VIRTUAL PRESENCE AND THE MIND'S EYE IN 3-D ONLINE COMMUNITIES.

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ABSTRACT:

Digital technologies have introduced fundamental changes in the forms, content, and media of communication. Indeed, some have suggested we are in the early stages of a seismic shift comparable to that in antiquity with the transition from a primarily oral culture to one based upon writing. The digital transformation is rapidly displacing the long-standing hegemony of text, and restoring in part social, bodily, oral and spatial elements, but in radically reconfigured forms and formats. Contributing to and drawing upon such changes and possibilities, scholars and those responsible for sites preserving or displaying cultural heritage, have undertaken projects to explore the properties and potential of the online communities enabled by "Virtual Worlds" and related platforms for teaching, collaboration, publication, and new modes of disciplinary research. Others, keenly observing and evaluating such work, are poised to contribute to it.

It is crucial that leadership be provided to ensure that serious and sustained investigation be undertaken by scholars who have experience, and achievements, in more traditional forms of research, and who perceive the emerging potential of Virtual World work to advance their investigations. The Virtual Museums Transnational Network will seek to engage such scholars and provide leadership in this emerging and immensely attractive new area of cultural heritage exploration and experience.

This presentation reviews examples of the current "state of the art" in heritage based Virtual World initiatives, looking at the new modes of social interaction and experience enabled by such online communities, and some of the achievements and future aspirations of this work.

1. INTRODUCTION

Projects which undertake to create research-based 3-D models of cultural heritage artefacts (including online multi-user environments) give rise to a number of interrelated questions, including: what is the status (including limitations) of these models as scientific evidence? What value and interest do virtual restorations have that might complement non-digital, scholarly investigation and analysis? How may the distinctive process of visualisation-based research contribute to our understanding of lost and inaccessible monuments from the past? King's Visualisation Lab (KVL), in order to address some of these questions, convened a Symposium and Expert Seminar in February 2006 at the British Academy and King's College London. Over two days, fifty delegates debated various approaches regarding the deployment of 3-D models as research and, on the third day, a smaller group of experts produced the first draft of a document called "The London Charter" (http://www.londoncharter.org/).

The London Charter, having evolved through an extensive process of consultation, articulates a set of principles that establish what is required for 3-D visualisation both to be, and to be seen to be, as intellectually rigorous and robust as any other research method. Since 2006, the Charter has been extensively revised, translated into a number of languages and extended into specific constituent disciplines; it is now widely cited and adopted as an authoritative guideline for good practice in the rapidly evolving and still emerging field of cultural heritage visualisation.

Transparent communication of research processes and outcomes is a crucial condition of the utility and credibility of 3-D visualisation in professional cultural heritage and scholarly contexts. In particular, it must be possible for scholarly communities to evaluate the choice of a given visualisation method and how it has been applied in each specific case without having to rely exclusively on the "authority claims" of the visualisation's creators, however experienced or eminent those creators might be. Following the London Charter, therefore, we may now take it as a given that scholarly research using 3-D modelling must adhere to a rigorous methodology as researchers compile, analyse and interpret research sources, and then subsequently document, explain and annotate the research outcomes – including the models themselves.

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VIRTUAL WORLDS AS ONLINE COMMUNITIES*

Scholars and researchers from many disciplines within the humanities are on the verge of a profound change in the way they search for, construct, and present knowledge to colleagues. Virtual Worlds, in addition to an array of other digital tools, will bring about significant changes within the humanities by facilitating multi-institutional, cross-disciplinary research and collaboration as well as providing new ways to recreate and contextualize evidence that heretofore was impossible to study or publish.

The first use of computers, when introduced to a new area, is always to automate what has been done in the past manually. With low-level tasks—such as arranging, listing, recalling, and reproducing data—transferred to computers, humans are freed up to focus on higher-order cognitive responsibilities such as constructing, creating, designing, defending, and developing analytical arguments and new research themes. A Virtual World is a computer program that generates a dynamic representation of a real or imagined world and embodies the essential qualities required to support higher-order cognitive activities.

