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Imago Tusciae: A digital archive of historical maps of Tuscany (Italy)

Keywords: Cartographic Heritage, digital archives, Tuscany, historic cartography

Summary

The *Imago Tusciae* project, developed at the Geography Workshop of the Department of History at the University of Siena (working group: Cinzia Bartoli, Luca Deravignone, Barbara Gelli, Claudio Greppi, Giuseppe Lauricella, Fortunato Lepore, Giancarlo Macchi Janica and Giulio Tarchi), is an online digital archive of the historic cartography of Tuscany. At present the archive comprises around 2,000 documents belonging to different fonds of the Siena State Archives, soon to be joined by the maps from the Grosseto State Archives. The objective is that of progressively gathering within the archive the cartographic documentation from the various registries in Tuscany (archives and both public and private libraries) as well as that concerning Tuscany but conserved elsewhere (in Italy and abroad).

In addition to operating as a means for consulting the data and seeking information, the application also makes it possible to view the maps and other related documents in high resolution and offers a range of tools for study and reflection: informative factsheets on the documents, lists of authors with respective biographical details, bibliographic references, lists of archive fonds and atlases of maps complete with descriptions and an interactive chronology localised on the map of modern-day Tuscany. By exploiting the technical features of Web 2.0 (through tabbed browsing) and using a linear and intuitive interface architecture, the application seeks to offer a user experience as similar as possible to that of a scholar at a desk in an archive, with documents of diverse provenance and suggestions generated by the cross-referenced examination of the sources.

Introduction

Imago Tusciae is an online digital archive project related to the historical cartography of Tuscany (Italy) produced by a work team from the Geography Laboratory of the Department of History of the University of Siena (in partnership with Cinzia Bartoli, Fortunato Lepore and Giovanna Tramacere) (Guarducci and Greppi 2008). The digital archive presently includes 2023 documents that belong to various collections in the Siena State Archives and were previously available for offline consultation (from 2006 on) at computer stations in the Siena State Archives and in the Geography Laboratory. Some 2250 maps from the Grosseto State Archives, most of which have already been reproduced digitally and filed, will soon be added.

This project has been made possible thanks to the financial support of the Monte dei Paschi di Siena Foundation and two triennial memoranda of intent stipulated between the Department of History of the University of Siena and the state archives of Siena and Grosseto, with the goal of continually improving the preservation and valorisation of the documentary heritage held in these institutions. These two large depositories gather together the most important documents related to the Old Sienese

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State, which primarily included the present-day provinces of Siena and Grosseto, i.e. southern Tuscany, from the Middle Ages until the unification of Italy. The heritage mainly comprises manuscripts – few of which were printed in Tuscany or elsewhere for commercial or celebratory purposes – drawn in Indian ink and/or watercolour or tempera. From the fourteenth to the nineteenth centuries such graphical representations were produced by central or local government institutions under the domain of the Republic of Siena and the New Sienese State, which maintained ample administrative autonomy when it became part of the Grand Duchy of Tuscany founded by Cosimo I dei Medici in the mid sixteenth century. In 1765-66, Grand Duke Pietro Leopoldo of Lorraine transformed the areas in and around Siena and Grosseto into two districts (the Upper and Lower Sienese Provinces), each granted its own administrative autonomy within the Granducal State, which continued up to 1859 on the eve of Italian unification.



Figure 1. Imago Tusciae home page. In addition to a presentation of the project, users are offered the choice of working with a single archive or all the contents of the database.

After unification, the regional government ceased promoting cartographic production (apart from some local representations drafted by municipal offices and *Genio Civile*, decentralised government civil engineering offices), until the Istituto Geografico Militare began producing the "Carta d'Italia" (*Maps of Italy*) with scales of 1:100,000, 1:50,000 and 1:25,000 in the 1870s and '80s.

An important part of the iconographic heritage that we considered was also produced on behalf of civic bodies (representing clerics, hospital workers and knights) as well as upper-middle-class and aristocratic families in Siena who owned large properties, such as estates, farms, landholdings, mills, homes and workshops. Other documents refer to the considerable number of Tuscan and foreign landowners with sizeable properties who also had jurisdictional power over the inhabited areas and territorial districts of southern Tuscany, at least until the time of Grand Duke Pietro Leopoldo (1765-1790).

