The 5th International Symposium on Virtual Reality, Archaeology and Cultural Heritage VAST (2004)
K. Cain, Y. Chrysanthou, F. Niccolucci, N. Silberman (Editors)

Digital Meanders Through a Dusty Archaeology: a Web-Based Exploration of Excavation Practice

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Abstract

This paper describes a multimedia application developed during fieldwork at Quseir al-Qadim, Egypt. It discusses the role of such technologies in exploring the creation of pasts, particularly through narrative and personal experience and identifies further strands of development in the light of results to date. A concrete application of multimedia technologies, the research described draws on a diversity of archaeological knowledge, seeking to represent this diversity and the contingency of resulting archaeologies upon interwoven dialogues. Methods of directing and developing pathways through information form a crucial element of these and have much to offer the interpretation of the archaeological practice explored. CGI incorporated into the application provides one of a series of expressions of the port of Myos Hormos as imagined and as described through conventional archaeological methods.

Categories and Subject Descriptors (according to ACM CCS): J.5 [Arts and Humanities]: Architecture

1. Introduction

The Quseir al-Qadim project is based on the Egyptian Red Sea coast, 8km from the modern town of Quseir [PB2005].The project began in 1999 and concentrates on the late Ayyubid/ Mamluk medieval harbour of Quseir al-Qadim and the Roman port identified by the excavations as *Myos Hormos*. This port was of key importance to Rome, providing a trade link to East Africa, Arabia and India. The project comprises a number of interconnected aspects – including excavation, geophysical prospection, topographic surveying, oral history, community archaeology – with computational components linking and benefiting them all. The project team is similarly diverse in its approaches, backgrounds and specialities and an aspect of the project has been to explore the dynamics of these relationships through narrative and multimedia-based discussion.

The relationship between narratives and archaeologically defined pasts forms a growing element in our understanding of what it is to work on and to create archaeological sites, and then to port these creations to a wider realm. Narratives of practice, storytelling, oral histories and externalisation of imagined pasts through graphical elements form growing elements of an increasingly intriguing and exhilarating past. In the *Constructing Myos Hormos* website an aim has been to combine these strands and provide for an ever-expanding narrative of the excavated port in a particular period – the first and second centuries AD.

The website is structured around a narrative describing a journey towards and around Myos Hormos. It is accompanied by many digital images, all of which incorporate some processing and the majority artificial graphical elements. The pages and their attendant imagery are designed to stimulate and provide feedback from emotional engagements with the archaeology – whether the narrative itself, comments upon it from technical or emotional perspectives, alternative narratives produced by project members, access to the project databases linked seamlessly to the overarching structure, and external resources. In all this memory and interaction are key. Taking the graphics as an example, the website provides a novel form of 'authentication' – that is to say, the exploration of the discourse within which the graphics emerge: excavated buildings, finds, geophysical interpretation, experience on site, project dynamics, aesthetic choice, technical limitations and potentials. Thus, an image may be encountered with or connected to textual and graphical information relating to its topic (a gold leaf box), people (the small finds expert), other aspects (a modern box in the graphic artist's tent) or indeed may have no prescribed relationship at all. Exploration of the website by those whose lives are in part defined by the site itself creates, recreates and confronts these connections: an image of an excavated interior may incorporate elements of photographs from fieldwork, photographs of project members incorporated into the graphic, or painted representations of another site that happened to be on the graphic artist's mind.

2. Website structure

The website has been developed entirely by archaeologists, the aim being to build even the generation

of the website itself into a narrative of Quseir. It is database driven and generated via Active Server Pages (ASP). Although some pages remain natively in XHTML the majority now employ an XML-based solution – the XHTML being generated using XSLT and CSS. Given the project databases' and online reports' comparable structures, it has been possible seamlessly to call data from these and from the specific data created for this project. Thus, a project member might meander from narrative, to additional note, to specific comment, to the project report, and finally to a database record.

Figure 1: Composite image from the website.

Of particular interest in the study of the relationships created between information types and sources on the website, and to those relationships apparent between people, has been the facility for users to define their own commented links between pages, links to external resources and to commentaries produced relating to a specific word, phrase or image. Links are then generated automatically from these submissions, such that a word or phrase present on any page will become one or more links. The navigation of this diversity of links is tracked and tied to the project members, giving an idea of the growth and directionality of the resource. A number of predefined pathways exist, for example following the order in which each page was created, a linear narrative through the site or through the notes, or a route through each project member's comments in sequence. These pathways are also *sedimented* through exploration, paralleling issues in movement and engagement with archaeologicaal data. Optionally the more a link is followed (either by a user or by all users) the more visually apparent it is. This is particularly influential when all other link forms are obscured – rendering a page of text with links only identified by changing spectra: black through to a primary colour.

