

Archaeological and Cultural Heritage Preservation



EPOCH Lecture Notes

Archaeological and Cultural Heritage Preservation

Within the Light of New Technologies

Selected papers

from the joint Archaeolingua-EPOCH workshop,

27 September – 2 October 2004, Százhalombatta, Hungary



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ISBN 978-963-8046-78-9

Published by ARCHAEOLOGIA
Printed in Hungary by Prime Rate

Budapest 2006

Content

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| EPOCH: European Excellence on Cultural Heritage ICT Applications <i>Franco Niccolucci</i> | 7 |
| Programme. | 11 |
| Introduction <i>Erzsébet Jerem</i> | 15 |
| Soils as Documents of the Interaction Between Man and Environment <i>György Füleký</i> | 17 |
| Late Pleistocene and Holocene Climatic and Environmental Changes <i>László Kordos</i> | 27 |
| Palynological Research: a Useful/Unavoidable Key for Environmental Archaeology <i>Imola Juhász</i> | 29 |
| Are “Autochthonous” Animal Breeds Living Monuments? <i>László Bartosiewicz</i> | 33 |
| The Role of Archaeo-Ornithology in Environmental and Animal History Studies <i>Erika Gál</i> | 49 |
| Historical Plant-Biodiversity in the Carpathian Basin <i>Ferenc Gyulai</i> | 63 |
| The Protection of Cultural Heritage by Legislative Methods in Hungary <i>Katalin Wollák</i> | 73 |
| The Medieval Royal Seat and Forest at Visegrád A Proposed World Heritage Site and its Heritage Aspects <i>József Laszlovszky</i> | 83 |
| The Visegrád World Heritage Project: Problems and Tasks <i>Péter Szabó</i> | 91 |
| The Concept of Archaeological Presentation Sites and Visitor Centres in Hungary <i>Erzsébet Jerem – Zsolt Vasáros – Gábor Kállay – Zsolt Mester</i> | 97 |
| IT Documentation and GIS in Archaeology: a Case Study <i>György Csáki</i> | 107 |
| Using Archaeological GIS in Zala County <i>István Eke – Tibor Frankovics – Judit Kvassay</i> | 111 |
| Use of Informatics at the Százhalombatta Tell Excavation <i>Ildikó Poroszlai – Magdolna Vicze – Dániel Fűkőh</i> | 121 |
| Angkor GIS, RS & Radar – Pioneering Contribution of Hungary to “Archaeology from Space” <i>János Jelen</i> | 129 |
| Three Dimensional Visualization and Virtual Reality in the Research and Interpretation of Archaeological Data <i>Sorin Hermon</i> | 143 |



EPOCH: European Excellence on Cultural Heritage ICT Applications.

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EPOCH is a consortium of 85 partners (University Departments, Research Centres, Cultural Institutions and Heritage Agencies) coordinated by the University of Brighton to carry out a 4-year project on ICT applications to Cultural Heritage. The EPOCH project (technically, a *Network of Excellence*, in the EU terminology) has been granted about 8 million Euros and started on 15 March 2004. The overall goal of the project is to foster integration and cross-fertilization among researchers and research institutions across Europe, and among different disciplines in the Humanities and in the technological field. This goal is achieved by monitoring such needs and opportunities as those offered by technological development, by carrying out positive actions towards integration, such as the creation of interdisciplinary task forces and supporting researchers' mobility and relocation, and by developing a common infrastructure for research and applications.

The management of such a huge consortium is not an easy task, and the coordinator is helped by three other executive directors and by an Executive Committee of seven people. Strategic decisions are taken by the Board of Directors and approved by all partners in the Assembly, or through electronic vote. Nonetheless, EPOCH is as an open and democratic community, with new partners entering every year and other interested institutions joining as affiliates.

