Archeologia e Calcolatori
Supplemento 1, 2007, 31-63

ARCHAEOLOGICAL KNOWLEDGE, VIRTUAL EXHIBITIONS AND THE SOCIAL CONSTRUCTION OF MEANING

1. Introduction

The use of the World Wide Web as a public communication vehicle has been a widespread phenomenon among museums since the 1990s. The semi-official Virtual Library museum pages directory (Bowen 1994), supported by the International Council of Museums, lists nowadays thousands of museum websites from almost a hundred countries; the Museums and the Web international conference, organised on a yearly basis, recently celebrated its tenth birthday, having so far yielded hundreds of contributions on the theory and practice of museum web communication (Copeland 2006; Sumption 2006). While among websites commonly associated with the name "museum" most belong to museum organisations, there is an increasing number of such websites not based on physical space – in the sense of a building with a material collection and an exhibition gallery – but existing solely in cyberspace, and challenging established notions of authenticity, materiality and scholarly mediation (Trant 1998, 110-113; Dietz *et al.* 2004). These exclusively *virtual* museums, and increasingly their hybrid counterparts, offer to their visitors the experience of "armchair travel" to a collection presented through a digital surrogate, i.e., to a virtual exhibition.

Among disciplines occupied with the material traces of human existence, archaeology is probably the one that has been most open to the application of information and communication technologies; indeed, the rise of statistical and computer-based approaches in the period of neo-evolutionism and the New Archaeology has not slowed down even after the post-modern turn and post-processual methodological alternatives of the last twenty years. Yet, as noted by two leading workers in the field of archaeological computing:

«Substantial amounts of work undertaken so far by archaeologists using information technology has concentrated on taking advantage of computational power of the technology, with less attention having been paid to the semantic potential, the possibilities of enabling variability in interpretation, or the multi-modal communication opportunities that they can enable. Increasingly technologies are enabling richer and higher impact communication with popular audiences through the use of virtual reality (VR), geographical information systems (GIS), and web-based publication opportunities. The emerging representational mechanisms now enable us to present dynamic phenomena, to show processes in action rather than static descriptions of them, and to vary the narratives to respond to the needs, experience and interests

of our varied audiences without necessarily sacrificing the archaeological integrity of our arguments. Some areas of communication (such as VR) enable the roles of actor and observer or presenter and interpreter to shift, thereby broadening kinds of participation in archaeological study» (Huggett, Ross 2004, 137-139, table 6.1).

The Virtual Library museum pages include a hundred and forty one museum websites including "archaeology" or "archaeological" in their description. The directory is admittedly «an eclectic selection of web services» (Bowen 1994: Overview), some countries are under-represented, and there are a few dozen further websites of archaeological interest missed by the aforementioned search, such as Latin American museums lacking a description in English. On the other hand, solely or mainly archaeological museums constitute less than half of those found above. And, while recent research confirms that most visitors of museum websites spend time in exploring virtual exhibitions (70-75% of all visitors to the Virtual Museum of Canada website, Dietz *et al.* 2004, 25), such exhibitions are rare among museum websites; similarly, only a handful among virtual exhibition websites nominated by the Museums and the Web international conference jury for the *Best of the Web* awards during the last ten years are related to archaeology, and the extensive collection of archaeological links in relevant surveys and indexes (Mattison 2006) contain few that could qualify as virtual exhibitions proper.

This paper approaches the potential and issues faced in the definition, construction and use of archaeological virtual exhibitions, in the context presented above, from the double viewpoint of archaeological theory and heritage communication. While it is neither a survey of virtual exhibitionary practice (Hoopes 1997; Schweibenz 1998; Trant 1998; Hertzum 1999; Copeland 2006) nor a comprehensive attempt at theory construction on virtual museums or new media communication (such as Deloche 2001; Manovich 2001), it attempts, nevertheless, to raise some theoretical issues related to the scope, rhetorics and public understanding of archaeological knowledge, examine relevant examples of current practice, and note a few possible directions for the future of archaeological virtual exhibitions in that light.

2. Scope of archaeological knowledge

Our understanding of what constitutes archaeological knowledge, and archaeology as a discipline, largely circumscribes the potential content, or subject-matter, of archaeological virtual exhibitions. Since its emergence as a "unified science" on the ruins of antiquarianism, archaeology developed its research apparatus – explanatory framework, general and middle-range theories, methodologies and techniques – on the basis of the "three principles" of technology, typology and stratigraphy, allowing «the remains of the past

to be organised into an ordered system by means of verifiable procedures of collection and classification» (Schnapp 1996, 321-324; cf. also Trigger 1989, 73-103). Such an archaeology depends greatly on the availability of object catalogues in the form of illustrated *corpora*, and of excavation publications presenting the archaeological context of discovery of features and finds: *compilations* of archaeological material, primarily descriptive in nature, to use Gardin's classification of archaeological constructs (Gardin 1980). This framework, exemplified by the further systematisation of excavation, field recording and stratigraphic processing methodologies, and the schematisation of the attribute-type-artefact model (Clarke 1978) largely determines archaeological practice to the present day.

Archaeological illustration, and later the invention of photography, were closely related with the development of archaeology as a discipline, as is convincingly argued by Schnapp in his lavishly illustrated historical account of the "discovery of the past" (Schnapp 1996, 238 ff.); publications of exhaustive catalogues of drawings and engravings were, indeed, instrumental in the deployment of the typological method in archaeology, and the same is true of stratigraphy. Dixon demonstrates how Piranesi's *Ichnographia* and its *Vedute* of ancient Rome, with their ruin aesthetic and detachment from historical time, act to place antiquity in an "uchronia" (Dixon 2005, 120). Indeed, the professionalisation of archaeology, at the end of the 19th century, and the publication of large excavation projects such as Pompei, Olympia and Samothrace is marked by the abundance of plans, sections and other site drawings prepared by trained architects, the presentation of large corpora of photographs and the development of extensive, precise documentation of artefacts in the form of line drawings, typologies and seriations (Trigger 1989, 196-204).

Archaeology is defined by the materiality of its subject-matter, the importance of context – both archaeological and social – and its continuing osmosis with other disciplines. As noted in a discussion of the specification of the *Sacred Way* Compact Disc-Interactive prototype, an early experiment in archaeological multimedia:

«Archaeology is an object-based discipline. It is based on the study of material remains from the past, and the conditions of their deposition and subsequent history. Archaeology is not, however, about isolated objects. It is, in a primary sense, about the associations of moveable artefacts and immoveable features in their archaeological context, placed in relation with the two major conceptual axes of space and time. In a secondary, but equally important sense, archaeology is also about the people behind the objects: their creators and users. In an excavated site, archaeologists are concerned not only to put the artefacts in taxonomies, and to identify the phases of its history, but also to find the social use of space, and to identify the significance of particular finds for the society which used them; at a second level, archaeologists are

concerned with establishing regularities in the way economy, society and polity functioned in the past. As a discipline, therefore, archaeology lies in the crossroads of fields such as history, geography and anthropology. It is primacy of objects and space, suitable for visual presentation, and the cross-disciplinary nature of archaeology that makes it interesting as an application field for multimedia» (Dallas *et al.* 1993, 118-119).

Classical archaeology, it is also noted, presents particular interest for public communication, on the basis of the visual interest and high information content of Classical archaeological evidence – buildings made of durable materials and employing monumental forms, well-developed and extensive representational art, textual sources providing context for the interpretation of archaeological finds and features. It has firm foundations in universal intellectual history, museums and antiquarianism; its methods, developed in the course of the last two centuries, exhibit a strong dependence on textual sources and philological study, and close affinity with art history and the study of visual forms (Bianchi Bandinelli, Franchi dell'Orto 1976), a fact which makes it the least pure – and potentially the most interdisciplinary – of archaeologies. It remains, to a great extent, an *idiographic* discipline concerned with establishing the concrete facts about a particular site, style, or historical event, rather than infer broader social laws. Experiencing Classical archaeology is, for many Classical archaeologists and for public perception, primarily not related to painstaking scientific work at the field, but to the visual appreciation and study of Classical monuments and artworks. Indeed, it is no accident that, with few exceptions (e.g., for Greek archaeology, Snodgrass 1992; Shanks 1996), handbooks of Classical archaeology are, predominantly, histories of Classical art (Robertson 1975; Boardman 1996; Lawrence, Tomlinson 1996; Spivey 1997), and academic courses are structured around the teaching of sculpture, architecture, etc.

On the other hand, the shift of 20th century prehistoric archaeology from natural towards social science, exemplified most notably in neo-evolutionist New Archaeology, opened up archaeological inquiry to broader issues, such as demography, social organisation, economy and technology, and introduced quantitative and formal methods, and media of communication such as data tables, statistical measures, charts, diagrams and GIS-driven visualisations (Clarke 1972, 1977; Reilly, Rahtz 1992). The subsequent archaeological interest in symbolic systems such as art, religion and cognition, the disaffection with the presumed scientism and positivism of New Archaeology and the influence of post-structuralism, cultural studies and hermeneutics led in recent decades to the emergence of contextual, interpretative and phenomenological approaches, emphasising the inter-subjective and constructed nature of our knowledge of the past, focussing on the relationship between field, archaeologist and the public, and introducing new modes of approaching the past, such as storytelling,

performance and ethnography (Hodder 1982; Shanks, Tilley 1992; Hamilakis *et al.* 2001; Pearson, Shanks 2001; McDavid 2002; Hodder 2003).

Nevertheless, artefacts remain central to archaeological interpretation. Material culture studies, at the crossroads between archaeology, ethnography and museum interpretation, had already introduced practical methods of approaching, analysing and understanding artefacts, typically based on a stepwise process and emphasising the constructed, process-based production of meaning from object, e.g., by moving from a) an examination of material form, to b) comparison with a peer group of similar objects and assignment to a type, class or series, c) examination of syntagmatic context (assemblage, structure to which the object belongs, environmental and material setting) setting artefacts in their relationship with other artefacts, d) definition of the socio-cultural context of events, subjects, and circumstances of construction, consumption, and use, e) consideration of meaning relating to the non-morphological, non-functional properties of objects, f) setting in the context of contemporary understandings and interests, and g) interpretation (McClung Fleming 1974; Pearce 1994, 109-143).

The meaning of archaeological objects is increasingly sought not only in their intrinsic, depositional context, but in semantic dimensions that relate equally, if not more, with the act of reception by contemporary societies. A study of megalithic monuments in European archaeology, published online as a hyper-document, suggests no less than twenty such semantic dimensions: nostalgia, admiration, identity, pride, progress, legitimation, reassurance/ideology, aura, authenticity/respect, preservation, desecration, disrespect/destruction, physical uses, shelter/stone use, entertainment, play/adventure, "Denkmal", study, and cosmology (Holtorf 1998). Influential recent approaches in the anthropology of art and consumption suggest that artefacts should be viewed not merely as semiotic signs or as objects of aesthetic appreciation, but as subjects endowed with agency in co-defining identity and co-determining the field of action of their producers and users (Gell 1998, 1999), or as biographical objects endowed, through a process of individualisation, with personal life histories (Kopytoff 1986). These notions help integrate the pre- with the post-depositional history of archaeological objects, and provide a socio-cultural interpretative framework for understanding how and why some, such as the Parthenon marbles now in the British Museum, continue to *act*, today, as performative agents of memory and heritage (Hamilakis 1999).