Some of the most famous works of cartography preserved in the state archives of Siena and Grosseto

include drawings by Granducal engineer and architect Ferdinando Morozzi from the second half of the eighteenth century (Francovich 1976; Guarducci 2008); the group of loose maps from the collection of the Magistratura dei Quattro Conservatori dello Stato Senese (Vichi 1990); and a sample of maps from various collections in the Grosseto State Archives that were exhibited in 2001 (Barsanti, Bonelli Conenna and Rombai 2001).

Our ultimate goal is ambitious. If the project attracts the interest and support of territorial institutions (the regional government of Tuscany or its provinces), *Imago Tusciae* will progressively collect the cartographic documentation located in all the archives and public and private libraries in Tuscany, as well as that related to the region but preserved elsewhere (in Italy or abroad), in order to create the most complete digital catalogue possible.

Dispersion of cartographic documents

The abundant geo-iconographic documentation related to Tuscany is in fact spread among several depositories inside and outside the region as well as in cities in Italy and abroad, in family archives and in institutions and businesses that, while still in operation, may not be easy to reach and/or consult. Many documents (both prints and manuscripts) have ended up in the hands of Italian and foreign collectors. Not only does this state of affairs present an obstacle for researchers, but it is also one of the main motivations of this project.

Thousands of fourteenth-to-nineteenth-century maps, primarily handwritten administrative documents (with a few printed exceptions), are kept in the state archives of Lucca, Florence, Massa, Pisa, Livorno, Siena, Arezzo, Pistoia, Prato and Grosseto and in the library of the Istituto Geografico Militare in Florence (Rombai 2010a; Rombai 2010b), in addition to other libraries and municipal and local archives that are too numerous to list here (in Florence alone these include the Biblioteca Nazionale Centrale, the Riccardiana, the Moreniana and the Osservatorio Ximeniano).

Many documents related to the region are also preserved in public archives and libraries in other Italian regions and abroad. A large number of maps related to Tuscany in particular, are to be found throughout Italy, including the state and ministerial archives and the Istituto Storico e di Cultura dell'Arma del Genio in Rome; the state archives and the Istituto Idrografico della Marina in Genoa; and the state archives of Modena, Bologna, Parma and Naples. They are also located in various foreign countries: Spain (in the Archivos de Estado in Madrid and in Simancas); France (in the Archives Nationales and the Bibliothèque Nationale in Paris and in the Service Historique de l'Armée de Terre and the Service Historique de la Marine in Vincennes); Austria (in the Österreichischen Staatsarchiv, the Kriegsarchiv and the Hauptbibliothek in Vienna); Great Britain (in the National Archives and the National Marine Archives in London); and the Czech Republic (in the Rodinný Archiv, Toskánsckých Habsburků in Prague).

The dispersion of the documentation, with the problems this entails, explains why we have limited knowledge at our disposal. Though many studies have been conducted on all or parts of the Tuscan region, we know of only a few sufficiently complete inventories of cartographic documents related to single areas or organised into single archives and depository collections. These include the Osservatorio Ximeniano in Florence, the Miscellanea di Piante in the Florence State Archives and the Piante dell'Ufficio Fiumi e Fossi in the Pisa State Archives.

The typology and contents of historical cartographic documents

As noted above, Tuscany possesses a significant cartographic heritage that was primarily produced by central and peripheral offices from the fourteenth to the nineteenth centuries, mainly thanks to the initiatives of the two States of Florence (expanded to include the provinces of Siena and Grosseto as part of the Grand Duchy towards the mid sixteenth century) and Lucca. An important part of that heritage was also produced on behalf of the oligarchies and the civic bodies that owned extensive landed estates and properties.