Virtual Worlds are characterized by their ability to facilitate active immersion, which is more than a visual process of seeing what is on the screen, an auditory process of decoding sounds, or a haptic or kinesthetic process of moving a mouse and performing keystrokes. Instead, Virtual Worlds evoke a sense of "being there" by stimulating a combination of the senses and higher order cognitive processes, such as imagination and visualisation.

Participants in Virtual Worlds may:
  (a) access virtual contexts,
  (b) share virtual experiences,
  (c) see what cannot be seen by the unaided eye because it is too small, too large, too slow, or too fast,
  (d) visualise what is improbable or impossible,
  (e) hear what cannot be heard without amplification or filtration,
  (f) interact with and create digital artifacts,
  (g) represent themselves through "avatars," which can be graphical or text-based, or
  (h) communicate with other participants synchronously, asynchronously, or both via text, audio, video, or a combination thereof.

Through Virtual Worlds, researchers and scholars from varying disciplines—who each draw upon scholarly precedence, favoured research methods, and preferred units of analysis that may or may not be consistent with other disciplines—are brought together and allowed to share common experiences.

The recently established "Virtual Museums Transnational Network" (under the EU Framework 7 Programme) as part of its work will consider how such worlds can address -- while greatly extending -- many of the activities and topics which have traditionally been the focus of conventional museums. Virtual Worlds, among other things, have the potential to bring together collections of objects and activities separated by time

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* Our description of Virtual Worlds is based upon an unpublished document which we co-authored as a member of the Mellon Virtual Worlds Consortium: "Harnessing Virtual Worlds for Arts and Humanities Research and Scholarship".

and distances, to restore objects affected by the elements and mistreatment, or to contextualise artefacts in different historical dimensions. This technology can be used to recreate events described in historical records, model and test hypotheses, or draw together a community of researchers to participate in the co-creation and evaluation of an idea. These 3-D representations visually encapsulate assumptions that can be scrutinized by a broad community. Bringing together previously disconnected knowledge sources and research techniques in the Virtual World to understand specific phenomena and artefacts can generate "conceptual collisions" (Bransford et al., 2006). Through such collisions, new insights can be generated from previously disconnected disciplines and inconsistencies in interpretation are forced into the open, inviting discussion about how to justify representations of, for example, ancient buildings and the activities that took place within them. This provides an innovative and potentially fruitful way of assembling the knowledge of the community for joint exploration and critique. With thoughtful management and some additional tool development, Virtual Worlds could
begin to serve as a new publication medium.

Given the complexity of humanistic research, these disciplines are going to demand more computing power, more storage, and more bandwidth than those from other scholarly areas (e.g., the physical sciences) ever have or ever will. Advances in computing power, storage capacity, and bandwidth have made possible Virtual Worlds, in addition to an array of other digital tools, which have crucial relevance to humanities researchers and scholars. By modelling elements from both the real and imagined worlds, including physically and historically accurate topography, and natural phenomena such as gravity, motion, and climate, Virtual Worlds catalogue our cultural heritage. "Digital cultural heritage resources are a fundamental dataset for the humanities," Unsworth and colleagues (2006) argue in a recent report of the American Council of Learned Societies Commission on cyberinfrastructure for the humanities and social sciences. "These resources," they go on, "combined with computer networks and software tools, now shape the way that scholars discover and make sense of the human record, while also shaping the way their findings are communicated to students, colleagues, and the general public."

Virtual Worlds have the potential to bring about profound, far-reaching, and thoroughgoing changes within the humanities in the near future and the long term by allowing scholars and researchers to investigate and publish multi-disciplinary humanistic themes and areas that before or otherwise were impossible to study or publish. Conceptual collisions, and the sustained research and learning opportunities in them, hold great promise for advancing scholarly work in the arts and humanities. The development and implementation of research and scholarship undertaken in Virtual Worlds, however, must be carefully guided by humanists and scholars who see its potential and can identify the appropriate tools and services that may yet need to be developed for Virtual Worlds to support humanistic research more fully.

