Marco van Egmond*

Georeferencing for the future of history?

Keywords: Georeferencing, institutional map collections, use of georeferenced old maps

Summary: Utrecht University Library has been georeferencing digitized maps since 2013. To do so, it uses Georeferencer software, which is ideally suited for crowdsourcing. Since then, several sub-collections of scanned maps have been georeferenced and made accessible in OldMapsOnline (https://oldmapsonline.org) with great success. Via an interactive world map, this Internet application provides intuitive access to over a million georeferenced cartographic documents now held by more than seventy international libraries and institutions. This makes OldMapsOnline probably the largest cartographic discovery platform in the world.
Over time, the application has been further developed and improved. In May 2024, the latest version was launched, with major innovations and enhancements. For example, a historical world atlas with time slider has been integrated (www.timemap.org), allowing the old maps to be placed in context. Furthermore, the presentation and performance of the georeferenced maps themselves have been improved. Finally, the application is better suited for personalization and community-building. Interested people can now easily contribute individually to the growth of the corpus of available maps in OldMapsOnline by uploading, describing and georeferencing maps themselves.
Utrecht University Library carried out a new georeferencing project in 2024, using Georeferencer and OldMapsOnline. That provided an opportunity to take a hard look at the new version of the latter application. The presentation will discuss the many functionalities of the OldMapsOnline upgrade and the practical experiences with it. Can the application really be labelled as the 'Google maps for history' – an indispensable tool for historical research – as the initiators themselves ambitiously state? And are we thus indeed georeferencing for the future of history?

Introduction

Not so long ago, institutions unlocked their map collections by, among other things, adding coordinates to descriptions of cartographic documents. For each map and map series, the outer longitudes and latitudes were usually determined manually; often an intensive job. I myself had to do this in the 1990s, as a young cataloguer at the cartographic department of the Royal Library in The Hague. To my perhaps silly question as to what all this diligent coordinate work was for, my then supervisor and curator replied that it was literally his 'dream' to make his map collection intuitively accessible via a geographic computer interface in the distant future using that mathematical data. A dream he had no illusion of seeing come true in his lifetime.
But visionary my executive, then, certainly was! Indeed, now, less than thirty years later, a so-called 'geosearch' is available to a modern map collection simply as a discovery tool. Not on the basis of manually searched coordinates, but through the application of digital bounding boxes or by georeferencing maps online, with or without the help of crowdsourcing. Those localized maps can then be made visible in Internet applications with a geographic interface. Searching for digitized maps thus becomes very intuitive and easy.

* Dr. Marco van Egmond (1969) is curator of maps, and atlases at the Utrecht University Library, The Netherlands [m.vanegmond@uu.nl].

One of the leading applications for map discovery is OldMapsOnline. In it, more than a million maps, mostly from before 1900, have now been made accessible via a zoomable world map (Figure 1). The OldMapsOnline application has been around since 2012 and has had several technical and content upgrades since then. In May 2024, a radically redesigned upgrade was released, the main novelty being the integration with an interactive historical world map.

Figure 1: Homepage of OldMapsOnline.

Utrecht University Library has also been providing cartographic content to OldMapsOnline since 2013. To do so, it uses Georeferencer software, which is ideally suited for georeferencing scanned maps by crowdsourcing. Since then, several sub-collections of scanned maps have been georeferenced and made accessible in OldMapsOnline with great success. Utrecht University Library carried out a new georeferencing project in 2024. That provided an opportunity to take a hard look at the new version of the application. This paper will discuss the many functionalities of the OldMapsOnline upgrade and the practical experiences with it. Can the application really be labelled as the Google Maps for History – an indispensable tool for historical research – as the initiators themselves ambitiously state? And are we thus indeed georeferencing for the future of history?

OldMapsOnline: a tool for finding maps

One of the major advantages of georeferencing scans of old maps is that it provides unprecedented digital capabilities for geographically accessing map collections. Once georeferenced, the geospatial metadata can form the basis for high-quality and optimal searching and finding of maps.[1] The added value of enriching the digitized maps with this kind of metadata becomes extraordinarily clear in OldMapsOnline's search engine. The gateway makes it possible to search for online maps through both textual interfaces – online gazetteers – and geographic interfaces, thus providing a tool

[1] Fleet [et al.] (2012).

for faceted search.[2] It is OldMapsOnline's goal to create a federated search portal, able to simultaneously search as many map libraries worldwide as possible.[3] In this way, a 'Google for old maps' could be created.[4] Furthermore, the ambition was expressed early on to expand the application in the future to include other georeferenced content, such as topographical prints, photographs, travel reports, archival documents with a geographical component, etc.[5]

The first version of OldMapsOnline was launched in February 2012 and at that time had over 60,000 digitized high-resolution maps from five institutions.[6] A year later, these numbers had already risen to 140,000 maps from nineteen institutions.[7] Now, more than a decade later, the search engine provides access to more than a million maps from more than seventy different institutions. The site has attracted over twenty million visitors in its existence and – according to its own website – currently averages 1,5 million visitors per month.