It attempting to define the subject-matter of archaeological virtual exhibitions, we are faced, unavoidably, by larger dilemmas, regarding the stuff of archaeology. As is made clear from the discussion so far, there are methodologically diverse archaeologies ranging from quantitative, formal and scientific to art historical, philological, humanistic ones; some focus on the materiality of archaeological objects, while others see object histories and past people

as their object of enquiry; some seek nomothetic explanation through generalisation and recourse to social theory, while others focus on understanding the idiographic condition of the evidence at hand; for some, the objective of archaeology is to establish true beliefs about the past while others, more or less guarded, dispute the possibility of objective knowledge; some are more interested in statements about archaeological realities, while others in the theories and methods that allow the definition of such statements.

There are, however, notable commonalities. Despite differences, archaeological knowledge depends, to a significant extent, on statements made of material things (archaeological objects, artefacts, features, finds, ecofacts, etc.), and on observations on their form and configuration by archaeologists who experience them as sense realities, primarily through vision and touch. Analogical – or iconic – representations of objects, such as drawings, photographs and photorealistic models are, therefore, relevant media for preserving the possibility of sense experience of archaeological objects as soon as these are removed from their original context, and for as long as it is not possible to review the original. In terms of media selection, this privileges access to the original archaeological evidence through drawing, photography and video (Smiles, Moser 2005), digitised collections of artefacts, digital archaeological archives (Richards, Robinson 2000) and computer-based modelling of archaeological sites ("Virtual Archaeology", Reilly 1989, 1991; Barceló *et al.* 2000a).

Besides, archaeological finds share some important formal properties with other classes of artefacts: they may be understood as occurrences of (constructed or "presumed real" – this important, and widely studied, issue is not relevant for the present discussion) categories, such as types, groups, classes, etc.; these categories are connected by *specialisation-generalisation relations*, collectively producing arrangements such as typologies, classifications and taxonomies; objects may present themselves in *compositional arrangements*, and may display a "part aggregation" structure that is not amenable to simple description by enumeration of traits; they are located in *historic*, in addition to respectively linear and Euclidean, *time* and *space*; physical objects exhibit complex relationships with *conceptual* counterparts, as well as with people, places, events and abstract ideas, concepts, and effects; information is often *missing*, for different reasons and with different interpretations; knowledge depends as a rule on evaluating *beliefs*, rather than data, and is *context dependent*; and, it is manifested not only through the rational evaluation of statements but also through the *multimodal* experience of text and audiovisual media (Dallas 1994, 253-257). Archaeological finds, in particular, are derived from a domain of deposition or discovery assigning them to spatial structures (such as strata, excavation contexts or closed deposits) and collocating them with other finds, and these observed patterns may be used to make assertions about the position of objects in space and time.

In addition, archaeological evidence results from *inscribed* memory practices, manifested in commemoration and the creation of durable, physical traces, characterised by repetition and formulaic form – artefacts belonging to types, monuments belonging to orders, stylistic patterns that follow grammatical or formal regularities – rather than *embodied*, performative, fleeting acts of memory characterising ritual and social behaviour, typically absent from the archaeological record (Connerton 1989, 72-79; Rowlands 1993; van Dyke, Alcock 2003a, 3-4). Nevertheless, significant knowledge on archaeological objects consists of an understanding of object histories, both pre- and post-depositional. Even traits deemed to be mere properties of objects, such as material, and decoration, can be seen as emergent from *events* related to object creation and technology, presuming, at least, a context of time, space, and agent. Furthermore, there are several, if not all, kinds of archaeology whereby sequences of events, i.e., narratives, constitute important carriers of knowledge.

The diverse spectrum of archaeologies presented above, and the commonalities identified further on, circumscribe the potential subject-matter of archaeological virtual exhibitions. For the pragmatic context of archaeological virtual exhibitions is public archaeology: the body of knowledge, methods and practices related to the public understanding of archaeology as a field of knowledge and set of professional and interpretative practices, regardless of one's methodological viewpoint. Against a continuing "crisis of curation" afflicting archaeological archives and collections, whereby «despite the huge resources expended in generating, they are barely used even by archaeologists, let alone the public as a whole» (Merriman 2004b, 87), public archaeology could provide, firstly, increased learning opportunities to combat the "cultural deficit" of large segments of the general public, and, secondly, to a more open understanding of archaeological realities through the construction of "multiple perspectives" (Merriman 2004a, 5-8). The archaeologist thus becomes an educator, and an interpreter of archaeological knowledge, and virtual exhibition presents itself as an alternative, or complementary, means of archaeological communication with the public.

3. Communicating archaeological meaning

Thus defined, archaeological exhibition, virtual and real, is set in a particular frame of relationship with archaeological knowledge. In order to examine the nature of this relationship, we shall now turn briefly to the question: *how* is archaeological meaning [to be] communicated?

A key set of ideas on this issue, focussing on archaeological research communication, emerged through the experimentation with descriptive and analytical "codes" for various classes of archaeological objects by J.-C. Gardin

and his team during the 1960s, his consequent work on knowledge bases, the later formulation of the theory of archaeological constructs differentiated between descriptive *compilations* and hypothesis-driven *explanations,* and the logicist thesis of privileging schematised over narrative modes of archaeological argument (Gardin 1980, 55-90). Gardin later acknowledges the unavoidable co-existence of a "scientific" and "narrative" modes of archaeological communication, recognising the legitimacy of the persuasive rhetoric of the latter, and calling for their integration within a "new vision of scholarship" (Gardin 1994). In practice, most archaeological research to date is still published in the form of language, depends on the use of language rather than formal code, and it is often difficult to classify archaeological publications into pure compilations or pure explanations as, in most cases, the two *genres* co-exist.

Schematisations of archaeological evidence and argument lend themselves well to publication following the hypertext model, facilitating the presentation of archaeological evidence and argument in more succinct, structurally lucid manner (Gardin 1999). Archaeological work published in the *Internet Archaeology* journal goes some way in the direction of «exploiting the capabilities of digital technologies to provide alternative or enhanced views of archaeological argument, not least by allowing the direct manipulation and summarisation of supporting data» (Dallas 1997, 63), and technology is now ripe to enable the integration of extensive photographic and video documentation, semantically-rich descriptions of objects, geographic information, and hypertextual argumentation, with appropriate search, display and manipulation interfaces.

On this basis, it may indeed be a timely task to identify in specific expressions of archaeological knowledge «broadly defined styles of reasoning and argumentation» such as descriptive, logico-deductive and dialectic (Bearman 1996, 14). Djindjan's recent introduction of a calculus for the archaeological publication, consisting of references to primary information entities, i.e., archaeological objects and properties (*enoncés*), both intrinsic such as morphology and extrinsic such as dating, and of relations (*predicats*) such as identification, differentiation, enrichment, exploration and prediction (Djindjian 2002, 2004) is particularly interesting in this context, bearing some affinity with generic models of understanding textual discourse such as Rhetorical Structure Theory (Mann, Thompson 1987; Mann 2005), hypertext-based structured argumentation methodologies (Shum *et al.* 2000; Shum, Selvin 2001), and, on the other hand, domain-specific conceptualisations of artefact description and analysis process (Pearce 1994).

Bridging the gap between primary evidence and public interpretation entails multiple transformations connecting, to paraphrase Latour (1987), «the field and the museum». Multiple fields articulate the relationship between archaeological fieldwork, its primary and secondary record (excavation logbooks,

artefact inventories; plans, maps and illustrations), tools and instruments of research; interpretative syllogisms and theories; identities and relationships between groups of stakeholders, such as source communities and archaeologists: «a means of maintaining something of the complexity of archaeological practice in our modes of documentation and language» (Witmore 2004, 159). The call for archaeological «interpretation at the trowel's edge», dictating the principles of field research and publication at the Çatalhöyük excavation (Hodder 1997, 694), is one possible response to ensure that primary observations are articulated with knowledge construction and scholarly communication.

The very process of placing archaeological objects in a collection storeroom, or of inventorying them in a database, entails the production of meaning; as has been noted, the physical arrangements of «collections […] represent, in fact, cultural classifications of artefacts» (Dallas 1994, 258). As was discovered by Hemmings *et al.,* in their illuminating ethnographic study of curatorial work in the Science and Industry Museum at Manchester, curators impart artefacts with meaning through naming and property attribution since the first moment of object accessioning; the contextualisation process related to creating exhibition storyline is inextricably linked with artefact categorisation; the "sense of order" imparted in a collection constrains, and enables, the generation of alternative interpretations: «the practiced eye of the curator can 'see' how [the] material could be potentially re-organised as a display item […] the sorting and classifying of the material is done with an eye to the story that can be told» (Hemmings *et al.* 1997, 155). Conversely, exhibitions could be seen not merely as effects but also as agents of meaning construction: as *metaphor engines* whose kinaesthetic and cognitive affordances privilege visitor-driven construction of meaning going beyond typological-paradigmatic order and contextual-syntagmatic elaboration (C. Dallas, quoted in Perrot 1999, 152).

The idea that exhibitions are mere information transfer devices, imprinting authoritative scholarly knowledge, albeit in an imperfect form, upon their visitors, is also questioned by constructivist exhibition theory, advancing the view that meaning construction by visitors takes place in a two-step process of *expert construction* and *public construction* (Copeland 2004, 134-137), based on a complex negotiation between objects, settings etc. and visitors, and taking into account prior knowledge they may possess. The related notion of *conversational elaboration* (Leinhardt, Crowley 1998) helps explain the process by which meaning is constructed iteratively, in concrete situations where visitors encounter objects in the context of prior knowledge and beliefs. On the other hand, borrowing from J. Clifford's conceptualisation of the role of the anthropological exhibition as a mediator between the authority of the museum and indigenous communities (Clifford 1997), exhibitions can be seen as *contact zones* between curators on the one hand, objects (viewed as agents,

Gell 1998) and their creators on the other. In the most general sense, exhibitions can be defined as a field, or contact zone, between visitors, exhibition makers and original creators (and users, consumers) of artefacts presented.

If research publication in archaeology serves the interests of good scholarship, archaeological exhibitions unavoidably relate to the interests of their diverse audiences, and of the "general public". A recent MORI survey in the United Kingdom found out that people who visit museum exhibitions are interested, in order of preference, in "how people used to live" (62%); ancient history (57%); historical paintings and drawings (49%); local cultures, here [i.e. in the UK] and around the world (39%); science & technology (39%); modern paintings and drawings (37%); people and places around the world (35%); pottery, textiles and other crafts (34%); etc. (Davies 2005, 94). The questionnaire measures interest on *ad-hoc* themes, but the results cluster around topics such as everyday life, culture, people and places, as well as art and material culture. Another study notes that visitors to heritage sites favour iconic, and especially enactive, modes of representation over symbolic ones. (Copeland 2004, 137-139, table 6.1). This preference for interactivity and story, on the one hand, and visual experience on the other, over the contemplation of complex argument, fits well the thematic interests found out by the MORI survey. It underlines a polarisation between practices of heritage that are univocal, non-controversial, and driven by stereotypes and symbolic needs of the present, and the scholarly pursuit of historical truth, based on complex, unstable and multivocal argumentation, and summoning theoretical and domain-specific knowledge and skills (Lowenthal 1985).