This considerable cartographic heritage, produced from the Renaissance onwards for purposes of administrative and territorial control, can and must be known and valorised to support further archaeological, topographical, historical-territorial and historical-geographical research. In fact, historical maps represent a precious source for geographers, archaeologists, historical topographers, historians of production and settlement structures and more generally territorial organization, as well as architect-planners, forest rangers, physical geographers, hydrologists, etc. In general, the representations document the presence of artefacts or the remains of ancient or mediaeval artefacts often furnished with their respective toponyms, usually forgotten in whole or in part: residential and production settlements, streets and canals or old river channels, parcels of land, caves or mines, administered land sectioned off by varying degrees, etc. The *Imago Tusciae* project also intends to help expose the original ways that historical cartography can contribute to knowing, protecting and valorising our archaeological, historical-architectural and landscape heritage.

The maps of the Siena State Archives cover a time span that stretches from the fourteenth century to the first half of the nineteenth century. The collections include chorographical and topographical images or partial large-scale territorial maps; plans and views or single portions of built-up areas; architectural and other drawings; common or land maps and thematic or special maps, with delimited boundaries (borders between owners, administrative borders, government borders); issues regarding streets and water (hydrographical structures, mills, aqueducts and springs, works of land reclamation, works of regime regulation, flood occurrences); land holdings (predial or "cabrei" maps and detailed surveys, property index maps, plots of land for various uses, rural assets granted for various uses, reserves and customs-houses); mines and factories; settlements and architectural developments (buildings, fortresses, monuments).

Overall, the representations of southern Tuscany confirm what we already know from the literature, i.e., that the birth of modern cartography in Tuscany and in Italy in the fifteenth to sixteenth centuries benefited from both spatial surveying techniques (with reference of course to Claudius Ptolemy and Euclidean trigonometry) and pictorial techniques (which had been updated by the discovery and refinement of perspective; consider the importance of a figure such as Leon Battista Alberti). Every so often maps relied on such Euclidean-Ptolemaic or landscape-perspectival language, often integrating the respective approaches in order to graphically render the urban and territorial forms and contents of relatively large terrestrial spaces, such as hydro-morphological structures; the intended agricultural and forestal uses of soil; settlement and infrastructural grids; and political-administrative networks. Almost always, at least before the geometrical cadastres and geodetic surveys requested by the Lorraine family during the eighteenth and nineteenth centuries, the geometric culture increasingly integrated itself with the pictorial one, albeit on a scale that varied according to the mapmaker (Rombai 1993).

Imago Tusciae will allow users to move from the history of cartography to the documented history of the region and the targeted geographical, naturalistic, historical and archaeological-topographical recognition of the present landscape through the use of cartography. In fact, proper knowledge of cartography inevitably entails resolving complex scientific problems as well as issues such as dating, attribution, function, patronage, techniques of construction and reproduction, and relationships with state and local administrators and the strategies and interests of private patrons.

Historical maps must be studied in relation to their political-social and scientific-cultural contexts. We therefore need consolidated multidisciplinary skills in order to understand the territory (in its past and present configurations) and continually integrate our sources with other kinds of documents (writings, archaeological evidence, landscape-environmental surveys of the land, etc.), which taken on their own are not enough to explain the complexity of the territory in its continual and diversified evolution from area to area.

The application of *Imago Tusciae*: technical data and scientific contents

Imago Tusciae not only provides users with high-resolution reproductions of maps but also the tools with which to study and reflect on them, such as informational files about the documents; lists of map-makers with related biographical information; bibliographic references; lists of archival collections and atlases with descriptions of the maps they contain; and an interactive chronology that is localised on a contemporary map of Tuscany.



Figure 2. Initial consultation page. In addition to conducting a free search, users can view maps from single collections or individual mapmakers via the menu, or they can work with toponyms and chronology. The number of maps in the database, their provenance and the number of makers is automatically updated and displayed.

