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## The heritage of archaeological mapping in Greece and some tools for a digital approach

*Keywords:* archaeological cartography; timeline; geotemporal visualization;  
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### *Summary*

Maps with archaeological themes constitute a distinct area of cartographic interest. Even before the era of scientific archaeology (which started in the 19<sup>th</sup> century), archaeological thematic subjects were depicted on maps, in one way or another. The Greek world and its history and archaeology become a popular map subject, starting from the 15<sup>th</sup> century and onwards. The history of archaeological mapping concerning Greece has developed along two main paths: mapping the archaeological locations/monuments and/or historical places and mapping for the archaeological excavations concerning the Greek world. The outcome of the above constitutes a body of an interesting cartographic heritage, which physically can be found in various forms and locations (i.e. libraries, books, atlases etc.)

The paper attempts to approach this fragmented and diffused cartographic heritage by means of digital tools in order to suggest and provide an environment for a virtual overview of its components. The aim of the work is to propose the use of a global platform for positioning and viewing the maps in geographic space and in time, together with an interface for accessing and displaying relevant information.

### Introduction

In order to estimate the historical contribution of cartographic heritage it is necessary to follow its course in all the dimensions of its evolution. Cartography, far from being a strictly bordered and monothematic discipline, has always been the “meeting point” for many fields of scientific and cultural interest. Typical manifestation of this are the maps having archaeological themes as their subject. By studying the respective cartographic material, one can trace the course of archaeology from its beginnings till the era that it becomes an independent scientific field, in the 19<sup>th</sup> century.

One of the major poles attracting interest in this context has been the classical antiquity (Black, 1997); more specifically, the history and archaeology of the Greek world becomes a map-theme from the 15<sup>th</sup> century onwards. At that time, in the first editions of Ptolemy’s Geography in Europe, a superiority with respect to the scale of representation of Greece is evident in the maps, attracting thus the readers’ attention (Livieratos, 2009). During the following centuries (i.e. from the 15<sup>th</sup> to the 18<sup>th</sup>) the interest of the West for

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Greece increases significantly; even after the establishment of the modern Greek state and despite its initial rather troublous status, Greece continues to charm Europe because it is associated with its ancient glorious past and classical antiquity. From the Renaissance till the late 19<sup>th</sup> century a remarkable body of cartographic heritage with historical/archaeological orientation has been produced (see e.g. Livieratos op. cit., Livieratos 2001 and 2007, Tolia 2008 and 2010).

The history of archaeological mapping concerning Greece has developed along two paths:

- i. Mapping the archaeological locations and monuments (existing at the time, or anticipated in their ancient status), or/and mapping historical places. This was a consequence of the interest about the history of the classical past; its archaeological expression concerning Greece was manifested from the 18<sup>th</sup> century and forth.
- ii. Mapping for the archaeological activities (i.e. archaeological excavations) concerning the Greek world, starting from the 19<sup>th</sup> century.

The outcome of the above constitutes a valuable body of cartographic heritage, which physically can be found in various forms and locations (i.e. libraries, books, atlases, collections etc). This heritage is the result of combined efforts: the archaeological activities carried out by the modern Greek state (founded in 1830), the excavations of the so called “Foreign Archaeological Schools / Institutes”, which started their activity in the country by the mid-19<sup>th</sup> century and of course the rich body of the archaeological mapping heritage generated from the 15<sup>th</sup> century onwards, as mentioned previously.

One of the positive outcomes of the digital technologies is that nowadays many map archives have been transferred into digital form and become available to the public via the Internet. In this way the possibility to bring together the initially fragmented and diffused material of archaeological mapping becomes feasible. In order to provide more attractive and effective means for a virtual integration of archaeological cartographic material a digital environment is proposed and implemented in this paper. Based on a popular digital platform such as Google maps, the aim of the work discussed in the following is mainly twofold:

- a. To position and display the (appropriately georeferenced) maps of carto-archaeological heritage on a global web platform (e.g. Google maps).
- b. To provide the suitable interface for an effective overview, as well as for convenient inspection of the included digital cartographic material.

For this purpose a cartographic application for online use is developed, based on open source software; it integrates geographic space (for positioning and viewing the maps) with a timeline (for viewing their respective position in historical time).

### **The archaeological maps**

The cartographic material used for the purposes of this pilot study is a representative selection of archaeological maps concerning Greece, already published in digital form on the Web. More specifically we used maps publicly available through the on-line digital collections of: the University of Heidelberg (*URL1*), the American School of Classical Studies in Athens, Greece (*URL2*) and the Library of Congress Vatican Exhibit (*URL3*). Occasional other digital map images publicly available on the Web were also utilized (e.g. *URLs4-6*).