The main outputs of EPOCH include the Research Agenda report, a yearly document focusing on those issues that appear as the most relevant for research and applications. The report is the product of internal consultation performed in several workshops and then submitted to the review college, an organism formed by well known experts to evaluate the network's proposals and results. After approval by the EU reviewers, the report is forwarded to the scientific community as a contribution to coordinate efforts towards an effective advancement of European research in this field. The 2006 version of the Research Agenda will soon be available, with a draft document now undergoing the review process.

Another similar document is the Report on the State of the Union about policies, practices and research, which records the situation of member states concerning the applications of ICT to CH. The first issue includes reports regarding almost all states contributed by different authors from an unofficial perspective. Overall conclusions demonstrate the existence of two levels of development in Europe and should raise governmental concerns about delays still occurring in some countries.

The report on Training Offerings and Needs in Europe takes a snapshot of the situation of higher education in the relevant fields, with particular attention to interdisciplinary curricula. Here a similar hiatus appears, which may cause in the long term a substantial divide among education levels in different European states, and push students and researchers to the more advanced countries, thus aggravating the situation. The report is being distributed to all potentially interested academic authorities.

All the reports are available for download from the project web site www.epoch-net.org (approval for www.epoch.eu is pending at the .eu registrar), where a whole bunch of information about the project is provided for researchers, heritage professionals and the public at large.

EPOCH is developing a substantial research activity. This includes the preparation of showcases aimed at heritage professionals to demonstrate how current technology may be put to work for heritage. The showcases developed in years 1 and 2 are the following:

- **showcase 1 : On Site Reconstruction Experience**

Visitors see virtual reconstructions of disappeared monuments superimposed on the scene through AR glasses, giving a feel for the original appearance of a site *in situ*, stressing the authenticity of the remains

- **showcase 2 : Multimodal Interface for Safe Presentation of Valuable Objects**
Offers museum visitors an intuitive tool for the exploration of objects not physically present by manipulating a touch-sensitive replica and seeing the original object visualised in 3D (annotated multi-media information is activated by touching parts of the replica)
- **showcase 3 : Tool for Stratigraphic Data Recording**
Demonstrates a state-of-the-art tool that can assist archaeologists in the systematic recording of their excavations through detailed 3D capture and representation of stratigraphical layers.
- **showcase 4 : Multilingual Avatars**
Designed to raise awareness of the potential of underpinning technologies in modelling and rendering of wide-ranging, highly-detailed scenes, combined with multi-lingual avatars, responding through natural language and combined in a low-cost real-time system
- **showcase 5 : e-Tourism through Cultural Routes**
Creates a new form of web supported tourism, through cultural routes, digital souvenirs, e-business and a distributed network of IT enriched sites
- **showcase 6 : Avatar based interactive storytelling :**
Interactive storytelling from database through talking head avatars, with personalisation and high quality synthetic voice
- **showcase 7 : Archaeological documentation for the Semantic Web :**
Demonstrates the archaeological community the advantages of integration by creating an effective documentation system for archaeologists, based upon digital libraries and visual tools
- **showcase 8 : Image-based Modeling :**
Demonstrates the CH community that 3D acquisition and modelling does not necessarily call for expensive devices, and can become part of normal archaeological practice, based on images taken in any case.

A more detailed explanation of showcases is available on the EPOCH web site. It is expected that other ongoing research projects (so-called NEWTONs, see below) will produce further showcases as well.

Showcases have eventually developed into scenarios, that is generalized applications of ICT to Cultural Heritage, using EPOCH's technology and susceptible of application to a large number of cases. These are not yet off-the-shelf products, but may be turned into industrial applications with no large effort. Most of the work will likely concern personalization to individual cases, as it has appeared that two cultural applications hardly ever are identical, but almost always have peculiarities deriving from site-specific features and from cultural diversity that should be carefully preserved. It is expected that a business model may be built on this, and EPOCH is currently investigating the socio-economic impact of culture with a yearly conference named "**Heritage Impact**" held in Brighton at the end of June. The team working on such issues is developing a business model for cultural institutions and policy makers.

