Archiving Cultural Objects in the 21st century: Pottery from Karabournaki

Dr. D. Tsiafakis, A. Tsompanopoulos, G. Pavlidis, Dr. N. Tsirliganis, V. Evangelidis, prof. Chr. Chamzas

The rapid technological evolution of the 20th century offering all new possibilities has already influenced, although to a limited scale so far, the methods used for the presentation and preservation of the human history and culture. With the advent of the 21st century these technologies reached their maturity and made clear that for accomplishing the best results in archiving, preserving and disseminating cultural objects, the traditional scholarly research should be supplemented with the achievements of the exact sciences and technology.

Keeping that in mind, we will try to present our work in recording and publishing the archaeological material from "Karabournaki". (**fig. 1**) Karabournaki is located in North Aegean, on the edge of the promontory in the center of Thermaic Gulf, nearby Thessaloniki.[1] The site preserves the remains of a settlement placed on the top of a low mound, with its cemeteries extended in the area surrounding the bottoms of that hill, while the ancient harbor reaches the lower part of the mound. Even though no inscription with the name of the ancient city has been found yet, several scholars have argued for a relation of the site with ancient Therma, based upon its location and literary and archaeological data.[2] The majority of the revealed antiquities seem so far to come from houses dated presumably in the 6th century B.C.[3] The site is extremely useful for the scholar interested in pottery, since it preserves a great number of ceramics. Local pots are found together with imported vases, all in great numbers and quality. Geometric pottery with a number of East Greek and Euboian fragments, are certainly among the earliest imports, but it is possible that

some Mycenaean and Sub-Mycenaean sherds come also from the same place.[4] Based on them and on pottery found in the earlier excavations, it has been suggested that the occupation on the site was continuous from the Late Bronze Age down to the Roman times. The majority of the vases, however, date in the Archaic times, with East Greek -and all its known centers such as Miletus, Samos, Chios, North Ionia and Lesbos-, Corinthian, Attic and Laconian to be the principal categories of imported ceramics found at Karabournaki.[5] The material evidence, both, architectural remains and pottery, demonstrate that the site flourished during the Archaic period and at that time (and very probably, earlier in the Geometric, and later in the Classical times), Karabournaki was a place of meeting of influences from both East and West.

Facing the problem of recording the past in the case of the pottery from Karabournaki, we decided to combine the information provided by different fields in order to achieve the best possible way for the study and publication of the site. The original idea was to include all the information regarding the object –vase in our case- in only one database that will be easily accessible to the excavator or curator of the material as well as to any scholar or even the general public anywhere in the world. The execution of that idea turned to a collaborative project of specialists in various fields.[6] Archaeologists, art historians, nuclear physicists, chemists, and conservators are needed to provide the necessary information for each object. In order, however, to create the database and make it accessible through the Internet is required the contribution of experts in the use and application of new technologies.

While working on the execution of the project though, the original plan was extended beyond the pottery, and in its present form it applies to the entire excavation. The focus now is on designing and constructing a database system containing the full amount of the available information regarding the site, with extended search and

visualization capabilities that can deliver its multilingual content over the Internet. Two deliverables come out at the completion of the project:

a) an Internet version and
b) a multimedia database containing all the existing information regarding the site (architecture, objects), available for any type of use, study, and publication **(fig. 2)**.

The major difference among the two deliverables is that as for the Internet version, the excavator/curator maintains always the option/control to choose and decide the full amount of the presented information (categories of material, specific fields from the records, photos, drawings etc.); meaning simply that (a) is always part of (b), and (a) is always defined by the excavator. In order to make the database accessible to any user universally, it was decided to be bilingual, with the two chosen languages Greek and English.

The figure 2 shows the general structure of the database entitled KARABOURNAKI. The web interface design for the Internet users will be based on the same scheme. The database system is divided in five parts:

1. "The Excavation", holding all the general information needed for the site, meaning introductory texts, maps, and photographs. Of particular importance here is the use of GIS (Geographic Information Systems),[7] a system used to store, combine, manipulate and analyze geographically referenced data of different types. In the case of Karabournaki, through GIS is possible to integrate different formats (texts, photos, external databases, 3d reconstructions etc) of the excavation on a geographical map and to explore the placement of an ancient settlement in relation to others in the same region, in our case Thermaikos.

