Themata 5 E-learning Archaeology, the Heritage Handbook

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E-learning Archaeology

the Heritage Handbook

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Table of Contents

15

Methods and engagement, publicity and media relationships *by Francois Bertemes & Peter F. Biehl*

MSCO Abstract

Multimedia technology and the internet have inaugurated a new chapter in the way archaeology is communicated to the public. But though media officers are a given in the museums and the heritage management services, media training for archaeology and heritage management students is still an exception. The same is true for the booming market of journalism: though more stories and specialised beats in national and international newspapers and magazines are produced, there is still no training for archaeologists available for how to deal with journalists in the field or for how to write press releases themselves. Archaeology is undergoing a revolution, within both the presentation of the practical work and theoretical questions regarding what knowledge is communicated, as well as how is the specialist community and the public engaged in this knowledge production and knowledge transfer.

This module discusses ways how both communities can be served and presents a case study of a 'multimedia excavation' that also serves as a training ground for young heritage management and archaeology students. As such, it outlines how multimedia can be applied to excavating, analysing, processing and interpreting the past as well as communicating and popularising archaeology to the public. The module discusses the project as a paradigm and explains why it is important for 21st century archaeologists to engage with the public via media and multimedia in the digital age.

→ LU Introduction

In the background of the continuing financial crisis and the cuts to public funding it has become pivotal to better perform 'communicating archaeology' to the public (Biehl 2005: 240; see also Hamilakis 2001:5). The best way to popularise archaeology – [with] popularization as a key strategy to engage with the public via media (Biehl 2005:244-247; Daum 1998:25; especially Brittain and Clack:30-31) – is via multimedia. It's easy to learn, inexpensive, efficient, powerful and fast. The best way to start such an endeavour in archaeology is to study the theory and practice of how to use multimedia in the classroom as well as in the field. The students have to get acquainted with the process of transferring their acquired knowledge to archaeologists/heritage managers and to the public. They have to understand the potentials the new tools provide for popularising archaeology, though they also have to be aware of the dangers embedded in these processes.

The use of multimedia in museums and heritage management services is currently taken for granted. Therefore, the procurement of an overall media competence in future archaeologists should already have been achieved during academic studies and ideally already during undergraduate studies.

The practical example/case study will demonstrate how a multimedia training programme can teach students to use modern multimedia technologies to document, analyse, visualise and popularise archaeological research or heritage management. This is done by working on an archaeological excavation and working with archaeological data and the use of multimedia tools that can enhance the learning of innovative ways to connect theory and practice in archaeology and modern heritage management, as well as to popularise archaeology and to communicate it to the public.

→ LU Archaeology in the digital age *by Francois Bertemes & Peter F. Biehl*

SCO Multimedia in archaeology

Multimedia (and hypermedia) are hot topics these days, and around the world, archaeologists are increasingly taking advantage of them to enhance their research. This began in 1997 with the influential Special Review Section on 'Electronic Archaeology', edited and introduced by Sarah Champion (Antiquity 71, 1997, 1027-1076).

> ***Animation***
>
> We can differentiate among six different domains in electronic/digital archaeology or the so-called 'E-Archaeology':
>
> First, there is the World Wide Web itself
>
> > electronic publishing (journal and monographs)
> > electronic communication groups, forums and lists
> > electronic archiving (server and CD-ROMS and DVDS)
> > e-learning and e-teaching
> > and the application of hyper- and multimedia in archaeology (Biehl 2002:147)

But as much as they like applying new technology, few archaeologists are interested in reading about it. After all, they say, new media really belongs to the world of computer programmers, graphic designers and commercial managers. Archaeologists may use some of its tools, but its relevance to archaeology is minimal and it has nothing 'directly' to do with archaeology. Or does it? In the past decade, we can witness that far from being marginal, technology is rapidly moving to the centre of archaeology (see publications such as Kamermans and Fennema 1996, Altekamp and Tiedemann 1999, Barceló et al. 2000, Lock and Brown 2000, Lock 2006, Richards and Robinson 2000, Morrison, Popham and Wikander 2000, etc.). New media is revolutionising both practice and theory as well as methods of engagement, publicity and media relationships in archaeology. With its speed and simplicity of explanation, new media can – in fact, has already begun to – alter the way we as specialists view our work (Myrup Kristensen 2007:73). It has also shifted the way the public regards archaeology (Biehl and Gramsch 2001, 271-273).

sco Multimedia and hypermedia

The terms 'multimedia' (and 'hypermedia') and 'new media' emerged in computer science circles in the 1980s (For an excellent introduction to the subject and stringent definitions see Steinmetz 2000, especially 695-742).