We prepared the map-cataloguing tool several times, starting with an extremely detailed data file, which required too much time to compile, and ending with the file currently being used for recording information, which has proven fully reliable. It must be specified that the data file we adopted is the

result of research experiments from the 1980s, modelled after manual cataloguing systems or electronic programmes written by various researchers working for single institutes of preservation or for homogenous territorial contexts. We are referring here specifically to the work carried out or supervised by Margherita Azzari, Danilo Barsanti, Stefano Bertocci, Gabriele Ciampi, Claudio Greppi, Anna Guarducci, Marco Piccardi, Leonardo Rombai and Pietro Vichi, among others, in relation to the maps collected in the state archives of Florence, Siena, Lucca, Pisa and Grosseto; the municipal archives of Florence, Fiesole and San Gimignano; and the territories of Prato, Fiesole, Monsummano Terme, Empoli, Orbetello and Grosseto. The descriptive files summarise the formal characteristics and territorial contents of the maps in an effort to display as much of the information they provide as possible through the characteristics of the drawing, the toponymy and the topographical image.

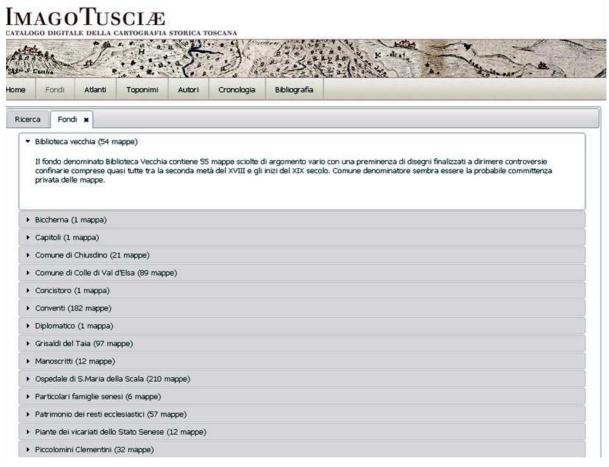


Figure 3. The list of collections in the Siena State Archives and their description. One can view the filed collections for each single archive. When a single collection is selected, all the maps therein are displayed along with their related files.

Our point of departure for creating the web application was our evaluation of the "digitalised historical map" and its importance as a testimony of a territory's past. The initial bulk of information gathered in an archive, which includes the map itself, as a digital image file, and the metadata in the reference file, was connected with other entities – like the biographies of various mapmakers or the archival collections in which the maps are preserved – according to a relational model memorised in

the Database Management System (DBMS). The map became the central core of a data network whose contents, when combined, allow new knowledge to be acquired. The historical map was also connected to geographical reference coordinates, thus establishing a dialogue between the region's past and present. The next problem was how to insert this knowledge network into the larger network of the Internet.



Figure 4. When searching by toponym, maps are displayed on the basis of the portion of the territory they represent. The map in question is also localised on current maps using the central toponym and the representational scale.

Another typical problem of complex web applications is how rapidly things go out of date, considering the frenzied pace at which technology evolves in this industry. In order to remedy this very real difficulty, which is the bane of many sites, we tried to implement a structure that was not only modular but also "open", based on open-source standards supported by solid communities around the world that can exchange data with other present and future web technologies. The entire application was written in three languages that are widespread and represent open standards: JavaScript, PHP and SQL. A positive consequence of this choice is that we saved a great deal of money by not having to buy software licenses, money that was reallocated towards human resources, which in turn enhance the scientific value of the application.

Since a continually evolving model is the crucial feature of the Internet, we did not develop the web site by following a ready-made project but rather by using separate modules that are modified on a weekly basis by the assigned work team formed for such purpose and made up of researchers with various skills. Indeed, the team members are of "mixed" technical and humanistic backgrounds: geographers, historical cartography experts and historians with knowledge of desktop publishing, computers or graphics and photography or advanced spatial analysis, all with a solid historiographical range. The researchers with humanistic background have taken charge of all the tasks as regards the IT aspects of the project and have been able to develop the software they needed thanks to the low

costs of the hardware and the constant support of large global communities who follow open-source software in solving particular problems and debugging.

