

Global Access to Mediterranean Archaeology

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Abstract. Research concerning migrations of peoples, cross-cultural impacts, or trade networks can be determined by comparative analyses of remains from sites scattered across the Mediterranean. In that case access to on-line databases that contain data necessary for multi-disciplinary archaeological analyses is essential. By providing a web-based GIS such analyses across this wide geographic area can be facilitated more readily. The introduction of GIS on a local scale can be extended to global proportions with essential planning that includes agreement of terms and the level of data that are to be provided for a “global” database. Subsequently standards require to be established that will allow for terms to be set and then be used by archaeologists from different countries. It is proposed that such standards be used to create an on-line Mediterranean Archaeology GIS database.

Keywords: Mediterranean Archaeology, on-line GIS, standard terms, data warehousing

1. Introduction

Managing data is a great challenge for archaeology. First there is the need to physically store the findings somewhere safe, and then there is the even greater need of publishing them! Disregarding the type of media used for publication, archaeological data are valuable only if they can be easily accessed and used to develop theories about how people lived in the past (Günther, et al 2001). Therefore the value of data stored either in manual or electronic files to a certain extent is determined by how easily accessible it is. Archaeological data contain multitudes of clues that are usually derived by statistical analyses and other processing techniques. However the application of processing techniques and analyses requires that all the available data can be easily accessed. Therefore suitable organization and storage of archaeological data is necessary. This requirement led archaeologists to readily adopt the new digital archiving facility offered by database technology in order to efficiently process the mass of data accumulated at any one site (Dibble et. al. 1988). Databases provide relatively easy access to masses of data. But it's necessary to develop standards in order to effectively use databases. Standards are the key that can be used to unlock and share data amongst colleagues. A conceptual method for arriving at standards will be proposed with the need to be further developed and subsequently implemented to ensure that the most appropriate terms are selected.

The importance of having access to data in order to develop theories about cross-cultural contacts and migrations of people promoted an effort to share databases amongst colleagues over the Internet (Clarke 2001). In many cases the use of a GIS to include details about spatial data associated with the finds has extended the application of database technology at a site (Berg 2001). GIS technology offers the possibility of storing data with spatial attributes. Subsequently “map-based” searching facilities have been created in order to analyze the spatial characteristics that most archaeological data consist of. Ultimately the establishment of any archaeo-

logical database, whether it is map-based or not, requires careful planning in order for it to be of any lasting value.

An overview of databases and what these imply for archaeological research is followed by a survey of some Internet archaeological database. Then the application of GIS to coordinate spatial details about archaeological data is discussed showing how this can assist research about inter-site communication patterns in the past that resulted from trade or migration of people groups. Issues relating to the establishment of an on-line GIS database for Archaeology in the Mediterranean region are covered in order to plan for a future application of this nature. Finally ideas are provided that can assist in overcoming hindrances to creating a Mediterranean Archaeology GIS database that has a standard terminology for on-line access through the Internet.

2. Database Technology and Archaeology

The term “database” came into common use with developments in information technology over 30 years ago. A database allows for the efficient storage of records that can then be retrieved according to the queries made upon the data, and can be further processed for more detailed information. Databases provide a digital archive that enables masses of data to be queried almost instantaneously. Database technology continues to evolve as the power and speed of computers increases. Archaeological research quickly adopted database technology in order to store and retrieve valuable data about the findings at a site (Schlader 2002). Subsequently numerous databases were created and are being utilized by archaeologists at various sites.

Each archaeological site has a unique way of organizing its excavated material. Unfortunately this has been a major hurdle for the integration of data so that it can be easily shared amongst colleagues. However with proper planning and application of database technology that can provide translating mechanisms for common terms (vanLeusen 2001), it is now

possible, however difficult, to establish national and international web-based or Internet databases. The original intention of the Internet was to exchange data and ideas amongst colleagues. By making databases available over the Internet archaeologists around the world can now enhance their research. As database technology improves so too does the ability to share and use increasingly more and more data over the Internet. The increasing number of archaeological databases on the Internet demonstrates this.

