

GROPELLO CAIROLI (PV): COMPUTER APPLICATIONS FOR HISTORICAL-TOPOGRAPHIC SYNTHESIS

As recently underlined, computer applications should not be considered as a purely technological phenomenon, regarding a limited circle of followers, particularly involved in new technologies (SCAMPOLI 2007; MARATINI, RUGGIU 2008). Sometimes they can offer a new perspective on researches conducted in the past, as in the present study case, the result of the Dissertation for the Scuola di Specializzazione in Beni Archeologici of the Università Cattolica del Sacro Cuore in Milan. The geographical context examined is Gropello Cairoli, which from an archaeological perspective is one of the sites that best represents the western area of the province of Pavia, known as Lomellina.

The history of the research, which had already begun towards the end of the 19th century, is marked by finds made by local volunteers applying non-scientific methods, then followed by stratigraphic excavations directed by the Soprintendenza. Archaeologists and University students have then studied single areas of findings (FORTUNATI ZUCCALÀ 1979; ARATA 1984; MACCHIORO MALNATI 1994-1999; SPERTI 2004-2005; MANFREDI 2005-2006; LINA 2010-2011; RUOPPO 2011-2012), while a general overview of the development of Gropello has rarely been offered (MACCHIORO 1991). A complete study of the territory and of all of its finds is missing and the situation, both in relation to the topographical perspective and the documentation, thus results so fragmented that sometimes it is difficult to grasp the general chronological evolution.

This research concerns mainly the necropoleis, located in various parts of Gropello, without taking into consideration the area of Santo Spirito, where the findings suggest the presence of a settlement context (DE CARO 1999; RUFFA 2008, 2014).

By applying a Data Base Management System (DB) and a Geographical Information System (GIS), the information collected has been reorganized with the aim of highlighting new aspects and of defining the line of a historical-topographic synthesis.

The archaeological investigation has been conducted analyzing two aspects in parallel, the material culture and the geographical distribution of the necropoleis; these, in the first instance, have corresponded to two different methods and computer applications, which were later related to each other.

Initially, each burial and its funerary objects were analyzed, gathering the information both from published and unpublished studies. The collected data were fed into a purposely created relational database. Thanks to the characteristics of the relational model (ATZENI *et al.* 2006, 15-41; BOGDANI

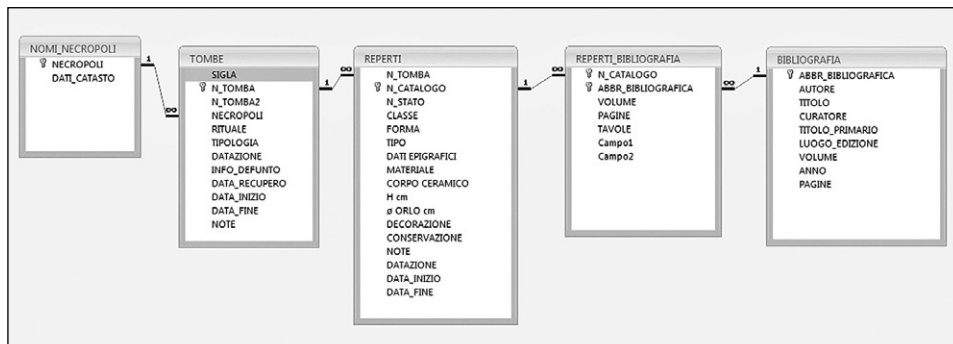


Fig. 1 – The Table Model of the relational database of Gropello Cairoli.

2009, 441-443) and its flexibility, it has been possible to modify the database, at first set up with only two entities/tables called *Tombe* (Burials) and *Reperti* (Objects), with the addition of the tables called *Necropoli* (Necropoleis) and *Bibliografia* (Bibliography). Each table was then divided into different attributes (columns) to better catalogue the collected data (Fig. 1).

Information regarding burials, the relative funerary furnishings and the clusters of sporadic materials were inserted into the entities/tables *Tombe* and *Reperti*. During the planning process, some difficulties, such as how to define the chronological element, have emerged. This information has been divided into three parts: *Data inizio* (Dating from); *Data fine* (Dating to) and *Fase* (Phase). Into the first two columns the *terminus post quem* and *ante quem* were inserted, wherever possible, treated as number data, by considering BC dates as negative numbers and AD dates as positive numbers. Instead, the column *Fase* has been completed with conventionally used text expressions like “Augustan Age” or “first half of 1st century BC”.

The DB has not been simply used as a container of data, but also as a support tool to help classify unpublished materials and constantly verify the general observations concerning the analysis of burials, funerary objects and their dating.