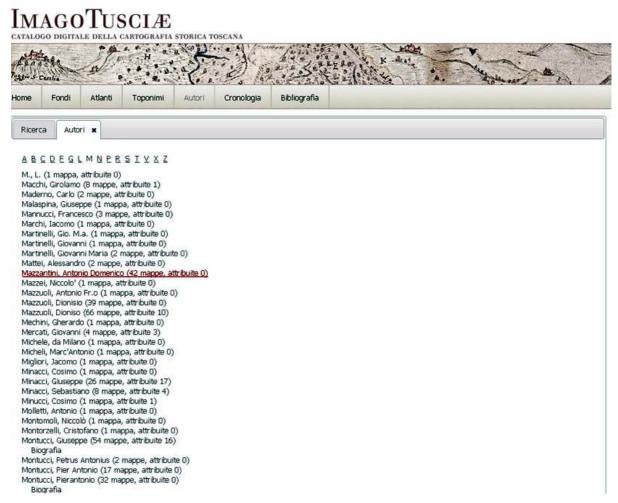


Figure 5. Search by mapmaker. Taking into account all the information related to the single maps, the user can search various maps drawn by the same mapmaker. In the case of more important names, a mapmaker's biography can also be displayed.

These were the premises that led to the "structure", i.e. organisation of the work based on the stages of advancement of the application's various modules. Each module was developed by an individual team member, jointly verified through real-time Internet access at the server where the work in progress resides and then discussed in weekly meetings. This organisational "structure" and the team members' common engagement in historical research translated into an almost transparent transfer of ideas, from their formulation and approval to their realisation in the application. Insofar as we are dealing with an application that allows an Internet navigator to consult a databank of historical maps (scanned at the archives concerned) along with the information related to them, the structure of the *Imago Tusciae* interface tries to provide a user experience that closely resembles that of a scholar in the archives standing before a table filled with pieces of notepaper, various kinds of documents and new ideas sparked by the cross-referencing of sources. The design of the interface was also refined using results from a focus group made up of various kinds of users.

In fact, we quickly recognised the need to place the single map at the centre of the user interface and to offer the related information in animated layers that stack onto the map itself. Taking advantage of "Web 2.0" techniques, the application disregarded old-style web navigation in which the user moves back and forth with pages overlapping and hiding the previous ones. Instead, the user can view all steps of the search using a tabbed navigation that corresponds to files containing various types of related information. Each file was expressly designed and offers different ways to scroll through its corresponding data. Where possible, the information from the files is also enriched with material from other files or sources on the same publication server or on the web. Users can add as many files as they like to their work area, which keeps a memory of their operations. In addition to this horizontal tab navigation, users can also access information that contextualises the single map using vertical tabs that open animated ribbons. These ribbons may contain a gallery of maps that respond to the search; a synthetic description of the piece of the archive in question; a form to refine the search and organise the results differently; the map's possible placement in an atlas and the ability to leaf through the atlas itself; a section of Google Maps showing the position of the historical map selected; and the possible presence in the archive of other historical maps of the surrounding area.

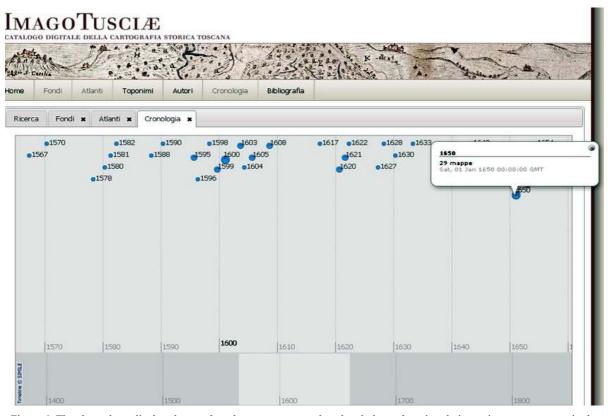


Figure 6. The chronology display shows when the maps were produced and places them in relation to important events in the historic evolution of Tuscany's political-administrative structure.