> ***Animation***

Multimedia refers to the integration of graphics, sound, video, and animation into documents or files. The files are then linked in an associative system of information storage and retrieval.

It is especially through hypermedia that the archaeologist can engage with the public and students in a much more powerful way: files contain cross-references called hyperlinks that connect to other files with related information. In a way, you can consider them as very smart footnotes that lead you through an endless maze of information. By using hyperlinks, users can move - or as the computer scientists say – 'navigate' from one document to another through these associations.

Hypermedia is structured around the idea of offering a working and learning environment that parallels human thinking - that is, an environment that allows the user to make associations between topics rather than move sequentially from one to the next, as in an alphabetical list. Hypermedia topics are thus linked in a manner that allows the user to jump from subject to related subject in searching for information.

If the information is primarily in text form, the document or file is called hypertext.

If graphics, video, music, animation, or other elements are included, the document is called a hypermedia document. The potential of this new media was quickly understood and seized upon by businessmen, media outlets and academics.

In the humanities, George Landow and Theodor Nelson have done some of the most extraordinary and pioneering work (Landow 1992, 1997, Nelson 1981, 1987).

Archaeologists, too, have responded and, every year, more multimedia tools are being used in our publications, documentation and communication with colleagues. The transition is remarkable and is allowing us to collect, process, store and disseminate archaeological data with never-before-achieved speed, facility and accuracy (Biehl 2002: 148).

sco Hyperlinks

But more than technical wizardry, new media offers stunning epistemological and theoretical potential for archaeologists and their engagement with the public and students. Since hyperlinks work with the same sort of roving associations made by the human mind, using hyperlinks actually facilitates learning and understanding (Keil-Slawik 1997, Fritsch 1998, Wydra 1999). They move with the user, instead of forcing him/her to follow a preordained pattern. They also transform the static into the dynamic. For instance, instead of seeing a drawing of a plan of a house with cooking pots, tools and rubbish strewn about, a student could be shown a whole environment, complete with sound and movement. If a student is interested in learning more about the pots, s/he could just click on them to get more information. Or, if s/he wants to know what the rubbish is, s/he could be presented with a variety of possible theories, some of which may be contradictory. The paths are not only multiple, they are interrelated. When looking at a text, the user – who could be an archaeologist, a student or simply a curious reader – does not have to read everything from start to finish. S/he can follow her/her own interests and even participate in the interpretation of a site, monument or object.

sco Communicating archaeology

But what else can multimedia do to better communicate archaeology? Let's start with the way archaeology is published. Martin Carver has recently laid out how 'open access' will dramatically change the way archaeology will be published and communicated in the near future (see Carver 2007). But still, the vast majority of archaeological texts is published 'traditionally' in paper form in journals or books and count on passive readers. The author has the sole voice and the texts

usually do not incite the reader to think about new ways of reading or thinking about archaeological data. In hypertext, on the other hand, the reader is forced to make choices and decisions and to become implicated in the construction of an account or interpretation of textual and visual material. In 'hypertext archaeology' the reader can click and move out of a text and search for references within a global network of information. The widespread availability and low cost of digital information flow also allows us to disseminate and communicate easily across international borders.

SCO Publishing in the digital age

Since they shift points of entry and viewpoints, new information technologies raise significant problems of authorship and control (Carver 2007: 140-141). Archaeological site reports have increasingly become collaborative, and new technology allows a radical extension of this process. Placed on the web or in some interactive hypertext environment, a site report can be continually commented upon and its original integrity can be enhanced. It can also be lost. As the autonomy and fixed nature of the text disintegrate, the author has less mastery and control over the message, some even speak of 'the death of the author' (Hodder 1999).