2. "Findings" is the second part of the database system. Here will be data regarding the various categories of the unearthed objects. In the case of Karabournaki the major group is Pottery. This sub-category is divided in the various Categories of ceramics found on the site (e.g. East Greek, Attic, Corinthian etc). From each Category of ceramics we will be led to the individual records of the FRAGMENTs.[8]

Each fragment/object has three different types of records: a) the archaeological or art historian, b) the conservation and c) the chemical analysis / archaeometrical.

- The archaeological record (a).[9] This contains all the available archaeological data and it has four different sections of information:
  - i). General Data regarding inventory nos., shape, fabric etc.,
  - ii). Dimensions
  - iii). Time & Space regarding dating, provenance, artist etc., and
  - iv). Description with information on inscriptions, comparanda, and remarks.
- The conservation data record (b) regards all the info for the condition and the treatment of the fragment/object.
- The chemical analysis/archaeometrical data record (c) includes data regarding the composition and the characteristics-properties of the material of the artifact as well as other miscellaneous information extracted with technological means. References and links to the original measurements and raw data are included for complicity and possible future re-examination-evaluation. The reference part is extended also to other similar data sources (for example chemical composition databases) where available, in order to support further study of the object (for instance provenance). This record incorporates three section areas:

i). Composition of the material referring to the stoichiometric and/or mineral composition of the sample. This section is distinguished in Surface or volume composition and Point or bulk composition,

ii). Properties and technological information. Properties refer to the physical or mechanical characteristics of the material of the sample (e.g. porosity, hardness, etc). Technological information refer to manufacturing parameters deduced from various measurements and observations (e.g. firing temperature, oxidizing or reducing atmosphere etc), and

iii). References that include the archives to all measurements, raw data and plots of the results. This material is available for future re-examination and/or evaluation of the extracted data.

The last part regarding the fragment/object includes all the photos, drawings and profiles. In this part we also include 3D reconstructions of particular fragments in order to present them in their original form and make them more understandable and accessible to both scholars and general public (**fig. 3**). This section also relates objects with trenches or as we say it has a 3D-GIS part.

3. "Trenches" is the third part of the Database (**fig. 1**). Here are stored all the drawings of each trench with the possibilities of selecting, searching and zooming on each of them and, furthermore, linking to findings, notes and other related information in the database.

4. "Excavation Notes" is the fourth part of the Database. Here will be stored and presented all the notebooks of the excavation together with summaries of each trench. There will be also the possibility of searching on that scanned material, to make them more useful to the user by providing links to findings and trenches or any other related information.

5. "Bibliography" is the last part of the Database. The bibliographical references regard all the known bibliography for Karabournaki as well as important references regarding the various categories of the objects.

All those parts are inter-connected in various ways through the use of a sophisticated search engine. The latter plays a very important role in the entire application and therefore has to be as flexible as possible to accommodate the needs of every user.

The achievement of our goal in creating the presented database system, involves the combination of several existing technologies as well as the development of new ones. The most important are shown in figure 4. The data input can be done in a two-fold way:

- by using a specifically designed software for off-line on-site data input and
- by using specific forms written in Rich Text Format (RTF).

All completed input forms are gathered and are either automatically fed to the database or parsed by a specially designed PERL parser,[10] which undertakes the task of interpreting a form into a format perceivable by the database.

Getting a little deeper into the technological domain we can name the adopted technologies:

1. MySQL was adopted as the **main database system**. MySQL is an SQL[11] based database system that is very efficient for web applications. It complies with the relational model and distributes the content into easily manageable and flexible tables.

2. To overcome the problem for the universal compatibility concerning the linguistic aspect and the multilingual character of the content was employed the Unicode Standard.[12]

3. To combine multimedia, databases and the Internet on a single interactive environment is to design an enhanced **user interface for the web**. The standard programming language for the web is the Hypertext Markup Language (HTML).[13] HTML is written in plain text but the resulting web pages are static. In most cases, however, the need for dynamic content is dominant. Therefore it was chosen to use the PHP,[14] a programming language able to construct dynamic pages, meaning pages with their content depending on the user's request.

4. Another important aspect of such an interface is **the artistic point of view**. Here was chosen the Macromedia Flash,[15] an integrated high-productivity authoring tool with the ability to publish appealing content over the Internet.

5. Taking a step forward in the **user interface design** domain we reached the borders of Virtual Reality (VR). Basically VR is about using computers to create images of 3D scenes with which one can interact and navigate. Although the Internet was used initially to communicate text and two-dimensional (2D) graphics, it was soon realized that it could be used to process three-dimensional (3D) graphics. Almost overnight VRML[16] (Virtual Reality Modeling Language) appeared and enabled Internet browsers to interact with 3D environments. One of the most widely used software to implement realistic 3D worlds is 3D Studio MAX.[17] It offers several different modeling technologies with great representation capabilities, while maintaining compatibility with other architectural and GIS software and systems and the VRML.