Having discussed at some length the subject-matter of archaeology, the production of archaeological knowledge and the construction of meaning in the context of public understanding of archaeology, we can now turn to examining the complementary, in the context of our topic, notion of virtual exhibition.

4. Virtual museums and virtual exhibitions

The formulation of a consistent and useful definition of the notion of virtual exhibition depends on its juxtaposition with its semantic cognate, the virtual museum. According to Dietz *et al.* (2004, 24), «the definition of the 'virtual museum' remains under practical construction inasmuch as there persists a strict demarcation between real and virtual, informing the notion of 'audience' and accentuating the differentiation between original object and surrogate in the minds of museum curators». This difference is reinforced by foregrounding the opposition between physical museums, accredited guardians of heritage and art with a central part in defining a canonical view of history and art, and ephemeral, elusive entities such as virtual museums, often lack-

ing permanent staff, a valuable collection and the authority of a gatekeeper organisation. In this context, virtual museums, displaying objects from virtual collections, may be thought to be *disjoint* to virtual exhibitions of objects from material collections belonging to "real" museums.

A diametrically opposed view is represented by William J. Mitchell's *City of Bits* metaphor: a transferral of physical places, institutions, functions and services of a late industrial city to its virtual counterpart in cyberspace. Galleries, in this brand new world, are to be supplanted for many of their current public functions by virtual museums, and material artefacts by their digital surrogates; "crowds become easy to handle" and, liberated from the exigencies of the physical fixity of objects, virtual museums can offer "far more choices for exploration" of meaningfully arranged digital surrogates of artworks than their material counterparts. Virtual museums are thus regarded as synonymous with virtual exhibitions, available everywhere through a computer screen or a video theatre, providing enhanced access to object surrogates and relevant information, and relegating physical museums, and their exhibitions, to mere «places for going back to the originals» (Mitchell 1995, 57-60).

An alternative definition stems from the conceptual burden of the term *virtual*, especially as used in the theory, practice and public mythology of Virtual Reality. Indeed, possibly the first published reference to virtual museums identifies them, effectively, as museum exhibitions supported by Virtual Reality technology, based on digital visual surrogates rather than physical artefacts, presenting them in three-dimensional virtual space simulating an exhibition gallery, and allowing new kinds of proximity, manipulation and interaction with visitors: dealing with «virtual artifacts, in a virtual setting accessible from a telecommunication network in a participatory manner» (Tsichritzis, Gibbs 1991, 18). In this sense, quite unlike the analogical definition proposed above, virtual museums are conceived as a *subset* of virtual exhibitions: one where digital surrogates of artefacts are placed in a simulated three-dimensional environment and which provide their users, through appropriate interfaces allowing traversal and manipulation, with an illusionistic, "make-believe" experience of exploring the rooms and displays of an imaginary gallery.

Notwithstanding the alternative meaning associations introduced by this discussion, it should be possible to conceptualise virtual museums, by analogy with established definitions of material museums, as *organisations,* displaying the following traits: a) lacking a physical, location-based existence and/or a material collection, b) performing functions of collection, curation, research, exhibition and communication with the public, c) managing a virtual collection consisting of surrogates of physical or of born-digital cultural objects, and, d) providing an educational, ludic and social service to their users. Following up on this analogy: a virtual museum will host a permanent virtual exhibition corresponding to a canonical selection, layout and interpretation

of its permanent collection of object surrogates, as well as mount, in time, a number of temporary virtual exhibitions, it will, also, appraise and collect virtual cultural objects, rather than material ones; it will employ practices of digital documentation, collections management and long-term preservation of its assets; it will perform research on its virtual collection, and support scholarly communication; it will provide visitors with the opportunity to enjoy virtual educational programmes and access virtual learning resources about its holdings; it will have outreach and publishing activities intended to maximise public knowledge and use of its collections.

Virtual museums are thus conceived as a *superset* of virtual exhibitions. In analogy with their material counterparts (Belcher 1991, 37-43; Barker 1999, 8-21; Davallon 1999, 227-253), virtual exhibitions can be understood as the communication technology or medium of virtual museums *par excellence,* complementary to their patrimonial, preservation-oriented functions, constituted of the selective arrangement, display and interpretation of digital cultural object surrogates through interaction with the public, and becoming virtual *destinations* for cultural visitability through non-corporeal travel (Dicks 2003, 176-186). Virtual exhibitions could include, in this sense, those available through diverse material supports or physical media, such as electronic titles published in CD-ROM or DVD-ROM format, and technology-based installations in museum locations, as well as through telecommunication networks, notably the Internet using the World Wide Web. Alternatives are associated with different traits as regards the experience that they can best support (Brochu *et al.* 1999; Welger-Barboza 2001, 49-141). But, as broadband telecommunications become more widely available, the World Wide Web becomes a predominant channel for the creation and use of virtual exhibitions which provide a ubiquitous, information-rich, engaging and personalised experiences to their visitors (Sumption 2006).

Dietz *et al.* (2004, 25) note the «great variability in content, structure, navigation, design and complexity» among virtual exhibitions, ranging from a simple selection of images to complex multimedia structures and narratives, and suggest that the pertinent trait of virtual exhibitions – which they see as synonymous to online exhibitions, web exhibitions and virtual exhibits – is «a stronger dependency established between context, form and content, and between the whole and its parts», thus differentiated from mere collection databases accessible online, directories or search results. Equally, the *Museums and the Web* international conference differentiates between *Best of the Web* awards for the best virtual exhibition, and others for «best e-services or e-commerce site, best educational use, best innovative or experimental application, best museum professional's site, best research site, best small site, and best overall museum website» (Archives & Museum Informatics 2006).

In this context, virtual exhibition is established as a medium of multimodal communication constituted of multimedia "texts", which exhibit specific information content, structural and rhetorical properties, arranged in hypertextual traversal structures, and dependent on varying degrees of interactivity, pre-scripted narrative, immersion and personalisation to define user experience. Like physical gallery-based exhibitions, it is produced as a "whole constructed experience" established on the basis of a programmatic order, and open to collaborative emergence of meaning through the act of virtual visit by members of the public. We shall return to these traits further on, with reference to archaeological virtual exhibitions.

5. Virtualisation as the *modus* of archaeological virtual exhibition

Shanks and Tilley propose a quasi-typology of archaeological museum exhibitions, discriminating between *aesthetic exhibitions,* whereby objects are de-contextualised and set apart to be viewed as contemplative objects (e.g. the British Museum Greek antiquities); *narrative displays,* whereby objects act as tokens of a, typically, romanticised, familiar and uncontroversial past (e.g., the Museum of London); *commodified* displays (e.g. shop windows in York Castle); heritage sites where the past is simulated in reconstructed architectural form (such as Beamish); and exhibitions which celebrate "the archaeologist as hero" through displays that focus on presenting the work and process, rather than the object, of archaeology (e.g., in Jorvik Viking Centre) (Shanks, Tilley 1992, 86-90). The same authors note interesting commonalities, e.g. the primacy of object documentation, manifested through descriptive labels which assume, in the eyes of visitors, the role of "academic price tags", and, conversely, the currency of romanticised "discovery" as the driving metaphor for archaeological displays (Shanks, Tilley 1992, 69-71).

Aesthetic exhibitions, as defined above, can be arranged on the basis of object style, provenance, chronology or creator – properties related to object creation – the common element being that, in all cases, we deal with object-centred exhibitions, intended to provide visitors with an experience of contemplative observation of artefacts. While the charge of de-contextualisation harks back to 19th century debates between archaeological reconstruction *in situ* and museum displays, it is relevant to art galleries rather than object-centred museum exhibitions as a whole (Corcoran *et al.* 2002); such exhibitions appear, rather, to constitute an «inherently spatial reorganisation where the objects are first excerpted from their original cultural and communicative context then recontextualised in the spaces of the museum according to an externally generated syntax. The possible combinations of objects become a chance to spatially play with different sequences of remembering and time» (Crang 2003).

It has been suggested that a museum display can be regarded as a spatialisation of knowledge through the arrangement of objects and associated

information (Hooper-Greenhill 1992, 90), i.e., the mapping of conceptual relationships underlying the intrinsic and extrinsic properties of artefacts (e.g., a typological order, a historic sequence) onto exhibit arrangements in gallery space. An inverted relationship applies to archaeological virtual exhibitions, endowed with *affordances* (as introduced by Gibson 1979) of hypertextual navigation, componential screen-based composition, multimedia delivery and multimodal interaction. Such virtual exhibitions transpose archaeological space-time, and artefact form, function and meaning relationships, onto a representation plane which in some cases simulates the physical space of an archaeological site (as discovered, or as reconstructed), whilst in other cases it denotes a typological, chronological, functional, iconographic, themed, or any other interpretative arrangement, adopting thus one of many alternatives for artefact contextualisation familiar from physical museum exhibitions.

According to this analysis, the *modus* of virtual exhibitions is not spatialisation but *virtualisation,* i.e., the construction of virtual environments, forms and interaction mechanisms that bear a relationship of analogy with the physical space, objects and experience of archaeology. The notion, current in cyberculture research, has been used in our context mainly to describe the reconstruction of buildings from archaeological evidence by means of Virtual Reality (Roussou 2002). But, considering our earlier discussion of archaeological knowledge and the production of meaning through exhibition, we could differentiate, tentatively, between diverse forms of virtualisation, manifested through different media, content and rhetorical devices: virtualisation of archaeological sites, of artefacts, of artefact histories, of socio-cultural process, and of archaeological process, to name but a few significant ones.

Spatial virtualisation of archaeological sites adopts the metaphor of virtual travel, in an artificial environment created by means of Virtual Reality technologies (Barceló *et al.* 2000a, 2000b; Frischer *et al.* 2001 for a comprehensive discussion). In the case of the Theban Mapping Project (Hansen 1997-2006), World Wide Web users are offered the opportunity of entering, virtually, Egyptian tombs such as that of Tausert and Setnakht (KV 14), represented in a laser-generated, wireframe model; at selected points, when movement stops, the surfaces of the walls are selectively wrapped by a photographic rendering of the wall-paintings found at that point, with links leading to a pop-up photograph and description of each individual scene (Fig. 1). The ability to generate artificial scenes by integrating digital surface representations from archaeological objects promises some interesting applications, such as the virtual "reunification of the Parthenon marbles", currently divided between Athens, London and other places, using photorealistic computer graphics and Virtual Reality, by Debevec and his team at the University of Southern California (Stumpfel *et al.* 2003).

