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Place names at the time of the establishment of the Hellenic State: towards the development of a historical gazetteer from the map of the French Scientific Mission

Keywords: Historical gazetteer, historical map, place name, Spatial Digital Humanities

Summary: Place names are recognized as part of cultural heritage and mirror the natural, cultural and political characteristics of the space and time they refer to. Historical primary sources (either texts, tables or maps) are rich in toponymical information from different historical periods and their study, management and analysis, apart from cultural and historical interest is a necessity from an information management point of view. In the framework of Semantic Web and Spatial Digital Humanities, datasets of historical place names, typically in form of gazetteers that document their changes through time, constitute a core element in any data management system. They support place-based search, display, organization and integration of digital resources having place names as their reference, while the spatial correlation of those resources opens new ways for their comparative analysis. This paper presents the results of the research conducted for the development of a historical gazetteer for Greek place names based on the map and reports of the French Scientific Mission that provided the first systematic mapping of the first Hellenic State. A spatial database has been created storing almost 9300 geographic entities that was further processed in order to be formed as Linked Open Data. This dataset is now part of the World Historical Gazetteer providing the community a basis for further enrichment in order to establish a profile specifically oriented to Greek place names, covering different historical periods.

Historical gazetteers

Historical gazetteers like other typical digital gazetteers, are directories of places that assign each place a unique, stable identifier in the form of a Uniform Resource Identifier (URI), including at least, three main fields (Yuan 2010): place names (and alternatives ones), spatial location and taxonomy (type of place), in order to resolve ambiguities between entities with the same name. A historical gazetteer has the role to document the historical sequence of the names of places in great detail (Southall et al. 2011) typically organizing those derived from large historical datasets, texts or maps. Historical gazetteers are exceptional tools for historical place name references, implementing capabilities of structured query, analysis and cartographic visualization (Mostern 2006) supporting historical research. They are necessary tools in the Digital Humanities and the backbone of many applications since they are vocabularies of formalized toponymical information. They support place-based search, display and integration of digital resources, as any type of information that includes the name of a place can be associated via a gazetteer’s record. By expressing place references as URIs, otherwise isolated datasets are implicitly linked to an interconnected graph of the Semantic Web. Being able to

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link - to go from one resource to another - is one of the most basic elements of the Semantic Web representing the concept of Linked Data. Thus, in the Geospatial Semantic Web, gazetteers give the common framework for linking resources by place names as the basic reference, so that it is possible to compare characteristics, events and phenomena with others that exist or have existed in the same geographic location, and thus, seemingly, unrelated facts can become correlated (Kemp 2010). Taking into consideration that place names form the underlying semantic content of almost all geographic documents (Simon et al. 2014), gazetteers are the bridge between texts and maps. They support the automatic identification of the spatial location of phenomena mentioned in texts (geoparsing) and then the projection of this information on maps and enhance spatialization of texts and textual analysis. As a result, geographic reference is added to documents supporting large volumes of text to be structured also by space - except of time and theme - opening up new ways for analyzing them (Gregory 2010). In that sense, gazetteers are a powerful core element in any information architecture (Mostern 2006).

Currently, there are many official gazetteers available on the web (e.g. Geonames) that focus primarily on modern geography but also several projects that have created datasets for different historical periods, such as Pleiades, a community – built gazetteer for ancient place names that incorporates multiple attestations about places. Other major gazetteers, locally focused, are the Great Britain Historical GIS with information from census reports, historical gazetteers, travelers’ narrations and historic maps, and the China Historical GIS gazetteer for the Chinese Dynasties. Some of the available gazetteers are usually very general and not very well adapted to multi-lingual historical data and they have limited or no support for applying queries based on spatial relationships since an underlying data model - to support the geometrical and topological relations of the places - is missing (Yuan 2010). Nevertheless, currently, a wider effort is in action for linking historical datasets and forming a Linked Past community, creating an umbrella of linked data for place names in terms of the “Pelagios Commons” and the “World Historical Gazetteer” (WHG). Pelagios is an infrastructure for Linked Open Geodata in the Humanities facilitating better linkage between online resources documenting the past based on the places they refer to. The key to connectivity in Pelagios is the use of shared online gazetteers so as to join different datasets (Simon et al. 2015). The WHG is a project of the World History Center with the goal to create a digital platform that will aggregate and index historical gazetteers and expose them as Linked Open Data (Simon et al. 2015).