In parallel, the spatial organization of the necropoleis has been considered in relation to various factors such as road proximity, landscape morphology, proximity to water flows and in relation to the chronological phase. In this case, some difficulties regarding the precise placement of discoveries arose, because the existing documents chiefly consist of sketches, drawn on the pages of the field journal, and only in a few cases scientific drawings exist. The investigation has been implemented with the consultation of historical maps, like the *Carta della Lumellina* sheet 11, dated 1816; the map of the Cavour Canal (sheet XLVIII – Mortara) compiled by the Compagnia Generale dei

Canali d'irrigazione Italiani; the historical series of IGM maps; and several aerial photos, in particular one taken by the 1951 IGM flight (sheet 59, series 3, frame 45). Several thematic maps, reporting the geo-morphology features of the Gropello territory, resulting from recent (2008) researches commissioned by the town of Gropello itself, were also considered.

All of the collected data, scanned as raster format, were inserted into the GIS platform and georeferenced applying topographic overlay system (FORTE 2002, 37), using as cartographic reference the *Carta Tecnica Regionale* (CTR) of Lombardy of 2007, sheets 7E3-4-5 and B7E3-4-5, scale 1:10,000, available from the Cartographic Website of Lombardy Region.

Specific shapefiles were created: one was dedicated to the traces of roads, identified through the observation of historical maps, IGM maps and aerial photography; another one was created to record each burial, specifying in the related attribute table the ID tag, corresponding to the same tag used as primary key into the relational database. In this way, it has been possible to link the described shapefiles to the entity *Tombe* of the database, thus linking non-spatial data to proper topographical information.

The burials belonging to the same chronological phase were then highlighted applying the specific function "Select by attribute" and separated shapefiles were created from the selection.

In general, all the data accumulated, reorganized and analyzed consist of 286 tombs, of which about 185 included funerary furnishing, and of a copious amount of sporadic artifacts. The chronological span goes from the final part of the La Tène Age (125/120-30/25 BC) to the first part of the Roman Imperial Age (1st century-beginning of 2nd century AD). Across this period, burials were gathered together into three main phases: a) La Tène D period (125-30 BC); b) Augustan and Tiberian Age (30 BC-first decades of 1st century AD); c) period between Claudian and Traianean Age. In the more ancient period, evidence is centered in the eastern part of Gropello territory, in particular in the localities named Marone and Frascate, confirming the importance of this sector as already defined by the archaeological traces coming from Santo Spirito promontory.

Across the second phase of the La Tène D period, the widening of the necropoleis area towards the western sector is evident, as shown by the necropolis at Cascina Menabrea. Consistent with the demographic growth registered in all the Lomellina, archeological evidence of Augustan and Tiberian Age is more numerous and includes an increase in the extent of necropoleis, with the establishment of a new funerary zone located among the localities of Cascina Miradolo and Cascina Guala. The only exception is represented by Frascate locality, where traces of this chronological phase are scarcer than those of the previous period. Lastly, archeological data related to the last period are decidedly less numerous: starting from the beginning of the second half of the