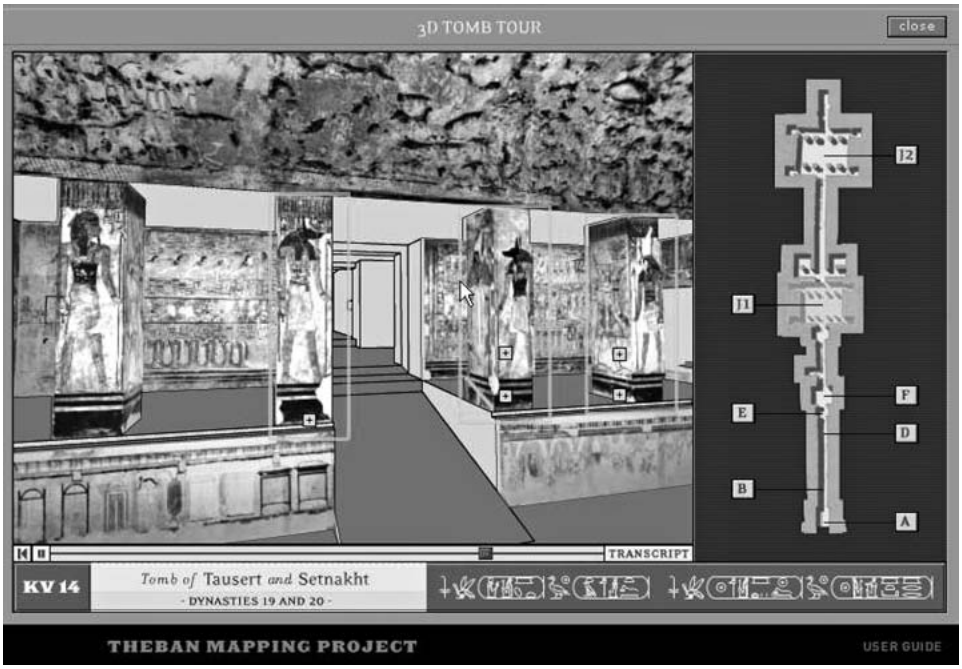

Fig. 1 – Spatial virtualisation of the tomb of Tausert and Setnakht (KV14), *Theban Mapping Project* (Hansen 1997-2006).

Different solutions on how original architectural space should be rendered in virtual reconstructions are critically discussed by Johnson (2005) in the context of his virtual visit to the Monticello historic house. There is, however, an inherent conflict between the persuasiveness of stunning photo-realistic representation, often pursued by computer science-driven projects, and the application of scholarly caution. As noted about Virtual Reality in archaeological video documentaries, with current advances in computer graphics «one may take a Roman street, render it with a particular artistic effect in mind, filter it through a number of processes, and add appropriate noise, blemishes, and underlying background texture, and the result may be extremely realistic: this time as a realistic, unreal *artist's impression*». For computer graphics specialists, as much as for documentary film directors, «a valuable output is one that is visually stunning» (Earl 2005, 212-213).

Conversely, in the Theban Mapping Project, the decision to use a wire-frame rather than a fully rendered actual view of the tomb for traversal may have been dictated by technological limitations regarding network bandwidth, but, interestingly, it projects a view of the tomb as a "mental template", a

conceptual representation of its layout, which, in many cases, may be more appropriate for archaeological visualisation, where often full information on original architectural form is sorely missing; the constructedness of the model is made explicit by the adoption of the language of architectural visualisation, through the concurrent display of a plan of the building. But this is an exception; on the whole, the call to adopt a virtual *expography* whereby the exhibition allows "the seams to show", presenting a "set of fragments about the past" and creating the precondition for a dialogic relationship between exhibit and public (Witcomb 2003, 161) is to a great extent unanswered by current practice.

The congruent problem of dealing with alternative reconstructions receives equally little attention by most projects, despite Roberts and Ryan's vision of the possibility of creating alternative instances of a Virtual Reality model, allowing «a 'tour' in which the archaeologist presents the different interpretations, by developing discrete realizations, interspersed and overlaid with appropriate descriptions, references and annotations» (Roberts, Ryan 1997). In the Troia VR virtual exhibition, digital photographs of various aspects of the site, as well as of assemblages of archaeological artefacts as found, are, *on mouseover*, replaced by computer graphic reconstructions of the same spot, in a time-shifted enhanced reality, peek-a-boo effect highlighting the relationship between evidence and virtual representation (Jablonka 2004). In the virtual Lascaux exhibition, on the other hand, spatial virtualisation is merely supported by an annotated picture gallery of the full iconographic programme of the caves, accessible through hotspots on the plan shown, and based on photographs taken before the original caves were closed for archaeological preservation issues during the 1950s (Aujoulat, Michoud 1998). Yet, the promise of information technology in liberating us from the «tyranny of the artist's reconstruction», so that «any reconstruction […] incorporate[s] ideas about such things as individual structural elements, construction materials, structural properties, cultural influences and phasing» (Daniels-Dwyer 2004, 262), echoed by the call to go beyond "wonderful images" in archaeological site virtualisation (Barceló *et al.* 2000), remains greatly unfulfilled to date.

Spatial virtualisation of archaeological sites is central to creating *a sense of place* for virtual visitors, an important concern for phenomenological and reflexive approaches (Tilley 1994; van Dyke, Alcock 2003b) privileging affective and sensory engagement and exposing the intimate relationship between spatial experience, memory and the social construction of meaning about the past. As advocated by Gillings, reflexivity can be based on creating conditions for subjective gaze, for instance, by providing panoramic illustrations putting the visitor in the centre (such as those made possible by Quicktime VR technology), in analogy with antiquarian drawings, often violating the rules of perspective in order to provide with a more pertinent view of visited places;

Fig. 2 – Screenshot of a VRML model of the centrepiece of the Parthenon frieze from below, approximating the view of an ancient visitor, *Parthenon sculpture gallery*, University of Southern California (YUN 2003).

similarly, a virtual visitor of the University of Southern California's Parthenon sculpture gallery (YUN 2003) will be able to manipulate the VRML model of pieces from the Parthenon frieze so that they are viewed from an angle that approaches that of an ancient visitor looking up from the temple colonnade (Fig. 2). But the creation of a sense of place goes beyond issues of accuracy or point of view in spatial representation, to create a "stage" for the enactment of the past by means of narrative, and virtual presence of visitors, allowing the establishment of a relationship between "viewer and viewed", and thus moving from mimicry and imitation – a charge against current Virtual Reality applications – to true *mimesis* (GILLINGS 2005, 234-236).

Interactive fiction is used by the makers of the *Cloth and Clay: Communicate culture* virtual exhibition, hosted by the Virtual Museum of Canada (SHAUGHNESSY *et al.* 2002); virtual visitors are invited to take part in adventure, whereby they are transported from within the physical exhibition gallery of the Gardiner Museum of Ceramic Art back to the past, and they control the interaction by selecting among alternative versions of the continuation of the

story. While the virtual visitors' sense of place is supported by artists' graphic illustrations of scenes populated by ancient Mayans, it is clear that the intention is to go beyond spatial virtualisation, towards supporting visitor experience of a re-created ancient place through story and dramatisation.

A shift to a broader notion of *experience virtualisation*, demanding more of visitors than a story-driven approach, is illustrated by early reports of Tringham and Mills' *CatVidPlace: Collaboration on the senses of place* project: «Having done a series of video/sound walks at Çatalhöyük we are now working on integrating these in an interface that enables us to explore senses of place through different scenarios. One scenario is based on archaeological information – an approach similar to information panels encountered on site. Another scenario considers the role of the senses when touring the site and how they are integral to the experience of engagement; how they may be complementary in certain instances and perhaps contradictory in others. A third scenario considers memory; how previous engagement (as a visitor or as an archaeologist) with the site may be influential in subsequent encounters. Another scenario may embrace performance» (Mills, Tringham 2006).

The Çatalhöyük project presents, perhaps, the most explicitly programmatic attempt to integrate archaeological research and public communication, in an approach governed by «the four goals of reflexivity, contextuality, interactivity, multivocality». It integrates experience virtualisation with *virtualisation of the archaeological process*, and with *artefact virtualisation,* deeming that these are inextricably linked. Archaeologists work with video transcripts of their dig meetings to aid interpretation, linked into the site database, while hypertext is used to link database entries into narratives. The vision presented is to create a Virtual Reality front end to the database, so that virtual visitors «are able to 'fly' into the site, into individual buildings, 'click' on paintings or artefacts and so move gradually, if desired, into all the scientific information available». By accessing the full, unadulterated *corpus* of archaeological documentation and *in situ* interpretative statements by archaeologists as they excavate, it is hoped that visitors will be able to reach their own conclusions on open archaeological problems: «one problem we have at Çatalhöyük is in deciding whether a building is in some sense a 'house'; rather than accepting 'our' conclusions on this, users will be able to access the data, as far as that is possible, and can come to their own conclusions about the definition of a 'house'» (Hodder 1997, 699). While this statement may be glossing over some pertinent issues related to the role of (cultural, technological, professional) *literacies* involved in archaeological interpretation, the approach is interesting, in that it attempts to tackle central issues in the construction of archaeological meaning through the situated interaction between archaeologists, virtual visitors and ancient artefacts/people.

This approach to public communication is deployed through a number of connected initiatives by collaborating institutions and researchers. The *Mysteries*

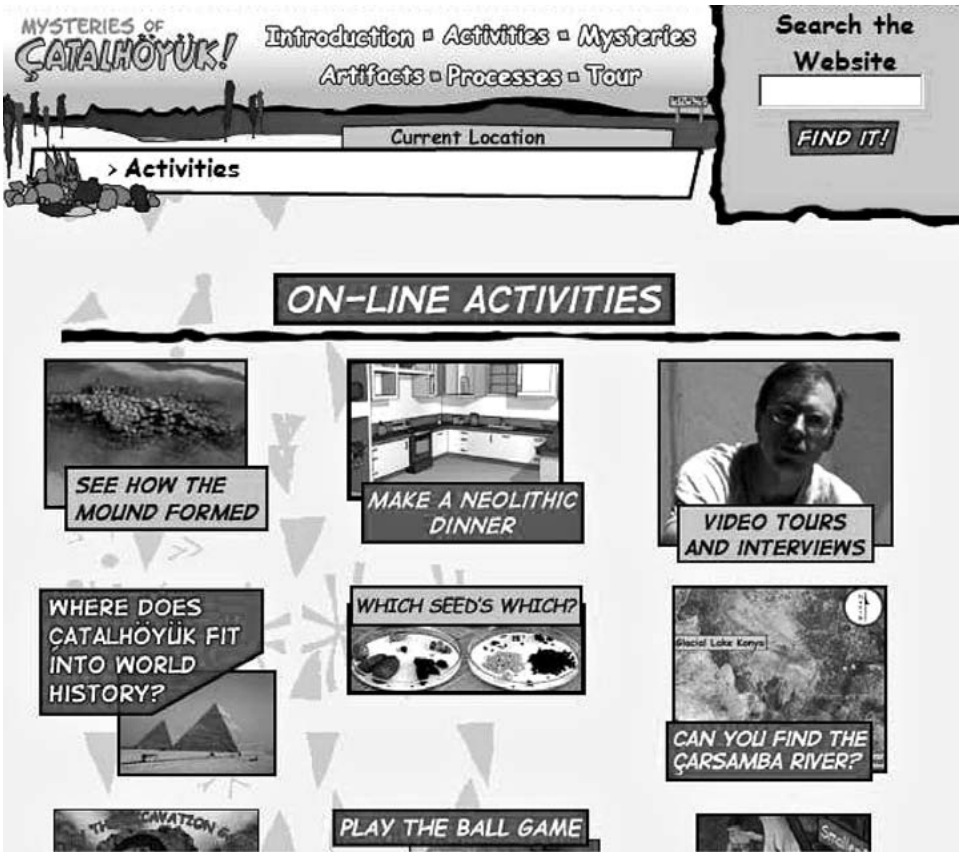

Fig. 3 – On-line activities web page. *Mysteries of Çatalhöyük!* (Science Museum of Minnesota

of Çatalhöyük! virtual exhibition (Science Museum of Minnesota 2001), adopts the format of a children's interactive comic book, integrating simplified graphic reconstructions of buildings, an interactive excavation game, various other games and quizzes, creative activities such as drawing, and first person interpretations by the excavation director, and presents the virtual visitor with choices such as "Make a Neolithic dinner", and "Read the bear paw mystery" (Fig. 3). The website provides access to a host of supplementary material, such as Quicktime VR tours of the archaeological site and the museum exhibition hosted by the Science Museum of Minnesota, interviews of members of the excavation team, and an extensive photographic record of finds and features from the site. The emphasis is on relating archaeological realities with contemporary issues, and of raising questions that younger visitors could address, avoiding didacticism

and the "unassailable voice" of traditional scholarly authority (Walsh 1997, 77-79); this is an exhibit adopting a constructivist approach, common among museum educational websites, while attempting to integrate learning about the actual Çatalhöyük site with insight, and information, on the life and work of archaeologists excavating the site.