**Historical maps and place names**

References of historical place names are typically derived from historical texts and historical maps. The extraction of place names from maps and their spatial footprint can be a hard work since according to the time period they were created, some historical maps may have an undefined reference system and a semantic content difficult to interpret (Guerra 2000). Georeference comes to address these issues establishing the relation between the historical map and the current base map so that place names can be digitized following a coherent data model. A fully automatic identification and transcription of place names from maps is not achievable, at least to a complete level, within current technological framework (Simon et al. 2014) but there are several approaches under research. The text recognition approach is based on Optical Character Recognition algorithms in order to convert
the place names in machine-readable format, but not without errors, since historical maps may contain text in varying orientations and sizes, and may have different levels of deterioration (Simon et al. 2014). Another approach is the annotation of historical maps, such as provided by Recogito, a tool suggested by Simon et al. (2014) which identifies potential place names in terms of their location and extent, as well as in terms of their orientation on the map image. Another method is suggested by Weinman (2013) and is based on the joint probability of the recognized string for each word in the map, with its associated place names, the image coordinates of the geographical feature represented by the word, and the georeference, which relates image coordinates to known feature locations (Weinman 2013:1045).

**Historical place names in Greece**

In Greece, place names are documents of the historical evolution of space (annexation of new territories) and their management became a political issue from the time of the establishment of the Hellenic State (Kyramargiou 2010). From the second half of 19th century and onwards, the toponymical issue was closely related to the administrative management of the State and a confirmation of its national identity. Place names should be changed from Ottoman, Slavic or Venetian to Greek either by alliteration or translation of names or by selecting ancient predecessor names or names depicting e.g. the natural character of the locality (Kyramargiou 2010). Different decrees from 1833 defined several new place names and in 1909 the Committee for the Toponymes of Greece was established in order to study place names and suggest new ones.

A significant issue in the research of toponymy in Greece is the lack of primary sources (Kallivretakis 2003). The first official record of place names was conducted by Kapodistrias in 1828 in terms of statistical records followed by the work of the French Scientific Mission in 1829. Before these, there are the Venetian and Ottoman records (regarding properties, taxes and micro-toponymy) that give information, but not without biases, since the problem of the names’ transcription is dominant (Kallivretakis 2003).

Currently, various scattered datasets of place names have been created using historical documents or maps for different historical periods or for different spatial extents and mainly regarding settlements (e.g. the “Toponymiko” gazetteer of Rethymnos). The most complete dataset (but without location coordinates) is the database “Name Changes of Settlements in Greece - 1913-1996” of Pandektis project¹, which captures the name changes from 1913, recording the modern name, the name at the time of the change (frequently Slavic or Ottoman), and the possible ancient name (which often formed the basis of the modern equivalent). The vast majority of these datasets are not structured with the potential to be linked to official gazetteers or integrated in larger efforts of linked data in the Web. As a result, the emerging issue of “where to locate” the place name becomes problematic and usually for the same place we have different coordinates recorded - depending on the research scope and the desirable level of detail and not associated with place names records of official reference.