According to the analysis developed in the Research Agenda, EPOCH has outlined a number of issues worth investigating, as they are pointed out by heritage professionals as necessary and useful, or they correspond to missing tools in the production pipeline of cultural communication. Some of these are developed within the Common Infrastructure activity, as they use existing technology and just require being organized, setup and deployed. So EPOCH researchers have surveyed current applications (a list is available on the web site) and are currently improving their fit to cultural heritage needs. In particular this applies to standards. Here EPOCH's work is addressing documentation, where CIDOC-CRM stands as the ISO internationally accepted documentation standard for cultural heritage objects, collections and sites; technology, where discussion is ongoing to define the most suitable one for "CH 3D objects"; and usability, with the preparation of guidelines. It appears that notwithstanding the theoretical acceptance of CIDOC-CRM as the overall solution for documentation, a plethora of de-facto standard is still widely used and for some cases (e.g. archaeological excavations) there is still much work to do. Technological solutions are also the subject of a debate, with X3D, COLLADA and MPEG-21 candidating for EPOCH's choice. Such activities show the definite advantage of a large community: for example the work on documentation is currently involving 7 European documentation systems and the national agencies in charge of them. EPOCH is actively supporting the definition of the Ename Charter for the interpretation of heritage sites (www.enamecharter.org), and a Charter on the credibility of 3D visualization in cultural applications, both addressing social issues involved with the use of computer graphics technology for cultural communication.

In other cases, the Research Agenda has shown that software tools are in fact lacking. EPOCH has promoted and is financially supporting the creation by groupings of partners of NEW TOOLS Needed (NEWTON), i. e. pieces of software addressing such issues.

They include:

- **Archive Mapper for Archaeology (AMA)**
AMA will develop a tool for semi-automated mapping to CIDOC. One of AMA's explicit goals is to stimulate the adoption of CIDOC-CRM as reference model by heritage professionals and heritage policy makers, showcasing the bi-directional equivalence between it and existing national or de-facto standards and providing the tools to implement such mapping.
- **Context Influenced Mobile Acquisition and Delivery of CH Data (CIMAD)**
CIMAD, a collaboration between institutes from Italy and the United Kingdom, has an ambitious goal: it aims at the implementation of a framework for "smart" cultural heritage environments. These environments will support distributed and mobile on-site applications, from data capture to public dissemination.
- **Integration of Images and Laserscan Data for 3D Modelling (IMODELASER)**
In recent years a number of techniques for data acquisition and processing have been developed in photogrammetry and computer vision. However, in terms of quality and reliability, the results are often not yet acceptable for cultural heritage professionals. To solve this dilemma, a team in Zürich will work on the integration of image and laserscan data for 3D modelling.
- **Underwater Data Collection and Photogrammetry (UPGRADE)**
The new UPGRADE project is bringing together experts in underwater archaeology to develop a software suite for the integration and fusion of acoustical, optical and platform navigation data. These tools should make the whole process largely automatic, and facilitate the construction of georeferenced 3D maps of underwater archaeological areas.
- **Virtual Human Open Simulation Framework for Cultural Heritage (CHARACTERISE)**
While 3D representations of cultural heritage sites are becoming more common, the empty streets of these models can often seem sterile and lifeless. In the new VIRTUMAN project experts from Switzerland and the United Kingdom will join forces to create a 'Scene Population Toolkit. This toolkit will allow to place intelligent, multilingual avatars into virtual scenes.
- **The Epoch 3D Multimedia Kiosk (3DKIOSK)**
3D processing involves an entire chain of steps, from different techniques to capture 3D data, over ways to clean up these data and integrate the results into models, up to ways of visualising the models. 3DKIOSK wants to offer novel solutions for each of these levels. The goal is an integrated turnkey solution, tailored for the needs and requirements of museums.

More details on NEWTONs are available on the EPOCH web site.