The objective of the *RAVE: Real Audiences. Virtual Excavations* virtual exhibition is to provide a multi-layered account of archaeological interpretation of Çatalhöyük, from the "grand narrative" to the micro-archaeology level (Ashley Lopez 2003). The exhibit is organised in a pre-scripted set of atmospheric visual sequences, presented in linear order, based on vignettes from the life of the excavation, and supplemented by brief textual commentary. The effect is based on recreating for virtual visitors the experience of archaeologists working on the site, rather than involving them in discussing particular issues of archaeological interpretation, like in the *Mysteries* exhibition. Other virtual exhibitions at Berkeley's Multimedia Authoring Center for Teaching in Archaeology, inspired by Tringham's earlier *Chimaera Web* (Tringham *et al.* n.d.), follow a similar experiential approach.

On the other hand, the main Çatalhöyük website (Çatalhöyük Research Project n.d.) includes a massive, systematic, hypertextual presentation of excavation data, as well as some photographs and artist's illustrations of the site, combined with the subjective, archaeologist-centered accounts presented in the notebooks: partial in nature, often opaque, but also interesting in that they present «archaeology in the making» (Hoopes 1999). The hypertext database is organised in cross-referenced sections describing areas, buildings, spaces, features, units and diaries; apart from an aerial photograph, introducing the areas section, information presented is almost exclusively textual, and while intriguing, it will be difficult to follow for the non-specialist. Enhanced with photographic evidence, plans and drawings, virtual and artists illustration, as well as the rich interpretative accounts presented in publications and informal accounts by excavation team members, this hypertextually organised body of knowledge could provide an excellent foundation for the creation of a virtualised site access environment, fulfilling the promise of empowering visitors so that they decide on their own about "the definition of a 'house'".

Virtual exhibitions with a clear public communication role, mentioned above, appear to be complementary rather than integral to the main Çatalhöyük database. Technological limitations are not irrelevant to this situation, as the pleas that «scholarship and [public] communication […] should both be supported by a unified information system» (Dallas 1994, 259-261; Blackaby 1997; Besser 1997) met so far with little practical response by makers of cultural and archaeological information systems; admittedly, it is only now, at a time when large scale digital collections become widely available, and interoperability standards for cultural information, like the CIDOC Conceptual

Reference Model, achieve acceptance (Doerr 2003; ISO Technical Committee 46 2006), that such a development can be conceived in practice.

Virtualisation of the archaeological research process is manifested through a number of research documentation projects, attracting the interest of the general public as demonstrated by the success of television shows such as Channel 4's *Time Team Live* (Platt, Reynolds 1997-2006). An archaeological reality show, presented by popular comedian Tony Robinson, *Time Team Live* has been «broadcasting an archaeological dig against the clock» and "as it happened", presenting also regular updates on the World Wide Web and through a dial-and-listen telephone number. Since 2000, the show website was enhanced with video clips from the excavation; in 2001, public web chats were organised, hosted by members of the excavation team; in the 2004 season, multi-vocal, parallel narratives and interpretations were introduced; by 2006, the *Time Team* website had been enhanced with integrated simulcasts on the web, "texting" and television, and with weblogs presenting a continuous update of the excavation.

Similarly, the Australian Pandora Expedition was among the most popular virtual exhibits in the Australian Museums On Line (AMOL) service, which managed to attract 35,64% of all top story page views, exploiting the combination between a popular subject – underwater archaeology – and interactive multimedia communication (Sumption 2000). Underwater archaeologists working on a boat above the shipwreck posted photographs directly to the virtual exhibition site, and responded frequently to email messages by virtual visitors. Fascination with archaeological discovery, as well as the elevation of the archaeologist to the status of an exciting, adventurous *persona,* co-operate in ensuring success of these projects. These applications focus on archaeological process virtualisation, but only, it should be noted, in the sense of communicating the practice of archaeology through a kind of performance, rather than in the sense of introducing virtual visitors to the universe of archaeological discourse. Like living history re-enactment experiences, «these are quite good at intimate vignettes but poor at linking them in to wider trends and long run processes» (Crang 2003, 264-265).

Virtualisation of artefacts, on the other hand, is based on the availability of digital reproductions of archaeological objects, supplemented by adequate representations of information pertaining to them, typically organised in the form of digitised collections or archives (HATII, NINCH 2003; Hughes 2004). While in examples discussed so far with regard to site virtualisation the focus is on spatial relationships – either in the sense of archaeological excavation context or, more commonly, in the sense of architectural virtual reconstruction – here the emphasis is on the presentation and analysis of the form, function and meaning of individual artefacts, and their contextualisation in typologies and syntagmatic contexts.

A common approach is based on the virtualisation of the museum exhibition catalogue or *catalogue raisonné*, and providing access to core inventory record information, exhibition *lemma* and pictures (or 3D visual representations) of artefacts, by means of browsing, indexes on important attributes (such as object name, period, creator, provenance, etc.), and search functions. The *genre* was established with the success of the London National Gallery's *Micro Gallery* installation and derivative *Microsoft® Art Gallery* CD-ROMs (Morrison 1995), and appears also frequently in archaeological and ancient art virtual exhibitions organized by museums, such as the *Glory of Byzantium* (Metropolitan Museum of Art 2000) and the *One Million Days in China* (The Burrell Collection, Alienation Design 2004) virtual exhibitions, the former following more closely the format of a traditional exhibition catalogue, presenting object information with a thumbnail picture linked to a medium-sized picture of each exhibit, the latter combining object presentation with a form to order a print of exhibition images. *Eternal Egypt* (CULTNAT – Egyptian Center for Documentation of Cultural and Natural Heritage, IBM Corporation 2005) adopts a structured, embedded links approach, encouraging, for each exhibit, navigation to related objects according to several different object cataloguing attributes such as object name, culture, technique, style, material, period and location, approximating more closely an hypermedia database front end than an online catalogue.

Textual information, in these virtual exhibitions, follows an authoritative, neutral voice ranging from that of a full exhibition catalogue *lemma* to a shorter exhibition label. In the *Cloth and Clay: Communicating culture* virtual exhibition, on the other hand, objects are presented "in [their] own words", offering a first person account of their form, function, deposition and discovery: «I began my life as a simple lump of clay – not just any lump, but special clay extracted from a prized resource and used only for the making of fine ceramic objects like me. The hands of a skilled professional potter molded me into my hollow shape, with my armbands, nose-ring, ear ornaments, game ball, and braided clay coils added with great care and detail. […] I am a representation of a ballplayer, from the West Mexican state of Nayarit or possibly from Jalisco» (Shaughnessy *et al.* 2002).

While the personal voice does much to animate the relationship between visitor and exhibit, this first person account is little more than a rhetorical *trope*, as all the information conveyed through the artefact's account is a straightforward transference of the all-knowing, authoritative voice of archaeological authority. The agency of the object (Gell 1998), which could be manifested through the possibility of juxtaposition with other objects, contextualisation, annotation and surprise, is not called upon in this virtual exhibition; this is no *biographical object* (Kopytoff 1986), as its biography is little more than the factual account of the episodes of its existence, from creation to collection.

However, it is the *themed virtualisation* of the illustrated essay, presenting in written text an account of archaeological objects and their identification, history and interpretation, and linked to pictorial and multimedia documentation, which predominates as the most common *genre* of virtual exhibition. *The Sensuous and the Sacred: Chola Bronzes from South India* at Washington's Sackler Gallery provides, for instance, a step-by-step illustration of the *cire perdue* bronze working process, as well as contextual essays on the history and culture of the Chola dynasty period, and on the iconography of bronzes exhibited (Arthur M. Sackler Gallery 2003). The majority of virtual exhibitions presenting archaeological artefacts are structured around a thematic presentation of topics based on text, illustrated by photographs, videos or 3D animations of objects, and linked in a hypertextual, interconnected structure.

The Sport of Life and Death: The Mesoamerican Ballgame, a monographic virtual exhibition on the ballgame played throughout Mesoamerica from about 1800 BC to the Spanish conquest (Mint Museum of Art, Interactive Knowledge Inc. 2002; Whittington, Barger 2002) uses text, but also an extensive web of Quicktime VR animation, drawings and illustrations, audio and video files around an original clay model of the ball court, together with quiz activities, to provide an educational complement to the homonymous travelling exhibition and scholarly catalogue. The clay model itself is presented through video, displaying different general and detail views of the model, and exploring various aspects of the game, its rules, players and spectators; related artefacts, sites of ballgame courts, and textual sources are used to illustrate diverse aspects of meaning relating to the main exhibit. A *reflexive* element is introduced by a presentation of a contemporary re-enactment of the ballgame, and a "Now and then" section is used to draw analogies with modern spectator sports. All in all, the extensive use of multimedia appears to fit well the needs of themed virtualisation illustrated by this example.

6. Conclusions

Some general observations on the scope of approaches to archaeological virtualisation presented above are called for. Firstly, it appears that the full realisation of the value of specific applications cannot be achieved by establishing a formal "dividing line" between the pre-scripted, multimedia elements in the virtual exhibition, and the associated knowledge assets, annotations and functionalities accompanying them; the symbolic barrier between exhibition space and other areas in a traditional museum – educational programmes halls, library, front desk and interaction with docents – makes little sense in the open ended navigation environment of a hypermedia application on the World Wide Web, where visitors are free to roam between frames of a

multimedia presentation, themed textual commentary, interactive activities, and a research database. Modes of virtualisation are typically mixed, and the effects to visitors – affective, cognitive and social – are the result of the overall configuration, rather than a single element. In fact, some of the most interesting cases examined, as regards the possibilities they raise for archaeological meaning construction, are those of fully dynamic, evolving cases of virtualised archaeological experiences, such as the live presentations of *Time Team Live*, and the diverse public communication experiments of members of the Çatalhöyük team.

