Capturing the Elusive Interactive Artwork via CD-ROM

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Abstract

Multimedia technologies have transformed our expectations for the very nature of a work of art as well as how we experience and document them. This paper discusses the authors' experience in the digital art world as curator, author, and most recently as a producer of multimedia and documentary video, have in many ways reflected developments in art and technology itself

Keywords

Interactive Art, Virtual Curation, Interactive Exhibits, Electronic Exhibition Catalogs

Multimedia technologies have transformed our expectations for the very nature of a work of art as well as how we experience and document them. With the increasing emphasis on interactivity in artworks, traditional publications and documentation have become inadequate as a means of capture and elucidation. Via CD-ROM, not only can the interaction be simulated but also through the incorporation of video, either the artists themselves, scholars, or other individuals, can explain the artwork and the enabling technology.

My presentation will show how my experiences in the digital art world as curator, author, and most recently as a producer of multimedia and documentary video, have in many ways reflected developments in art and technology itself. I will also discuss how my own role and responsibilities have changed in response to these occurrences.

Since the early nineteen-eighties when I entered the digital art field, I have had to grapple continuously with how technological advances necessitate innovative vocabularies and forms of presentation for both publications and the display of art. Over these past two decades, I have experienced the limitations and frustrations associated with securing both the equipment as well as the optimum viewing conditions for the often rigorous demands associated with exhibiting interactive art. On countless occasions I have struggled as well to overcome the limitations imposed by the use of traditional print formats both for the display and documentation of digital artworks. Lamentably, the great degree of empowerment which digital technology placed in the hands of artists on the screen was met by a commensurate amount of frustration with the inability to display digital artworks in a satisfactory format off the screen. And I, like many others in the field, was involved in the seemingly endless debates focused on the preferable output for computer-generated imagery. This debate, however, was not surprising considering that the majority of works on display were either photographic prints or plotter drawings.

In the context of this conference, I can not help but muse how truly far we have come since the early nineteen-eighties, when I began my study of computer art. I was then working at the Guggenheim Museum in New York doing research for a scholarly catalogue of the Peggy Guggenheim Collection in Venice. Two of the organizers of that year's SIGGRAPH art show, computer artist Darcy Gerbarg and Louise Etra Ledeen, wife of video artist Bill Etra and collaborator with video artist Bill Etra and engineer Steve Rutt in the building of the *Rutt/Etra Synthesizer*, asked if I would write a critical essay for the art show catalog. My mandate was to write about the medium using traditional methodology for art criticism rather than once again relegating computer art to the realm of self-reflective discourse. The challenge was daunting not only because the art form was still a fledgling one but also the technology was relatively unfamiliar to me. Despite the very valid argument that the art should be evaluated on its own, in this field at that time, the technology was hard to ignore. There was simply no such thing as a seamless interface!

After several months of research and endless interviews with dozens of key people in the field, I wrote an essay, "Art and Technology: Bridging the Gap in the Computer Age," for an exhibition which included stills from Nelson Max's highly acclaimed animation *Carla's Island*. Created by Max at Lawrence Livermore Labs, this very beautiful animation won a standing ovation from a then very

appreciative audience at the traditional SIGGRAPH Film and Video Review Event .

LED-illuminated sculpture such as Tom Eatherton's 9 x 9 foot *Point*, the various possible illuminated patterns of which would take years to exhaust, represented the state- of- the -art in computer-controlled sculpture at that time. Color plotter drawings such as the delicately colored ones in Colette and Charles Bangert's *Grass Series* were among the artistic highlights of the time. Jane Veeder's *Warp It Out*, in which video-grabbed images of participants were transformed by warping and changes in color, was the only interactive art work in the show. Interactivity was still out of the reach of most artists due to the requisite programming rigors and the prohibitive cost of equipment. The limitations inherent in computer art at the time not withstanding, that SIGGRAPH had a revolutionary effect on my career as a curator. I became irrevocably convinced, in spite of the unpopularity of my belief in the traditional art world in the early nineteen-eighties, that digital technology would have an unparalleled transformative effect on the artmaking process.

Several years later, assuming my newfound somewhat messianic role, I organized a large traveling exhibition called *Digital Visions: Computers and Art*, the first such exhibition to be shown at major art museums in the United States. The exhibited works represented a historic overview in the field to date and included paintings, sculpture, drawings, architecture, mixed media, film and video. Vibeke Sorensen's whimsical, three-dimensional *Fish and Chips*, in which brilliantly colored three-dimensionally modeled goldfish are paired with computer chips, a visual pun on the very technology which she used to make the image, was reproduced on the cover of the catalogue, which was distributed by Harry N. Abrams, New York, the first monograph on the subject produced by a major art publisher. At that time, the interactive component comprised a growing yet still small portion of the total works on display. When the touring exhibition came to the IBM Gallery in New York in the Spring of 1988, an enormous additional budget of several hundred thousand dollars was required simply to add eight computer-controlled exhibits to the show (only five of which were interactive), all running on IBM PCs much smaller than any we use today. Among these were Harold Cohen's computer-driven drawing machine run by an artificial intelligence program he calls *Aaron*; IBM Thomas J. Watson scientist Richard Voss's interactive fractal landscape installation and a program written by pioneer computer filmmaker John Whitney Sr., which lets the user simultaneously create digital sound and corresponding digital imagery displayed on a computer monitor.