Results for NEWTONs are expected during year 3. Some partial ones are already available, as a web service for creating 3D models from photos, which has been successfully tested in a number of conditions, including for example the use of plain tourist images to build 3D models of heritage buildings. Such a service will be integrated into 3DKIOSK.

As we are convinced that committing to research without caring for researchers is useless, EPOCH is carrying out an effective human resource development program. This includes training, with courses and Summer Schools (three/four in 2006) organized by partners under the supervision and with the financial support of the project. Support is also granted to young people wishing to attend conferences and courses under the EPOCH bursary program (some 50 scholarship per year granted as yet) and the mobility program, providing support for researchers from partners wishing to temporarily relocate at another partner to carry out joint research activity.

Finally, spread and outreach of EPOCH's results are obtained by attending and lecturing at scientific conferences and commercial exhibitions and by participating in EU-organized events. Wherever possible, EPOCH has managed a booth where demonstrations are performed and information material is distributed. Along with the organization of several workshops, EPOCH has organized every year a session at an important Spring event (the CAA Conference and/or the EVA Conference) and organizes every November its yearly Conference named VAST (2003: Brighton; 2004: Brussels; 2005: Pisa; 2006: Nicosia), which is attended by some 200 researchers from inside and outside the network. Dissemination is further achieved by a publication series, which hosts proceedings, manuals, reports and other printed material, distributed on paper by a professional publishing house (EPOCH partner) and also available for free from the web site.

What will be the future of EPOCH after the end of EU support in March 2008?

Of course, much will depend on the quality of its results: if they prove to be useful, the scientific community will take over and further develop them. However, we have started planning the future of EPOCH beyond EPOCH.

One promising solution consists of the creation of national/regional Expertise Centres, no-profit organizations supporting SMEs activity and favouring the matching of the offer by them with the demand by heritage institutions, local governments and public heritage agencies. The Centres should be self-sustainable and form a Europe-wide network.

It is also expected that ties created in four years of activity among research institutions will survive and interdisciplinary trans-national teams that have worked together for so long do not dissolve, as unfortunately sometimes happens in EU-funded research. Partnerships from within EPOCH have already successfully bid for other projects and are working on them.

How to make these liaisons permanent is still a matter of investigation, which will take an important place now that the project has passed over the mid-term mark and is sailing downwind towards ever-improved results.

International workshop on
Archaeological and Cultural Heritage Preservation
Within the Light of New Technologies

27 September – 2 October 2004
Százhalombatta, Hungary

All the programmes are held in Hotel Training, Százhalombatta, unless otherwise stated. Coffee breaks will take place during the Panel/Theme sessions.

Monday, 27 September

12.00–14.00

Registration in Hotel Training

14.00–15.30

Ildikó Poroszlai (“Matrica” Museum, Százhalombatta)

Welcoming speech

Franco Niccolucci (School of Archaeology, University of Florence, Italy)

An introduction to the EPOCH Network of Excellence

Sorin Hermon (PIN, University of Florence, Italy)

EPOCH and Central and Eastern Europe

Coffee break

Erzsébet Jerem (Archaeological Institute of the Hungarian Academy of Sciences;
University of Miskolc; Archaeolingua Foundation)

The past, present and future of the Százhalombatta workshops

György Fülek (Szent István University, Gödöllő)

Soils: testimonies of the interaction between Man and the environment

17.00–18.00

Visit to the Százhalombatta Archaeological Park (in case of good weather)

18.30–

Welcome drinks and reception in “Matrica” Museum, Százhalombatta

Tuesday, 28 September

Panel/theme session I

The study of natural and cultural landscape – multidisciplinary methods and the application of Information Technology

9.00–12.30

László Kordos (Geological Institute of Hungary, Budapest)

Researching the changes in Late Pleistocene, Holocene and present-day climate and environment

Imola Juhász (Archaeological Institute of the HAS)

Palynological research: a useful/unavoidable key for environmental archaeology

Coffee break

Franco Niccolucci

Using information technology for archaeological prospection,
documentation and complex evaluation of data and results

Sorin Hermon

The virtual dimension of archaeology

12.30–14.00

Lunch

14.00–17.00

László Bartosiewicz (Eötvös Loránd University, Budapest; University of Edinburgh)

Are ancient animal breeds living monuments?