The application's layout was also influenced by these structural choices so that the subject of the analysis – be it a map from the past, the biography of a mapmaker, an atlas to leaf through or an interactive chronology localised on a contemporary map of Tuscany – is always clearly presented to

the user at the centre of the screen. The application therefore offers tools with which to study and reflect upon the documents and presents itself as a means for consulting the data. It also lets users see a preview of the document and carry out targeted research, including cross-referencing other fields. Users can view the data in three different modes, depending on their needs: by individual file (including all the aforementioned fields), in miniature and for print.

The "Chronology" file, built by adapting an open-source widget developed at MIT, is of particular interest. It displays a timeline in which the user can interactively scroll through various events relating to Tuscany's political and institutional history while at the same time verifying the presence in the archive of testimonies documenting the state of the territory.

A user's consultation of the archive nevertheless starts with the simple search box, modelled after the famous one by Google, behind which a potent search engine is being developed. By referring to a thematic thesaurus of terms, the engine can interpret a user's desires to a certain extent as well as offer dynamic suggestions to help the user better specify his or her search. In the future, *Imago Tusciae*'s search engine will also supply multiple results organised according to a "geographical" ranking, i.e. the distance from the place that best corresponds to the user's request.

The results of all the searches carried out in the various modules are provided in XML. This means the application can dialogue with other databanks hosted by other web sites and structure the data according to international thematic standards of geography or other disciplines.

While the published site is the application's front end, the system has a user-friendly back end, expressly developed to be equally available on the web, through which qualified users can modify all the databank records and insert new information in real time.

Online publication also allows the cartographic documents to be preserved from the wear and tear that would inevitably result from all the consultations that would otherwise be made on the original material itself by the scholars and institutions in charge of managing the territory and the landscape.

Imago Tusciae was also designed to expand the number of archive users beyond the scholarly public. In fact, our proposal was based on the idea of creating a tool that straddles research and publicity, scientific knowledge and a valorisation of the impressive cartographic heritage preserved in the archives, through a simple means that can be used by, and is accessible to, everyone. The visual approach and the abundance of easily accessible related information are meant to spark curiosity in the general user, even outside the narrow academic circle of historic cartography, without relinquishing the scientific rigour of the application in any way. The modular structure of both the application and the data model that forms its skeleton also lend themselves to hosting other digitalised archival documents, with very little adjustment required. Imago Tusciae is therefore a genuine knowledge system that is fully prepared to gather and implement new ontologies of historical sources.



Pianta del podere della Marciliana posto nella comunità di Belforte

Datazione: [1750-1799]

Autore: Mattio Gabbrielli pubblico agrimensore

Scala grafica: Tavole 120 senesi

Scala numerica: Altezza: 478 Larghezza: 680 Nº fogli/tavole: 1

Tecnica: china e acquarello Supporto: carta Orientamento: sud-ovest in alto Conservazione: discreta

> Archivio: Archivio di Stato di Siena Fondo: Biblioteca Vecchia

Serie: Nº filza/volume: Titolo filza/volume: Nº inserto: Titolo inserto: Nº carta: 55

Annotazioni: La presente carta raffigura la pianta del podere della Marciliana, nella comunità di Belforte, con i suoi annessi. In basso a sinistra è presente la veduta della casa poderale. I terreni sono costituiti da seminativo e sodivo arborato. Il podere risulta confinato dal torrente Lucignano, dal torrente Lucignanino e dalle proprietà del Carmine, della Cappella di S. Niccolò, dei Signori Belisario Bulgarini e Berlinghieri. Il fondo denominato Biblioteca Vecchia contiene 55 mappe sciolte di argomento vario, con una prevalenza di disegni finalizzati a dirimere controversie confinarie (si noti sul retro di molti fogli il nome dei due proprietari contendenti), comprese quasi tutte tra la seconda metà del XVIII secolo e gli inizi del XIX. Comune denominatore è la probabile committenza privata della maggior parte delle carte.

Bibliografia:

Compilatore: Monica Stefanelli e Barbara Gelli

Ultimo aggiornamento: 09/01/2008

Figure 7. Example of a file. The first section provides a miniature, which lets users view the map inside a light-box, in addition to the map's main attributes (dating, maker, scale, technique, etc.); the second section displays the map's archival context; and the third section provides a brief description and related bibliography. The names of the individuals who compiled the file and the date it was catalogued are also recorded.