An attempt to cover the important phases of archaeological mapping was made, starting with maps from the “father” of archaeological cartography Christoforo Buondelmonti and his “*Liber Insularum Archipelagi*” (1420), through the travelers and philhellenes of the 17<sup>th</sup> and 18<sup>th</sup> century until the foreign expeditions of the 19<sup>th</sup> century and works of Foreign Institutions in Greece from mid-19<sup>th</sup> to mid- 20<sup>th</sup> century.

The maps encountered can be grouped in four main categories. Apart from the first one, the rest refer to the era of scientific archaeology (mid-19<sup>th</sup> century and forth). An interesting shift, also, with respect to the makers of the maps, is evident here.

- 1) Maps of historical places of the classical antiquity and / or the respective archaeological locations, either in their existing status at the time of mapping or as a representation of their anticipated ancient form. Maps of travelers from the 15<sup>th</sup> –18<sup>th</sup> century belong in this category.
- 2) Maps of the “inventory” type, depicting archaeological finds at excavation sites. Most of the times scale and orientation -and often a grid- are present on the map. Information about the mapmakers is not always available -it seems, however, that the task is carried out mostly by architects participating in the excavation team, or even by the archaeologists themselves. The date is usually noted (sometimes not only the year but also the month, as well), since this is crucial for monitoring the progress of the excavation site.
- 3) Maps representing the excavation spot as a reconstruction of its status in a certain era of the past (e.g. in the classical, roman etc. years). Usually this type of maps is derived from the inventory maps of the previous category; often they are combinations of topography with architectural plans. Although here the emphasis is put on map design the makers of the maps include the elements of scale and orientation, so that the location of the site within the broader landscape can be identified.
- 4) Finally, maps that can be described as general purpose are often found in the excavation archives. They are maps that were created for other tasks but happen to assist -directly or indirectly- the excavation works (for instance, state maps about the morphology of the area). They are useful during the early stages of excavations for reconnaissance and overview purposes, allowing for comparison with descriptions from old written sources and for spotting the locations. Also to be found are general use topographic maps (useful especially for foreign excavation teams), hypsometric contour maps and occasionally topographic plans used in cases where, for instance, land expropriation was required in order to conduct the excavation.

Modern digital technologies allow us to reclaim such cartographic material and move, through it, in geo-space and in time in order to follow the developments in archaeology and archaeological mapping.

### **An environment for geotemporal visualization**

The notion of heritage is interrelated with history and consequently with evolution in both geo-space and time. Rather than displaying geography or time alone, the coupling of both in a single visual interface is the optimal approach, when it comes to communicating, via

digital means, the course and development of cartographic heritage (or its archaeological aspect, in our case).

It could be noticed, at this point, that the simultaneous representation of the spatial and temporal dimension is not a novel concept in cartography. The depiction of biblical events in medieval *mappamundi* or the losses of the Napoleonic army in Russia shown on the well-known Minard map (published in 1869) are among the many examples of paper maps displaying changes through time.

Archaeological and historical maps are time related in many aspects: a map reader is interested in viewing an area, as we anticipate that it once existed in antiquity, to compare it with nowadays, to trace the changes that occurred through time. For the study of history the possibility to “view” time through the spatial dimensions that it has evolved is quite supportive. At the same time it is very important, from a geographical point of view, to record the way that geo-space is shaped and transformed by human activities in the historic continuum. This combined use of maps and timelines displays in a direct and comprehensive way the above linkages; it thus allows for the development of applications addressed to the broad public (e.g. a museum exhibition), but also for more specialized tools for scientific / academic environments and needs (such as e.g. the evolution of an area’s history and human ecology or archaeological research, i.e. different excavation stages in the course of time).

Nevertheless, the digital implementation of these is not a straightforward task, in the sense that the visualization of geotemporal information is quite a specific case. In this respect, the use of open source software was considered as an optimal manner for fulfilling the needs of the work.

We used the *timemap.js* library, which is a tool to help show information simultaneously on an online map and a timeline. It is written in Javascript and is using the Google Maps API (API: Application Programming Interface) and the SIMILE timeline API (*URL7*). Since it is released as open source, anyone can have access to the source code and can further develop, modify and adjust it to one’s needs and data.

For our application we used and modified the Javascript source code, adding our own data, maps and images; a description of the functionality of the environment that was created is given in the following. The overview of the digital visualization environment can be seen in Figure 1. A Google map is coupled to a timeline. Items of interest are displayed on both the timeline and the map and they are actively interlinked. Only the items in the visible range of the timeline are shown on the map. These refer to archaeological maps (symbols in red), to items of Greek historical cartographic interest (symbols in blue) and to selected contemporary important events (in history, science, arts etc., symbolized in green). The combination of space and time in this way gives a sense of both how contemporary the displayed items are and how they relate in geo-space.