VISUALISATION-BASED RESEARCH AT THE ROMAN VILLA OF OPLONTIS

In the course of a number projects employing 3-D research based modelling, King's Visualisation Lab has addressed a question pertaining to work on Roman houses and villas,

namely: "what value does such modelling have specifically for investigating the archaeological remains of Roman domestic décor and spaces?" The answers to this may most usefully be illustrated through our current research on the Roman Villa at Oplontis, and our creation of a Virtual World based upon this work.

Before doing this however, it is useful to identify some of the factors which potentially describe and determine the user's experience – whether alone, or as part of a larger community -- when participating in a Virtual World environment. Such environments, particularly when encountered by user's through the medium of avatars under their direction and control, can engender a powerful sense of virtual presence, extending to an awareness of virtual embodiment, sensual perception and the capacity to experience and explore such online worlds through vision, time, a sense of movement within space, sound, interaction with other avatars, and the exchange of information and communication through text or voice. Such affordances have the potential to enhance very substantially our experience both of the virtual models themselves, and also, by imaginative and cognitive engagement to gain a strong sense of how the original artefacts and spaces may have been used and perceived by those who conceived, built, used and experienced them when they were first created. Through this process, empirical research and the analyses and factual data informing it, through the application to it enabled by imagination, sensual perception, and "the mind's eye" to it, have the capacity to become transformed into an aesthetic medium: what might indeed be thought of as a species of inter-active theatre.

For almost two years, working very closely with John Clarke of the University of Texas at Austin and his team directing the Oplontis Project, we have been preparing an extremely accurate and detailed 3-D computer model of the current state of this nearly 100-room villa near Pompeii which was buried by the eruption of Vesuvius in A.D. 79. Computer modelling enables analysis of hypotheses postulating and exploring Roman spatial and visual strategies governing both architecture and décor and the manner in which images and objects addressed viewers as they moved through a building's spaces.

It can be useful to think of a Roman house as constituting a veritable *mise-en-scène*. The organisation of space and décor in Roman domestic environments contributed to both the cognitive and corporeal experiences through which ancient occupants perceived and understood their living spaces. As James Gibson's theory of bodily awareness holds, the surfaces of the physical structures about us are the determining coordinates for visual reality; we see and understand "not with the eyes but with the eyes-in-the-head-on-the-body-resting-on-the-ground", and also perceive the world around us sequentially as a dynamic "optical array" composed of "surfaces, continuities, breaks, edges, obstacles and openings, representing potential routes for movement and barriers to get around ." (Rehm, 2002, p. 8) John Clarke, in his book *Houses of Roman Italy* (1991), presented case studies of seventeen Roman houses, from the villas of the elite to modest apartments, asking "What were the meanings of domestic décor for ancient Romans ?" In the process, he coined the term "kinesthetic address" to describe how both décor and architectonic elements suggest movement to the viewer.

Our collaboration with Clarke is enabling us, working from a combination of archaeological evidence and visual and textual analysis, both virtually to represent the villa as it is now, and hypothetically to recreate its architecture, inhabitants and

lighting conditions together with moveable furnishings appropriate to their settings. Until recently, an intractable problem for scholars was the impossibility of viewing dynamically the complete composition of an ancient domestic venue, including expressive elements such as lighting, décor, objects, and acoustics, all of which play significant roles in shaping the impact of the entire configuration upon viewers as they move sequentially through ambient spaces. With the publication of our digital model, viewers will be able to progress through these environments as avatars (virtual representations of people) investigating how access could be granted or denied to different areas in the villa, and gaining new understandings of the spatial and decorative conditioning of perception as visitors followed their itinerary, from transitional passageway spaces to static entertainment rooms designed to offer its occupants carefully-arranged views. The model will provide, for the first time, a means of empirically investigating how Roman occupants experienced the complete experiential ensemble of the villa.

The process of minutely and systematically researching a villa in order virtually to restore it and hypothetically to represent lost elements itself yields significant material discoveries and interpretative gains. The digital outcomes of the project – detailed, online 3-D models of the villa both in its existing state and hypothetically restored as a Virtual World – will greatly facilitate the efforts of archaeologists and historians worldwide in addressing research questions. The models will provide a perpetually-accessible, augmented virtual "field trip" to the monument, contextually augmented by dynamically linking to the project database of primary research resources and archaeological archives that even a physical visit to the villa cannot supply.