3. Current Internet Archaeological Databases

A concerted effort has recently been made to coordinate disparate archaeological databases in order to disseminate valuable data amongst colleagues from different countries (Vatanen 2002). Some examples of already existing on-line databases and what they offer archaeological research are now presented. These examples provide a basis from which new databases, such as the one proposed for Mediterranean archaeologists, can be better developed.

The objective of EuroPreArt (<http://www.europreart.net/>) is to maintain an on-line database of European prehistoric art, by cultivating and fostering a European institutional network devoted to updating this database. Given the interdisciplinary nature of this database it is in the process of developing methodologies for data inventory, networking and on-line accessibility. The project has implemented a model website that presents textual and image data to the wider public, and is open to further contributions. This database can be queried on-line to provide details about a site, such as its plan, a digital image of the rock art, reference material and other details.

The ARENA (Archaeological Records of Europe-Network Access) project, <http://ads.ahds.ac.uk/arena/>, provides a broad disparate network of archaeological databases across six nations. The ARENA project provides access to digital or e-publications. This increasingly popular means of archaeological publication is also available at the ArchTERA project site (<http://archterra.cilea.it>) that is dedicated to promoting the European Archaeology Web across Bulgaria, Romania and Poland. This Internet site aims to extend existing scientific relations in the field of archaeology between European countries and to encourage long-term collaboration between partners and collections from across Europe by sharing digital data via on-line methods (vanLeusen et. al. 2001).

The TimeMap project combines GIS technology and digital library research to provide diverse digital resources on computer servers around the world to be viewed by means of a map interface. TimeMap essentially generates interactive maps that show cultural changes over time (Johnson et. al. 2002). Items on the maps can be linked to non-spatial resources such as photographs, sound files, videos, texts, bibliographical information, or tables, thus providing an abundance of digital data (www.timemap.net). The Electronic Cultural Atlas Initiative (<http://ecai.org/>) keeps on expanding as various institutes from around the world contribute their cultural data. It utilizes the computer software developed by TimeMap to allow on-line access to maps showing changes in human history over time. Researchers from different regions around the world maintain these cultural time maps.

Apart from “international” databases, national databases and web sites about a nation’s cultural heritage have also been created. For example CANMORE or the Computer Application for National MONuments Record Enquiries allows on-line access to the database of the National Monuments Record of Scotland (NMRS), www.rcahms.gov.uk/canmoreintro.html. This database contains details about archaeological sites, monuments, buildings and maritime sites in Scotland together with an index to the drawings, manuscripts and photographs in the Collections of the NMRS. CANMORE enables this data to be searched by location (place name, area or Ordnance Survey 1:10,000 maps) by type (the classification or function of a site, monument or building) or by keyword. The database consists of over 200,000 site-based records spanning Scotland’s heritage from prehistory through to 21st century architectural and engineering achievements. In June 2002 this on-line database was extended to include CANMAP, a web-based GIS database that allows geographic searches where map-based or GIS data can be queried, <http://www.rcahms.gov.uk/canmore/login.show>.

4. Why Use a GIS?

Spatial or GIS databases have the ability to store and retrieve spatial and attribute data about every line or point on a map. A GIS can allow archaeologists to see the location and have information about their data on interactive maps. A GIS can allow plans of excavations to be stored in a digital format that allow access to data about everything found at a site on a daily basis. GIS databases facilitate a variety of spatial analyses. At just one site, intra-site investigations can study for example the architecture. In this case a GIS provides digital plans for the site of Akrotiri on Thera. The digitised site plans can be used to investigate the dimensions of buildings, such as the dimensions of each wall. A GIS database can also store images of the buildings at a site, but most importantly it can be used to derive, for example the size of each room in a building, as is shown in Figure 2. for the West House at Akrotiri.

If architectural data from other sites were available on-line then comparative analyses could be performed. In this case buildings at other sites that have similar sized rooms can be



Fig. 1. Results of a search request at the EuroPreArt Internet site.