With a current corpus of over a million maps OldMapsOnline forms probably the largest cartographic discovery platform in the world. Most of those maps were georeferenced through Georeferencer's crowdsourcing tool.[8] Both Internet applications more or less coexisted initially, but over time OldMapsOnline and Georeferencer have become increasingly integrated with each other.

A new version of OldMapsOnline

Over time, the application of OldMapsOnline has been further developed and improved. In May 2024, the latest version was launched, with major innovations and suitable for all devices. Most striking is the integration of a historical world atlas, allowing the maps to be analyzed in context.[9] Furthermore, the presentation and performance of the georeferenced maps themselves have been improved. Finally, the application – now available in twelve different languages – is better suited for personalization and community-building. Interested people can easily contribute individually to the growth of the corpus of available maps in OldMapsOnline by uploading, describing and georeferencing maps themselves. We will discuss these changes one by one.

Historical context

Compared to the previous version of OldMapsOnline, the latest version has a modified interface. Most prominent is the standard map view with country borders and at the bottom a time slider (Figure 2). By changing the position of this slider, one can intuitively maneuver through time and the boundaries change according to the state situation at the time. The slider goes back to the year 4,000 before the beginning of the era. Thus, an interactive, dynamic history atlas is available to the user. Each of the distinguished areas is linked to a summary and a lemma in Wikipedia. The same goes for the leaders of the time, which become visible by clicking on 'Rulers' in the top center menu (Figure 3). The 'People' option leads to more than 2,000,000 (!) localized 'celebrities' who in one way or another won their place in history. Finally, 'Battles' brings up the most important battles and sieges.

[2] Southall & Přidal (2012), p. 73.
[3] For a review of other attempts for a federated map search portal: Southall & Přidal (2012), p. 74-75.
[4] Southall & Přidal (2012), p. 73.
[5] *Ibid.*, p. 80.
[6] Fleet [et al.] (2012); Southall & Přidal (2012), p. 77.
[7] Aucott [et al.] (2013), p. 8.
[8] URL: https://www.oldmapsonline.org/en/community/join.
[9] Also accessible via its own URL: www.timemap.org.

For now, the map view is limited to the administrative division into unitary states and countries; there is no further division into, for example, provinces and municipalities. Perhaps such a further administrative subdivision belongs to the future possibilities, for example if a user zooms in deeper on a particular state or nation? In this respect, the historical base map is in full development; for example, dynamic reconstructions of fortifications and road patterns are included for some cities. In the longer term, this offers unprecedented opportunities to arrive at a kind of historical Google Maps.

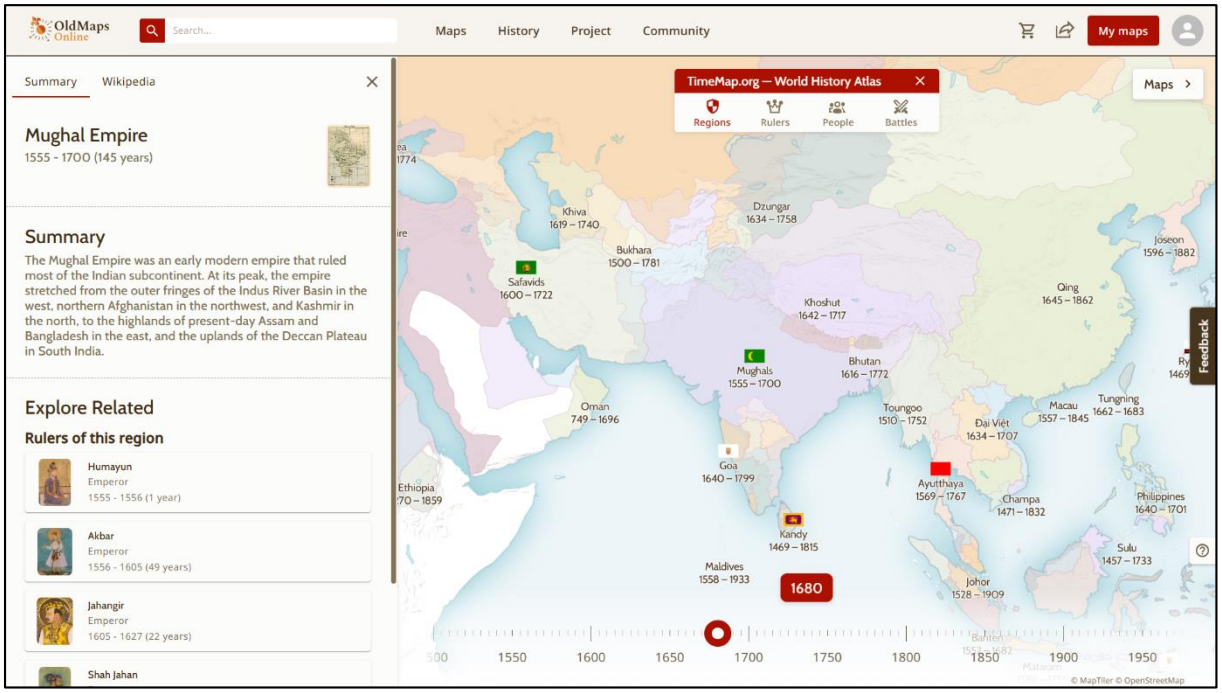

Figure 2: ‘Regions’ South Asia in 1680 in TimeMap, and linkage with the Mughal Empire.