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The case of the French Scientific Mission

The French Scientific Mission was part of the Military Mission - known as “Expédition de Morée” – that was sent to Greece from France, in 1829, in terms of the Treaty of London, in order to restrict the war on Peloponnese between Greece and Ottoman Empire. The Scientific Mission’s goal was to map the territories and record the available resources of the Hellenic State that was about to be established. The Mission was organized in three departments - the Department of Natural Sciences, the Department of Archaeology and the Department of Architecture and Sculpture - and collected data about natural resources, geology, flora and fauna, infrastructures, monuments and demography among others that were published in eight volumes between 1831 and 1838. The topographical surveys were conducted by a team of 27 cartographers - headed by Peytier, Servier and Puillon de Boblaye - part of the Department of Natural Sciences. The work of the team initiated by the establishment of a trigonometrical network of 134 points that were further enriched with almost 1000 points, the location of which was calculated with an accuracy of 0°,2 (Nakos 2012). At first, the geographical extent of the surveys covered the area of Peloponnese and Cyclades, resulting to a map of six sheets (published in 1832) and later, the areas of Attica, Evoia, and Central Greece were also included to the final map “Carte de la Grèce”, published in 1852 (Figure 1).

The map of 1852 consists of 20 sheets, of scale 1:200,000, and depicts the administrative units, the distribution of settlements (towns, villages, isolated houses etc.) as well as monasteries, churches, water and wind mills, the network of communication (roads, ports, custom houses, inns, bridges etc.), the hydrographic network (rivers, lakes, springs, etc.), the defensive network of older periods, Venetian castles and many more along with a rich toponymical information. As Kapodistrias claimed, the spelling accuracy and extensive toponymical information of the map were of great value that none of the precedent maps had (Saitas 2011). The work of the Mission offered the basis for a detailed and accurate cartographic depiction (Livieratos 2009) since then and constitutes the first official mapping of the Hellenic State at the end of the Ottoman period. The statistical data about the Peloponnese settlements, give this work a particular demographic value (Papadopoulos, 2003) and even though the geometric precision is not equal throughout the map’s extent - because at first the survey was conducted in detail but then it was simplified in order to accelerate works (Livieratos 2009) - the map of 1852 has been a cartographic reference in Greece for almost one century.
In terms of this research, based on the final map of 1852\(^2\) of the French Scientific Mission and the report “\(\text{Géographie}\)\(^3\) of Bory de Saint-Vincent, a methodology of four steps was implemented in order to develop a historical gazetteer of the place names at the time of the establishment of the Hellenic State. The steps are: a) georeference of the historical map, b) development of a spatial database and vectorization of the geographic entities depicted in the map, also compared to the modern map’s entities, c) enrichment of the database with information from current datasets, d) development of the dataset as Linked Open Data and integration in the WHG. This process is further described below, presenting, in parallel, the results of each step.

**Georeference of the historical map**

In order to extract the geographic entities and the toponymical information from the map of 1852, it was necessary to rectify the map. The map was created in Flamsteed (known today as Sanson-Flamsteed or Sinusoidal) equivalent map projection and the meridian of Paris as prime. At first, the reference system of the map was re-constructed and then each map sheet was georeferenced using the nodes of intersections of the grid lines as control points (of known coordinates). This was necessary in order to bring the map in its physical dimensions avoiding possible deformations from the map’s scanning (Tsorlini et al. 2013). Also, the geodetic points (the coordinates of which were published in “\(\text{Géographie}\)”) were also used in order to test the result. Then, in order to compare the historical map

\(^{2}\) A digital copy of the map was provided by the Greek Literary and Historical Archive – ELIA.

\(^{3}\) Jean-Baptiste-Geneviève-Marcellin Bory de Saint-Vincent, Expédition scientifique de Morée. Section des sciences physiques. Tome II, 1re partie. \(\text{Géographie}\), Paris 1834.
with the current base map, the historical map sheets were georeferenced to the reference system of the map sheets (of scale 1:50,000) of the Hellenic Military Geographical Service (HGRS87). Different points were tested (centroids of settlements, churches, springs, etc. that have remained the same until today), covering the extent of the map sheet, as control points and affine transformation was applied. An overview of the georeferenced map sheets is illustrated in Figure 2. The rectified map sheets were assessed regarding their geometrical accuracy and distortion using the “MapAnalyst” software (Jenny and Hurni 2011). The distortion grid represented deformation in some locations of the historical map sheets indicating areas with lower accuracy that were in special focus in the next steps of the process (an example of the distortion grid of map sheet 7 is illustrated in Figure 3).