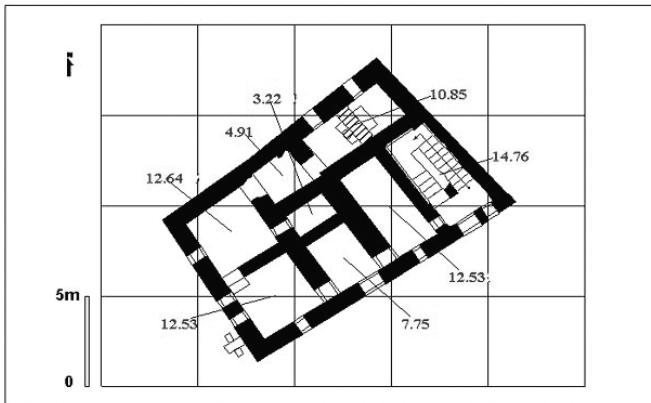


Fig. 2. The dimensions (in m²) of rooms in the West House.

found relatively quickly, and may then be used to develop a building typology for a particular era or area.

On the other hand Landscape Archaeology can apply a GIS in order to investigate sites in relation to their environment, significant features in the landscape, or in relation to each other. For research in this field of archaeology a GIS is used to map sites across a wide region. Inter-site investigations across wide-areas can determine if there are any patterns in site distribution, or possible cross-cultural impacts. As such the distribution of sites across a region and their relation to their immediate environment can be examined more easily by using a GIS.

Because GIS provide a multitude and variety of analyses, an on-line Mediterranean Archaeology database should be created by using GIS technology. GIS databases that can be queried over the Internet allow the possibility for extending archaeological research and presentation methods. By using an on-line GIS researchers can select either a specific area of a map or select a particular site and have access to the site's database for comparative study. Similar characteristics can be selected to appear on a map to determine, for instance, whether certain distribution patterns exist. Since on-line GIS databases can provide access to a multitude of data it is proposed that a GIS database be established for Mediterranean archaeology and be made available over the Internet.

5. Establishing an On-line GIS Database

The idea for establishing a Mediterranean Archaeology GIS database was inspired by an exhibition that was held at the Museum of Cycladic Art in Athens during 2003 where archaeological objects from around the Mediterranean region were displayed. The international nature and requirement for managing and sharing archaeological data has increased over recent years so it is proposed that a Mediterranean Archaeology GIS database become available on-line for access by researchers as well as the general public. If plans and images of buildings, and artifacts that have been found at Mediterranean sites were available in an on-line GIS database then Mediterranean archaeologists would have almost instantaneous access to compare their own findings with those of others, and display results on a map. By doing so theories

about trade networks and how cultures had interacted with each other in the past could be facilitated more easily. Given a suitable "user-friendly" interface to the data (Bulas-Cruz et al 1999), an integrated Mediterranean Archaeology GIS database could allow efficient retrieval and analysis of maps, text, photographs, drawings and even 3D images of artifacts and buildings. But how can such an on-line GIS database be implemented?

The benefits and efficiency that Internet databases provide have been demonstrated as a solution to accessing the diversity of archaeological data from around the world. Internet access can assist both the public and researchers in gaining a greater understanding about archaeology by exploring narratives or searching for relevant artefacts and monuments. However it is necessary that standards be set for such databases to come into existence. Given the fact that research about Mediterranean Archaeology is carried out around the world at various research centers, points of contact should not be limited to archaeologists who excavate the relevant sites but should be extended beyond the Mediterranean region. So various institutes around the world that are involved with researching Mediterranean Archaeology would have to eventually be contacted to determine what sort of data and standards are to be used.

Starting off with institutes on this side of the Atlantic, a possible solution to this formidable task is to coordinate major centers that would be responsible for communicating with other institutes in order to reach a consensus. The map below, Figure 3., proposes some initial points of contact between universities and research centers. The major research centers located in Athens, Rome, Paris, Madrid, Berlin, London and Nicosia are to set up committees that maintain contact with branches or links to other major centers in order to determine on a broad level what is to be included in the database. This proposed network of institutes can act as centers that promote collaboration with surrounding institutes. In turn these surrounding institutes can also take the initiative to collaborate with even further institutes in their region, thus creating a hierarchy of communication.