Figure 3: ‘Rulers’ South Asia in 1680 in TimeMap, and linkage with emperor Kangxi.

Exploring maps

The integration with the world history atlas of TimeMap aims to use linked data to add historical context information to the georeferenced maps in OldMapsOnline. And of course the other way around, to link contemporary map images to historical events and situations. This gives the application a real time-space dimension, a 'time machine'. And OldMapsOnline becomes more than a 'Google for old maps', namely a 'Google maps for history'.

The map images can be found by clicking the 'Maps' button in the upper right corner from TimeMap. Or directly through OldMapsOnline. As with the interactive history atlas, the maps can be filtered by using the time slider; thus, for any desired region and time, the most relevant cartographic documents emerge as search results. The option is also provided to assess the quantitative distribution of map images of a particular area through a graphical display. Of the United States, for example, detailed map images are obviously only available from after about 1750, while those of the Netherlands with its rich cartographic tradition are available as early as 1550 (Figure 4). The same option brings up the details of the mapped regions as zoomable thumbnails, giving the user a quick insight into the relevance of the map images.

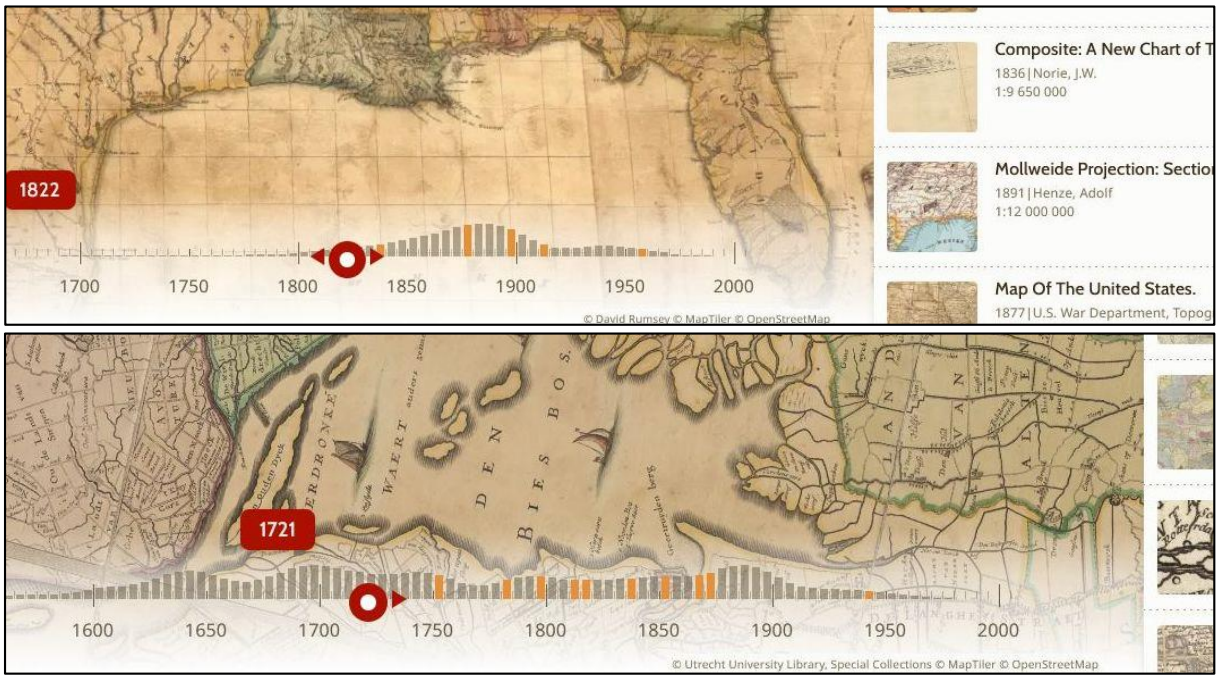

Figure 4: Quantitative distribution of available maps in OldMapsOnline for the regions of the United States (top), and the Netherlands (bottom). Orange bars indicate the highlighted maps of the search results at the right.

Once a map is found, it can be analyzed via 'Compare' by transforming, rotating and adjusting transparency, among other things. Further metadata about the map can also be found here. Logging in using a free account further offers the possibility of using various reference maps, including satellite images or OpenStreetMap. 'Export' leads to, for example, the familiar links for reusing the georeferenced map in, for example, GIS applications (WMTS, XYZ, etc.) and the GeoTIFF and JPG. New in this version of OldMapsOnline is the export option of the map via the IIIF manifest. Via 'Export' the 'under the hood' section is also accessible, i.e. the georeferencing and accuracy analysis of the respective map.

Via '3D', the selected map can be viewed in perspective and linked to a digital elevation model. Optionally, one can choose a view as a three-dimensional block diagram, which can be shared via a QR code (Figure 5). This is obviously especially interesting for maps of mountainous areas.