Two years ago video art pioneer Nam June Paik asked me to co-direct the InfoArt Pavilion at the 1995 Kwangju Biennale in Korea. The plan was to exhibit both the key pioneers of video history such as Nam June himself, Doug Davis, and Steve Beck, as well as recent cutting-edge achievements in the digital art world. My responsibilities included writing a catalogue, which I agreed to do on the condition that I could also produce an interactive catalogue or CD-ROM. This request was not motivated by a belief that traditionally published books and exhibition catalogs were obsolete but by my strong conviction that CD-ROM was the only format in which we could appropriately capture the newer interactive artworks on display. Museum professionals often lament the closing of an exhibition for numerous reasons, among them, the fact that photographic documentation of individual artworks rarely conveys the contextual impact of an installation. Documentation of interactive artworks is inadequate for numerous additional reasons, but most importantly, because of the elusiveness of capturing the transforming and individualized nature of interaction with such displays as well as the time element which is involved. All these characteristics require a non-standardized recording format.

As a curator in the computer art field, I have been responsible on numerous occasions for acquiring and maintaining the equipment requisite for the organization of complex international exhibitions., such as the InfoART Pavilion, an exhibition which brought thirty-two artists and their technologically-implemented art works to Korea. Daunting as this process has been, nothing approached the obstacles that we had to overcome in the production of invert: *The Digital Frontier from Video to Virtual Reality*, the CD-ROM art catalog that I produced and edited. As some indication of the amount the amount of work involved in this project, the printed

catalog was ready in time for the opening of the exhibition, the CD-ROM took an additional year.

This interactive catalog of the invert Pavilion highlights the achievements of sixteen of the leading artists in the world who are working in new media: Jean-Louis Bossier, Benjamin Briton, Edmond Couch, Luc Courtesan, Peter D'Agostino, Paul Earls, Scott Fisher, Paul Garrin, Perry Hoberman, Nam June Paik, Christa Sommerer and Laurent Mignonneau, Tsai Wen-Ying, David Rokeby and Steina Vasulka. Created on personal computers as well as super computers, the digital artworks on this CD-ROM are enormously varied in composition, artistic intention and technological configuration. From virtual life forms to a virtual reconstruction and tour of the Paleolithic caves of Lascaux, France, to a VRML world of fanciful creatures, *InfoART* presents the state of art at the end of a century in which artistic guidelines have been challenged and radically transformed. The artists featured create interactive multimedia compositions using the latest technologies including virtual reality, digital photography, synthesized music, three-dimensional laser imagery, digital life and the World Wide Web.

Many of the obstacles I alluded to were to be expected when authoring a title in a new medium whose parameters had not been fully explored or even developed. The very feasibility of some of my requests waeres unknown at the onset. And some of our challenges and constraints were completely unanticipated and yet curiously paralleled standard publishing restrictions. In the books, exhibition catalogs and articles which I had written in the past, for example, word count had been limited by editorial constraints, design and/or budget considerations. In this publication, despite the vast amounts of data possibly storable on a CD-ROM, the word count in my introductory essay was also limited. In this case, the limitation was caused by technological limitations, that is, by the word count possible in a scrollable text in one continuous file. In addition, my original goal had been to simulate the interactivity of the artworks on the disc. This desire had to be relinquished in most instances, because of cost considerations. Interactivity, as this audience well knows, often strains budgets.

With the new formats available to us, the role and responsibility of author have indisputably changed. The advent of multimedia has brought with it a plethora of options. Not only content but also manner of presentation has assumed unprecedented importance. Although one has always had the option to skip from page to page, chapter to chapter in a book, omit one section, linger over another, these concepts have an altogether new unprecedented significance now because of the different navigational tools which are available. Neither a *Myst*-like quest arresting as the images on that CD may be, nor an action-packed drama like *Doom*, was what we sought. Instead, our goal was substantive content, accurate information, and an encapsulation of the nature of each artwork, that is, not only what makes it technologically distinct but also its intrinsic value and characteristics as a work of art.

As the opening screen from the section on each artist shows, the following information was available on every one, that is, artist's statement, description of the work, technical information and biographical data. Through multimedia, we were able to convey the experience of the installations, the personalities of the artists, as well as the distinguishing characteristics of each. In order to do so, content was not all that was of importance, but method of presentation was of equal concern. Although the basic format was maintained throughout the CD, the presentation within each section was varied so that it did not become formulaic. Other considerations included the media available to us, as well as making the presentation harmonious with the individual characteristics of each artwork. Clearly, our challenge involved accurately and appropriately portraying the divergent and complex art forms represented on the CD.

In the case of Massachusetts Institute of Technology Center for Advanced Studies Fellow Paul Earls, who creates room-sized environments filled with electronic music and sound and movement responsive light, the goal was to capture the effect of laser light modulated by sound and movement in a darkened room. For the viewer interested in learning how Earls's *Laser Room* is constructed and controlled, the technical screen is informative.

For pioneering cybernetic sculptor Tsai Wen-Ying, we had to meet another challenge, that is, how to portray stroboscopically illuminated sound responsive sculpture. In this case, because video is so un-

satisfactory a medium for capturing such effects, we chose computer graphics to portray three works by the artist: an undulating wall-mounted piece; a group of slender rods crowned by reflective discs; and his hallmark work, *Upward Falling Fountain*, in which tiny glistening droplets of water, appear to flow upward in different configurations in response to sound input.

With traditional forms of publication, the author need not labor over the very nature of the exchange, the design of the interface or the psychological implications of the new technology on users, each element of which was a major concern for us. Whereas educational considerations were customary for me, the interface and the potential psychological implications of a product were not. However, if one agrees with the arguments set forth by authors Byron Reeves and Clifford Nass in their recent publication, *The Media Equation: How People Treat Computers, Television and New Media Like Real People and Places*, this psychological dimension will inevitably become the focus of even closer scrutiny in such publications and artworks in the future.