Researchers at these links can then be engaged in a discourse amongst each other in order to reach an agreement about what level of data are to be included and about what terms are to be used in the database. The major centers should then coordinate the different viewpoints amongst themselves and then establish a level of agreement amongst all researchers throughout the entire network. Eventually a facility to allow contributions to the database by as many researchers as possible should become available.

By establishing and maintaining contact with researchers at various institutes an on-line Mediterranean Archaeology GIS database could be designed to incorporate detailed information about individual sites, documents and interactive maps of local site plans. The database should also allow for easy registration of additional resources, such as photographs, commentaries and links to specific Internet sites. It is therefore necessary to establish a suitable digital infrastructure to allow Mediterranean archaeologists that are responsible for the archiving, and maintenance of information to contribute to this central source of data.

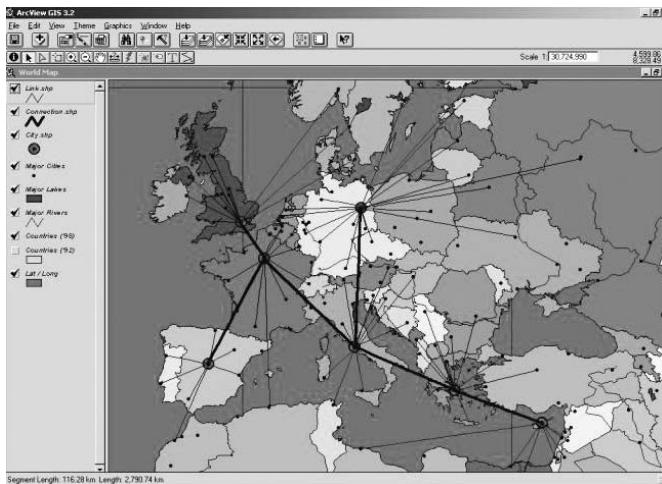


Fig. 3. Points of Contact: Coordinating Research Institutes.

Above all is the importance of arriving at standard terms to be used amongst researchers. This in itself will require a specific team to oversee the ongoing development of a common terminology. Within a given time-frame standard terms and a database structure should be finalised in order to create and finally implement an on-line Mediterranean Archaeology GIS database. Of course if it is, and most likely it will be, difficult to reach an agreement even amongst the 7 centers, a voting system can be set up and standards can then be democratically elected.

6. Setting Standard Terms for On-line Access

Amongst archaeologists terminology varies to such a degree that in many cases it is difficult determining standard definitions even for archaeologists within one country. This is usually because terminology originates on the field and field practices common to one site may not apply across all sites. Establishing a common or standard terminology means that either excavation recording forms may have to be eventually transformed or generic terms are to be devised for the creation of on-line databases (Madsen 2001).

Thesauri or on-line “dictionaries” can facilitate translation of terms from one region to another so that archaeologists in different countries with a variety of languages can comply with the standard terms (vanLeusen 2001). It is metadata or data about data in a database that allows for the translation of terms and access to the available data through thesauri. Metadata are the basis for creating data warehouses or in other words very large databases that are usually deployed on-line. In the case of data warehouses the process of data mining (as the term itself implies) relies on the metadata in order to retrieve relevant data for the extraction of information and hence knowledge.

It is not unforeseeable in the future that as an ever-increasing amount and variety of archaeological data are digitized at sites, data warehousing techniques that apply to on-line applications, will become a necessary adaptation for archaeological data. Again the major hurdle will be arriving at standard terms or incorporating some sort of ontology. Ontology entails a shared understanding or some sort of worldview with respect to a given concept. In other words,

ontology is an explicit, agreed specification that includes a vocabulary of terms with their definitions and their relationship to each other. This set of precise definitions, or axioms, provides the meaning of terms, and enable a consistent interpretation of the terms defined in the vocabulary. For an on-line Mediterranean Archaeology GIS database it is proposed that interested parties set up a forum via the Internet whereby archaeologists researching the Mediterranean region are contacted and encouraged to contribute to and refine archaeological terminology for the creation this database. One method for arriving at a standard terminology may include a voting system through the network of research centers as defined above in section 5. Despite the potential diversity of opinions it is not unforeseeable that common ground can eventually be established, by employing a system for proposing and voting on what data and terms are to be used. This voting system could apply for example to terms for artifacts, features, and architectural elements. The major objective is to commence a process of designing and planning for this on-line GIS database because easy access to digital databases for archaeological analyses is becoming more and more essential.