![Figure 2. An overview of the georeferenced map sheets.](image1)

![Figure 3. The distortion grid of map sheet 7.](image2)
Development of the database and vectorization of the geographic entities

After the georeference of the map sheets, a spatial database was created in order to store the information extracted from the map. The database follows a hierarchy of six main classes - administrative units, physical space, constructed space, ruins, communication network, and geodetic elements - that are further categorized into sub-classes, also taking into account the map’s legend. For example, the map’s legend for the settlements (constructed space), six types are distinguished: capital of prefecture, capital of province, capital of community, village, settlement (small village) and scattered houses.

The geographic entities were attributed with several common properties: a) ID, an internal database identifier, b) Current place name, c) Historical place name, as depicted in the historical map, d) Older place name, also depicted in the map, e) Alternative place name, when available from the map, f) Geographic location (coordinates), g) Time, the chronological period on which the geographic entity exists, h) Reference, the source from which the entity is derived, i) Place type (e.g. village or lake), and j) Administrative unit of that period (prefecture and province in 1852), k) Name change (an indication whether the entity’s name has changed), l) Existence (an indication whether the entity exists today or not).

Regarding the settlements specifically, the following attributes were also included: a) Population, the number of inhabitants as recorded in 1828, b) Number of families, as recorded in 1828, c) Province in which the settlement belongs, in 1828, d) Committee in which the settlement belongs, in 1828, e) Section in which the settlement belongs, in 1828, f) Hellenic Statistical Authority code, the unique code of the settlement as stored in the Hellenic Statistical Authority database in order to set the link with this official dataset and to conduct statistical analysis, g) Id Pandektis, the unique identifier from the database of Pandektis database4.

The geographic entities were vectorized from the map as points, lines or polygons and were, in parallel, compared to the modern map and datasets in order to attribute them with the above mentioned properties or correct their location, where necessary.

The correlation of the historical geographic entities with the modern ones was based on the map sheets of the Hellenic Military Geographical Service and for the settlements in specific, also on the database of the Hellenic Statistical Authority for modern settlements. The comparison was implemented by visual interpretation, adding transparency to the historical map, overlaid on the modern one (Figure 4), and taking into account name matching and geographic location proximity (Figure 5). As a result, three cases were distinguished regarding the geographic entities: a) matching in historical and modern name and location, b) change in the place name and matching in location, c) matching in the place name but no location matching. The last case refered to a) misplacements of entities due to the historical map’s deviations, b) merging of neighbor entities under one name (e.g. two settlements that have been merged to one), c) relocation of entities. From the above process, several errors were corrected and the name changes were recorded in the database.

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4 http://pandektis.ekt.gr/pandektis/handle/10442/4968.
Figure 4: An example of the map sheet 7 overlaid in the corresponding Hellenic Military Geographical Service map sheets.

Figure 5: An example of the location matching of the historical (in blue) and the modern (in yellow) settlements (from the database of current settlements of the Hellenic Statistical Authority) in Arcadia region.

The place names of the historical map refer to all type of geographic entities (settlements, rivers, regions, ports etc.) but this is not systematic (not all entities’ names are depicted in the map). The most complete dataset regarding the toponymy is the one for settlements that includes 3888 names. Some of the most encountered names, are Neokhori, Pyrgos and Hagios Nikolaos (Table 1).
The comparison, shown that almost 30% of the settlements names have changed (1152 names in total), typically Ottoman (e.g. Ali Tchelebi to Samiko, Hassan Pacha to Aristodimion, Ib-rahim Effendi to Episkopi, Bedeni to Pefki etc.), Slavic (e.g. Podagora to Pournaria) or Venetian (e.g. Tsepheremini to Valira) words. The name changes are mostly located in Messenie (184 names) and Achaea - Elide (175 names). The settlements network with name changes symbolized with different color, are depicted in Figure 6 while in Figure 7, an example of name changes around Megalopolis town is illustrated.