The value of both the processes and outcomes of visualisation-enabled research lies in those new questions they make it possible to conceive and approach, such as:

• How can a schematic, hypothetical reconstruction of the villa's original coastal topography increase our understanding of the views that different parts of the villa afforded which, today, through occlusion and significant change in the location of coastline, are now difficult to discern?

• How did the villa's proffered vistas relate to those established elsewhere in Roman architecture and discussed in both ancient and scholarly literature?

• How may a determination of the likely height of the villa's upper storeys inform our understanding of the daily and seasonal cycles of natural and artificial illumination within the varied apertures and courtyards of the villa?

• How might fixed décor and moveable furniture, together with calculable changes in natural light, have affected changes in room function at different times of the day, from season to season, and over time as the villa changed in size and layout?

• How may water features and planting schemes of enclosed, interior and outdoor gardens, together with, now-dispersed, ensembles of statuary and period objects and furnishings, have affected Roman visitors' perceptions and experiences of the villa's architecture and décor, especially its fantastical, and whimsically allusive frescoes?

• Using avatars, how might one model the social and functional use of spaces and décor, for example during a dinner extending over several rooms and involving the prandial and post-prandial entertainments of which we read?

• How may digital modelling of environments and virtual simulation of human presence, when allied with analysis of fresco and mosaic patterns that distinguish between slave/service and family/guest areas, assist us in calculating the probable organisation of movement associated with various spaces and activities?

• How may degrees of privacy and display have been regulated, temporally, spatially and socially?

• How may our understanding of contemporaneous texts about villas and the life they accommodated, as well as our interpretations of visual evidence, be extended by reconsidering them carefully in relation to a detailed working model of an actual villa?

The Oplontis Project seeks to extend, critically and methodologically, the study of Roman domestic space and décor by understanding these as part of complex cultural interplays of signs that produced and negotiated aesthetic, social, cultural, and economic values . Because the Roman house was a place for business, entertainment and worship, its spaces had to be multi-functional. Degrees of access to different areas within the villa depended on the social status of visitors and their relationship to the owner. We know, in general, what spaces clients, peers, and slaves could visit and on what occasions. However, while the specific ensembles of furniture and furnishings of any given Roman house were an essential part of the "meaning" of the house and its static décor, these are for the most part irrecoverable. In short, we do not know how those spaces looked when in use, and this has hampered and distorted analyses of domestic space and décor.

The computer models produced by these projects are comprehensive records of what is preserved at the site (as at Oplontis) or of what can be reassembled from now widely dispersed fragments as in the case of a project KVL undertook for the Metropolitan Museum, N.Y. on the Roman Villa of Boscoreale (Bergmann, *et. al.* 2010). However, our work also addresses itself to a methodological conflict between archaeological and art-historical approaches to the study of ancient art and architecture. Archaeological reconstructions of ancient houses and villas typically limit themselves to the precise structural and decorative evidence available – i.e. only those elements which have survived or for which hard evidence is available. This gives archaeologists a good sense of the existing state of the building (although visitors, because of the methods used to restore such sites, are frequently not enabled to distinguish modern from ancient construction). But the decision not fully to restore lost frescos, or to reintroduce lost elements such as furnishings, lighting, ornaments, and inhabitants, while quite right for archaeological purposes, nevertheless deprives social and art historians of the whole architectural and decorative ensemble necessary for an understanding of the dynamic use of space in antiquity as a complex system of signification. On this point, therefore, the methodological requirements of the archaeologist and art-historian diverge significantly.

Such essential but elusive elements can be reconstituted to a degree in the mind's eye of the imagination, but even an historical imagination of the highest order cannot rival the computer's capacity systematically, precisely and simultaneously to reconstitute an extensive living, furnished, inhabited villa; nor can the individual mind's eye accurately communicate its vision to others for evaluation.

The space and decorative schemes of ancient spaces are commonly treated, in scholarly discussions, as if they were fully-intact artefacts. However, in antiquity, such rooms obtained both their fully-realised aesthetic form and their social meaning through human activity in relation to furniture and lighting, as well as through their physical relationship to other configurations of space and décor in neighbouring rooms.