In the end, there can be as many understandings and interpretations of a text and data as there are users/readers and writers.

Applied to the web site of famous excavation sites such as Çatalhöyük or Troy (*www.catalhoyuk.com, www.troia.de*), this could open up completely new trajectories for doing archaeological research as well as ways of engaging with the public. For instance, we could link databases, house plans and stratigraphies and the material culture found in them with re-constructions or with personalised diaries of the excavators.

This would not only bring a new dimension to learning about a find, but would also provide a solid record of how data was collected and teamwork experienced. The data of the excavation report could also be linked to an interactive bibliography, where one could get current as well as past research studies on the site and any related ones. The bibliography and the report could be linked to a virtual reality reconstruction of the site. That site could then be hyperlinked to texts relevant to the discussion that appear in scientific journals and the press. Even a technology-sceptic must admit this would be a profound accomplishment and teaching/learning tool, as well as a completely new way to popularise archaeology.

In summary, archaeological publications based on hypermedia, such as e-books, e-journals, website publishing and books with multimedia CD-ROMS or DVDS, promote and facilitate multivocality.

SCO Public engagement

> ***Animation***

Multivocality

Like hypertext and hypermedia, multivocality functions on the premise that fragments can be linked in such a way as to form a comprehensive whole. As such, it emphasises the past as dialogue rather than monologue. Many voices share in the conversation, rather than one unified 'us' voice. Hypermedia technologies are, therefore, better suited than linear publications for engaging with the public and to better communicate with other archaeologists in analysing and interpreting archaeological data.

Reflexivity

How archaeology is presented to the public can also be enhanced and improved by hypermedia in a variety of ways, including virtual reality demonstrations and the use of narrative. It took a lot of years of struggle, but archaeologists today have grown accustomed to thinking of the past as something not wholly real. We now accept that the past is at least partly defined by how we reconstruct it and is therefore artificial and 'virtual'.

Changing Perspectives

This is true of all elements, from our data catalogues to our site reports, to modern research topics involving landscape. New technology allows us to produce digital information for which we can easily change the font, size of letters or lay-out to enhance or emphasise our point - or merely to study specific data more efficiently. What we then create is a virtual representation, not the real artefact, monument or landscape. We have also shifted our focus from specific 'monuments' such as graves, settlements or hoards, to looking carefully at how monuments and landscapes were perceived by the people using them (Biehl and Gramsch 2002, 121-123). By employing 'virtual/digital archaeology' we can re-construct these monuments and landscapes and better study them as a whole (Barceló Forte and Sanders 2000).

Narratives

In addition to creating a more 'visual' vision of the past through virtual re-constructions, we have also begun to make the past livelier by introducing narratives about peoples and individuals. This is a hot topic, but many archaeologists regard this practice with skepticism, believing it moves too close to the realm of fiction. Certainly, the technique is useful, but, to date, we have not found

a way of convincingly embedding it in our work. Narratives can be dangerous when they attempt to provide sweeping stories about large migrations of prehistoric peoples. They are at their most useful, however, when they are applied to the 'lives' of individuals, as Ruth Tringham applies them in her hypertext account of Opovo (Tringham 2007).

Hypertext
Although it is fragmented, hypertext is grounded in linearity. There is almost always a 'menu' to which the user can continually return, and there are buttons directing a user to 'click here' or 'start here'. And, although the user can choose what direction s/he goes, s/he certainly follows some sort of path through the hypertext environment. In this way, the past is experienced as a network or a map, rather than as a one-dimensional road (see also Holtorf 2000, *http://citdpress.utsc.utoronto.ca/holtorf/index.html*).

Critique
Hypermedia also fills another gap in recent theoretical discussion – the profound need for more 'critique'. A user can read a text side by side with critiques of the text simply by pressing a button. Or, a user can call up a text along with the data supporting it, or compare reports of stratigraphical relationships to field photographs or videos. Clearly, this adds new dimension ('reflexivity') and depth to our ability to scrutinise each other and ourselves.