It is noted that not all place names correspond to the modern ones since a) there are abandoned settlements, already 168 depicted in the historical map and 542 that existed then but now have been abandoned (as the comparison shown), or b) new settlements have been established since then.

<table>
<thead>
<tr>
<th>Name on map</th>
<th>Number of times depicted in the map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neokhori</td>
<td>27</td>
</tr>
<tr>
<td>Pyrgos</td>
<td>17</td>
</tr>
<tr>
<td>Hagios Nikolaos</td>
<td>13</td>
</tr>
<tr>
<td>Hagios Georgios</td>
<td>11</td>
</tr>
<tr>
<td>Hagios Ioannis</td>
<td>10</td>
</tr>
<tr>
<td>Mazi</td>
<td>9</td>
</tr>
<tr>
<td>Kastania</td>
<td>8</td>
</tr>
<tr>
<td>Platanos</td>
<td>8</td>
</tr>
<tr>
<td>Hagios Dimitrios</td>
<td>7</td>
</tr>
<tr>
<td>Karya</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 1: Most encountered place names for settlements.

Figure 6: Name changes (red) and names that have remained the same until today (blue) for the settlements of 1852.
Almost 200 Kalyves or Kalyvia (a place where the habitats of a village⁵ - usually of higher elevation - spend the winter) are also depicted in the map (an example is illustrated in Figure 8). Kalyvia are named after the village on which they depend (e.g. Kalyvia de Diakopto) or they have totally different names. Most of the settlements that have been established in the location of Kalyvia have changed names (e.g. Kalyvia de Mamousia is now the village Agios Andreas in Egion) but there are some that have preserved this toponymy (e.g. Kalyvia Karywn). Another interesting case is the marine place names including ports, bays, caps, islands for which a number of older names are also depicted in the map (e.g. Porto Quaglio/Achilleus portus) as well as older names and locations of ancient towns or regions.

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⁵ There are cases where a village may have more than one “Kalyvia”.

Figure 7: Settlements (around the town of Megalopolis) and their names as depicted in the historical map and in labels the modern names. The settlements whose name has changed are represented by orange points.
The records of the database regarding settlements were populated with demographic data from the accompanied table of the map (in map sheet 10) according to the administrative division of 1852, as well as, from the tables included in the report “Géographie”, that provided the population and number of families per settlement according to the administrative units of 1829 (Figure 9). This valuable information, spatially processed afterwards, provided interesting results regarding the distribution and correlations of the settlements but these are out of the scope of this paper to be presented.

Enrichment of the database

The enrichment of the database mainly refers to the subset of the historical settlements for which additional information from current datasets was available. After the name and location matching, the official settlement codes (as well as the previous chronologically codes) of the Hellenic Statistical Authority were attributed to the historical settlements. This enables the automatic linking between the
two datasets, as well as, with other digital resources that share these codes (in terms of this research, 2854 records of the database were also linked to Wikidata records based on this code).

The place names changes (of the settlements) were compared to those of the database of Pandektis and a link between these two datasets was established based on the official code of the Statistical Authority (available in both datasets). This acted bidirectionally: more thematic attributes from Pandektis (e.g. date of name change, official decree defining the change etc.), were integrated into our database (Figure 10) and Pandektis records were enriched with (the previously missing) geographic location from our database. It is noted though, that not all place names of Pandektis are depicted in the map of 1852 and vice versa, not all names (that have changed and are depicted in the map of 1852) are included in Pandektis. More specific, 837 name changes (out of 1152), are documented in the database of Pandektis.