Rather than intimidating, I found the involvement in many more aspects of the design than ever before necessitated by the multimedia format the most rewarding aspect of my role as author and producer. My activities, so to speak, were far more interactive than usual, and did not end with delivery and final proofing of an edited manuscript that was accurate and read well, but in many ways only began there. I also was concerned with equipment requirements, navigational and installation instructions, pressing, packaging, and design of every single element including the insert leaflet, the box as well as the graphics which were pressed onto the CD itself. Creating a dual platform product raised numerous other often problematic considerations. In addition, there was the issue of functionality. When I began, I was unfamiliar with the often exacerbating debugging process and the very concept of "bug sheets" was a new term for me. I was especially fortunate in that Judson Rosebush, an old friend and producer of many outstanding multimedia titles, agreed to be involved in this part of the production. Also involved were countless hours of testing by myself, publisher Steve Rutt, and any and all of our friends and employees who would take the disk and test it on differently configured systems.

Lastly, entertainment - often considered anathema to the museum experience by art professionals - was also a design intention. In the segment on my collaborator, Nam June Paik, for example, not only is his amazing status and achievement in raising video to a high art form conveyed but also his charismatic and entertaining personality. Paik's biography section includes excerpts from one of his legendary John Cage performances with cellist Charlotte Moorman. Also included is a clip in which Nam June reacalls Moorman's arrest for a semi-nude performance. Another video clip gives a glimpse of Paik's highly acclaimed video synthesizer as well as some work, which was done using the different video processing techniques, which it made possible.

The multidimensional potential of new media may afford impersonal encounters for those who welcome the anonymity and distance of human-computer interaction, which is often not available in interpersonal exchanges. Yet not all encounters are comfortably remote. There coexists what Brenda Laurel identifies in her important study on *Computers as Theatre* as the trend "toward personalization and sensory immediacy in multimedia software."[1] Parisian-born artist Jean-Louis Boissier, for example, exploits the revelatory potential of multimedia as an electronic diary. In *Flora Petrinsularis*, he ensnares the viewer with his own fascination with the life of French 18th Century philosopher Jean-Jacques Rousseau while banished in exile for his radical thinking. In this multimedia masterpiece, Boissier juxtaposes somewhat voyeuristic glances into several of Rousseau's amorous liaisons with the natural beauty of the herb garden and its magnificent plantings on which he also lavished considerable attention while he was exiled. Boissier portrays both the beautiful and seductive women in Rousseau's life as well as the splendor of the flowers and plants meticulously collected by the great philosopher with equal scrutiny yet distanced respect. Sound, image and motion are exquisitely joined accompanied by either the seductiveness of heavy breathing or the rippling of shallow water over rocks.

For the interactive laser disk installation *Family Portrait*, Canadian artist Luc Courchesne captured the subjects of his portraits, each one of whom is portrayed in video from the shoulders up. In instal-

lation, these video personages appear suspended in mid-air reflected from overhead monitors and behind angled sheets of glass. Touch screen input initiates the viewer's interaction with the portraits.

On the CD, we selected two of the members of Courchesne's family, a middle-aged man and an older woman. Once the viewer enters into an exchange with any of the members of this convincing, yet eerie family, one finds these characters, humorous, deadpan, inquisitive, probing and incredibly real. Their captivating personalities encourage intimacy and intensity in a dialogue that comes to feel so lifelike that the viewer becomes absorbed in the exchange to such an extent that he or she laments its ending.

In her dialogue, the older woman both reveals something about herself as well as what she feels to be true for many women her age. Courchesne's compelling, eerily lifelike characters and the power they exert on viewers are illustrative of the phenomenon sometimes fearfully referred to as techno-seduction. Rather than finding such a state inherently evil, I hypothesize something altogether to the contrary, that is, today, techno-immersion is simply commonplace. My belief echoes that of Nicholas Negroponte, Director of the Massachusetts Institute of Technology Media Lab in his landmark study, *Being Digital*. According to Negroponte, we live in an era distinguished by "computer ubiquity," and at least twelve computers influence our lives every day.

As a consequence, we live in a society where virtual reality is everyday reality for members of our youngest generation who watch *Virtual Rangers* before being whisked off to school. For these same youngsters, the notion of spending hours online in a chat room with a community of friends, many of whom are unknown other than their screen identities, is as frequent an after school activity as a play date with a neighborhood child.

Our children are growing up as part of a society in which confidences are shared before last names, ages and place of residence are exchanged. We are the last generation for whom multimedia is an option. From now on it is the accepted *modus operandi*. The format, capacity, and speed may be variable, but the accessibility of knowledge in digital format is the rule, not the exception.

Several of the artists in the *InfoART* Pavilion and portrayed on the CD work in the field of Virtual Reality. University of Paris Professor Edmond Couchot is a seminal figure in the development of artistic applications of VR. His hallmark work, *The Feather*, was created between 1988-90, with the help of French flight simulations specialists. Both this piece and the more recent *I Sow to the Four Winds*, are graphically displayed as large-scale projections in a darkened room, activated when the participant blows into a small microphone mounted on a panel of Plexiglas. The speed at which *The Feather* is propelled into flight is determined by the strength of the person's breath. Whereas, in the case of the latter work, blowing into the microphone causes clumps of dried dandelion seeds to be detached until the stem is barren. These deceptively simple yet elegant works exemplify how high-tech tools can inspire poetic reverie.