Summary
One of the biggest problems in easing multimedia into archaeology has less to do with the medium than the users, as has been pointed out. In the article 'Cyberspace/Cyberpast/Cybernation: Constructing Hellenism in Hyperreality', Yannis Hamilakis says 'the representation of archaeological production on the Internet is a phenomenon which has barely been touched upon. To date, most archaeological discussion seems to treat the Internet simply as a technological device' (Hamilakis 2000: 257). He adds, 'the links between antiquity/archaeology and cyberspace is a topic which has not been explored in any systematic way. Yet the issue has important implications for the nature of the archaeological process in the present and the notion of archaeological authorship, as well as for the construction of archaeological knowledges' (Hamilakis 2000: 243). Clearly, we need to work harder at integrating technology into our thought-processes and work styles and powerful databases are here the key.

> SCO Exercises

→ LU Archaeological databases in the digital age

by Francois Bertemes & Peter F. Biehl

SCO In the beginning was the database...
Among the many challenges to archaeological work and heritage management, the design and implementation of a recording system is paramount. A good system mirrors the analysis as well as sampling, survey or excavation strategy deployed at a site and is able to capture both the process of archaeology and its products, the physical artefacts and the related metadata.

Archaeology as practiced in the digital age creates many more 'artefacts' than those unearthed by traditional excavation methods. The recording system must accommodate multimedia in the true sense of the word – physical forms, plans, sketches, journals, slide and negative film images, video, digital stills, audio recordings, 3D models, GIS data and satellite imagery.

Ideally, the system would be multi-user, multi-scalar, multilingual, cross-platform (or platform free, i.e. web-based), and built using open architecture standards to assure expandability and longevity while conforming to the low budget constraints most archaeological projects face.

SCO Data Management Systems
There are numerous technical solutions to the issue of datamanagement, for this is a common problem in database design. However, the challenge is to create a solution that does not require the end users (archaeologists) to become IT (information technology) specialists and does not require dependencies on programmers and computer scientists. It is essential that archaeologists be involved in the design process from inception to execution, and this means the solution has to be understandable and operable by archaeologists. The database solution needs to be easily modifiable and expandable to meet the changing needs of the field, while at the same time it must be robust and stable enough to sustain scrutiny from a worldwide user base.

One option is to use an integrated digital 'data management system' (see below) that is well suited to the special requirements of archaeological work and heritage management. In archaeological fieldwork, for example, the essential data can be entered in the field directly into 'off-line' PDA (portable data assistant, e.g. Palm or Pocket PC) devices and uploaded throughout the day into the centralised database. Paper records are not replaced. On the contrary, the process of entering the data from the paper records into the PDA provides a vital cross-check that the field records are complete

and accurate through verification processes built into the digital database. By moving the entry process to the field and excavation, we can give the excavating students feedback dynamically in real-time. The benefits of such feedback are immediate and clear. Because every field document is tracked in one integrated data system, we can dramatically reduce the risk that an archaeological feature is not adequately recorded as well as the potential for wasted time and effort through redundancy or over-recording. Several validation steps are in place to assure data integrity, culminating in a complete and accurate digital record. To accommodate the realities of time constraints in the field and the overwhelming amount of data entry if all of the data from the field notes were entered, the database serves as a retrieval system. Notes, forms, plans and sketches are scanned and given ID numbers so that the 'analogue' documents remain intact and data entry is manageable.

SCO Digital Documentation

This process is identical for all other forms of documentation, digital or physical. Digital photos can be downloaded to a computer, catalogued, annotated in the database and archived onto CDs/DVDs.

> ***Animation***
> Screen-resolution preview images can be stored on a server and are accessible directly through the database.
> Digital video can be digitised, viewed for content, annotated and archived into the same media database.
> Digital drawings of profiles, plans and features and other 'digital originals' can be safeguarded through password protection and non-modifiable instances are made available for general use.
> The process of making the record of the archaeological process available to this level of detail provides a superlative opportunity for in-field analysis and collaborative work whilst functioning as a buffer between the users and the primary documents by reducing the need for multiple interactions with the originals.