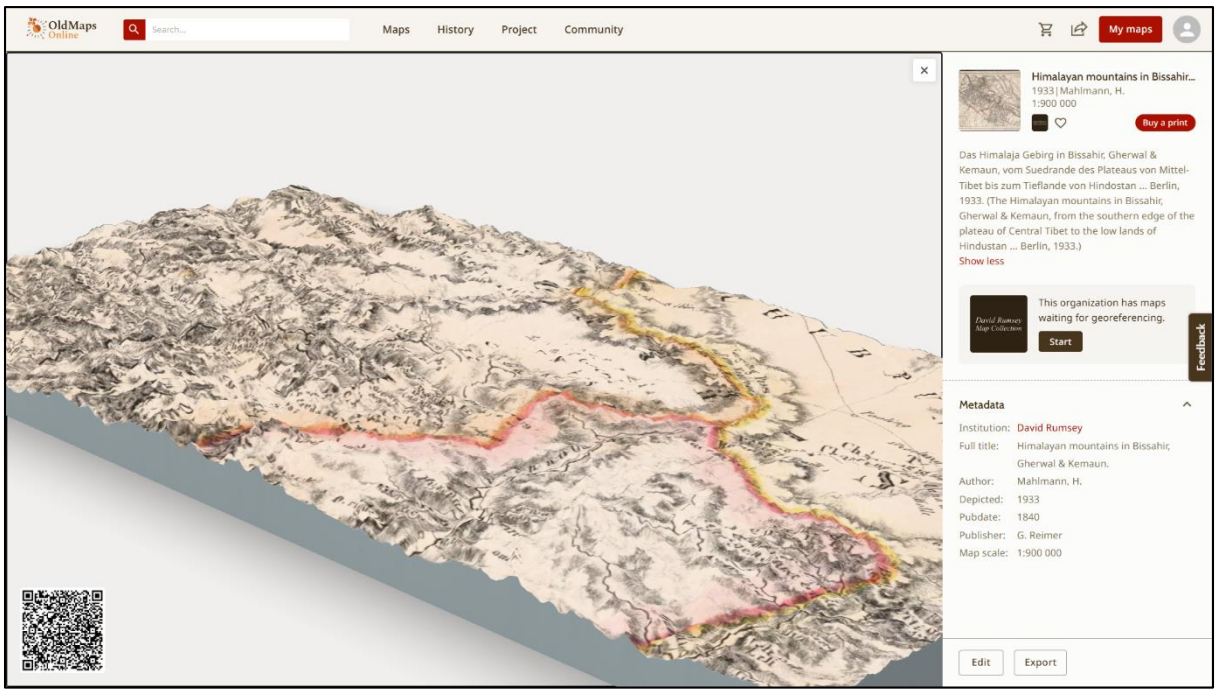

Figure 5: Digital elevation model of the Himalaya, using a map by Mahlmann, 1833.

Personalization and community-building

A major objective of OldMapsOnline is to maximize the expansion of the searchable corpus of georeferenced maps. In order to achieve this objective even better, the new version focuses heavily on personalization and community building. Specifically, it is now possible for individuals to georeference maps independently through OldMapsOnline and include them in the system. This can be done by importing a URL or manifest of a scanned map based on IIIF standards, *the* current file format for exchanging digitized images. Another option is to upload a digital map file in all common formats via drag and drop or browse. The map can then be georeferenced. Users can also add the necessary metadata via an editor and choose whether to share the map with the community or use it purely for private purposes.

In this way, OldMapsOnline hopes especially to enthuse the worldwide community of historically interested people about cartographic documents and to strongly stimulate the growth of the discovery platform. In principle, private use of OldMapsOnline's system is free; the maps can be consulted by anyone at any time and georeferenced and analyzed free of charge after creating an account. By upgrading membership ('friend' or 'member') for a fee, additional options and functionalities become available to individual customers, including an ad-free environment, unlimited addition of maps to the community, advanced search capabilities and export of GeoTIFF downloads and GIS links. Institutions or institutional users also enjoy these benefits, but additionally have access to a variety of crowdsourcing widgets, advanced search capabilities and a customized geographical search application for the own map collection.

Some examples of usage

As said, Utrecht University Library was one of the first institutions to carry out a georeferencing project using the new version of OldMapsOnline. This provided an opportunity to get acquainted with it in practice. The application immediately showed its tremendous potential for adequately unlocking global history and geography through an intuitive time-space approach. The beautiful look-and-feel of the website, the innovative MapRank Search and the handy time slider really invite to an addictive exploration of history. A few examples from Utrecht may illustrate this.
In the Utrecht georeferencing project, over 1,000 old maps of diverse areas were up for georeferencing. As usual, it took little to no effort to mobilize the crowd. Even without any promotion, the maps were georeferenced in a matter of weeks. The software for georeferencing, Georeferencer, remained unchanged. However, it is more integrated into OldMapsOnline's application. And through a link, a georeferenced map can be viewed directly in OldMapsOnline's environment. A good example is the large-scale, nine-sheet map of the Rhine between Leverkusen and the Dutch border, published in Berlin in 1836. The mosaic of this detailed map (1:25,000) can be very nicely viewed in perspective and analyzed using, for example, a satellite image as a reference (Figure 6).[10]