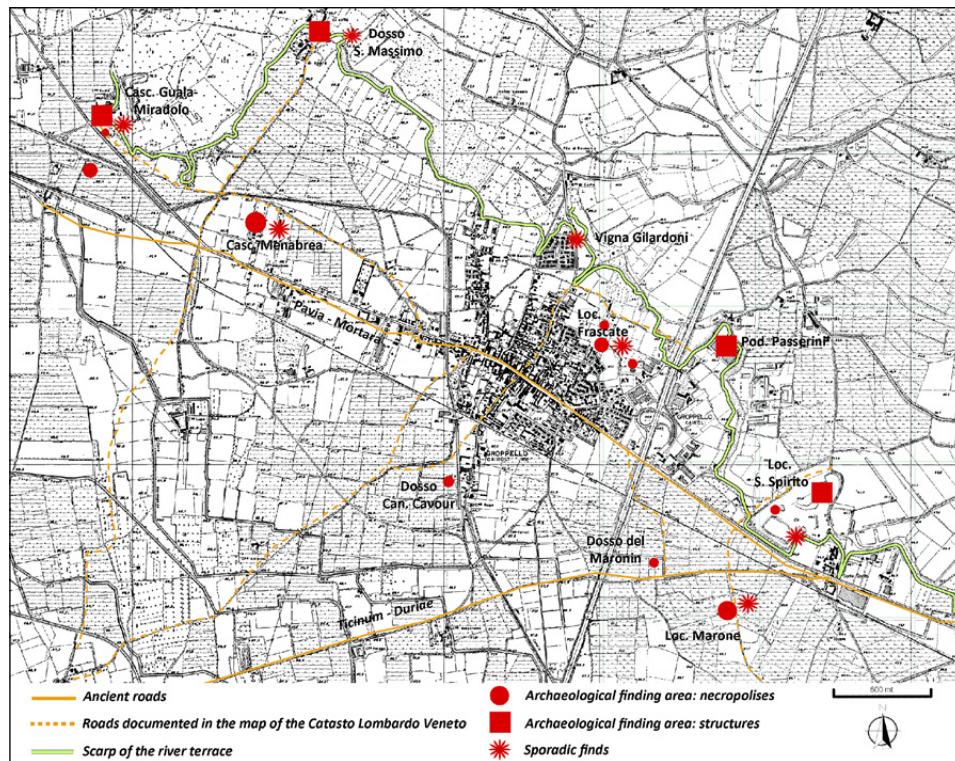


Fig. 2 – The archaeological map of Gropello Cairoli.

1st century AD, it seems that the necropoleis at Cascina Miradolo and Guala as well as the one in Frascate locality were no longer used. The latest burials come from the Marone locality, confirming again the importance of this sector.

The location of the necropoleis indicates a correlation with road proximity and natural resources (Fig. 2). The majority of them are located near road routes, such as the Marone necropolis, founded near the ancient Ticinum-Duriae road. Another prime example is the Frascate necropolis, which was placed in proximity to another road (the Pavia-Mortara pathway) that joins by a straight line the towns of Gropello, Garlasco, Tromello and Mortara. Archaeological finds and historical maps highlight the past importance of this road. The necropoleis placement has suggested the presence of a widespread distribution of small settlements, probably situated up to the scarp of the river terrace on which Gropello arises. In fact, according to Davide Pace’s information (MACCHIORO 1991), other archaeological evidence of settlements might have been found near the localities of Dozzo S.

Massimo and Cascina Guala, located along the limit of the above mentioned river terrace (Fig. 2). This seems to confirm a similar situation to that of the Bronze Age, when the settlements were located on high ground and on river terraces, in safe positions, near water resources (ARSLAN 1984, 116; VANNACCI LUNAZZI 1988).

In conclusion, although in this case the potential of computer applications was not exploited to the full, these tools, however, were extremely useful in managing and reorganizing the archaeological data; they specifically allowed to better point out the finds location and to revise the information that flowed into the Raptor System, the WebGIS platform created and managed by the former Soprintendenza Archeologia of Friuli Venezia Giulia, Lombardy and Veneto. Furthermore the most interesting contribution that ensued was the continuous encouragement of a methodological approach coupled with new topics to examine in depth. As recently pointed out, the project and the study of conceptual model of computer applications force the archaeologist approaching them to evaluate the quality and type of collected data again and again, encouraging a continuous methodological thinking (CORTESE 2016). In the investigation presented, for example, the gathered data (particularly funerary artifacts) were characterized by considerable non-homogeneity due to the different studies from which they derived and so have been repeatedly checked in order to find the better way to implement them into the rigid architecture of a database system. By so doing, the necessity of a complete review and upgrade of Lomellina archaeological artifacts information appears, also in light of the latest bibliography (SPAGNOLO GARZOLI 1999, 2009; KNOBLOCH 2013), in which the late-Celtic objects were treated as an autonomous category of materials and to whose definition the completion of study of Lomellina evidence could make an interesting contribution.

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ABSTRACT

From an archaeological perspective, one of the sites that best represents the western area of the province of Pavia, Lomellina, is Gropello Cairoli, due to the large number of discoveries,

which had already been made by the end of the 19th century. Archaeological data chiefly concern the necropoleis, located in various parts of Gropello, while traces regarding settlements are scarcer. The chronological span goes from the end of the 2nd century BC to the 2nd century AD. Until now, the attention of experts has been focused principally on the detailed analysis of single necropoleis and on the numerous funerary furnishings, while a general overview of the development of Gropello has rarely been offered. A reconstruction of the chronological evolution of the territory and a historical-topographic synthesis has been proposed using a Database Management System and a Geographical Information System. All available spatial data, consisting of historical maps, aerial photos and sketches, were inserted in the GIS platform and the single burials were georeferenced, wherever possible, using the system of topographic overlay. At the same time all the information of non-spatial type, including the data relative to the artefacts and the burials, were fed into a specially created Relational Database. Therefore, it was possible to create specific queries, underlining particular chronological phases and analyzing the distribution of the evidence. The interpretation of the resulting data has suggested the presence of a widespread distribution of small settlements, with the funerary areas along the roadsides. An important demographic growth between the second half of the 1st century BC and the first half of the 1st century AD is evident, after which there is a slow decline suggested by the increasing rarity of archaeological finds.