What has been described is a digital accession system for the physical and virtual artefacts excavated or created by archaeologists in an excavation – the same scenario can be created for heritage management work. But in order to move between present and past analysis, interpretation and visualisation of the archaeological record - we must also transport the past into the present, e.g. make our work understandable and sizeable for the public, and here we will use the Goseck multimedia excavation in Saxony-Anhalt, Germany as a case study.

> SCO Exercises

LU Goseck *Case study* *by Francois Bertemes & Peter F. Biehl*

SCO Multimedia Excavation Project' in Goseck, Saxony-Anhalt, Germany

From 2002-2005, a 'multimedia excavation project' was carried out by the Institute of Prehistoric Archaeology at the Martin-Luther-University Halle-Wittenberg under the direction of Francois Bertemes and Peter F. Biehl (*www.praehist.uni-halle.de*) and funded by a multimedia programme of the state of Saxony-Anhalt. The project consisted of two main parts: first, there was the apprentice field school of the Institute of Prehistoric Archaeology at the Martin-Luther-University, in which its undergraduate students learned 'traditional' excavation techniques at the excavation of the Neolithic circular enclosure in Goseck (for the archaeology of Goseck see Bertemes et al. 2004, Bertemes and Biehl 2005a and b, Bertemes and Northe 2006/07 and 2007, Bertemes, Biehl and Meller forthcoming). This part of the project was logistically and financially supported by the Heritage Management Service of Saxony-Anhalt (*http://www.archlsa.de/*). Second, there was the multimedia training programme, in which the students were trained to use modern multimedia technologies to document, analyse, visualise and popularise the archaeological research.

Beside the excavation of the Neolithic circular enclosure in Goseck, the core part of the project was the introduction of multimedia, through working with archaeological data and the use of multimedia tools that can enhance the learning of innovative ways to connect theory and practice in archaeology as well as to popularise archaeology and to communicate it to the public. Students were not only trained to use multimedia in the process of the excavation and documentation of archaeological data but also 'to tell their story' of the excavation, the site and its possible meanings and functions in the past.

In small projects in the classroom as well as during the apprentice field school, they learned to use multimedia tools to present their interpretations and to visualise them in 3D reconstructions. They also learned to build and administrate websites and to use the Goseck-website to popularise the site via the world-wide-web. In order to include the public in the project, the students were trained to give tours of the site to visitors and to interview the local people about their conception of the past of the Goseck enclosure. These videos were put on the website to assure some sort of 'multivocality' – and

have proven to be a good means to popularise the site and its archaeology on the one hand, and to make it create a better understanding of it in the public on the other (for a detailed discussion of the Goseck website, see Samida 2004:214-219).

sco The website

The website is built as an 'open access/knowledge' source that offers information to the interested public without any previous knowledge and to archaeologists alike (*www.praehist.uni-halle.de/goseck.html*). It consists of differentiated levels of information ranging from short introductory texts written in a popular scientific manner (the texts are available only in German) added to by photos and videos, to detailed descriptions and illustrations of the archaeological data. Though all levels are accessible - which guarantees a general transparency – only the 'deeper' levels of the website keep some sort of 'scientific standard' of archaeological publications, and provide the archaeologist-user with all available information of the excavated artefacts and their contexts, i.e. plans, photos, videos descriptions of finds and findings.

But due to hypermedia all information on the website is interconnected and can be approached in a multi-linear way. Rather than following the authors' linear argumentation in traditional forms of publication such as books and journal articles, the reader/user of the Goseck website can browse through the information in a non-linear way, and approach the data the way they want to (Biehl 2002, 2005). Another advantage is that all data can be made available, which is normally not possible in traditional publications due to financial reasons. All users could access all the data of the excavation at any time, but in practice it's the virtual reality objects that enjoy great popularity (see also Rieche/Schneider 2002, Samida 2004). But such modern presentation forms of artefacts and sites are not only interesting for the public but also for the archaeologists, who can view and analyse the artefacts more 'closely' (see also Copeland 2004).