The text grows with each new use, by the addition of successive commentaries and notes and by increased complexity of interlinking. The text exists in some definitive form (it is not wholly 'living' as variations to the 'original' text exist as separate text elements) whilst demonstrating a growth of information on each given topic. As the pathways provide linear direction through the information so the automatic and user-defined links create a non-linear reading option, with the aim of providing an experience centred on user choice, which will itself relate to user familiarity with web navigation and screen reading.

3. Conclusions

The website provides an insight into and record of the dynamics of field practice, and of the modes through which personal pasts are constructed and externalised. Users have identified a growth in appreciation of the excavated site and a willingness to contribute much of themselves into an organic and interesting representation of it. Pathways are used extensively but with frequent deviations, followed by a return to the core narrative. Commentaries upon pages and specific terms, and glossaries are exploited to great effect. The diverse, personalised picture constructed of *Myos Hormos* from these informal comments and links to formalised archaeological data moves beyond that available in the interim reports and is of considerable interest.

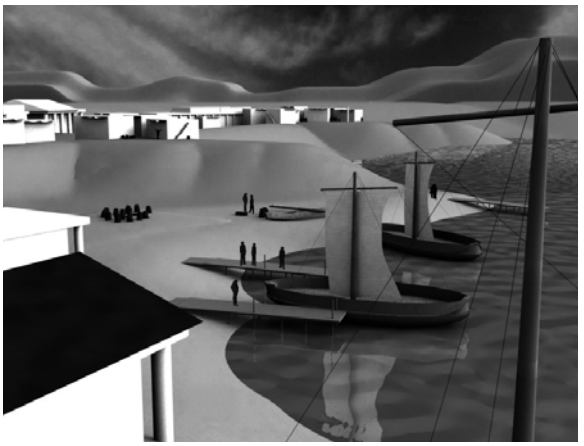

Figure 1: Composite image from the website.

In the specific case of graphical renderings of *Myos Hormos* the comments and navigation suggest that standard means of authentication are not required given the specialised audience. Indeed the lack of direct authentication has encouraged a greater depth of interpretation and critique of the images. Rather than suggesting simply that a building does not accurately reflect the planned layout from a trench, comments consider the range of influences upon the reconstruction process itself. It is this depth of interaction with the information which the project as a whole aims to encourage and which will, hopefully, result in an engaging and illuminating archaeological canvas.

Note

Since the website discussed incorporates unpublished data and commentaries of an informal nature any degree of public access will only become available after initial project publication [PB2005].

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Beyond Trowels and Pickaxes: Intergenerational Teaching and Stewardship in the Digital Age

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Abstract

An intergenerational, mobius-strip model for teaching state-of-the-art digital documentation strategies to undergraduate students is introduced in this paper. Working in partnership with faculty and cultural heritage projects worldwide, we provide students the opportunity to develop exceptional levels of expertise in such techniques as 3D laser scanning, GIS, databases, photogrammetry, video recording, high resolution photography and spherical vr. Students work with primary research data to learn both practical skills as well as the theoretical, historical and political frameworks that situate the heritage sites. Through field schools, the students are given the opportunity to participate in real world documentation projects, producing new sets of primary data for the next generation of students to explore. Their field efforts form the basis of their own research questions, leading to undergraduate and graduate theses and dissertations while providing the research projects with remarkable, living digital archives. Perhaps most importantly, the students themselves become digitally literate stewards and trainers in their own right.

Keywords: archaeology, digital documentation, training, pedagogy, cultural heritage, education.

1. Introduction

A 19 year old sophomore takes an introduction to archaeology course and comes to realize that behind the Hollywood version of archaeology where Indiana Jones or Lara Croft use good looks and weapons to save the world from evildoers, there are regular people using trowels and pickaxes to dig into the past centimetre by centimetre. Not discouraged by the mundane reality of modern discipline, the student continues taking courses in Anthropology and archaeology, perhaps a course or two on field methodology or artifact analysis and eventually signs up for a field school, paid for out of pocket or through internship. Here, their hopes and aspirations of doing actual archaeological fieldwork are realized and the student returns from the field with a newfound love for hoeing, sifting, shovelling and sieving. The diehards among them might actually pursue a career in archaeology, recognizing that there is more to the practice than moving piles of soil from one location to another and that once dues are properly paid and skills are developed, they may prove to be more useful to a field project in more substantive ways than pot washing or dry sieving. Most, however, will be discouraged and disillusioned after their field experiences and will turn their energies to other research interests where their participation is more engaging and their efforts more appreciated.