Secondly, in terms of archaeological meaning and mode of representation, while one might think that interactive multimedia would provide an ideal medium for an exciting and effective communication of essential archaeological methods, such as stratigraphy and typology, these are largely ignored in virtual exhibitions and are thus relegated – with few exceptions of educational games, abstracting these methods into simplified models – to access by the specialist, rather than the amateur. Indeed, contextual archaeological knowledge is more often presented in the processed, summative form of thematic essays, illustrated by visual examples, rather than by direct examination of archaeological argument emerging from, and verifiable through, stratigraphic or typological analysis processes; visualisation of formal analyses, in the guise of statistical diagrams, charts and data-driven maps, are equally lacking. On the other hand, the presentation of museum-based ancient art is common; while, ironically, the "primacy of the object" and the resulting aura of authenticity is typically asserted much more firmly for works of art, it is these that are often presented as digital surrogates in a virtual catalogue format, in the tradition of an *imaginary museum* (Rieusset-Lemarié 1999) and of physical "aesthetic exhibitions". In addition, some archaeological virtual exhibitions make use of personal, reflexive commentary, of fiction, or of interactive games in order to encourage personal engagement between objects, exhibition makers and virtual visitors, in line with the 'phenomenological turn' apparent in archaeological scholarship and in museum studies at large. On the whole, virtual exhibitions examined tend to focus on idiographic, rather than nomothetic, aspects of archaeological knowledge.

Thirdly, in most cases, archaeological meaning is generated through the hand-crafted, designed-in-the-small authoring of text, image and multimedia information units by virtual exhibition makers. The voice and the rhetorical features employed vary, from the first-person, action-oriented style of constructivist learning experience to the neutral language of an archaeological research report. Even when a reflexive, personal voice is summoned, it carries a more or less closed account of the author's *interpretation* of an archaeological situation, rather than an invitation to explore archaeological *evidence* against multivocal archaeological argument. As noted by the author of the virtually recreated

tomb of Tutankhamun, "technology has progressed to a point where visitors are empowered to select from multiple context-generating frameworks" (Tolva 2005); but, in the absence of functionalities foregrounding the viewpoint of virtual visitors – there is still minimal occurrence of wikis, weblogs, discussion forums, comment fields, social tags, personalisation features, visitor presence trails, and, in general, Web 2.0 features among most virtual exhibitions examined – and their co-operative involvement in the construction of meaning is not manifested in the "inscribed memory" of the interface.

Finally, there is still minimal effort in the direction of activating archaeological knowledge through the data structuring and algorithmic capabilities afforded by information technology. Current generation archaeological virtual exhibitions are not, as a rule, designed "in the large" on the basis of latent knowledge and rhetorical structures (Garzotto *et al.* 1991), and, as hypermedia applications, they are not endowed with a strong semantic conception of their own structure and content; and, while conceptual analysis for artefact-based cultural heritage information has reached a point of maturity in the form of the CIDOC Conceptual Reference Model international standard (ISO Technical Committee 46 2006), and the generic concepts of information structuring and access in hypermedia applications are relatively well understood (Garzotto *et al.* 1993), the domain-specific *genres,* atomic patterns and levels of articulation employed by virtual exhibitions intended to communicate archaeological knowledge have yet to be adequately defined and analysed (despite some preliminary work by Minerva Working Group 5 2003; van Welie, Klaassen 2004). The calls to go "beyond wonderful images", to present "archaeology in action", "to show processes in action rather than static descriptions of them", to use technology as "a metaphor engine", and to enable "procedural authorship" (Dietz 1999) of user experiences are yet to be realised, as archaeological meaning in most virtual exhibitions remains entrapped in information objects such as text snippets and images, which are not represented, annotated and organised in ways reflecting their signifying structure.

We have attempted in this paper to sketch out an account linking the historical development of archaeology, and the construction of diverse kinds of archaeological knowledge, with exhibition as a medium of public communication; we have, then, attempted to discuss of virtual exhibition in the context of virtual museums, presented the notion of virtualisation as the pertinent trait of archaeological virtual exhibitions, and suggested some ideas about their content, formal representation and affordances. Yet we should not miss the fact that virtual exhibitions are still fledgling, unstable practices, ignored by the majority of the archaeological public. Most people who responded to a recent survey among museum goers in Britain, while welcoming the use of technology in the gallery, were unaware of virtual mu-

seums; they stated that they were «unclear of the benefits [a virtual museum] might offer to them and were less sure of using this at home» (Davies 2005, 98-99). Most mainstream archaeologists are rather disinterested in public communication in general, most archaeological museums shy away from information technology as a tool for public communication, and archaeological virtual exhibitions remain relatively rare, despite the fact that there is a strong case for their necessity (Zanini 2004) in the context of what we might humorously call "archaeological social responsibility". Some key issues, regarding the construction of archaeological meaning through virtual exhibitions, depend on the way empirical users "exercise" actual virtual exhibitions, and it is clear that more evidence in this field will increase significantly our understanding.

There are several important questions which were tackled here only partially, or not at all. What are archaeological virtual exhibitions as *media,* and how do they relate with the history of archaeological communication? What is an adequate calculus for conceptualising the syntax and semantics of virtual exhibitions, and how does it fit operationally in the context of international conceptual standards for cultural information? What are the discursive forms of archaeological virtual exhibitions, between narrative, database, and argumentation; textual, visual and cinematic rhetorics? What are their affordances, which literacies do they presuppose of their visitors, and how do they relate to our current understanding of the role of archaeologists and audiences? Which formalisms, methods and tools are, finally, appropriate in order to fulfil the promise of "richer and higher impact communication" of archaeology with broader audiences?

As archaeological virtual exhibitions will multiply, and as they will be identified increasingly, through interaction and annotation, as manifestations of our own social understanding of the past, the formal and semantic properties of virtual exhibitions will emerge as a significant issue in the context of archaeological *digital curation*. As advocated in this paper, further work requires not only unification with relevant research and practice in information and communication technologies, but also further reflection, research and operationalisation through practical systems of the multiple fields relating archaeological knowledge with the production of archaeological meaning through virtualisation. The wealth of research contributions relevant to this problem, and cited here, as well as the magnitude of important questions that remain unanswered, bear witness to the fact that this is a promising domain for further investigation in the context of archaeological informatics.

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REFERENCES

Archives & Museum Informatics 2006, *Best of the Web, Museums and the Web 2006*, Website, Archives & Museum Informatics (http://www.archimuse.com/mw2006/best/index.html).

Arthur M. Sackler Gallery 2003, *The Sensuous and the Sacred: Chola Bronzes from South India*, Arthur M. Sackler Gallery, Smithsonian Institution (http://www.asia.si.edu/exhibitions/online/chola/chola.htm).

Ashley Lopez M. 2003, *RAVE: Real Audiences. Virtual Excavations*, Virtual exhibition, Multimedia Authoring Center for Teaching in Archaeology, University of California, Berkeley (http://www.mactia.berkeley.edu/features/rave/default.html).

Aujoulat N., Michoud S. 1998, *La grotte de Lascaux*, Virtual exhibition, Ministère de la culture et de la communication, République Française.

Barceló J.A., Forte M., Sanders D.H. 2000a, *Virtual Reality in Archaeology,* Oxford, Archaeopress.

Barceló J.A., Forte M., Sanders D.H. 2000b, *The diversity of archaeological virtual worlds*, in Barceló, Forte, Sanders 2000a (http://www.learningsites.com/Support_pages/BFS_VRinA_intro.html).

Barker E. 1999, *Contemporary Cultures of Display,* New Haven, Conn.-London, Yale University Press.

Bearman D. 1996, *Overview and discussion points*, in Getty Art History Information Program (ed.), *Research Agenda for Networked Cultural Heritage*, Santa Monica, CA, Getty AHIP, 7-22.

Bearman D., Trant J. (eds.) 1997, *Museums and the Web '97: Selected Papers*, Pittsburgh, Archives & Museum Informatics.

Belcher M. 1991, *Exhibitions in Museums,* Leicester, Leicester University Press.

Besser H. 1997, *Integrating collections management information into on-line exhibits: The web as a facilitator for linking two separate processes*, in Bearman, Trant 1997, 201-205.

Bianchi Bandinelli R., Franchi dell'Orto L. 1976, *Introduzione all'archeologia,* Roma-Bari, Universale Laterza.

Blackaby J. 1997, *Building integrated museum information retrieval systems: Practical approaches to data organisation and access*, in Bearman, Trant 1997, 128-133.

Boardman J.S. 1996, *Greek Art,* London, Thames and Hudson.

Bowen J.P. 1994, *Virtual Library Museums Pages*, Website, International Council of Museums (http://icom.museum/vlmp/).

Brochu D., Davallon J., Camirand C., Gottesdiener H., Le Marec J., Lemieux A., Poli M.-S., Tari K. 1999, *Les musées face à l'édition multimédia,* Dijon, OCIM.

Çatalhöyük Research Project n.d., *Çatalhöyük: Excavations of a Neolithic Anatolian Höyük*, 6 November 2006, McDonald Institute for Archaeological Research, University of Cambridge (http://www.catalhoyuk.com/).

Clarke D.L. 1972, *Models in Archaeology,* London, Methuen.

Clarke D.L. 1977, *Spatial Archaeology,* London-New York, Academic Press.

Clarke D.L. 1978, *Analytical Archaeology,* New York, Columbia University Press.

Clifford J. 1997, *Museums as Contact Zones. Routes, Travel and Translation in the Late Twentieth Century*, Cambridge, Mass.-London, Harvard University Press, 188-219.

Connerton P. 1989, *How Societies Remember*, Cambridge-New York, Cambridge University Press.

Copeland C. 2006, *Out of our mines! A retrospective look at on-line museum collections-based learning and instruction (1997-2006)*, in J. Trant, D. Bearman (eds.), *Museums and the Web 2006*, Albuquerque, NM, Archives & Museum Informatics (http://www.archimuse.com/mw2006/papers/copeland/copeland.html).

Copeland T. 2004, *Presenting archaeology to the public*, in N. Merriman (ed.), *Public Archaeology*, London-New York, Routledge, 132-144.

Corcoran F., Demaine J., Picard M., Dicaire L.-G., Taylor J. 2002, *INUIT3D: An interactive virtual 3D web exhibition*, in J. Trant, D. Bearman (eds.), *Museums and the Web 2002*, Boston, Archives & Museum Informatics (http://www.archimuse.com/mw2002/papers/corcoran/corcoran.html).

Crang M. 2003, *On display: The poetics, politics and interpretation of exhibitions*, in M. Ogborn, A. Blunt, P. Gurffudd, J. May, D. Pinder (eds.), *Cultural Geography in Practice*, 255-268 (http://eprints.dur.ac.uk/archive/00000062/).

CULTNAT – Egyptian Center for Documentation of Cultural and Natural Heritage, IBM Corporation 2005, *Eternal Egypt*, The Supreme Council of Antiquities, Egypt (http://www.eternalegypt.org/).

Dallas C. 1994, *A new agenda for museum information systems*, in S. Ross (ed.), *Problems and Potentials of Electronic Information in Archaeology Conference: Pre-circulated Papers*, London, British Library, 251-264.

Dallas C. 1997, *A step beyond reading in archaeological publication: Internet Archaeology, issue 1*, «Archives and Museum Informatics», 11, 55-64.