Based on the comparison to Pandektis, several cases of historical settlements from the map were identified that were wrongly correlated to modern settlements (due to location proximity). The mapping of Pandektis records gave, also, the advantage to perform an automatic second validation in order to identify potential name changes that weren’t identified from the historical map, due to errors in the name matching and location proximity (an example is given in Figure 11). These two cases of errors were resolved in order to produce the final dataset.

![Figure 10: Part of the attributes for the village “Arakhova” in Achaea.](image)
Development of Linked Open Data and integration in the WHG

The geodatabase now stores almost 9300 entities (3888 records of settlements and 5416 points of interest) at different thematic layers and is integrated in a web mapping application\(^6\) that presents the published work of the French Scientific Mission. In order the database to serve as a gazetteer, data are provided usually in lists along with search functionality for the users. Regarding the settlements dataset, this was exported from the database, as a separate gazetteer dataset, and is available as a standalone application\(^7\) in which a unique URI for each place name has been created providing a dedicated web page for each record (Figure 12).

Furthermore, the database (including all 9300 entities) was formed according to the Linked Place (LP) model which allows data to be encoded as Linked Open Data (LOD) and thus as a result, this can be integrated into a wider framework of gazetteers and to be linked to others datasets. The LP was developed by the WHG and includes fields for temporal scoping of names, locations, types, “when”, and relations as well as rich attribution (e.g. descriptions or depictions). Several attributes are optional but there are attributes highly recommended, in order to facilitate matching contributors’ records with those already in the WHG index and with authority resources (e.g. Getty Thesaurus of Geographic Names, GeoNames, Wikidata): “Name”, “source”, “start” are some required fields while recommended fields include “matches”, “types”, “variants”, “geometry” etc. After creating data as LOD, the dataset was uploaded to WHG. The WHG offers the API for publishing place names datasets as LOD and also the mechanism tool for performing reconciliation against the Getty Thesaurus of Geographic Names (TGN). Reconciliation is the process of identifying matches of the place records of our gazetteer to existing records in online place name authorities. Until now, the reconciliation has resulted to almost 14000 name variants for our dataset records that come from the links of the dataset to Pandektis, Wikidata and Getty Thesaurus of Geographic Names. The next step currently being implemented is the validation of the reconciliation results as well as the integration of the gaz-

\(^6\) The application, developed in terms of another project, is available at: https://moree1829.gr/.

\(^7\) http://83.212.114.186/map1/
etteer into Pelagios platform, a functionality currently under construction by the team of Pelagios. As a result of the latter, the system will provide a range of exemplar free prototypes (e.g. “Peripleo” search interface) that can be used for visualizing and querying the gazetteer information, as well as, any other gazetteer connected. The gazetteer, as part of the WHG⁸, is available at: http://whgazetteer.org (Figure 13).

Figure 12: The gazetteer record for the village “Laiika”.

Figure 13: The gazetteer as part of the WHG.
Conclusions

In terms of this research, a gazetteer has been developed from the map of the French Scientific Mission. It includes the place names that were valid at the time of the establishment of the Hellenic State not only for settlements (which is typical for gazetteers) but also for other geographic entities (rivers, springs, mountain peaks, etc.) something that constitutes it a source of valuable information regarding Greek places. The places included in the gazetteer are correlated to modern ones, documented and especially for settlements, enriched with information from different data sources (Pandektis, Hellenic Statistical Authority etc.). By connecting to Pelagios and WHG, the gazetteer can be further enriched with data stored in other gazetteers under the umbrella of these two initiatives. Vice versa, it can enrich other gazetteers and actually provide a profile specifically oriented to Greek toponymy and correlated resources resolving possible ambiguities present in other datasets regarding Greek names. Ultimate goal is the gazetteer to act as a reference database and as a tool for historical research, supporting scholars (but also the wider public) in the retrieval of data related to named historical entities such as places, people, periods, and events. Also, to constitute a formal basis for the integration of heterogeneous historical sources enabling their geospatial analysis and visualization having place names as their formal reference.

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