Archaeological field training is plagued by a chicken and egg problem. We want to provide opportunities for newbie students to learn the craft of archaeology, but research projects have aims and deadlines, we are limited in our capacities and patience due to constraints of time and budget. We feel our ethical responsibility to do the best archaeological research we can do in the field, for our discipline is inherently destructive and we will not be able to go back and undo mistakes made by apprentices. Thus, students who participate in fieldschools find themselves cutting their teeth on the least glamorous of jobs, such as topsoil clearing, sorting and sieving, artifact washing. These are all important jobs and someone needs to do them, but are we doing the students and the discipline a disservice by relegating exuberant students to the most menial aspects of our practice?

Moreover, archaeology in the digital age is becoming more multi-disciplinary than ever, employing technologies from computer science, survey, information technology, architecture, ecology, environmental science and beyond. As we redefine the boundaries of our field, the opportunities for exciting visualization methods that transcend traditional archaeological documentation has never been greater. We struggle to keep up with the latest technological advances and how to integrate them in our field methodologies, weighing the benefits of 3D laser scanning, for example, with the costs of post-production. The question we must ask ourselves is how will we continue to innovate and evolve our discipline *and* future generations of archaeologists at the same time?

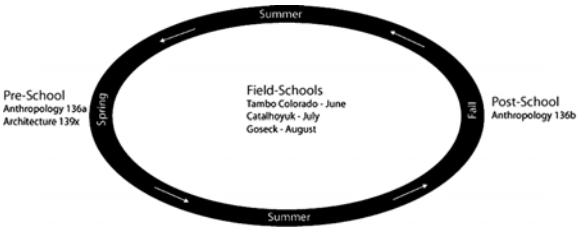
2. A Pedagogy of intergenerational action

The Multimedia Authoring Center for Teaching in Anthropology at UC Berkeley was established in 1998 upon recognizing the need to provide training in digital literacy for students and faculty. Courses affiliated with the lab use primary research data from faculty and graduate student projects, mostly archaeological or ethnographic in nature. Through the years,

our teaching philosophy has shifted from providing definitive content that can be used to develop a research product to a more open-ended, author-centered approach where instructors act as guides to the primary data and help facilitate the creation of narratives and subjective conjectures about the site or given set of research agendas. This method has proven itself to be both effective and highly rewarding for everyone involved, resulting in innovative projects of exceptional depth and substance. See http://www.mactia.berkeley.edu for examples.

The problem with any course, set of courses or academic program is that a tremendous amount of effort and training goes into the students with little or limited return on the investment. The same can be said for field schools, where the participants of the field school can dabble in the art of archaeology for a summer, but may never return to the site again. Thus, our vested interest in the student as product is more minimal than if we were in a vocational program, teaching apprentices to work in a metal shop, or medical school training interns to become doctors. At the end of the term, the student leaves and takes their newfound knowledge with them.

To disrupt this cycle, we have reconceived our course structure to give these students an opportunity to join our instructional team as peer mentors. These advanced students take a central role not only in the teaching and training of the next generation of students, but in the primary knowledge production itself.



2.1. Mobius strip of knowledge production

In the new structure, students in the introductory course on archaeology have the option of taking a special adjunct section that explores the confluence of new media and archaeology. Students then self-select and may choose to participate in a series of theoretical or topic centered courses that provide the backdrop for archaeological and anthropological fieldwork, such as the general college course we taught in Spring 2004, 'Heritage Futures in the Digital Age.' This class was the first of its kind at Berkeley, a survey of pertinent cultural heritage themes ranging from stewardship and conservation to archaeology and intellectual property.

In their third years (junior level in the US four year program), the students may elect to take a two-semester course on archaeological recording methodologies. It is in this series that the 'mobius strip' model of intergenerational coaching comes to life, for the Part A course is derived from the primary data created in the field the previous summer. One-third of the class is made up of students who participated in the field projects that produced the material, and these students act as mentors to the other two-thirds, guiding them into and through the digital artifact collections. Part B is a practical course where students learn directly field recording strategies including 3D laser scanning, GIS, databases, photogrammetry, video recording, high resolution photography and spherical VR.