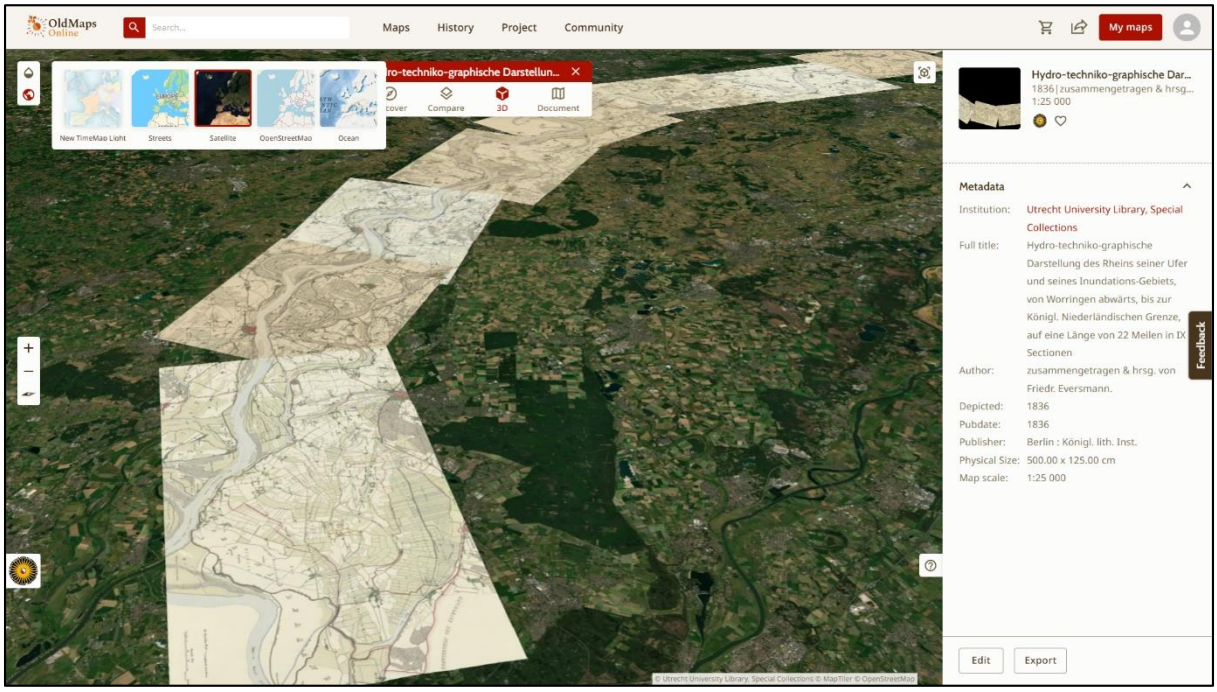

Figure 6: Nine-sheet map of the Rhine in Germany, published by Eversmann (Berlin, 1836).

Another example of the practical use of OldMapsOnline is the added value of the linked historical context information. In 2014, the Utrecht University Library launched a digital exhibition on fortification and siege maps. These maps, which often aptly depict the many European wars of succession in the 18th century in particular, were georeferenced and accessed in OldMapsOnline at the time. The integration with TimeMap's historical world map places the old maps and events of the time in a much deeper and broader perspective. The georeferenced maps of the famous siege of Lille (Rijsel) in 1708 – when the War of the Spanish Succession was at its height – clarify this. For

[10] URL: https://uu.oldmapsonline.org/maps/199cc3e5-9084-4d27-b430-524032fbe2a3/. The size of the map as shown in the image is approximately 500 x 125 cm!

example, by moving the time slider, TimeMap's historical base map already very aptly shows the development of the fortifications of the northern French city (Figure 7).