6. At the final step of the user interface design one has to consider the case when **existing technologies are not enough for the work** at hand. In such cases the designer has to think of implementing new technologies to fill the gaps. In order to be able to deliver these new technologies to any user through the Internet, the developer usually takes the path of creating new pieces of software, called Plug-ins.[18]

The combination of the mentioned technologies with the archaeological, archaeometrical and conservation data lead to the creation of a digitized excavation, that enables the scholars to handle and study all the available material in a multifunctional way. Furthermore, through the internet version, available in the Webb, the site of Karabournaki becomes known and accessible to everybody universally before the final publications that might take some time to appear.

Aknowledgements

Special thanks are due to prof. M. A. Tiverios, director of the current University excavations at Karabournaki, for providing full access to the excavation material. The authors are also grateful to D. Papadopoulou for her participation in the process of the project, and J. Podany and Ath. Velios for their contribution to the creation of the 'conservation record'.

Fig. Captions

Fig. 1. Karabournaki: trenches

Fig. 2. ‘Karabournaki’ excavation database diagram

Fig. 3. East Greek Fruitstand from Karabournaki: 3D reconstruction.

Fig. 4. ‘Karabournaki’ excavation database: technologies used.

Figures

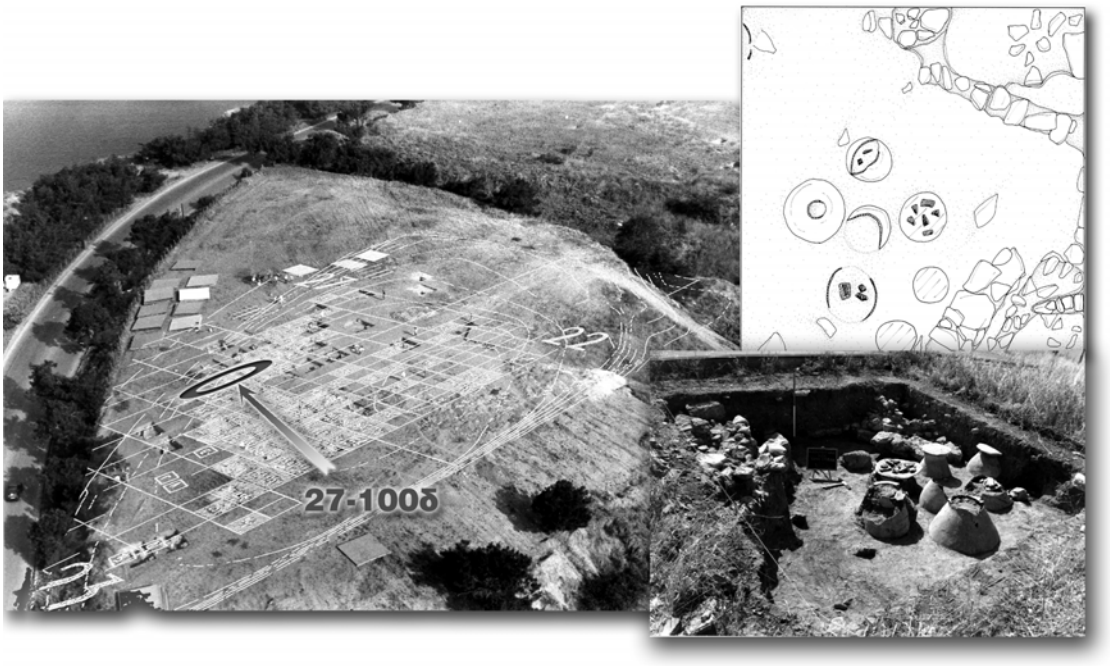

FIG. 1. Karabournaki: trenches

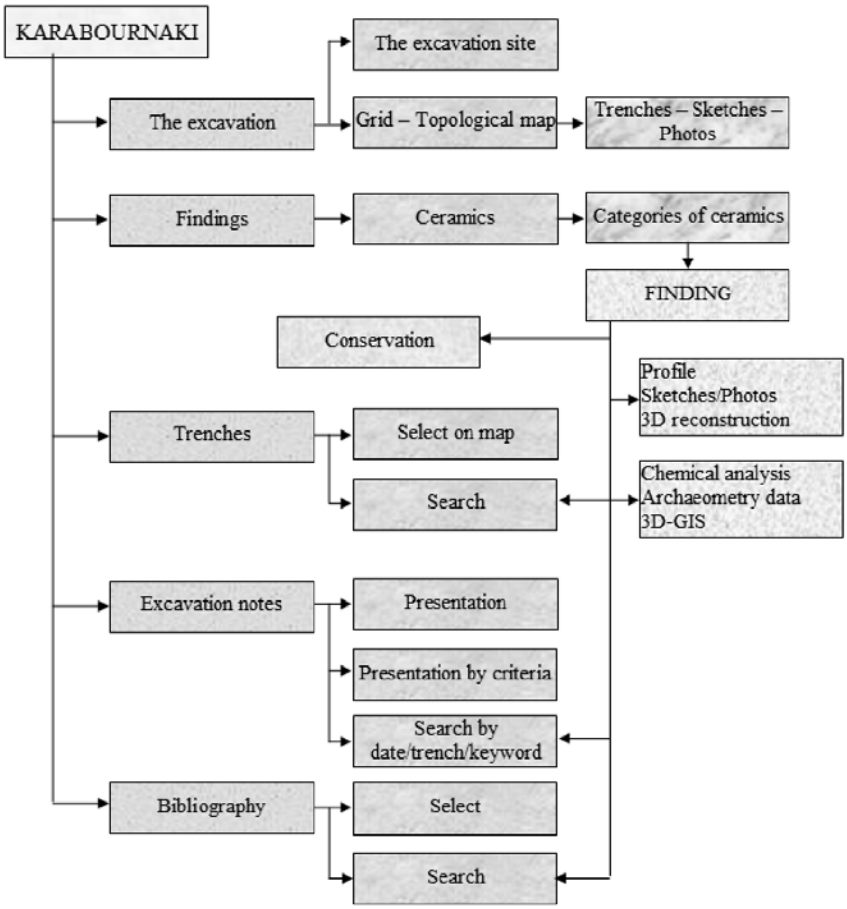

FIG. 2. 'Karabournaki' excavation database diagram

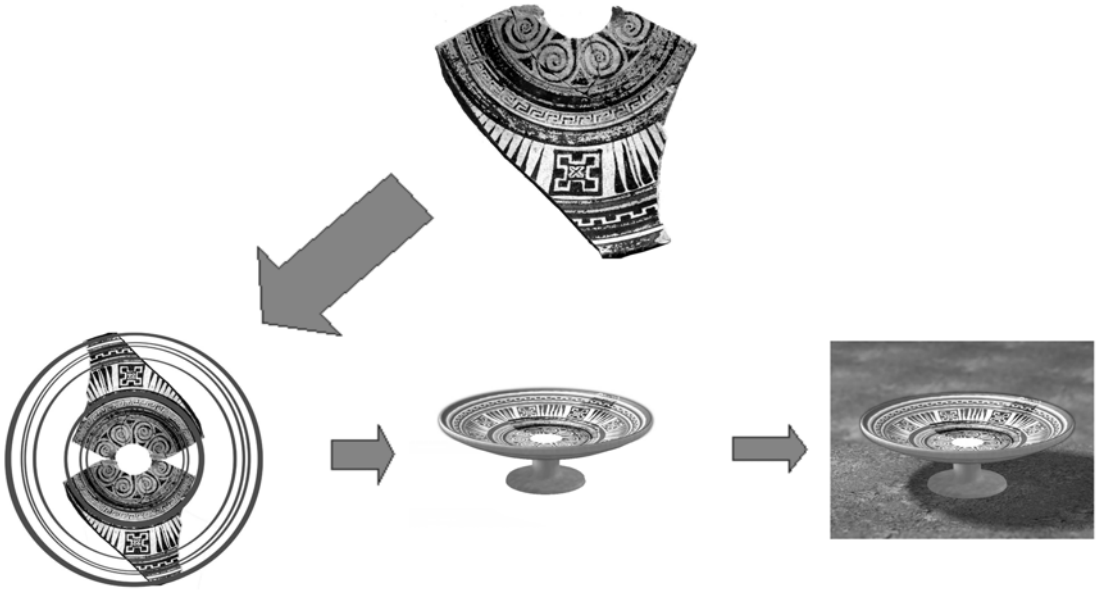

FIG. 3. East Greek Fruitstand from Karabournaki: 3D reconstruction.