Erika Gál (Archaeological Institute of the HAS)

The role of archaeo-ornithology in environmental and animal history studies

Coffee break

Sándor Gulyás (Department of Geology and Paleontology, University of Szeged)

Studying shellfishing in Neolithic Hungary: an overview of the applied methods
and some local examples

Ferenc Gyulai (Agrobotanical Institute of the HAS, Tápiószele)

Historical plant-biodiversity in the Carpathian Basin

17.00–18.00

Erzsébet Jerem

Summary, Q + A session

Wednesday, 29 September

Panel/theme session II

Heritage management and preservation

9.00–13.00

Katalin Wollák (National Office of Cultural Heritage, Budapest)

The regulatory enactments of cultural heritage in Hungary

József Laszlovszky (Eötvös Loránd University, Central European University, Budapest)

The Visegrád World Heritage project

Péter Szabó (Central European University, Budapest)

The problems and tasks concerning the Visegrád World Heritage project

Coffee break

András Pálóczi Horváth (Museum of Hungarian Agriculture; Károli Gáspár University, Budapest)

Environment-historical research of medieval settlements

András Bődöcs (Archaeological Institute, Eötvös Loránd University, Budapest)

Examples of problems and solutions in registering archaeological sites on aerial photographs in Hungary

Erzsébet Jerem, Zsolt Vasáros, Zsolt Mester (University of Miskolc)

Archaeological presentation sites and visitor centres in Hungary

13.00–13.30

Péter Szabó

Summary, Q + A session

13.30–14.30

Lunch

16.00

Guided tour of “Matrica” Museum, Százhalombatta

Thursday, 30 September

Panel/theme session III

Computer applications in presenting cultural heritage

9.00–12.30

György Csáki (ERDA Kft., Budapest)

IT documentation and GIS in archaeology: a case study

Judit Kvassay, István Eke (Göcsej Museum, Zalaegerszeg)

Using archaeological GIS in County Zala

Coffee break

Ildikó Poroszlai, Magdolna Vicze (“Matrica” Museum, Százhalombatta)

The application of new technologies at the Százhalombatta excavations

12.30–14.00

Lunch

14.00–ca. 17.00

Tamás Mezős (Budapest University of Technology and Economics)

The virtual architectural reconstruction of archaeological heritage

János Jelen (Angkor Foundation, Budapest)

Remote sensing and archaeology – a silent revolution or a tacit dimension?

Coffee break

Zsolt Vasáros (Budapest University of Technology and Economics; Narmer Bt.)

Cultural heritage, the public and architecture in the time of new communication technologies

17.00–18.00

Tamás Mezős, Zsolt Vasáros

Summary, Q + A session

18.00–18.30

Test, evaluation of workshop (on questionnaire)

19.00–

Farewell dinner

Erzsébet Jerem

Concluding remarks, evaluation of the workshop

Friday, 1 October

Field trip 1: Lake Balaton and its environs

Tác-Gorsium Roman Age Archaeological Park, Tihany (Iron Age hillfort and Abbey)

Saturday, 2 October

Field trip 2: Budapest

Buda Castle, Budapest Historical Museum, permanent archaeological exhibition of the Hungarian National Museum



Introduction

ERZSÉBET JEREM

Archaeological Institute of the Hungarian Academy of Sciences; University of Miskolc; Archaeolingua Foundation