This is only one example of how multimedia tools can change the practice of archaeology, and there are many more. It is important to note the fact that the layperson and the professional archaeologist can both access the data from the Goseck excavation - creating a new form of 'knowledge transfer' not only within the community of archaeologists, but also from the sciences to the public and vice versa (see also Holtorf 2007).

sco Webcam

Besides the website, the world-wide-web offers another possibility to popularise archaeology and to include the public in it: Web-cams. In Goseck we transmitted the archaeological excavation via a web-cam live on the world-wide-web. The user could 'look over the student's shoulder' and quasi participate in their archaeological training. The user could also learn about the daily work of an archaeologist and see the first results of the excavation on the website. Naturally, the site on which the web-cam ran could easily also be used for sponsoring, which becomes more and more important for the financing of archaeological research. Communicating archaeology with interactive websites and live web-cams can help us to make archaeology understandable, sizable and interesting for the public.

sco Popularisation

Of course, one of the most exciting parts about working on archaeological monuments is envisioning how we might 'rebuild' them. Of course, this is dicey and often dangerous work that sometimes borders on the theatrical – particularly when the public or the media imagination gets stirred. In Goseck, for example, media hype and tremendous public interest have been boosted by the Bronze Age sky disk of Nebra – a glorious depiction of the moon and celestial bodies, which was found about 25 kilometers north of Goseck (Meller 2004). With the find, the archaeo-astronomic interpretation of Goseck intensified to such a frenzy that careful scientific explanations of the site becomes overshadowed by free-wheeling media hype over what the site might have been. Thanks to careful planning and substantial funding by the Heritage Management Service of Saxony-Anhalt with the support of a local cultural association, Goseck's circular enclosure has been reconstructed to be as lifelike as possible. The reconstruction stands in its original place and serves as a means of bringing us closer to understanding how it functioned. It might also be a means of achieving that terribly difficult yet pivotal archaeological goal - interesting the public in prehistory.

Of course, the opposite danger is also there – that this– a carefully excavated Neolithic enclosure – will, because of its extraordinary imaginative potential, be usurped by the public and the media and transformed into a sort of archaeological Disneyland (for a detailed discussion of the different relations between the national medias/presses and archaeology, see Ascherson 2004, Benz and Liedmeier 2007, Kaeser 2008, Lüscher 2008, Scherzler 2007). In such a sad case, much of the site's meaning and context would be lost in the public's hunger for easy understanding. Although these dangers of this appealing but ultimately archaeologically destructive impulse should not be underestimated, the potentials of the popularisation of archaeology clearly countervail them: the dramatic budget cuts for teaching and research in most European countries forces us to better 'communicating

archaeology' to the public. The public has to understand why it should spend tax money on archaeological research. Herein results a responsibility for scientific transparency and sustainability in the research of the regional history and monuments.

> sco Exercises

msco References

Altekamp, S. and Tiedemann, P. 1999, Internet für Archäologen: Eine Praxis orientierte Einführung. Darmstadt: Primus-Verlag (Wissenschaftliche Buchgesellschaft Darmstadt).

Ascherson, N. 2004, Archaeology in the British Media. In: Merriman, N. (ed.), Public Archaeology. London: Routledge: 145-158.

Barceló, J.A. 2000, Visualizing what might be: An introduction to virtual reality techniques in archaeology, in Barceló, J.A., Forte, M. and Sanders, D.H. (eds.), Virtual Reality in Archaeology. Oxford: BAR International Series 843 (Computer Applications and Quantitative Methods in Archaeology), 9-36.

Benz, M. and Liedmeier, A. K. 2007, Archaeology and the German Press. In: Clack, T. and Brittain, M. (eds.), Archaeology and the Media, Walnut Creek: Left Coast Press: 153-174.

Bertemes, F., Biehl, P.F., Northe, A. and Schröder, O. 2004, Die neolithische Kreisgrabenanlage von Goseck, Kr. Weißenfels. Archäologie in Sachsen-Anhalt Bd. 2, 2004 (Landesamt für Archäologie Sachsen-Anhalt und der Archäologischen Gesellschaft in Sachsen-Anhalt e.V.): 137-145.

Bertemes, F. and Biehl, P.F. 2005a, Archäologie Multimedial': Die archäologischen Ausgrabungen in Goseck. In: Scientia Halensis 1, 2005: 5-6.