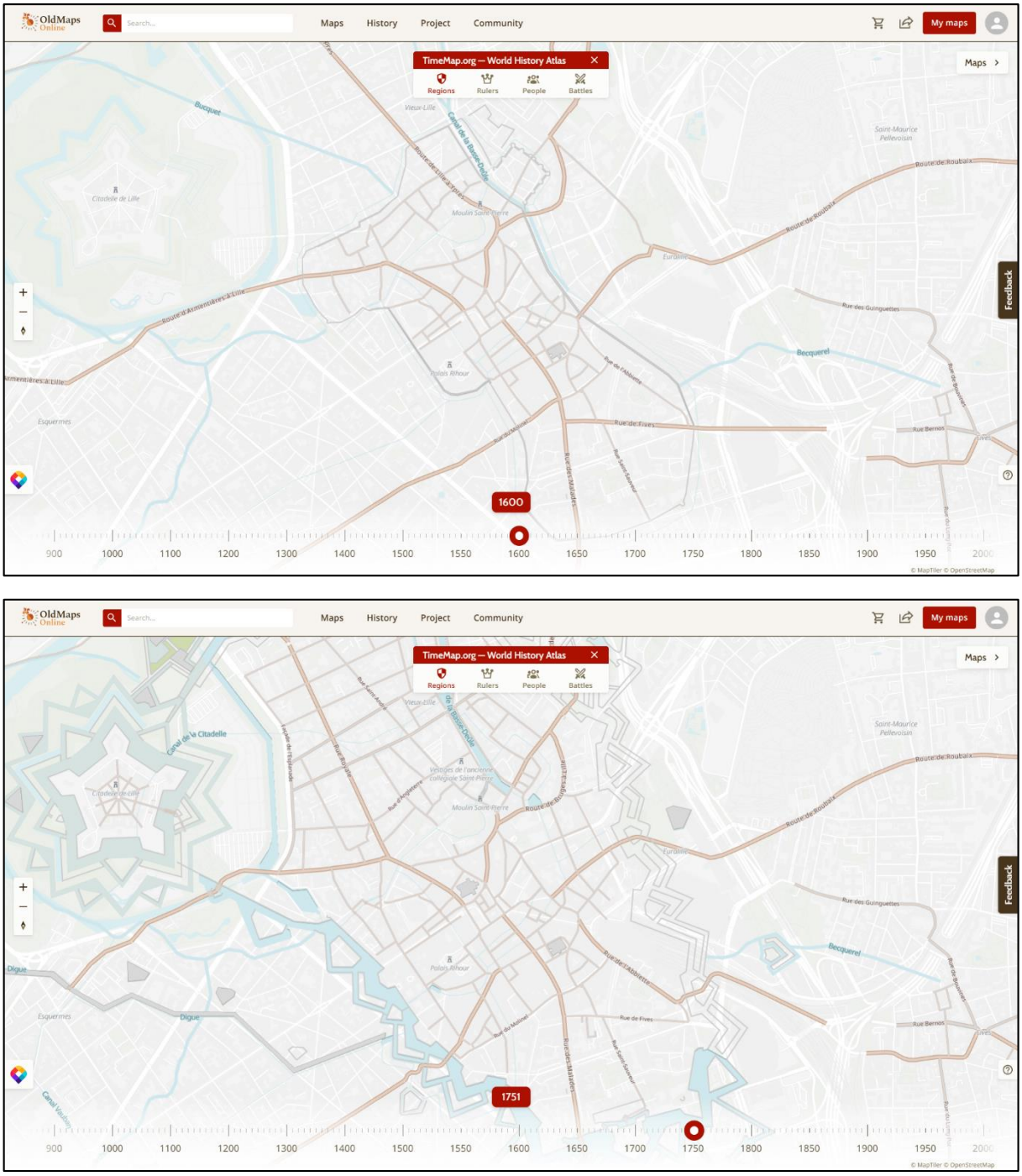

Figure 7: Spatial development of Lille (Rijsel) in TimeMap, 1600 (top) and 1750 (bottom).

Via 'Maps', users can access contemporary maps, such as that of the Brussels publisher Eugène-Henri Fricx (1644-1730, Figure 8). This beautifully engraved map from 1709 shows a vivid picture of the siege, showing the allied armies of England, the Republic of the United Netherlands, the German Kaiser, Prussia and the Austrian Habsburgs facing the defending French Sun King Louis XIV, aided by Bavaria and Spain. The siege began on 12 August 1708 and was to last 120 days. The Grand Alliance was under the supreme command of John Churchill, the Duke of Marlborough

and Prince Eugene of Savoy. The map clearly shows what the encirclement of Lille looked like in practice. The outer ring around the city was a so-called circumvallation line, which had to ensure that dismounting armies were stopped from the outside. Within it we see a counterattack line. From here, the surrounded city was bombarded with artillery and attacks. According to the legend, the circumvallation line was built by 7,000 peasants![11]