Another highly acclaimed virtual reality artwork is the *LASCAUX* project directed by University of Cincinnati Professor Benjamin Britton. He set as his goal the recreation via virtual reality techniques of these ancient Paleolithic caves in the Dordogne region of France, which are now closed to the public. Doing so, required a large interdisciplinary team of about twenty-five members including computer programmers and engineers as well as prominent archaeologists. Wearing VR goggles and navigating via a spaceball tracking mechanism, visitors to this three-dimensional computer-generated cave have the sense of total immersion on their passage through its winding corridors decorated with masterpieces of Paleolithic painting. The CD fly-through of the cave simulates this experience. We also included a gallery of digital photographs, which are now inside the computer-generated cave. Britton's wife, photographer Lisa Britton created these photographs to represent the four elements as well as to bring the Dordogne landscape inside the cave.

Austrian-born Christa Sommerer and French-born Laurent Mignonneau, who for the past few years have been invited researchers in the MIC Lab at the Advanced Telecommunication Research Laboratories in Kyoto, Japan, are highly acclaimed for their successful realizations of natural interfaces between real and virtual worlds. Based on the interests of both artists in naturalistic subject matter before they began collaborating on their interactive computer

installations in 1992, their works are identified by the individualized encounters which each participant incites through movement, touch, illumination, graphic input or email message.

Those of us who act as documentarians of artists and artworks often experience the frustration of attempting to describe or elucidate a creative concept which we felt was much better expressed by the artist or artwork itself. Brenda Laurel has convincingly postulated the *Computers as Theatre* metaphor in her important study of the same name. According to Laurel "we have at least two reasons to consider theatre as a promising foundation for thinking about and designing human-computer experiences. First, there is significant overlap in the fundamental objective of the two domains – that is, representing action with multiple agents. Second, theatre suggests the basis for a model of human-computer activity that is familiar, comprehensible, and evocative."[2] In the context of this paper, the metaphor gives increased credibility to the choice of multimedia for the depiction of interactive artworks. In the case of *InfoART*, the CD literally put the artists themselves on the so-called stage along with their artworks, and lets them do what is frequently most effective in the explanation of artworks, that is, speak for themselves. The opportunity which multimedia offered to let Mignonneau and Sommerer, for example, explain both the philosophy and the functionality of their masterpiece of virtual reality art, *A-VOLVE*, wonderfully exemplifies how potent the medium can be.

The names of Steina Vasulka and her husband Woody are synonymous with pioneering efforts in video. The Vasulkas have been responsible for some of the most powerfully inventive video images of our time.

In her biography section on the *InfoArt* CD, a video clip of Steina Vasulka, who trained as a classical musician and subsequently played in the symphony of her native Iceland, sets the stage, quite literally for her later *Violin Power*, a midi-violin and laser disk performance which is included in the "Works" section. In this short clip we see her amazing performance style. She has been developing her performance of *Violin Power*, which in her words "plays video on the violin," since 1991. In this piece, videos by the artist and her husband Woody, which are displayed on multi-monitor installations, are controlled by playing her MIDI-interfaced violin. Having both her student performance and her contemporary work available simultaneously reinforces the pivotal role music plays in her video compositions.

The proliferation of multimedia publications over the past several years has incited the frequent refrain: "Why multimedia? Would the subject be served equally well in a traditional format such as a book or a video?" Often the answer is "Yes." In the case of *InfoART*, as I hope my presentation has illustrated, I am confident that the subject matter was best presented and documented indocumented in an interactive format. In the course of creating this CD, my new role as multimedia producer in addition to author and curator instilled in me a profound appreciation and respect for all sectors of the multimedia profession as well as the desire, despite all the hurdles we had to overcome, to jump at the opportunity to produce another such publication, although probably now in a newer format such as DVD. For museum professionals in the new media field, multimedia offers a format harmonious with the subject matter; for all others in the field, the medium affords a format harmonious with our times and the expectations of the art-viewing public.

REFERENCES

1 Brenda Laurel, *Computers as Theatre* (Addison-Wesley Publishing Co., Reading Massachusetts, 1992), 212

2 Ibid., 21

The Evaluation of a Multimedia Application for Gallery Interpretation: The Euesperides Project in Oxford

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Abstract

The paper describes the Euesperides research project set in Oxford. This involved: a) the design of a multimedia prototype program for an archaeological exhibition b) formative evaluation of the prototype with parts of the targeted audience, and c) summative evaluation of the use of the program in the exhibition. The evaluation study showed that the multimedia program was an effective interpretative tool both in its own right, as well as an integral part of the exhibition.

Keywords

interactive multimedia, hypermedia, formative evaluation, summative evaluation, Ashmolean Museum

1. Introduction

The Euesperides project was part of doctoral research at the University of Oxford investigating the potential of interactive multimedia for museums and archaeology. The project involved the design of a prototype program for a museum exhibition (Economou 1995) and its evaluation.

The program presents the history and archaeology of the ancient Greek colony Euesperides in North Libya, based on material from the site kept at the Ashmolean Museum, Oxford. It combines information from the excavation of the site (images from vases, coins, inscriptions, aerial photographs, etc.), with the historical background of the city. The Euesperides prototype was designed for the temporary exhibition "From the Gardens of the Hesperides: The excavation of an ancient Greek city in North Africa", which was organized by the Ashmolean Museum and was hosted at the Museum of Oxford in September-October 1995.

