artefacts and touching them provided visitors with an important point of reference in formulating their ideas about what the mystery objects might be.

It was evident in the data from the exhibition that Re-tracing the Past was very successful in engaging visitors, especially children, and in capturing their interest. As discussed, visitors were impressed by the exhibition and this was attributable to the non-interactive aspects of the experience, as much as to its interactive aspects. To assess the level of visitors' engagement within the exhibition, a number of dwell-time analyses were conducted; and subsequently correlated with other sources of feedback. One particularly insightful example from the data is the duration of Mark and Thomas' visit to Re-tracing the Past. Mark and Thomas record their first opinion about the Y-Shaped Object, one of the four mystery artefacts, when the digital video tape displays 00:04:06.

After the boys record their final opinion before going home, the timer reads 03:09:28:24. The boys have spent over thirty minutes in the exhibition, and it seems they would spend more time in the exhibition but they have to go home. The boys are interacting as intended for the duration of their visit. They are constantly active, running excitedly between the two spaces, the Study Room and Room of Opinion, to collect more clues, record more opinions, and handle and explore the replica objects.

Therefore, taken in the context of the level of active engagement the boys exhibited while in the exhibition, the significant amount of time they spent in the exhibition, (over thirty minutes), helps to prove that they were engaged and very much enjoyed the experience.

The novel technology was effectively integrated with the physical properties of the exhibition space, helping to enhance visitors' interaction with the four mystery artefacts. For example, the virtual touch machine, which helped visitors to appreciate material properties, such as the density of the objects, and also to explore what it probably sounded like when the objects were being forged or made. One child visitor, Pat, while hitting the virtual Stone Ball, compares it with the Dodecahedron.

Pat: "It's thick, the other one [Dodecahedron] is hollow."
Jason: "It's [Stone Ball] like brick."

The exhibition was also successful in encouraging and supporting collaboration. In the following vignette, Lorna helps an adult visitor, Helen, to operate the interactive desk effectively. Lorna helps Helen to position properly an RFID-tagged keycard representing the Y-Shaped Object on the designated interactive spots on the map.

Lorna: "You have to put it on the square on the map."
Helen: "Oh, ... it's working now ... thank you."
Lorna: "No problem."

Interestingly, visitors tended to engage in collaboration most effectively at the interactive trunk. The trunk would display extra information about an object or objects if visitors placed two cards together simultaneously. There was "collaborative added value" to visitors' interaction at the trunk. By working together they could uncover extra information. This "reward" for their collaboration at the trunk helped significantly to encourage co-operation among visitors using this interactive.
The exhibition also supported visitors in discussing artefacts and formulating their own theories about the objects. In the following vignette Mark, and Paddy, who is also a Hunt Museum docent, consider an opinion they hear on the radio in the study room. The opinion was recorded previously by Jason during a school-visit: "I think it was used as a slingshot or catapult."

Paddy: "Can I hear that again? Would you mind playing that again?"
[Mark plays the opinion again.]
Paddy: "Uhm ... this is what the kid thinks ... You see [to Mark, while making a note of Jason’s idea], I did some research on the Y-Shaped Object some years ago. ... Nobody really knows what it is ... I came to write down some of the things they say..."
Mark: "Oh yeah ... what do you think it is?"
Paddy: "I think it’s got something to do with horses ... ."

The hybrid exhibition engaged visitors’ different sensory modalities: sight, sound, touch, for example. Furthermore, one girl commented: "It smells like my nanna’s [Grandmother’s] house in here." The fittings of the Study Room were covered with beeswax to help add further authenticity to the experience and create the actual smell of an old and musty room. A number of visitors remarked about this. Therefore, in addition to their visual, aural and tactual senses, the exhibition also engaged visitors’ olfaction.

**CONCLUSION**

The Hunt Museum exhibition exemplified the possibilities afforded by hybrid digital-physical environments to enhance the museum educational experience. A central aspect of what made Re-Tracing the Past successful was the participatory design process, which ensured that key stakeholders were involved throughout the selection and implementation of the novel computational and interpretive features of the experience.

The analysis of the exhibition in the museum was highly positive overall. It showed visitors, of all ages, engaged in multi-modal interaction with artefacts. Furthermore, the authentic design of the Study Room engaged visitors and piqued their curiosity, as did the surreal atmosphere of the Room of Opinion. The exhibition also encouraged and supported collaboration between visitors, where they discussed and shared opinions of the four mystery artefacts.

In summary: such hybrid digital-physical exhibitions are ideal for visitors to experience material culture, where novel computational power and other physical, interpretive museum activities and techniques are innovatively combined, in ways that would not be possible with traditional computer technologies.

Tony Hall1, Liam Bannon2, Luigina Cioffi3, & Eamonn Murphy4

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