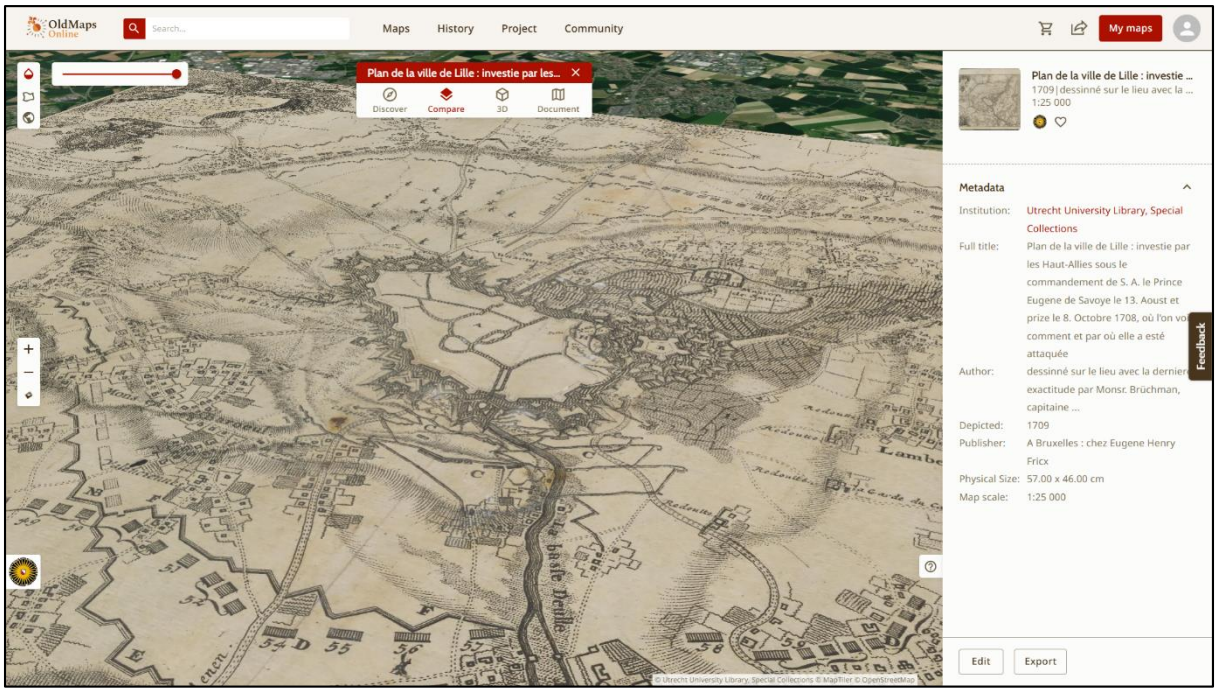

Figure 8: Perspective view of the siege of Lille in 1708, published by Fricx in 1709.

A final practical example concerns the development of cities and areas. Here OldMapsOnline is useful not only as a tool for studying historical-geographical development, but also cartographic 'evolution'. The city of Rotterdam is illustrative in this regard. During the 17th century, this important seaport town more than doubled in population. Joan Blaeu's map, first published in 1649, shows the growing city in all its grandeur (Figure 9a). The graph at the bottom shows the distribution by number of maps; thus, most of the maps of Rotterdam in OldMapsOnline date from the 19th century. To the right, thumbnails show zoomed-in details of relevant maps, which are marked in the graphic display with an orange color. Those maps themselves also demonstrate the development of the cartographic representation of the city.

[11] URL: https://uu.oldmapsonline.org/maps/d29b0d23-9eab-5ff6-b377-6919bb993a7e/
Although the siege of Lille yielded a victory for the Allies, it did not quite succeed in keeping French dismemberment units out of the circumvallation line. In late September, the commander of the besieged French garrison in Lille, Marshal Boufflers, sent a request for help to Duke Christian Louis de Montmorency-Luxembourg. The latter managed to break through the allied lines with 2,000 horsemen, delivering 40,000 pounds of much-needed gunpowder to Boufflers. On 22 October 1708, the allies nevertheless managed to invade the town, but at a high cost of 12,000 dead. However, Boufflers continued to resist from the citadel for several more weeks, resulting in another 4,000 allied casualties. Finally, in early December, the citadel too fell into the hands of the besiegers.