Bertemes, F., and Biehl, P.F. 2005b. Goseck: Archäologie geht online. Archäologie in Deutschland, Heft 6, 2005: 36-38.

Bertemes, F. and Northe, A. 2006/2007. Neolithisches Heiligtum in prähistorischer Kulturlandschaft – die Abschlussuntersuchungen in der Kreisgrabenanlage von Goseck und weitere Grabungen in deren Umgebung. Archäologie in Sachsen-Anhalt 4.2, 2006 (2007): 269-281.

Bertemes, F. and Northe, A. 2007. Der Kreisgraben von Goseck – Ein Beitrag zum Verständnis früher monumentaler Kultbauten Mitteleuropas. In: Schmotz, K. (ed.) Vorträge des 25. Niederbayerischen Archäologentages. Verlag Marie Leidorf: Rahden: 169-184.

Bertemes, F., Biehl, P.F. and Meller, H. (eds.) forthcoming. Neolithische Kreisgrabenanlagen in Europa/Neolithic Circular Enclosures in Europe. Halle/Saale: Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie Sachsen-Anhalt - Landesmuseum für Vorgeschichte.

Biehl, P.F. 2002, Hypermedia and Archaeology: A Methodological and Theoretical Framework. In: F. Niccolucci (ed.), Multimedia Communication for Cultural Heritage. Proceedings of the Multimedia Conference in Prato, Italy 2001, All'Insegna del Giglio: Florence, 147-153.

Biehl, Peter F. 2005, Archäologie Multimedial: Potential und Gefahren der Popularisierung in der Archäologie. In: Archäologisches Nachrichtenblatt 10, 2005, 240-252.

Biehl, P.F., Bertemes, F. and Northe, A. in press, 'Multimedia Archaeology': Potentials and Dangers of Popularising Archaeology. In: Kucharik, M. (ed.), Archaeology and the Public. Prague.

Biehl, P.F. and Gramsch, A., 2001, Book Marks. European Journal of Archaeology, 4.2., 2002: 271-273.

Biehl, P.F. and Gramsch, A. 2002, Book Marks. Communicating Archaeology. European Journal of Archaeology 5.2., 2002: 249-250.

Brittain, M. and Clack, T. 2007, Introduction: Archaeology and the Media. In: Clack, T. and Brittain, M. (eds.), Archaeology and the Media, Walnut Creek: Left Coast Press: 11-66.

Carver, M. 2007, Archaeology journals, academics and Open Access. In: European Journal of Archaeology 10, 2-3: 135-148.

Copeland, T. 2004, Presenting archaeology to the public: constructing insights on-site. In: Merriman, N. (ed.), Public Archaeology. London: Routledge: 132-144.

Fritsch, H. 1998, Witness-learning. Pedagogical implications of net-based teaching and learning, in Hauff, M. (ed.), Media@uni-multi.media? Entwicklung, Gestaltung, Evaluation neuer Medien. Münster: Waxmann: 123-153.

Daum, A. W. 1998, Wissenschaftspopularisierung im 19. Jahrhundert. Bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit 1848-1914. München.

Hamilakis, Y. 2000, Cyberspace/Cyberpast/Cybernation: Constructing Hellenism in Hyperreality. In: European Journal of Archaeology 3.2., 2000: 241-264.

Harding, A. 2007, Communication in Archaeology. In: European Journal of Archaeology 10, 2-3: 119-134.

Hodder, I. 1999, The Archaeological Process. An Introduction. Oxford: Blackwell.

Holtorf, C. 2000, Monumental Past: The Life-histories of Megalithic Monuments in Mecklenburg-Vorpommern (Germany). Toronto: Electronic Monograph.University of Toronto, Centre for Instructional Technology Development.

Holtorf, C. 2007, Can you hear me at the back? Archaeology, communication and society. In: European Journal of Archaeology 10, 2-3: 149-166.

Kaeser, M.-A. 2008, Les archéologues et l'archéologie face aux medias, un mirroir dérangeant? In: Röder, B. (ed.), Images publiques de 'archéologie. Les Nouvelles de l'archéologie 113: 19-21.