7. Conclusions

Researchers all around the world can have easier access to archaeological data from an excavation when they are provided and made available through on-line databases. Apart from viewing artifacts and features found at a site, archaeologists could also investigate site plans and spatial distributions given the implementation of GIS databases. The opportunity for researchers to contribute to an on-line database is important for the on-going addition and improvement of the available archaeological data in an area. For dynamic databases that have the ability to add new data as they become available there is a requirement for the application of flexible strategies that can integrate database technology with methodologies of archaeological research as they develop. On the other side of the same coin is the necessity to establish a database that will be able to keep pace with changes in the IT industry and can incorporate new developments as they arise. Even though establishing an on-line Mediterranean Archaeology GIS database that encompasses all these goals may appear to be a formidable task, given the necessary infrastructure, financial support, and of course standards, ideas and plans can eventually come to fruition.

References

- Berg, E., 2001. National Registries of Sites and Monuments in Norway-Developing GIS-based Databases. In Stančič, Z., and Veljanovski, T. (eds), *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000*. Oxford, Archaeopress. BAR International Series 931.
- Bulas-Cruz, J. et al., 1999. Beyond traditional Web page designs – a communication language between designers and web page developers. In Barceló, J. A. et al., (eds),

- Proceedings of the 26th CAA conference, held at Barcelona, Spain, March 1998.* Oxford, Archaeopress. BAR International Series 757.
- Clarke, J., 2001. Web Access to an Archaeological GIS. In Stančič, Z. and Veljanovski, T. (eds), *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000.* Oxford, Archaeopress. BAR International Series 931.
- Dibble, H. L. and McPherron, S. P., 1988. On the Computerisation of Archaeological Projects. *Journal of Field Archaeology* 15.
- Gunther, H., et al, 2001. Publishing on the Internet: The Internet as an Academic Information Source. In Stančič, Z., and Veljanovski, T. (eds) *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000.* Oxford, Archaeopress. BAR International Series 931.
- Johnson, I. and Wilson, A., 2002. The TimeMap Kiosk: Delivering Historical Images. in a Spatio-Temporal Context. In Burenhult, G. (ed.), *Proceedings of the 29th CAA conference held at Visby, Gotland, Sweden, 25–29 April 2001.* Oxford, Archaeopress. BAR International Series 1016.
- Madsen, T., 2001. Transforming Diversity into Uniformity-Experiments with Meta-structures for Database Recording. In Stančič, Z., and Veljanovski, T. (eds), *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000.* Oxford, Archaeopress. BAR International Series 931.
- VanLeusen, M., 2001. Indexing and Retrieving Archaeological Resources on the Internet – A prototype Multilingual Thesaurus Application In Stančič, Z., and Veljanovski, T. (eds), *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000.* Oxford, Archaeopress. BAR International Series 931.
- VanLeusen, M., and Prinke, A., 2001. Archterra: Extending the European Archaeology Web over Bulgaria, Romania and Poland. In Stančič, Z., and Veljanovski, T. (eds), *Proceedings of the 28th CAA conference held at Ljubljana, Slovenia, 18–21 April 2000.* Oxford, Archaeopress. BAR International Series 931.
- Schlader, R., 2002. Archaeological databases: what are they and what do they mean? In Burenhult, G. (ed.), *Proceedings of the 29th CAA conference held at Visby, Gotland, Sweden, 25–29 April 2001.* Oxford, Archaeopress. BAR International Series 1016.
- Vatani, I., 2002. The Archaeologist Files: an approach to the digital contextualization of archaeological finds in user adaptive information systems.. In Burenhult, G. (ed.), *Proceedings of the 29th CAA conference held at Visby, Gotland, Sweden, 25–29 April 2001.* Oxford, Archaeopress. BAR International Series 1016.