Sandwiched in between are the actual field schools and internships in places such as Tambo Colorado, Peru, and Çatalhöyük, Turkey. Because the students already have two years of theoretical and one year of practical experience behind them, they come to the field pre-trained and prepared. We can put them to use immediately in contexts where were they to have no previous experience, they probably would not be able to work at all. The 'pre-school', as we call it, gives them exposure to the latest technologies in a non-threatening and synergistic environment and allows us to experiment with and hone our recording methodologies before attempting them in the field.

3. Next steps

Last Spring we taught the B part (practical) of the mobius strip and this summer we conducted three field schools. Currently we are teaching Part A, completing the first iteration of this new model. By VAST in December, we will be able to report on its effectiveness and related and unforeseen problems. We will look forward to the opportunity discuss the results and your feedback on its effectiveness and usefulness for archaeology, from the field to the classroom.

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Time Related Virtual Visualization of Cultural Remains & The 4D–QTVR Method

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Abstract

Field architects used to measure and draw architectural fragments manually during the field season, while the inking took place only during the following wintertime. Feedback from the pictorial notions to the respective excavation remained limited. Now the visual analyses can be studied already in situ, *over a 3D-interface. As also hypothetical interpretations of the building phases can now be modelled at once, new possibilities for fruitful field dialogue do occur. A time related virtual interface, here the Four-Dimensional Quick Time Virtual Reality (4D-QTVR) helps in formulating theories, which can be tested next day by sounding. Modelling of the exposed new facts [F], their interpretations [I] and their testing results [T] is here called a 'FIT-triangle'. If repeated continually this method tends to enhance the understanding of the site effectively. One result of this procedure can be a pin-pointed, question/answer based excavation procedure, which may save the remains from total uncovering – as well as time and money. The 4D-visualization can well be upgraded also after the excavation, according to the newest information, quite unlike the reconstructions cast in concrete right on top of the archaeological remains.*

H.5.2 [Information Interfaces and Presentation]: User Interfaces

1. Introduction

Time-aspect (the fourth dimension) challenges the visualization of cultural remains, especially in culturally rich, and multi-faceted areas like the Middle East, where the author has mostly been active as a field architect since 1995 (http://www.soderlund.fi).

- It is often not clear from which period a certain loose building block derives. The same building element may well have been used in several buildings from various periods. How to try to find the context(s) of this kind of evidence?
- Even major structures like city walls are in cases dated very differently, depending on researchers and their methods. The city walls as well the excellent Roman basements, built down to the solid rock, have been used for thousands of years by numerous cultures. In between these may have been long periods neglected. How to study this kind of structures, penetrating through the ages?
- Pictorial reconstructions are important tools in spreading information of a site. However it is often hard to see which features in them are factual, and which only hypothetical. How to comprehensibly indicate the solid archaeological evidence as separate from the hypothetical reconstructions erected on top of it?
- Archaeology destroys its targets. The less one has to excavate to understand the site, the better.
- Visualization may also harm the sites, especially if the in-situ-reconstructions are executed in solid materials, as is the case in Beit Shean / Scythopolis or Ephesus. Reconstructing several phases simultaneously may blur the periods of a site, resulting in a never existed, inconsistent, misleading physiognomy. On the other hand clearing a site to highlight only one of its periods is simply against the rule that all phases are equally valuable. Furthermore the post-excavatory evidence may radically chance the previous interpretations. This paper deals with a simple and fast way to show comprehensibly all the known phases of a site free of unintended anachronisms – and to spare the sites.

2. Method description

The latest architectural findings can be photographed, measured and drawn during the early morning excavation sessions, and inked, scanned and modelled in the afternoons. An Apple Macintosh PowerBook G4 (1G RAM) with Graphisoft's ArchiCAD 8.o (www.graphisoft.com) is used for the 3D-models.

The hypotheses are modelled on top of the facts, to be discussed, and, if needed, tested by sounding next morning. When repeated day by day this procedure leads to a 'FIT-triangle', where the three corners are:

1) addition of the newly exposed Facts
2) their Interpretation
3) Testing of the understanding by sounding

This procedure helps in filling the information *lacunas*, one after another as soon as they occur, and tends to lead to a cognitive way of excavating.