Kamermans, H. and Fennema, K. (eds.) 1996, Interfacing the Past. Computer Applications and Quantitative Methods in Archaeology, CAA 95 (Analecta Praehistorica Leidensia 28), Leiden: University of Leiden.

Keil-Slawik, R. 1997, Multimedia in der Hochschullehre, in Simon, H. (ed.), Virtueller Campus. Forschung und Entwicklung für neues Lehren und Lernen. Münster: Waxmann, 27-42.

Landow, George P. 1992, Hypertext: the Convergence of Contemporary Critical Theory and Technology. Baltimore (MA): John Hopkins University University Press.
Landow, George P. 1997, Hypertext 2.0. Baltimore: Johns Hopkins University Press.
Lock, G. and Brown, K. 2000, On the Theory and practice of Archaeological Computing. Oxford: Oxford University Committee for Archaeology Monograph No. 51.
Lock, G. 2006, Computers, learning and teaching in archaeology: life past and present on the screen. In: Evans, T.L. and Daly, P. (eds.) 2006, Digital Archaeology. Bridging Method and Theory. London: Routledge: 226-235.
Lüscher, G. 2008, Archéologie et journalisme. De la fouille au bureau de rédaction. In: Röder, B. (ed.), Images publiques de 'archéologie. Les Nouvelles de l'archéologie 113: 22-25.
Meller, H. (ed.) 2004, Der gschmiedete Himmel. Die weite Welt im Herzen Europas vor 3600 Jahren. Halle: Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalts.
Morrison, A., Popham, M. and Wikander, K. (eds.), 2000, Creating and Documenting Electronic Texts. Oxford: Oxbow Books (Oxford Text Archive).
Myrup Kristensen, T. 2007, Archaeological engagements: new media and beyond. In: European Journal of Archaeology 2007: 73-74.
Nelson, T.H. 1981, Literary Machines. Swarthmore, Pa.: Self-published.
Nelson, T.H. 1987, Computer Lip/Dream Macines. Seattle, Wash.: Microsoft Press.
Richards, J. and Robinson, D. (eds.), 2000, Digital Archives from Excavation and Fieldwork. A Guide to Good Practice. Oxford: Oxbow Books (Archaeology Data Service.
Samida, S. 2006, Wissenschaftskommunikation im Internet. Neue Medien in der Archäologie. München: Verlag Reinhard Fischer.
Scherzler, D. 2007, Journalists and archaeologists: notes on dealing constructively with the mass media. In: European Journal of Archaeology 10, 2-3: 185-206.
Steinmetz, R. 2000, Multimedia Technologie. Grundlagen, Komponenten und Systeme. Berlin, New York: Springer (third edition).
Tringham, R. 2007, Weaving house life and death into places: a blueprint for a hypermedia narrative. In: D. Bailey, D. A. Whittle, and V. Cummings (eds.), (Un)settling the Neolithic. Oxford: Oxbow Books: 98-111.
Wydra, D. 1999, Information und Kommunikation über Virtuelle Welten im Internet, in Lehmann, K. (ed.), Studieren 2000. Alte Inhalte in neuen Medien. Münster: Waxmann: 183-192.

→ **LU** Glossary *by Francois Bertemes & Peter F. Biehl*

SCO Glossary

Data Management Systems

Integral digital Data Management Systems (DMS) essentially pertains to the management of digital media, technical drawings and documents. Often the data are contained in 'records' of various forms, such as on paper, microfilms or on digital media. Hence, technical data management is also concerned with record management involving purely technical or techno-commercial or techno-legal information or data. Proper Data Management Systems are essential for the smooth and trouble-free management of large organisations, which are built around large-scale projects. DMS functions are conceptually similar to those of conventional archive functions, except that the archived material in this case are essentially digital media, technical drawings, survey maps, technical specifications, data sheets, feasibility reports, project reports, operation and maintenance manuals, standards, etc. Document registration, indexing, repository management, reprography, etc are all part of DMS. Various computer software systems are now available in this field. Various kinds of sophisticated reprography equipment, such as document scanners, microfilming and digitisation camera units, wide format printers, digital plotters, etc are available now which make the DMS functions concered with reprography much easier than a few decades ago.