The Ashmolean Museum organized the first systematic excavation of Euesperides in the 1950s and today holds a small number of artifacts from this relatively unknown site (Vickers et al 1994). The program (designed with Apple's HyperCard) aimed to offer contextual and interpretative information about the objects on display and also, to demonstrate aspects of archaeological theory and practice (Economou 1996a). It was possible to use a touch-sensitive monitor at the exhibition and a special kiosk was placed in a corner of the gallery to house all the computer equipment, leaving only the monitor visible to the public.

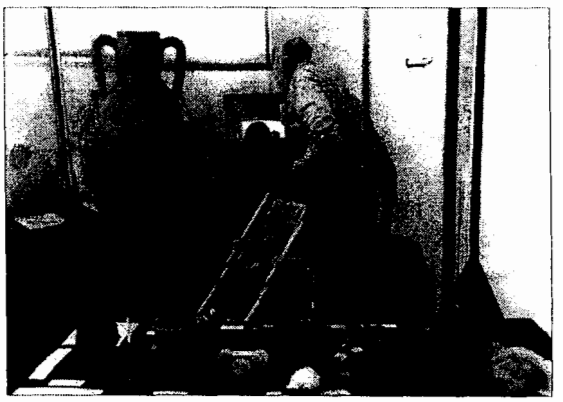


Fig. 1 Family group using the computer station located in a corner of the gallery

2. The Euesperides Multimedia Program

The program was structured in three main parts, which comprised of smaller units. From the 'Main Options' screen visitors could select to visit:

- **Where is Euesperides?** (an **'Introduction'** to the geography, history, and re-discovery of the city).
- **What was Euesperides?** (the **'History'** section, with a timeline and information from the primary sources, e.g. pottery, inscriptions, coins, ancient texts).

- **How did we find out about Euesperides?** (the **'Archaeology'** part, which offered information about the excavation of the site and the finds).

After at least one of these parts had been explored, a new button would appear:

- **What did you learn about Euesperides?** (**'Quiz'**). This included ten multiple choice questions which related to the information presented in the program.

A feature which proved very useful (as was shown during the evaluation) was the 'Program Plan', a screen with a diagram of the main parts of the program represented graphically as rectangular boxes. These were also active areas which could be touched to lead to the relevant part indicated by their name.

3. FORMATIVE EVALUATION

Throughout its design, the prototype was tested with a variety of users, from schoolchildren (fig. 2) and the Education Guides of the Ashmolean Museum, to graduate students and curators. Different approaches were used during this phase: informal sessions where the users were observed interacting with the prototype; encouragement of users to 'think aloud' and make comments; more structured evaluation, where the users were asked to fill in a structured questionnaire after using the program; computer interactive logging of the path that users took through the program.

Fig. 2: Formative evaluation of the Euesperides prototype with schoolchildren.

Formative testing was a continuous process during the design of the program, offering useful feedback and ideas. As it included different age groups, users with a varied background, level of interest, knowledge of the subject, and computer experience, it offered a perspective on a wide spectrum of the intended audience of the exhibition. Evaluation also helped to pinpoint programming problems and 'bugs' and led to changes and readjustments in the structure of the program, the content and language used, and generally the design of the user interface. For example, observation showed that schoolchildren had difficulty with the pronunciation of Greek names and led to the idea of adding sound buttons next to difficult words which could be touched to give the relevant pronunciation. The section titled 'Written Sources' became 'Ancient Writers' which is more understandable to younger users and the 'Program Plan' button was given the more intuitive title 'Where Am I?'.

The evaluation sessions confirmed one of the most important rules of interface design, the need for user input. One cannot overstress the importance of feedback from the users from the early design stages of any hypermedia program (Raphling 1994). In this case, even testing an unfinished prototype with small groups suggested useful changes before it was too late and provided ideas.

4. SUMMATIVE EVALUATION

After the program was completed and installed in the gallery, summative evaluation was carried out to record its effect on visitors (Economou 1996b; Economou 1996c).

The main aims were:

- Firstly, to draw a demographic profile of the visitors (who visited the exhibition and who used the application).

- Secondly, to describe the volume and pattern of visitor use (how were the exhibition and the program used).

- Thirdly, to explore the emotional and intellectual impact of the computer program and its relation with the exhibition (how were visitors affected

by it, how the program influenced the way they viewed the exhibition).

4.1 Methodology

The evaluation of the Euesperides prototype attempted to measure the program's effectiveness at various levels, taking into account the complex set of components: design, content, relation with the exhibition, emotional impact on the participants, effectiveness of information delivery. In order to gain deep understanding of the use of the program, it was necessary to relate quantitative with qualitative results and use several research methods:

- interviews with museum staff;
- interviews with visitors using exit questionnaires (both users and non-users of the program);
- observation and visitor tracking;
- computer logging of users' choices;
- analysis of comments in the visitors' book;
- postal questionnaires after the visit.

A problem which touched upon all the summative evaluation projects was that the person organizing and carrying out the evaluation was also the designer of the program. This raised the issue of objectivity and the ability of the evaluator to distance herself from the project to be studied. On the other hand, the close familiarity with the application and the in-depth knowledge of all its details facilitated aspects of the survey, such as the interpretation of the users' references to specific screens or the analysis of the interaction logs. Furthermore, the application of a range of evaluation methods, as well as the use of techniques to ensure well-spread sampling, assisted in controlling personal biases.