Figure 8. Search-results gallery. After a search, either free or via the menu, the results of each query are displayed in miniature along with a brief description and the date each map was produced. This data is located in a tab that can be closed at any moment to view the map below.



Figure 9. When viewing the maps, users can zoom in using the mouse roller or the relevant bar above to appreciate the high-resolution quality of the digital reproductions. At the same time, they can also move the zoomed-in detail simply by moving the cursor inside the square. The copyright of the maps is respected by making it impossible for users to download the high-resolution version.

Our main goal now is to refine the project even more so that it can be used not just for consultation, but also for the "production" of knowledge. In other words, we wish to create an "intelligent" search engine that can increasingly satisfy the needs of all kinds of users and supply a range of answers organised according to relevance, starting from those closest to the user's requests. We obviously have to consider the relationship between maps and territory when talking about cartography; we therefore intend to use geographical proximity as one of our criteria. Since we are dealing with a database that is centred on spatial/territorial representations, we feel we must aim to provide answers organised according to a geographical-topographical criterion and to offer the possibility of presenting maps that are organised topographically. This can also be done by using the placenames in single maps, not so much to georeference them within the territory (which is sometimes impossible given the non-geometric nature of many maps) but rather to show their "areas of interest" on current maps using the Google Maps interface.

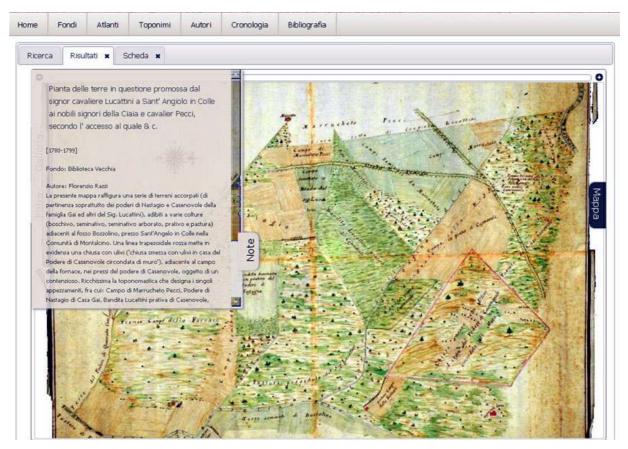


Figure 10. Example of the "notes" tab related to the displayed map. This describes the various aspects of the map and its context in a discursive way.

The answers will then reach the user as a true "gallery" of miniatures, furnished with essential information, rather than a simple list of titles. The user can therefore see the results of the search immediately and explicitly while at the same time appreciating the style of the maps themselves. The images in the gallery are organised by default on the collection or the archive and the progressive

numbering therein, but they can also be organised according to other criteria that take into account aspects like, for example, chronology or the representative scale.

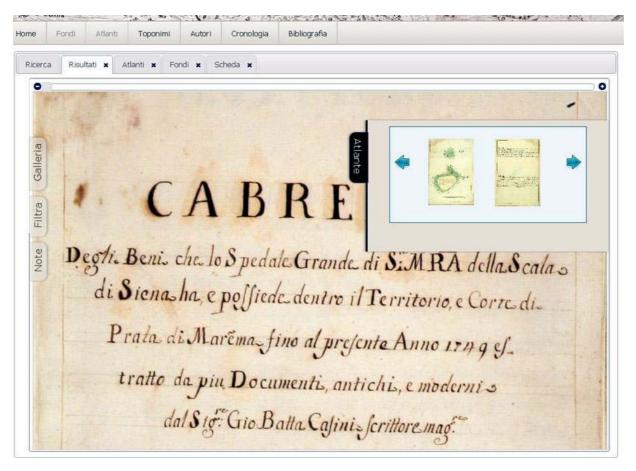


Figure 11. An example of an "atlas", i.e. a uniform, often bound, collection of maps. If a map belongs to an atlas, a tab appears automatically on the right-hand side of the square so that users can navigate through all the folios or pages of the volume.

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