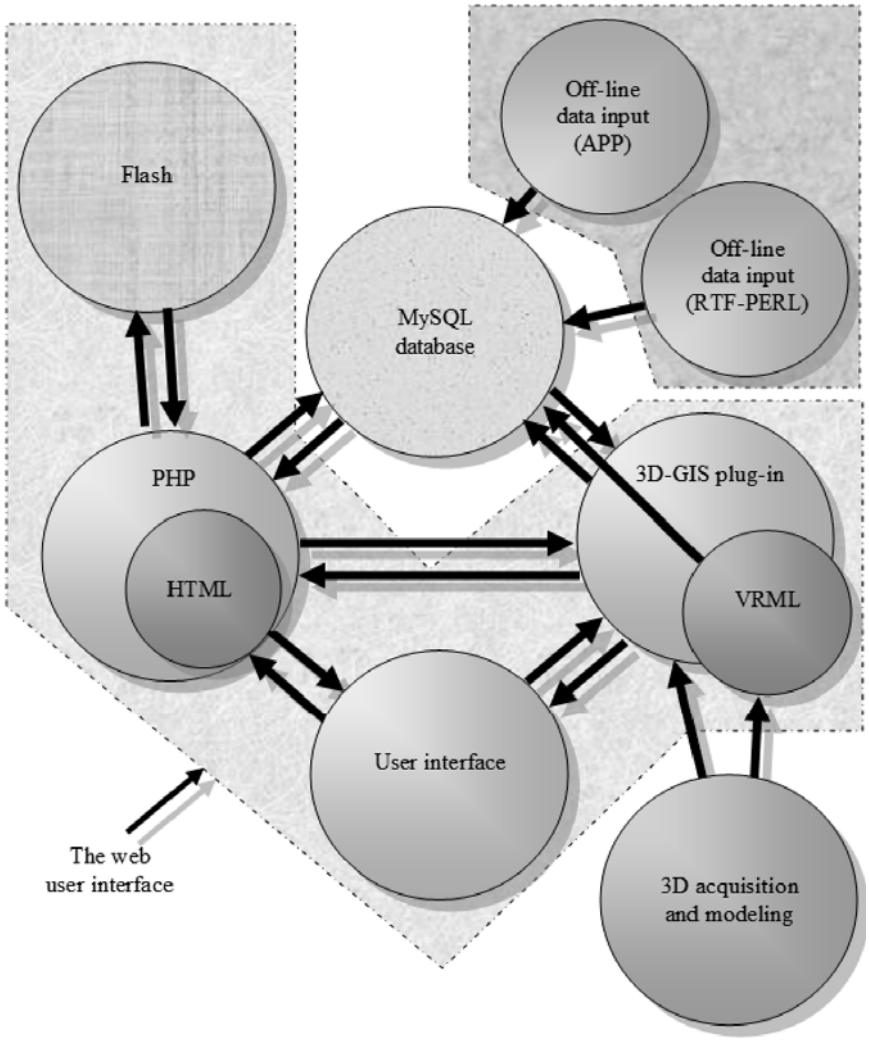

FIG. 4. 'Karabournaki' excavation database: technologies used.

Authors names and affiliations

Dr. Despoina Tsiafakis, Classical Archaeologist
Apostolos P. Tsompanopoulos, Electrical Engineer
George P. Pavlidis, Electrical Engineer
Dr. Nestor C. Tsirliganis, Nuclear Scientist
Vasilis Evangelidis, Archaeologist

For the all the 4 above names the affiliation is
Cultural and Educational
Technology Institute (CETI)
58 Tsimiski St.
GR- 67 100 Xanthi
Greece
www.ceti.gr
tel. ++30-5410-78 787
fax: ++30-5410-63 656
e-mail: tsiafakis@ceti.gr
tsompano@ceti.gr
gpavlid@ceti.gr
tnestor@ceti.gr
vasevang@ceti.gr

For the 5th author
Prof. Chr. Chamzas
prof. of the Electrical Engineering Department at Democritus University of Thrace, director CETI

As communication address maybe used the same as before at the Cultural and educational Technology Institute (CETI) and the e-mail is
chamzas@ceti.gr

REFERENCES

[1] For the site see M. Tiverios, "Kares sto mycho tou Thermaikou Kolpou," *Archaia Macedonia* 6 (1999) 1175-1181; E. Pandermali, E. Trakosopoulou, "Karabournaki 1995. H anaskafi tis IST' EPKA," *AErgoMak* 9 (1995) 283-292; K. A. Rhomaios, "Anaskafi sto Karabournaki tis Thessalonikis", *Epitymbion C. Tsounta*, Athens 1941, 358-387. L. Rey, "La Nécropole de Mikra-Karaburun près de Salonique," *Albania* 4 (1932) 67-76. See also note 3.