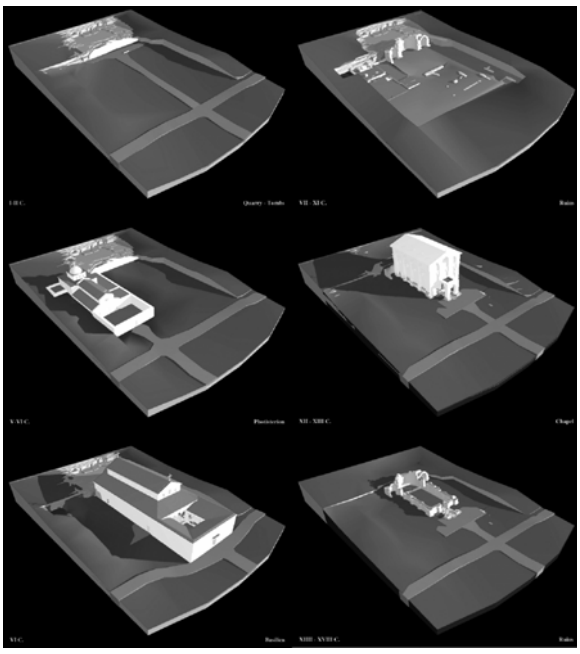

Figure 1: Some of the historic phases in the 4DQTVR, the Churches at Emmaus © ASOY 2000. Grey = factual.

QTVRs (http://www.apple.com/quicktime/qtvr/) are rendered overnight by Abvent's Artlantis 4.o (http://www.abvent.com/index.php). QuickTime Authoring Tool or equivalent is used for integrating the period-specific QTVRs into a Four Dimensional QuickTime Virtual Reality-model (4D-QTVR) [LSS00, JDM00], allowing the study of the complete curriculum of the site (Fig. 1).

CAD-based documentation is often blaimed for looking too final even when preliminary. The procedure here is based on the code coloured visualization of the various levels of uncertainty in the project, with categories e.g. as follows:

SOLID FACTS. The evidential building remains found *in situ* (grey in Fig. 1, Light in Fig. 2).

TRANSIT FACTS. The collapsed elements being elevated back to their original places on top of the solid remains. The virtual *anastylosis* is well comparable to the original building process, and can be very informative *an sich* (Fig. 2, 3).

Figure 2, 3: Anastylosis *of the Temple of Omrit c. 1 AD / c. 200 AD © ASOY 1999. Light = factual.*

DEDUCED ASPECTS. E.g. the missing upper parts of the buildings can be deduced on the basis of their remaining lower parts – the height of the piled-back columns may indicate the original height.

EDUCATED GUESSES. The missing features which most probably have to have existed; wooden doors, window frames, floors, ceilings and roof structures. Remains of limekilns surrounding the site may offer circumstantial evidence of the missing marbles.

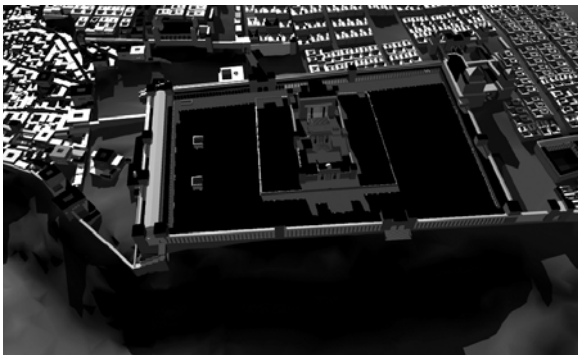

Figure 4: The city of Jerusalem in c. AD 70. © ASOY 2002.

TOPOGRAPHY. Use of present contours, water tables and vegetation is often misleading. However in cases present situation can tell about the past. The blocks of Jerusalem (Fig. 4) have been taken from hints of an ancient orthogonal setting, still visible in the modern maps [WJ78].

VEGETATION. Long-period changes in the pre-and historic vegetation are noteworthy, especially on such extreme areas like the Middle East.

Summary

The above described method has been useful in studying and illustrating sites both for the academic and layman audiences. We have e.g. provided TV-companies like TV5 in the USA, and CTVC and ITV in England as well as World History Channel with animations. It also seems that the method does offer possibilities in researching the sites by exposing the archaeology as little as possible and by offering an alternative to the damaging *in-situ* reconstructions.

Moreover, the sometimes too high threshold to the publishing phase gets lower if the above described visual documentation is at any given moment available for the authors of the excavation monograph.

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