Dallas C., Smith P., Lock G.R., Cornforth J., Davidson C. 1993, *Digital multimedia and Classical culture: The Sacred Way perspective*, in D.A. Roberts (ed.), *European Museum Documentation: Strategies and Standards*, Cambridge, Museum Documentation Association, 117-130.

Daniels-Dwyer R. 2004, *Beyond the artist's impression: From photo-realism to integrated reconstruction in buildings archaeology*, in J.H. Jameson (ed.), *The Reconstructed Past: Reconstructions in the Public Interpretation of Archaeology and History*, Walnut Creek, Calif.-Oxford, AltaMira Press, 261-270.

Davallon J. 1999, *L'exposition à l'oeuvre: stratégies de communication et médiation symbolique,* Paris, L'Harmattan.

Davies S. 2005, *Still popular: Museums and their visitors 1994-2004*, «Cultural Trends», 14, 1, 67-105.

Deloche B. 2001, *Le musée virtuel: vers une éthique des nouvelles images,* Paris, Presses Universitaires de France.

Dicks B. 2003, *Culture on Display: The Production of Contemporary Visitability,* Maidenhead, Berks., Open University Press.

Dietz S. 1999, *Telling stories: Procedural authorship and extracting meaning from museum databases*, in *Museums and the Web 1999*, New Orleans, Archives & Museum Informatics (http://www.archimuse.com/mw99/papers/dietz/dietz.html).

Dietz S., Besser H., Borda A., Lévy P. 2004, *Virtual Museum (of Canada): The Next Generation*, Canadian Heritage Information Network (http://www.chin.gc.ca/English/Pdf/Members/Next_Generation/vm_tng.pdf).

Dixon S.M. 2005, *Illustrating ancient Rome, or the ichnographia as uchronia and other time warps in Piranesi's Il Campo Marzio*, in Smiles, Moser 2005, 115-132.

Djindjian F. 2002, *Pour une théorie générale de la connaissance en archéologie*, in F. Djindjian, P. Moscati (eds.), *Commission IV. Data Management and Mathematical Methods in Archaeology. Proceedings of Symposia 1.3, 1.5, 1.8, 1.10, 14th UISPP Congress (Liège 2001)*, «Archeologia e Calcolatori», 13, 101-117.

Djindjian F. 2004, *La publication scientifique en langue naturelle est-elle en archéologie un discours logique? Essais de conception d'un language cognitif d'aide à la publication*, in Moscati 2004, 51-61.

Doerr M. 2003, *The CIDOC Conceptual Reference Model: An ontological approach to semantic interoperability of metadata*, «AI Magazine», 24, 3, 75-92.

Earl G.P. 2005, *Video killed engaging VR? Computer visualisations on the TV screen*, in Smiles, Moser 2005, 204-222.

Frischer B., Nicolucci F., Ryan N., Barceló J.A. 2001, *From CVR to CVRO: The Past, Present and Future of Cultural Virtual Reality* (http://www.cvro.org).

GARDIN J.C. 1980, *Archaeological Constructs: An Aspect of Theoretical Archaeology,* Cambridge-New York, Cambridge University Press.

GARDIN J.C. 1994, *The consequences, good or bad, of taking knowledge bases seriously*, in S. ROSS (ed.), *Problems and Potentials of Electronic Information in Archaeology Conference: Pre-circulated Papers*, London, British Academy & British Council of Archaeology.

GARDIN J.C. 1999, *Calcul et narrativité dans les publications archéologiques*, «Archeologia e Calcolatori», 10, 63-78 (http://soi.cnr.it/archcalc/indice/PDF10/10_05_Gardin.pdf).

GARZOTTO F., PAOLINI P., SCHWABE D. 1991, *Authoring-in-the-large: Software engineering techniques for hypertext application design*, in *Proceedings of the 6th International Workshop on Software Specification and Design (Como, Italy)*, IEEE Computer Society Press (http://portal.acm.org/ft_gateway.cfm?id=952814&type=pdf&coll=GUIDE&dl=GUIDE&CFID=2145142&CFTOKEN=71415201).

GARZOTTO F., PAOLINI P., SCHWABE D. 1993, *HDM – A model-based approach to hypertext application design*, «ACM Transactions on Information Systems», 11, 1, 1-26.

GELL A. 1998, *Art and Agency: An Anthropological Theory,* Oxford, Clarendon Press.

GELL A. 1999, *Vogel's net: Traps as artworks and artworks as traps*, in A. GELL (ed.), *The Art of Anthropology: Essays and Diagrams*, London School of Economics Monographs on Social Anthropology, London, Berg, 187-214.

GIBSON J.J. 1979, *The Ecological Approach to Visual Perception,* New York, Houghton Mifflin.

GILLINGS M. 2005, *The real, the virtually real, and the hyperreal: The role of VR in archaeology*, in SMILES, MOSER 2005, 223-239.

HAMILAKIS Y. 1999, *Stories from exile: Fragments from the cultural biography of the Parthenon (or 'Elgin') marbles*, «JSTOR», 303-320.

HAMILAKIS Y., PLUCIENNIK M., TARLOW S. 2001, *Academic performances, artistic presentations*, «Assemblage», 6 (http://ads.ahds.ac.uk/catalogue/adsdata/assemblage/html/6/art_web.html).

HANSEN N. 1997-2006, *Theban Mapping Project*, American University of Cairo, Second Story (http://www.thebanmappingproject.com).

HATII, NINCH 2003, *The NINCH Guide to Good Practice in the Digital Representation and Management of Cultural Heritage Materials (February 2003)*, Humanities Advanced Technology and Information Institute, University of Glasgow; National Initiative for a Networked Cultural Heritage (http://www.nyu.edu/its/humanities/ninchguide/).

HEMMINGS T., RANDALL D., FRANCIS D., MARR L., DIVALL C., PORTER G. 1997, *Situated knowledge and the Virtual Science and Industry Museum: Problems in the social-technical interface*, «Archives and Museum Informatics», 7, 2, 147-164 (http://dx.doi.org/10.1023/A:1009007316752).

HERTZUM M. 1999, *A review of Museum Web sites: In search of user-centred design*, «Archives and Museum Informatics», 12, 2, 127-138.

HODDER I. (ed.) 1982, *Symbolic and Structural Archaeology*, New York, Cambridge University Press.

HODDER I. 1997, *'Always momentary, fluid and flexible': Towards a reflexive excavation methodology*, «Antiquity», 71, 273, 691-700.

HODDER I. 2003, *Archaeological reflexivity and the "local" voice*, «Anthropological Quarterly», 76, 1, Winter, 55-69 (http://muse.jhu.edu/journals/anthropological_quarterly/v076/76.1hodder.pdf).

HOLTORF C.J. 1998, *The monumental past: The life-histories of megalithic monuments in Mecklenburg-Vorpommern (Germany)*, A living text based on a doctoral dissertation submitted to the University of Wales (Lampeter) in 1998, T-Space: University of Toronto Research Repository (https://tspace.library.utoronto.ca/citd/holtorf/0.1.html).

HOOPER-GREENHILL E. 1992, *Museums and the Shaping of Knowledge,* London-New York, Routledge.

HOOPES J.W. 1997, *The future of the past: Archaeology and anthropology on the World Wide Web*, «Archives and Museum Informatics», 11, 2, 87-105 (http://www.ku.edu/~hoopes/mw/).

Hoopes J.W. 1999, *Networks: Avoiding the driest dust that blows. Web site reports*, «Society for American Archaeology Bulletin», 17, 1 (http://www.saa.org/publications/saabulletin/17-1/SAA18.html).

Huggett J., Ross S. 2004, *Introduction*, in J. Huggett, S. Ross (eds.), *Archaeological Informatics. Beyond Technology*, «Internet Archaeology», 15, Themed Issue (http://intarch.ac.uk/journal/issue15/index.html).

Hughes L.M. 2004, *Digitizing Collections: Strategic Issues for the Information Manager,* London, Facet Publishing.

ISO Technical Committee 46 2006, *ISO 21127: 2006, Information and documentation – A reference ontology for the interchange of cultural heritage information*, ISO, International Organization for Standardization (http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=34424&scopelist=PROGRAMME).

Jablonka P. 2004, *Troia VR*, Website, Troia-Projekt, Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Eberhard Karls Universität Tübingen (http://www.uni-tuebingen.de/troia/vr/vr0501_en.html).

Johnson B. 2005, *Place-based storytelling tools: A new look at Monticello*, in J. Trant, D. Bearman (eds.), *Museums and the Web 2005*, Vancouver, Archives & Museum Informatics (http://www.archimuse.com/mw2005/papers/22johnsonB/johnsonB.html).

Kopytoff I. 1986, *The cultural biography of things*, in A. Appadurai (ed.), *The Social Life of Things: Commodities in Cultural Perspective*, Cambridge, Cambridge University Press, 64-91.

Latour B. 1987, *Science in Action: How to Follow Scientists and Engineers through Society,* Milton Keynes, Open University Press.

Lawrence A.W., Tomlinson R.A. 1996, *Greek Architecture,* New Haven-London, Yale University Press.

Leinhardt G., Crowley K. 1998, *Museum learning as conversational elaboration: A proposal to capture, code, and analyze talk in museums*, Museum Learning Collaborative Technical Report #MLC-01 (November 1998) (http://mlc.lrdc.pitt.edu/mlc).

Lowenthal D. 1985, *The Past is a Foreign Country,* Cambridge-New York, Cambridge University Press.

Mann W.C. 2005, *Rhetorical Structure Theory Web Site* (http://www.sfu.ca/rst).

Mann W.C., Thompson S.A. 1987, *Rhetorical Structure Theory: A Theory of Text Organization*, Marina del Rey, CA, Information Sciences Institute.

Manovich L. 2001, *The Language of New Media,* Cambridge, Mass., MIT Press.

Mattison D. 2006, *Digging up the virtual past: The archaeology of ancient Greece and Rome on the web*, «Searcher», 14, 2, 20-28 (http://pqasb.pqarchiver.com/infotoday/docsearch?7816985097261).

McClung Fleming E. 1974, *Artifact study: A proposed model*, «Winterthur Portfolio», 9, 153-173.

McDavid C. 2002, *Archaeologies that hurt; descendants that matter: A pragmatic approach to collaboration in the public interpretation of African-American archaeology*, «World Archaeology», 34, 2, Community archaeology, 303-314 (http://www.jstor.org/cgi-bin/jstor/printpage/00438243/ap030103/03a00060/0.pdf?backcontext=page&dowhat=Acrobat&config=jstor&userID=87203102231@ucl.ac.uk/01cc9933133d4410e47cb93ba&0.pdf).

Merriman N. 2004a, *Introduction: Diversity and dissonance in public archaeology*, in N. Merriman (ed.), *Public Archaeology*, London-New York, Routledge, 1-17.

Merriman N. 2004b, *Involving the public in museum archaeology*, in N. Merriman (ed.), *Public Archaeology*, London-New York, Routledge, 85-108.

Metropolitan Museum of Art 2000, *The Glory of Byzantium: Art of the Byzantine World*, Metropolitan Museum of Art (www.metmuseum.org/explore/byzantium/byzhome.html).