4.2 Summative Evaluation Findings

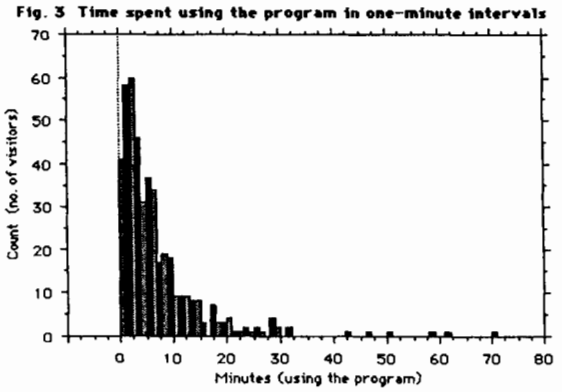
The experience from both the formative and summative evaluation showed that people were usually very happy to test the computer program and offer ideas. Visitors seemed to appreciate the fact that their opinion was asked and valued.

The results indicated that the computer program was an effective interpretative device both in its own right and as an integral part of the exhibition. In fact, they were unexpectedly positive for a rather untypical experiment, set (due to practical difficulties and the building work carried out at the Ashmolean Museum) in the Museum of Oxford, a local history museum which had no relation with the subject of the exhibition.

4.2.1 The Computer Program in its Own Right

As was shown by the observation study and the analysis of the interaction logs, the computer program attracted a large number of visitors. Most computer users enjoyed the application and were satisfied with the level of information it provided. Although several aspects of its user interface and navigation could be improved, the majority of users found it easy to use. The majority chose to describe it as 'interesting and exciting' and 'useful', as well as 'hi-tech and modern'.

The interactive program was clearly one of the most successful exhibits in the gallery, with high attractive and holding power. It received the highest number of visitors and the highest number of repeat visits of all exhibits. Visitors invested substantial amounts of time with the computer, more than with any other individual exhibit. In a field where the average holding power of an exhibit is measured in seconds, the tracking study showed that the average time spent at the computer station was 3.7 minutes, while most visitors stayed more than two minutes at the computer. This is more than three times the average time spent at the exhibit in the second ranking. The analysis of the interaction logs indicated that visitors used the computer program even longer, 7.7 minutes on average (5.6 minutes median time). (Interaction logging included a larger sample and recorded time automatically, but in a few cases might have recorded the interaction of two successive users as one—possibly the logs over 40 minutes in figure 3). This was probably to be expected, since the computer program demanded more time for visitors to process its messages, familiarize themselves with the novel technology, and explore every part of the information it presented. This was the most complex exhibit, but obviously, also one of the most attractive and enjoyable. At the same time, when assessing these results, it is necessary to take into account that the specific exhibition was not rich in objects and had problems in the way it was laid out. Under different conditions, a computer interactive might not have featured as well.



Several months after their visit, most of the visitors who responded to the mail survey were able to recall several details of their experience. Visitors remembered not only what they did and what they felt during their visit, but also described what the exhibition and the program was about, what they contained, and the thoughts that these triggered. Their answers suggest that the visit to the exhibition, and particularly the interaction with the computer program, were highly memorable and of lasting impact. An almost equal number of memories referred to the design and the content of the program, indicating that visitors were not only impressed by the use of a new medium, but had also paid attention to the content of the application and the messages it presented.

4.2.2 WHO USED THE PROGRAM

The computer program appealed to all age and gender combinations. It appears that the computer program attracted equally male and female visitors. In fact, the analysis of the interaction logs showed that slightly more female than male visitors used the computer. With the exception of few other studies (Allison & Gwaltney 1991; Hilke et al. 1988), most evaluations of computer interactives in museum settings show a predominance of male users (Doering et al. 1989; Giusti 1994a; Giusti 1994b; McManus 1993; Menninger 1991; Sharpe 1983).

The visitors who used the computer cover a very wide age range, from approximately five to eighty-one. Confirming the common perception about the users of interactive multimedia, the largest of the six age groups of computer users consisted of visitors under 11 (fig. 4). School children and teenagers visiting the exhibition were very likely to use the interactive program.

Fig. 4: Young visitors using the computer program at the exhibition

However, and unlike most similar studies (Allison & Gwaltney 1991; Doering et al. 1989; Giusti 1994a; Sharpe 1983), the majority of computer users were over 25, while there was also a high percentage of users over 55 years old (table 1).

Table 1. Frequency Distribution for Age of Computer Users

Code	Age Range	Count	Percent
1	up to 11	91	23
2	12-17	24	6
3	18-24	69	18
4	25-34	87	22
5	35-44	25	6
6	45-54	25	6
7	55+	73	19
Total		394	100

Visitors to the exhibition, computer users and non-users alike, were a very international group, with over fifteen countries recorded during the interviews from all continents, although the majority were from the UK.

Unlike most non-users who came to the exhibition on their own, the majority of computer users came in groups of two or more, which is in accordance with other similar studies (Doering et al. 1989; Giusti 1994b; McManus 1993; Menninger 1991).

Both users and non-users were highly educated, with more than half attending or having completed a higher education course at the time of the interview. However, very few had formal qualifications in archaeology or ancient history or specialized knowledge of the subject matter of the exhibition. More users reported that they had a special recreational interest in archaeology or history than non-users who stayed in the exhibition less than three minutes.

Although most users had considerable familiarity with computers, the program was also used by visitors who had very little or no experience with electronic media. The computer experience of users and non-users is broadly similar, indicating that previous computer experience did not affect the choice to use the program at the exhibition. For designers of computer programs for exhibitions this suggests that the standard and quality of their products should be of a level capable of satisfying experienced computer users, but at the same time, retaining ease of use and clear navigation so as not to alienate novices.