Virtual reconstructions, such as those by KVL, can demonstrate the value of considering Roman domestic environments as completed social ensembles. Detailed, computer-based reconstructions, when fully documented to reveal their evidential basis and graphically rendered so as to discriminate between direct archaeological evidence and hypothetical reconstruction, can significantly aid academic understanding and interpretation, as well as encourage critical evaluation. Modelling-centred research of this nature thus enables a widening of research agendas to include more holistically-conceived questions and empirically-informed methods.

The Oplontis Project's initial phase of study of the present-day fabric of the villa has distinguished ancient from modern construction; information which is visually displayed in the model. Computer modelling, by its capacity to filter information, can also aid in understanding and restoring the upper floors of the slaves' quarters, currently a confusing mix of ancient construction and modern restoration. In due course, our Oplontis model will also incorporate restored planting schemes (about which much is known) and sculptural finds on the basis of excavation reports and comparative analysis , as well as suggesting possible outline representations of the buried western part of the villa and the area to the south destroyed by the Sarno canal, based on comparison with other excavated villas.

Our model of the Villa at Oplontis will also digitally restore some 100 pieces of wall painting, now in storage, to their original decorative schemes and spaces. Because of constraints of time and resources at Oplontis, these fragments, many of them quite large, were never physically returned to the walls and have remained "orphaned" for over 30 years. Although physical reintegration would be the optimal solution, digital reconstruction is currently the most practical and affordable tool for such work. The virtual has the added advantage, over physical restoration, of flexibility and reversibility, without damage to site or artefacts, where the precise position and context of a fragment cannot definitively be determined. Finally, the Oplontis model will also represent the kinds of lost furnishings, fixtures and fittings – folding doors, shuttered windows, wooden panelling, tapestries, couches, chairs, chests and tables – which, contemporaneous comparanda indicate, were typical elements of the furnishings of such domestic settings. Again, the exclusion of such elements from physical archaeological sites – whatever the merits of such a policy in purely archaeological terms – has had the unfortunate side-effect of contributing to a diminution in awareness of and scholarly reflection upon the vital roles such elements played within the spatial, decorative and social "ensembles" of ancient houses and villas.

THEATRON 3: PRESENCE, PERCEPTION AND PERFORMANCE IN SECOND LIFE

In addition to such projects as that focussed upon the Roman Villa of Oplontis (and similar work pending as a member of the Mellon Foundation sponsored "Virtual World's Research Consortium"), King's Visualisation Lab undertook an extensive project presented in the Virtual World of Second Life. Here it drew upon both the experiences of its members in theatre historical research, and the inherent theatricalism of the Second Life environment and community, where role play, imaginary scenescapes, the donning of costumes and props, are ubiquitous, as an inherent element of the medium. The project, "Theatron 3" consists of 25 historic European performance places, ranging from 5th century B.C. to the twentieth century, built together with virtual guides and a host of interactive tools, scenarios and tutorials, customisable actors, props, sound effects, lighting and scenic technologies, streaming video and a "Director" tool to enable users to create live performances.

Theatron 3 represents the migration of an earlier virtual reality research and creation project to take advantage of the greatly enhanced affordances provided by the Second Life environment, which were not yet available during the earlier phase of the project. In 2002 a six-partner international consortium, led by Professor Richard Beacham, completed and launched the Theatron project (http://www.theatron.org/), funded under the EU Telematics in Education, Training, and Research Programme. This online interactive educational module comprised digital 3D models of 19 milestones in European theatre design: the Bayreuth Festspielhaus; the Drottningholm Palace Theatre, near Stockholm; the Drury Lane theatre London; the theatre of Epidaurus, Greece; the Globe Theatre London; a variety of Greek Temporary Stages; the Hellerau Festspielhaus, near Dresden; Medieval ecclesiastical drama settings; Medieval pageant stages; the Odeon of Agrippa, Athens; the Odeon of Pericles, Athens; Roman Temporary Stages; the Schaubühne am Lehniner Platz, Berlin; the Teatro Farnese, Parma; the Teatro Olimpico, Vicenza; the Teatro Sabbionetta; the Théâtre du Vieux-Colombier, Paris; the Theatre of Dionysus, Athens; and the Theatre of Pompey, Rome.