The past, present and future of the Százhalombatta workshops

In the autumn of 1996, the Matrica Museum of Százhalombatta organised a highly successful international conference on environmental and experimental archaeology. The Archaeological Park was opened officially during the conference, and this event marked the start of continuous research, which has allowed for the realisation of the above-mentioned fields within the confines of the park. The papers that were presented at the conference appeared in the Main Series of *Archaeolingua*, and the large number of copies sold and the positive responses have confirmed that environmental and experimental archaeology, topics which have not been dealt with in earnest in Hungary before, are indeed of interest to many. While working on the manuscripts, both Ildikó Poroszlai, the director of the museum and myself have come to the conclusion that based on the experiences we had at the conference, the multidisciplinary methodology required for the study of environmental and experimental archaeology should be made accessible to the new generation of researchers. This is how the idea of the Százhalombatta workshops was born, since none of the universities involved in archaeological education offered such subjects. Ottó Trogmayer, the chair of the Department of Archaeology at the University of Szeged, showed interest in the project and the result was a 5-year-long cooperation between the museum and the university, according to which the students participated at a workshop on either environmental or experimental archaeology at the beginning of the Autumn semester.

We started organising the first environmental archaeology workshop between 16–18 September 1997 with great enthusiasm, and this feeling remained with us in the following years as well. We tried to invite the leading experts of the field, and they took up this task with great willingness. We knew from the very beginning that an interdisciplinary team of experts was in the making, which had a very significant role in the development of the Park, and the excavations that were started in an international collaboration on the area of the hillfort. Following our initial idea, the lectures and practical presentations of the following years centred on experimental archaeology. Thanks to the great interest, we decided that year to publish the material of the lectures in a new series. Unfortunately, due to all sorts of objective and subjective reasons, we have managed to publish only one volume so far, but the extension of the workshop towards an international audience prompts us to make up for the missing materials.

The 5 years flew by very quickly and many things have happened in the life of both the Museum and the Park. Moreover, the first generation of students that has participated at the workshops has graduated from university. As the contract between the University of Szeged and the Museum expired, it seemed appropriate to cooperate with the University of Miskolc for the next period, where the teaching of “Palaeohuman-ecology” became a part of the curriculum. It was in this spirit that one of the most successful workshops took place last year between 24–26 September, in a Park boasting new buildings. Apart from Miskolc, students also came from Budapest, Gödöllő, Szeged and Pécs; some of our colleagues at the Museum and the respective universities also attended. The closing dinner was so successful that we promised to meet here next autumn as well.

This is how we have come to the present, which is also a time to celebrate. The Archaeolingua Foundation, which has cooperated very closely with the Matrica Museum in the past years, has become the member of a European network, whose main purpose, as we have just heard, is to preserve and present the archaeological heritage with the help of the latest tools of information technology. One of the priorities of the network is to pass this knowledge on to both the experts and the wider audience. Therefore, education, the role of multimedia in passing on information and producing publications (both traditional and electronic) form an integral part of the EPOCH programme. From here it was only a small step to organise one of the first international workshops at Százhalombatta, since the EU supports only those courses that complement previous events organised in the same spirit. As the Százhalombatta workshop met these requirements, it has become possible to support the attendance of international students as well, and even if the number of archaeology students is not too high, this can only be attributed to the very little time we had for preparation and organisation – and not of the lack of enthusiasm.

After all these, the question of “What next” comes automatically to mind. I believe that we have started on a new path, and as more of us tread along, the road becomes wider and deeper. Some of the lecturers of this workshop were already there at the very birth of this project, and I would like to thank them and all the other newcomers as well that they have so willingly agreed to come, despite their duties and responsibilities. Ildikó Poroszlai, the director of the Museum, and myself have been involved in the workshop from its conception, and we both sincerely hope that the first 7 years will be followed by an even more substantial 7 years, in compliance with the rhythm of nature.

The changing framework also means changing requirements, such as the publication of the lectures of the workshop. I would like to thank Réka Benczes, Zsolt Mester and Zsolt Vasáros for all their help, and the active participation of the Archaeolingua Team, Rita Kovács and András Kardos, in the organisation of the workshop. Needless to say, the long hours that all of us have spent in preparing the workshop will be only rewarded by the workshop’s success – to which I wish all the best for both the presenters and participants.