4.2.3 How They Used the Program

Visitors' behavior at the computer was diverse and indicated interest and engagement. Most visitors used the interactive program in groups, often talking to each other about it, pointing to parts of the screen, and relating them to previous experiences or objects they had just seen in the exhibition; several visitors appeared amused, excited, and animated when using the program.

Most users created unique paths through the application, taking advantage of the options offered and exploring various parts. However, some general trends emerged. Interestingly, the analysis of the interaction logs indicated that the most popular type of navigation of all age groups was linear. It appears that older visitors in particular, were more likely to explore the program in a linear fashion, using the "Next' button repeatedly. Younger visitors on the other hand, showed a greater tendency to navigate randomly and explore several areas superficially.

A clear and attractive interface, the use of visual elements, graphics, and sound, information on people and their lives, as well as the popularity of certain themes (such as the 'Myths') were factors which appear to have influenced users' choices.

4.2.4 What They Learned

Most visitors who used the program could later describe what it was about or at least refer to parts of it during the interviews. Those who could not answer or who gave wrong answers had spent less time with the computer. Five to six months after the exhibition, the majority of respondents could describe the program in a similar or even more accurate and complete way than during the interviews.

Interaction with the computer program appears to have helped users learn about specific themes related to Euesperides' history and archaeology. The interview questionnaires included some questions on the content of the program, attempting to test what information visitors had retained. The overall users' performance in the questions testing cognitive gain was not very high, but the visitors who did answer correctly, mentioned that they had found out the answer from the program. It also appears that they remembered this information five to six months after their visit, indicating that the use of the program had a memorable effect. Very few respondents to the post-visit mail survey answered wrongly at the survey, after having given the right answer during the exit interviews. In general, the educational impact of the program appears satisfactory, given the fact that few visitors explored all parts of the program and viewed all the information presented.

The personal opinion of most visitors was also that they had learned new things by using the program. The majority mentioned that everything they learned about Euesperides was new to them, while several referred to specific themes presented in the program.

More importantly, for some visitors the computer program appears to have raised questions in their

minds, making them think about archaeology, ancient civilizations, the discovery of the past. It also made several visitors aware of the way archaeologists work and of the types of evidence used by historians and archaeologists to extract information about the past, in many cases consolidating previous knowledge.

4.2.5 EFFECT OF THE PROGRAM ON VISITORS' EXPERIENCE AS A WHOLE

In direct contrast to the fears of many museum professionals, the data from the Euesperides survey indicate that the computer's presence in the exhibition enhanced visitors' experience and that the program was a useful and attractive component of the exhibition.

While visitors spent a good deal of time at the computer, they compensated for this fact by spending more time in the exhibition. The time visitors spent at the computer does not appear to have adversely effected the time they spent in the rest of the gallery. Computer users spent over seven minutes longer in the gallery than non-users. Even when the time at the computer is deducted, the remaining time they spent in the gallery (4.8 minutes mean, 2.1 median time) is still considerably higher than the time spent by non-users. It appears that the computer program encouraged visitors to explore and engage with the rest of the exhibits.

Due to the particularities of the exhibition 'From the Gardens of the Hesperides' in Oxford, there was a difference in the visiting pattern of visitors who entered directly the temporary exhibition gallery from outside and those who came across the exhibition at the end of their visit to the rest of the museum (fig. 5). The first group, which is considerably smaller, had come to the museum specifically for the exhibition, already motivated and interested in the subject, and spent a long time on average in the gallery. Most of these visitors also stopped at the computer kiosk and used the program.

The second and largest group consists mainly of visitors who encountered the exhibition unprepared, did not have any particular interest in the subject, and spent little time in the gallery. Several visitors from this group expressed their confusion and surprise when encountering without warning the sudden change of subject from the permanent displays which explore the history of Oxford to the temporary exhibition about the excavation of an ancient Greek colony. For one third of this group, the Euesperides exhibition functioned simply as a 'corridor' on the way out. Most did not even notice the existence of the computer station which was situated in a corner, away from this 'path to the exit'.

However, the most interesting observation was that the Euesperides interactive program acted as a strong attractor for a section of this less interested group. Several visitors headed directly towards the computer after entering the exhibition and a number of them stayed longer to look at the objects after using the program. In some cases it appears that the novelty of the technology and the interactive character of the program triggered their curiosity and prompted them to view with greater interest the rest of the exhibition. As a couple of visitors mentioned in their letters, the computer program was the main exhibit that attracted them to the display, without which, they probably would not have stopped to look at the exhibition.

For most users the computer interactive contributed considerably to their enjoyment and understanding of the display. Most visitors stated that the program helped them to enjoy the exhibition and understand why some of the exhibits are important for studying the past. The application offered them information about the materials and techniques used when the objects on display were made, as well as about the social and historical background to the exhibits. The majority of users interviewed thought also that the program made them more interested in the display in the rest of the gallery. Several users mentioned at the interviews that the program made things clearer, put them into perspective, and motivated them to go and look again at the objects. Very few visitors found that the program disrupted the atmosphere in the gallery.

Observation confirmed that the program encouraged visitors to go and look again at the objects. More computer users made repeat visits to other displays than non-users, and the number of repeat visits of computer users was higher on average than that of non-users. Computer users also made more stops at exhibits in the gallery. Generally, it seems that visitors who used the computer program were either already interested in the subject and the exhibition,

or became so after using the program, which encouraged them to look again and spent more time exploring the displays.