Each was meticulously researched by subject experts, modelled following rigorous standards of architectural and archaeological accuracy, and contextualised with a vast array of graphic and textual materials. Each site was represented by both a simple, real-time navigable model and a collection of pre-rendered images and animations of highly detailed models.

Users can study the critical analyses of the spaces provided, but can also independently assess the evidence on which the 3-D reconstructions are based (letters, critical descriptions, architectural texts, sketches, drawings and paintings etc.). The application was unprecedented as an ICT learning tool for higher education, and widely acclaimed, winning a 21st-century achievement award as Laureate in the Computerworld Honors Program and was the subject of several case studies in the EU Digicult Technology Watch Reports.

Theatron 3 transformed this earlier content, and additional content subsequently created by KVL, into an extensive, content-rich range of research-based virtual environments in Second Life, generating highly innovative, interactive teaching and learning resources designed to take full advantage of the pedagogical potential of the environment.

The project produced a set of complex virtual spaces, free for use for education and performance, capitalising on the existing assets of Theatron and newer assets. The development of a customised open source Second Life client has allowed real-time navigation to be combined with high graphical quality. The 3-D models are supplemented by existing and new interpretative content and a spectrum of original interactive tools, scenarios and automated tutorials, incorporating manipulable and customisable actors, props, sound effects and scenic technologies, streaming video and scripts enabling individual and group movement / choreography.

The project enabled new educational activities to be developed and implemented at partner institutions across a wide range of higher education subject areas - including scenography, creative writing, theatre design in addition to the performing arts - to take advantage of the social, collaborative and interactive aspects of this shared virtual environment. The insights of the project are too extensive to detail here, but included

• the ability to place oneself within those spaces provides insights into the lived experience of historical theatrical places.
• presenting these spaces as populated enables the nature of the spaces to be conveyed more fully.
• locating research content within the spaces enables the material to be conveyed more effectively

Such qualities, which in the case of the Theatron 3 project focussed on theatre historical activity, are specific examples of elements common to a great deal of activity arising from virtual presence and the engagement of the "mind's eye" within Virtual World communities.

These have been investigated in a number of studies, (e.g. Meadows, 2008, and Boellstorff, 2008), which explore such extensive and intriguing topics as the psychology of individual participation in Virtual Worlds, and the anthropology of the communities established and functioning in such worlds. For example, in Part II of his book, *Coming of Age in Second Life*, Boellstorff addresses the topic "Culture in a Virtual World". Working by applying traditional anthropological research techniques and analyses, he discusses in detail such elements as "personhood", and the manner in which presence and participation in a Virtual World impacts upon the sense of identity and self, the virtual "life cycle" of avatars, the roles of gender and race, and the vital role and levels and varieties of "presence" (including more significantly, a *social presence*) within the world. Such presence is expressed and experienced through the quality and nature of language used by avatars in a variety of situations, by the development and nurturing of friendships, the expression of sexuality, the experience of love, and the creation of complex patterns of relationships, including a vast array of special interest groups, and even virtual families.

Such Virtual Worlds as Second Life, and a range of other platforms currently at hand or in prospect have the potential significantly to extend and enhance the provision and presentation of traditional cultural heritage objects and sites, in ways that are significantly different from how in the past they have been experienced in museum displays or at the actual location of such sites. Moreover, they also are often able to communicate aspects of such heritage far more immediately,

suggestively and comprehensively than previous online programmes have been able to do. Through their evocation of communal activity, a wide range of expressions of individual and social presence, and direct engagement through the virtual embodiment and consequent cognitive -- intellective, emotional and psychological -- immersion of those entering into such worlds, they open up entirely new vistas to engage, extend, and sometimes even entrance the mind's eye of their "inhabitants". "Oh brave new world, that has such people in it"! [*]

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[*] Shakespeare, *The Tempest*, Act 5, Scene 1.