When an item is interactively selected (via the respective symbol on the map and/or the timeline) its “identity card”, so to speak, is activated, where relevant information is displayed; further links to other related resources on the web are then available (Fig. 2). It should be noted here that this possibility of establishing links at any point within the application is a strong feature of the code, because it allows for flexible connections with any resource available (e.g. web sites, other media, other applications etc.).

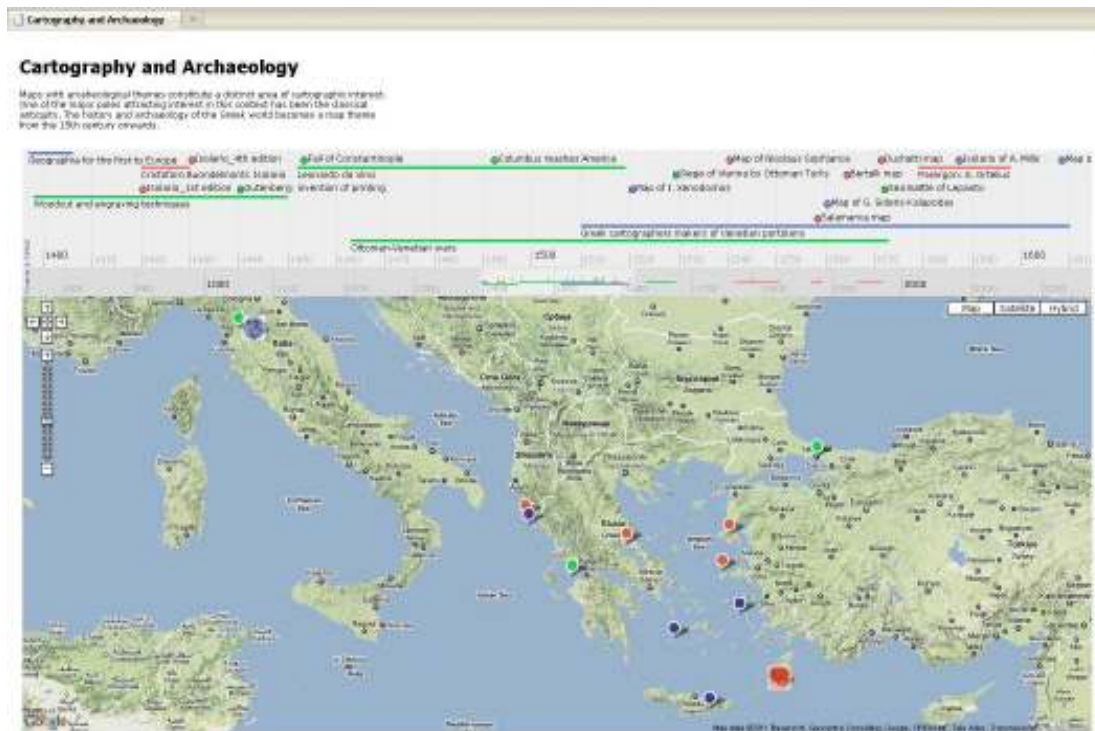


Figure1: Overview of the digital geotemporal visualization environment. Displayed items concern: archaeological mapping (in red), Greek cartography (in blue) and important historical events (in green).