[2] K. A. Rhomaios, "Pou ekeito I archaia Thermi," *Makedonika* 1 (1940) 1-7; N.G.L. Hammond, *A History of Macedonia* v. 1, Oxford 1972, 151; M. Tiverios, "Ostraka apo to Karabournaki," *AergoMak* 1, 1987, 247-260; idem, "Apo ta apomeinaria enos proellinistikou ierou 'peri ton Thermaion kolpon'," *Mnimi Lazaridi. Polis kai chora stin archaia Makedonia kai Thraki*, Thessaloniki 1990, 71-88. For a summary of the earlier discussions on ancient Therma cf. M. Vickers, "Therme and Thessaloniki," *Ancient Macedonian studies in honor of Charles F. Edson*, Thessaloniki 1981, 327-333; *Thessaloniki Philippou Vasilissan*. Meletes gia tin Archaia Thessaloniki, Thessaloniki 1985, passim.

[3] For an overview of the current University excavations in Karabournaki see M. Tiverios, E. Manakidou, D. Tsiafakis, "Panepistimiakes anaskafes sto Karabournaki Thessalonikis (2000-2002)," *Egnatia* 7 (in print); M. Tiverios, "Exi chronia panepistimiakon anaskafon sto Karabournaki Thessalonikis," *Egnatia* 5 (1995-2000) 297-321. See also the papers by M. Tiverios, E. Manakidou and D. Tsiafakis, in volumes of *AergoMak* 8-16 (1994-2002).

[4] Tiverios 1987, 247-260.

[5] For the East Greek pottery from the site see in particular D. Tsiafakis, "On Some East Greek Pottery found at Karabournaki at Thermaic Gulf," *Akten des Symposions Die Ägäis und das westliche Mittelmeer. Beziehungen und Wechselwirkungen 8. bis 5. Jh. V. Chr., Wien 24 bis 27 März 1999*, F.Krinzinger ed., Wien 2000, 399-405. For Corinthian and Attic imports see E. Manakidou, "Korinthische und attische Import Keramik der archaischen Zeit aus der Siedlung von Karabournaki/NordGriechenland," *Griechische Keramik im Kulturellen Kontext. Akten des Internationalen Vaen-Symposions in Kiel vom 24. bis 28.9.2001*, B. Schmaltz, M. Söldner eds., Münster 2003, 193-196.

[6] The working team on the project consists of experts in archaeology/art history (D. Tsiafakis, V. Evangelidis), nuclear physics (N. Tsirliganis), and engineering (C. Chamzas, A. Tsompanopoulos, G. Pavlidis).

[7] P. A. Burrough and R. McDonnel, *Principles of Geographical Information Systems*, Oxford 2000, esp. p. 11. For archaeological applications see D. Wheatley, M. Gillings, *Spatial Technology and Archaeology*, London 2002.

[8] In fig. 2 this corresponds to box FINDING.

[9] That corresponds to box FINDING in fig. 2.

[10] L. Wall, T. Christiansen, R. L. Schwartz, *Programming Perl*, [2] 1996.

[11] J. Celko, *SQL for Smarties: Advanced SQL Programming*,[2] San Francisco 2000, 1-9; P. DuBois, *MySQL Cookbook*, 2002.

[12] The Unicode Consortium, *The Unicode Standard version 3.0*, [2] 2000.

[13] A. Ehlen ed., *HTML Complete*, [2] Alameda 2000.

[14] W. McCarty, *PHP 4 A Beginner's Guide*, 2001; L. Welling, L. Thomson, *PHP and MySQL Web Development*, 2001.

[15] R. Reinhardt, J. W. Lentz, *Flash 5 Bible*, New York 2001.

[16] A. L. Ames, D. R. Nadeau, J. L. Moreland, *VRML 2.0 Sourcebook*, [2] 1997.

[17] K. Murdock, *3D Studio MAX R3 Bible*, Foster City 2000.

[18] K. Sankar, G. Baird, D. Doherty, R. Falla, B. Farrar, J. O'Donnell, J. Jr. Honeycutt, *Internet Explorer Plug-In and ActiveX Companion, Book and CD-ROM edition*, 1997.