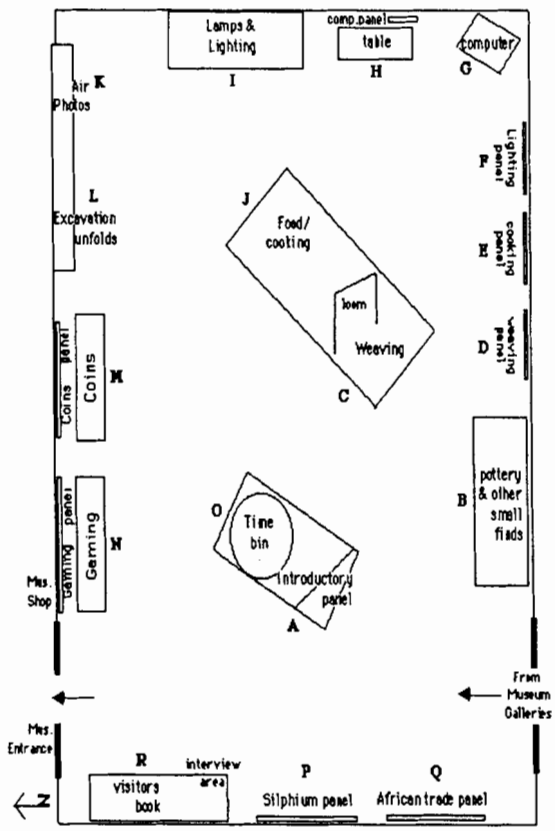


Fig. 5 Gallery plan of the exhibition with all the stops visitors made marked with capital letters

However, it also seems that the program sometimes overshadowed, at least temporarily, the rest of the displays. About a quarter of the users interviewed stated that they got absorbed in the program and lost interest in the objects around them. Because of the potent attraction and absorbing power of the computer screen, it is difficult to integrate computer interactives successfully with the surrounding static displays. It appears that several visitors were absorbed in the Euesperides prototype *while* using it, but some of them would *afterwards* explore the exhibition, stimulated and intrigued by the information they had seen in the application.

Although the results from the Euesperides evaluation are encouraging about the potential of interactive multimedia in museums, it is disappointing that the rest of the exhibits did not feature as well. This was not necessarily a case of the modern technology overshadowing the other, more static displays. On the contrary, in some cases the 'halo' effect of the computer program appears to have attracted visitors to examine the rest of the displays (especially visitors who came from the rest of the museum, without any preparation or special interest in the subject of the exhibition).

The overpowering role of the computer program might be explained by the fact that the exhibition was of small scale, based on a largely unknown subject, with very fragmentary material and problems in the way it was organized and laid out. At the same time, these might be the reasons why the program was so popular and effective. In a display which was not rich in artifacts and where the background information and often obscure associations were the ones that gave meaning and showed the importance of the objects, the interactive program played an important role in organizing the complex set of links, interpreting them, and making them easily available in an attractive way.

A number of visitors mentioned in their written memories of the exhibition several months after their visit that they had gained more information from the interactive program than from any other exhibit and that the application had clarified the main concept of the exhibition.

5. BEYOND EUESPERIDES

Overall, it was encouraging to observe that even a low-cost and experimental application, like the Euesperides prototype, can be a versatile and powerful tool in a museum exhibition. However, great caution is required when assessing the results of the Euesperides project and generalizing their applicability. The location of the exhibition, the character of the museum which hosted it, the exhibition's subject matter, the design of the computer program, and the location of the computer station in relation to

the rest of the display are only some of the variables which affected the survey and its results.

Under different conditions, in a different setting, and with a different material, the use of a multimedia interactive might not have been appropriate or effective. Careful thought needs to go into the decision to use multimedia in any museum presentation, balancing the technical, aesthetic, conceptual, and pedagogical viewpoints. Museums need to resist the pressure to appear fashionable and ensure that computer applications do not jeopardize the integrity and quality of the institution, nor the collections and ideas presented. Museum professionals should not forget that multimedia applications are just another tool for presenting and interpreting objects and ideas; the emphasis should be on the message, not the medium. At the same time, the experience from Euesperides and other findings are showing that the power and attraction of the medium are very impressive and can in certain circumstances be used to attract visitors to the message. This was one of the most interesting results of the study.

Additionally, even when the choice to use multimedia is made, careful thought needs to go into the kind of application that would be appropriate and the way that this should be implemented. For the exhibition 'From the Gardens of the Hesperides', which displayed only a small number of objects (most of them, on their own, of limited interest to the non-specialist), the integration of the specific interactive prototype in the gallery proved successful. This might not have been the case, for example, with an extensive collection of Renaissance paintings, where providing further information to be studied at leisure in a separate room (as is done in the MicroGallery of the National Gallery, London) might be more effective.

Despite the museum community's increasing awareness of the need for multimedia evaluation (McNamara 1986; Raphling 1994; Dierking & Falk 1997), only a small number of relevant studies are available. The Euesperides project showed that one type of computer interactive attracted and engaged visitors in Oxford and enhanced their experience from the specific archaeological exhibition. Further research is necessary to investigate and compare the performance and effect of different types of multimedia applications and platforms in similar settings. We need to understand better whether particular ideas lend themselves to specific types of interpretation media; record and compare the profile of computer users and non-users from a large number of projects; assess the effect of gender, age, social background, group composition, prior knowledge on the subject of the program; study the emotional and cognitive outcomes of different user groups.

The full potential of the technology in the cultural sector has yet to be realized and there are areas which need to be investigated further. However, the answer is not in technological solutions, but in deeper research and understanding. This experimentation and dialogue with the visitors can make interactive multimedia effective presentation and interpretation tools, capable of satisfying and enriching the experience of museum audiences.

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