Mills S., Tringham R. 2006, *CatVidPlace project: Collaboration on the senses of place*, Weblog posting, 22 May 2006, *Archaeoblog: all things archaeological* (http://traumwerk.stanford.edu/archaeolog/2006/05/catvidplace_project_collaborat.html).

MINERVA WORKING GROUP 5 2003, *Handbook for Quality in Cultural Web Sites: Improving Quality for Citizens*, version 1.2 (draft), Minerva Project (http://www.minervaeurope.org/publications/qualitycriteria1_2draft.htm).

MINT MUSEUM OF ART, INTERACTIVE KNOWLEDGE INC. 2002, *The Sport of Life and Death: The Mesoamerican Ballgame*, Mint Museum of Art (http://www.ballgame.org).

MITCHELL W.J. 1995, *City of Bits: Space, Place, and the Infobahn,* Cambridge, Mass.-London, MIT Press.

MORRISON A. 1995, *The Micro Gallery – Observations from three projects: London; San Diego; Washington DC*, in D. BEARMAN (ed.), *Hands On: Hypermedia & Interactivity in Museums Selected Papers from the Third International Conference on Hypermedia and Interactivity in Museums (ICHIM 95/MCN 95, San Francisco, CA)*, Archives & Museum Informatics, 13-20 (http://www.archimuse.com/publishing/ichim95_vol2/morrison.pdf).

MOSCATI P. (ed.) 2004, *Nuove frontiere della ricerca archeologica. Linguaggi, comunicazione, informatica – New Frontiers of Archaeological Research. Languages, Communication, Information Technology*, «Archeologia e Calcolatori», 15.

PEARCE S.M. (ed.) 1994, *Interpreting Objects and Collections,* London-New York, Routledge.

PEARSON M., SHANKS M. 2001, *Theatre/Archaeology: Reflections on a Hybrid Genre,* London-New York, Routledge.

PERROT X. 1999, *L'avenir du musée à l'heure des médias interactifs*, in D. CHATEAU, B. DARRAS (eds.), *Arts et multimédia: l'oeuvre d'art et sa reproduction à l'ère des médias interactifs*, Paris, Publications de la Sorbonne, 149-158.

PLATT S., REYNOLDS M. 1997-2006, *Time Team Website*, Website, Channel 4 (http://www.channel4.com/history/timeteam/).

REILLY P. 1989, *Data visualisation in archaeology*, «IBM Systems Journal», 28, 4, 569-579 (http://www.research.ibm.com/journal/sj/284/ibmsj2804F.pdf).

REILLY P. 1991, *Towards a virtual archaeology*, in K. LOCKYEAR, S.P.Q. RAHTZ (eds.), *Computer Applications and Quantitative Methods in Archaeology 1990*, BAR International Series 565, Oxford, Tempus Reparatum, 133-139.

REILLY P., RAHTZ S. (eds.) 1992, *Archaeology and the Information Age,* London, Routledge.

RICHARDS J.C., ROBINSON D. 2000, *Digital Archives from Excavation and Fieldwork: A Guide to Good Practice*, Oxford, Oxbow Books.

RIEUSSET-LEMARIÉ I. 1999, *Du musée imaginaire aux musées virtuels: l'oeuvre d'art à l'époque de sa reproduction métamorphique*, in D. CHATEAU, B. DARRAS (eds.), *Arts et multimédia: l'oeuvre d'art et sa reproduction à l'ère des médias interactifs*, Paris, Publications de la Sorbonne, 175-188.

ROBERTS J.C., RYAN N. 1997, *Alternative archaeological representations within virtual worlds*, in R. BOWDEN (ed.), *Proceedings of the 4th UK Virtual Reality Specialist Interest Group Conference*, London, Brunel University, 179-188 (http://www.cs.kent.ac.uk/pubs/1997/522/).

ROBERTSON M. 1975, *A History of Greek Art,* London, Cambridge University Press.

ROUSSOU M. 2002, *Virtual heritage: From the research lab to the broad public*, in F. NICOLUCCI (ed.), *Virtual Archaeology. Proceedings of the VAST Euroconference (Arezzo 2000)*, BAR International Series 1075, Oxford, Archaeopress, 93-100.

ROWLANDS M. 1993, *Role of memory in the transmission of culture*, «World Archaeology», 25, 2, 142-151.

SCHNAPP A. 1996, *The Discovery of the Past: The Origins of Archaeology*, London, British Museum.

SCHWEIBENZ W. 1998, *The "Virtual Museum": New perspectives for museums to present objects and information using the Internet as a knowledge base and communication system*, in H.H ZIMMERMANN, V. SCHRAMM (eds.), *6 Internationalen Symposiums für Informationswissenschaft (ISI '98 Prag), Schriften zur Informationswissenschaft 14, Knowledge Management und Kommunikationssysteme Workflow Management, Multimedia, Knowledge Transfer*, Konstanz, UKV, 185-200.

Science Museum of Minnesota 2001, *Mysteries of Çatalhöyük! An Archaeological Investigation*, Science Museum of Minnesota (http://www.smm.org/catal/).

Shanks M. 1996, *Classical Archaeology of Greece: Experiences of the Discipline,* London-New York, Routledge.

Shanks M., Tilley C.Y. 1992, *Re-constructing Archaeology: Theory and Practice,* London-New York, Routledge.

Shaughnessy R., Wolfe D., Dalrymple J. 2002, *Cloth & Clay: Communicating Culture*, Web exhibition, Virtual Museum of Canada, Textile Museum of Canada, Gardiner Museum of Ceramic Art (http://www.textilemuseum.ca/cloth_clay/home.html).

Shum S.B., Domingue J., Motta E. 2000, *Scholarly Discourse as Computable Structure. Lecture Notes in Computer Science: Open Hypermedia Systems and Structural Computing. 6th International Workshop, OHS-6, 2nd International Workshop, SC-2 (San Antonio, Texas, 2000) Proceedings*, 120-128 (http://www.springerlink.com/content/wm1qd0e0vjkqtuxe).

Shum S.B., Selvin A.M. 2001, *Structuring discourse for collective interpretation*, in *Distributed Collective Practices 2000: Conference on Collective Cognition and Memory Practices (Paris 2000)* (http://kmi.open.ac.uk/publications/pdf/kmi-01-1.pdf).

Smiles S., Moser S. (eds.) 2005, *Envisioning the Past: Archaeology and the Image,* Malden, MA-Oxford, Blackwell.

Snodgrass A.M. 1992, *An Archaeology of Greece: The Present State and Future Scope of a Discipline*, Oxford, University of California Press.

Spivey N.J. 1997, *Understanding Greek Sculpture: Ancient Meanings, Modern Readings,* London, Thames and Hudson.

Stumpfel J., Tchou C., Hawkins T., Martinez P., Emerson B., Brownlow M., Jones A., Yun N., Devebec P. 2003, *Digital reunification of the Parthenon and its sculptures*, in D. Arnold, A. Chalmers, F. Niccolucci (eds.), *4th International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage VAST*, The Eurographics Association (http://gl.ict.usc.edu/parthenongallery/ParthenonSculptures-Vast03-fin-prt.pdf).

Sumption K. 2000, *Meta-centers: Do the work and what might the future hold? A case study of Australian Museums on-line*, in *Museums and the Web 2000*, Minneapolis, Archives and Museum Informatics (http://www.archimuse.com/mw2000/papers/sumption/sumption.html).

Sumption K. 2006, *In search of the ubiquitous digital museum: Reflections of ten years of Museums and the Web*, in *Museums and the Web 2006*, Albuquerque, NM, Archives and Museum Informatics (http://www.archimuse.com/mw2006/papers/sumption/sumption.html).

The Burrell Collection, Alienation Design 2004, *One Million Days in China*, Glasgow Museums (http://www.glasgowmuseums.com/onemilliondaysinchina/).

Tilley C.Y. 1994, *A Phenomenology of Landscape: Places, Paths, and Monuments,* Oxford-Providence, R.I., Berg.

Tolva J. 2005, *Recontextualizing the collection: Virtual reconstruction, replacement, and repatriation*, in *Museums and the Web 2005,* Vancouver (http://www.archimuse.com/mw2005/papers/tolva/tolva.html).

Trant J. 1998, *When all you've got is "the real thing": Museums and authenticity in the networked world*, «Archives and Museum Informatics», 12, 107-125.

Trigger B.G. 1989, *A History of Archaeological Thought,* Cambridge-New York, Cambridge University Press.

Tringham R., Ashley M., Liao J. n.d., *Chimera Web*, University of California Berkeley (http://bmrc.berkeley.edu/people/tringham/chimera.html).

Tsichritzis D., Gibbs S. 1991, *Virtual museums and virtual realities*, in D. Bearman (ed.), *Hypermedia & Interactivity in Museums*, Pittsburgh, Archives & Museum Informatics, 7-16.

van Dyke R.M., Alcock S.E. (eds.) 2003a, *Archaeologies of Memory,* Maiden, MA, Blackwell.

van Dyke R.M., Alcock S.E. 2003b, *Archaeologies of memory: An introduction*, in van Dyke, Alcock 2003a, 8-13 (https://www.blackwellpublishing.com/content/BPL_Images/Content_store/Sample_chapter/0631235841/AOM1.pdf).

van Welie M., Klaassen B. 2004, *Evaluating Museum Websites using Design Patterns*, Technical report number: IR-IMSE-001 (December 2004).

Walsh P. 1997, *The Web and the Unassailable Voice*, «Archives and Museum Informatics: Cultural Heritage Quarterly», 11, 2, 77-85

Welger-Barboza C. 2001, *Du musée virtuel au musée médiathèque: le patrimoine à l'ère du document numérique,* Paris, Harmattan.

Whittington M., Barger C. 2002, *Integrating a traveling exhibit, catalog and educational web site*, in *Museums and the Web 2002*, Boston, Archives & Museum Informatics (http://www.archimuse.com/mw2002/papers/whittington/whittington.html).

Witcomb A. 2003, *Re-imagining the Museum: Beyond the Mausoleum*, London, Routledge.

Witmore C.L. 2004, *On multiple fields. Between the material world and media: two cases from the Peloponnesus, Greece*, «Archaeological Dialogues», 11, 2, 133-164.

Yun N. 2003, *The Parthenon Sculpture Gallery*, Website, University of Southern California (http://gl.ict.usc.edu/parthenongallery/).

Zanini E. 2004, *Scrivere per il multimediale: alcune riflessioni di un non-specialista, a partire da un'esperienza recente*, in Moscati 2004, 63-80.

ABSTRACT

The Author makes some general observations on the scope of various approaches to archaeological virtualisation, with particular reference to virtual exhibitions. He examines some interesting fully dynamic, evolving case-studies and, linking the historical development of archaeology to that of different kinds of archaeological knowledge, he highlights the possibilities offered by hypermedia applications on the World Wide Web not only for public communication, but also for archaeological meaning construction and mode of representation. The overall discussion points include virtual exhibition in the context of virtual museums, the notion of virtualisation and some ideas on content, formal representations and affordances. At the same time, the Author complains that virtual exhibitions are still fledgling, unstable practices, ignored by the majority of the archaeological public and, at the same time, by most mainstream archaeologists and most archaeological museums. Further work requires unification with relevant research and practice in Information and Communication Technologies, but also further reflection and research on the production of archaeological meaning through virtualisation.