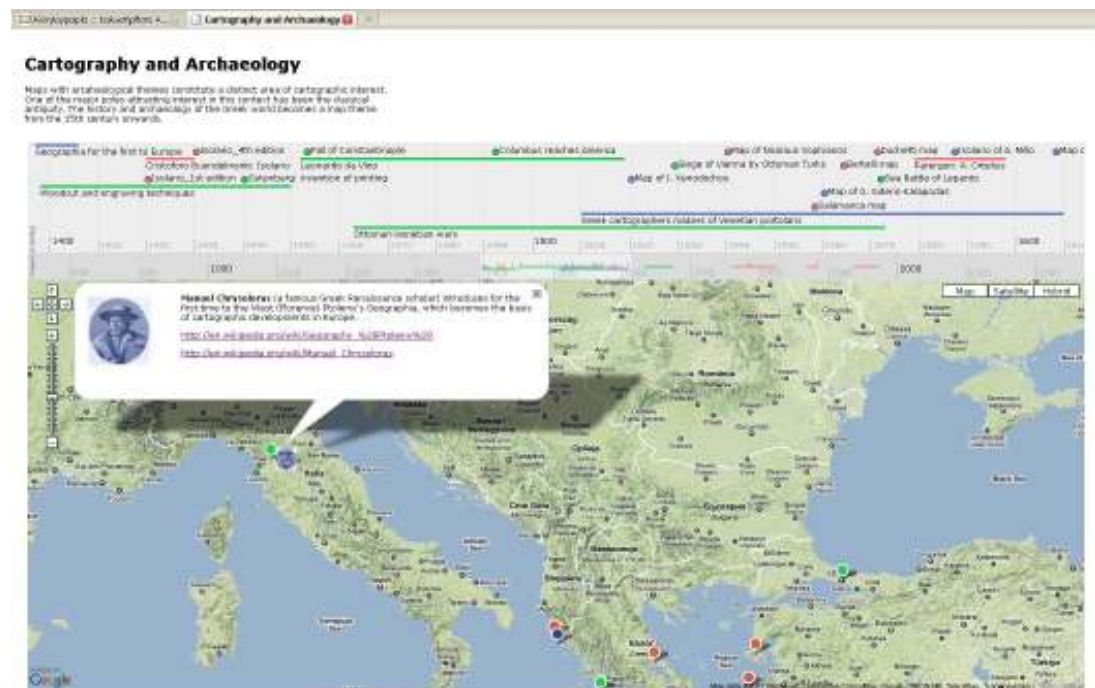


Figure2: Selection of items from the map and/or the timeline displays information and links to further resources.

The various historical maps can be viewed by selecting the respective symbol either from the timeline or from the overview map. From the relative link in each item’s “id card” (as mentioned previously) a new window opens, with the georeferenced map overlaid on

the contemporary one and with explanatory text about it. Two examples are shown in Figures 3 and 4 with the georeferenced Buondelmonti and Barbié du Bocage maps respectively, overlaid on Google maps. In order to visually correlate the old map with its modern counterpart the transparency of the overlaid map image can be modified, either in a static display as in Figure 5, or in an animated sequence, gradually.

Another option of the application is the display of the various phases of an excavation in an area, as depicted on the maps produced in successive years. This can give a more comprehensive idea of the course of works, especially in bigger projects. Figure 6 is a snapshot of such an animated sequence concerning excavations in the ancient Agora of Athens, carried out and mapped by the American School of Classical Studies in Athens.



Figure3: Georeferenced map of Chios from Buondelmonti's "*Liber Insularum Archipelagi*" overlaid on Google maps (map source: [URL3](#)).



Figure 4: Plataiai, the ancient battleground georeferenced: a Barbié du Bocage map transcribed in Greek, printed in Vienna, viewed on Google maps (map source: [URL6](#))



Figure 5: Map from the excavations in Olympia by E. Curtius & F. Adler, 1897. The semi-transparent georeferenced map allows for visual comparison with the modern background (map source: [URL1](#)).

## Conclusions

The development of applications and tools such as the one presented in this paper are greatly enhanced by the existence of open source software. The use of such software offers the great advantage of allowing the modification of our source programming code according to the needs of the theme and of the users. It is a challenge for all involved parties (cartographers, archaeologists, historians, software programmers) to be able to co-

operate on such a basis for offering additional and integrated tools, which will enhance the compilation of maps with the temporal dimension embedded.

The type of application presented here is addressed mainly to broad audiences, but could also be of help to specialized users (e.g. for managing map collections, for overview and data inspection of map-series such as the multiple editions of historical maps through time etc.). The open source mode of development allows for going a step further than the relevant popular applications currently available on the web. In terms of the present work, steps in potential developments could be made towards the functionality (such as the interactive manipulation of digital transparency, the embedding of more temporal resolutions etc.).



Figure 6: Two maps from the excavations in the Athens Agora, as frames of an animated sequence geo-referenced on Google maps (map source: *URL2*).



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## URLs

(last accessed on 10-09-2011)

- URL1*: <http://www.ub.uni-heidelberg.de/helios/fachinfo/www/arch/digilit/digilit.html>  
(University of Heidelberg Library, Digital Archaeological Literature)
- URL2*: <http://www.ascsa.edu.gr/index.php/digital-library/resources-listing-all-departments>  
(The American School of Classical Studies in Athens, Digital Resources)
- URL3*: [http://www.ibiblio.org/expo/vatican.exhibit/exhibit/Main\\_Hall.html](http://www.ibiblio.org/expo/vatican.exhibit/exhibit/Main_Hall.html)  
(the Library of Congress Vatican Exhibit)
- URL4*: <http://www.raremaps.com/gallery/detail/23113?view=print>  
(Salamanca/Duchetti map, 1558/1571)
- URL5*:  
[http://www.raremaps.com/gallery/detail/23197/Totius\\_Graeciae\\_Descriptio/Bertelli.html](http://www.raremaps.com/gallery/detail/23197/Totius_Graeciae_Descriptio/Bertelli.html)  
(Bertelli map, 1564)
- URL6*: <http://blog.pompilos.org/categoria/varia/?pg=7&c=varia>  
(Greek transl. of "Anacharsis" -Plataiai map, date missing)
- URL7*: <http://code.google.com/p/timemap/>  
(timemap - Project Hosting on Google Code)
- URL8*: <http://www.davidrumsey.com>  
(David Rumsey map collection)