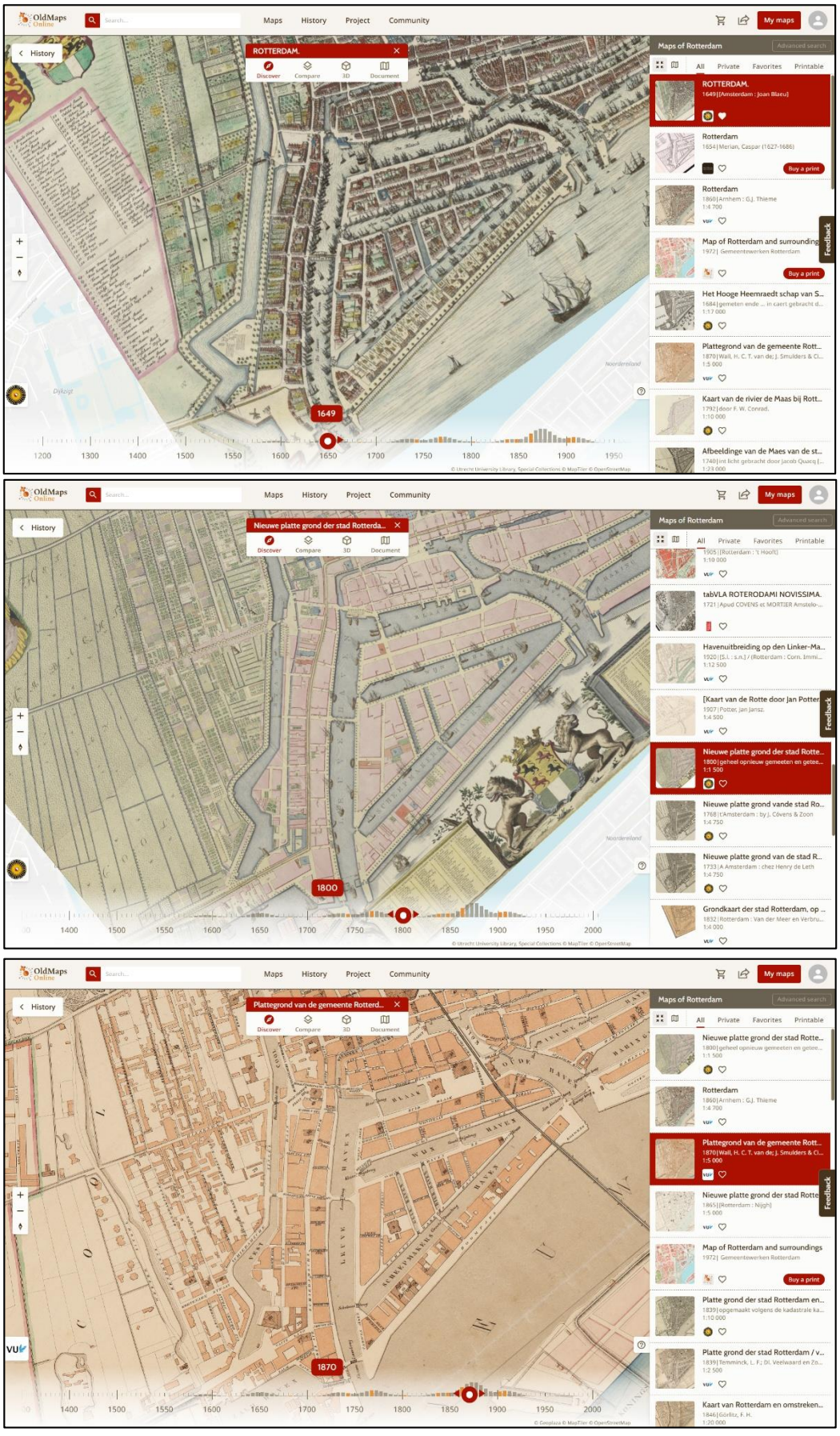

Figure 9a-c: Cartographical representation of the town of Rotterdam in OldMapsOnline, using the plan by Blaeu (1649, top), Munro (1800, middle), and Van de Wall (1870, bottom).

For example, Blaeu's 17th century map is drawn *in opstand* (in upright), say three-dimensional, form. While the 1800 map of surveyor Munro has a rather modern orthographic visualization, although the ships and mills are still depicted figuratively (Figure 9b). Seventy years later, these too have disappeared and we see a fully orthographic projection with the map by Van de Wall (Figure 9c).

The above examples of the practical use of OldMapsOnline are only a few of the legion of possibilities. Depending on the purpose, time period and region, many alternative options are open to researchers, students and other interested parties.

Concluding remarks

Fortunately, dreams are not always deception. My former supervisor's dream – a digital geographic interface that makes a map collection intuitively accessible to a user – has become a reality. And as a retiree, he gets to enjoy it daily from the comfort of his armchair! Thanks to the ambition of OldMapsOnline, a central platform for the discovery of scanned maps is coming ever closer. That ambition initially focused on providing a single entry point for users to search through map catalogs across a number of institutions in a geographical way, a 'Google for (old) maps'. Thanks to the recent integration with TimeMap's dynamic history atlas, however, the horizons are being broadened even further, effectively forming a 'Google maps for history'. And in this way, through OldMapsOnline, we are georeferencing for the future of history, as it were. It is not that far yet; we are still waiting for the addition of other locative data and images such as map series, photographs, prints, objects, etcetera. Integration with other external discovery systems in the field of maps and history is also being considered. In addition, much work remains to be done in producing the historical reconstructions of ancient settlements and street patterns.[12] But the potential for such an interactive atlas of global history is certainly there. A potential that was already recognized in the 16th century by the famous 16th-century map maker Abraham Ortelius, who stated 'Historiae Oculus Geographia' (geography is the eye of history). It is up to OldMapsOnline to make that eye look ever sharper digitally!

References

Aucott, Paula, Humphrey Southall, Petr Pridal (2013), *Old maps online: finding and referencing historical mapping as a platform for research and teaching*. – University of Portsmouth, https://pure.port.ac.uk/ws/portalfiles/portal/1757872/Old_Maps_Online_article_final.pdf

Egmond, Marco van (2019), 'The Dutch Landscape of Online Institutional Georeferencing'. – In: *e-Perimetron* (14,3): 126-139.

Fleet, C., K.C. Kowal, & P. Přidal (2012), 'Georeferencer: Crowdsourced Georeferencing for Map Library Collections'. – In: *D-Lib Magazine* 18.11/12 (2012): http://webdoc.sub.gwdg.de/edoc/aw/d-lib/dlib/november12/fleet/11fleet.html

Kowal, Kimberly C. & Petr Přidal (2012), 'Online georeferencing for libraries: the British Library implementation of Georeferencer for spatial metadata enhancement and public engagement'. – In: *Journal of Map & Geography Libraries* (8,3): 276-289.

[12] See for a prototype of Venice: https://timemachineatlas.eu/ and https://www.klokantech.com/references/timemachineatlas/

Oehrli, M. et al. (2011), 'MapRank: Geographical Search for Cartographic Materials in Libraries'. – In: *D-Lib Magazine*, 17 (9/10). http://dx.doi.org/10.1045/september2011-oehrli

Přidal, P. & Zabicka, P. (2008), 'Tiles as an Approach to On-line Publishing of scanned Old Maps, Vedute and other Historical Documents'. – In: *e-Perimetron* 3(1): 10-21.

Southall, H. & Přidal, P. (2012). Old Maps Online: Enabling Global Access to Historical Mapping. – In: *e-Perimetron* 7(2): 73-81.