

Mihailo St. Popović*, Bogdan Şandric**

Transfer of (historical) geographic knowledge Then and Now. From static data to user oriented visualization.

Keywords: Historical geography; archaeology; Byzantium; digital Humanities; visualisation.

Summary: This contribution has the aim to analyse and to compare the means by which geographic knowledge has been transferred throughout the 20th century and by which it should be presented at the beginning of the 21st century. The research evolves on the basis of two case studies. The first case study sheds light on a project entitled “Archaeologische Karte von Jugoslavien”, which was conducted by the archaeologist Nikola Vulić (1872-1945) in the 1930s for the historical landscape of Macedonia. It is specifically his map which is of interest to us, because it is a combination of different layers of knowledge available at that time. Although more than 70 years have elapsed since Vulić’s approach, some issues have remained unchanged. For instance, the *Tabula Imperii Romani (TIR)* as well as the *Tabula Imperii Byzantini (TIB)* still provide static data to the reader in the form of printed volumes with accompanying maps. Recently, the *Tabula Imperii Byzantini* has embraced the need to leave the exclusive static imagery to a certain extent and to turn to user oriented visualisation as well. It is at this point that the contribution turns to the second case study, which will explain the vital steps towards an internet presentation of the project *Tabula Imperii Byzantini*.

Nikola Vulić and the “Archaeologische Karte von Jugoslavien”

As stated in the summary above, my research evolves on the basis of two case studies for the time being. The first case study sheds light on a project, which is entitled “Archaeologische Karte von Jugoslavien” and which was conducted by the Serbian archaeologist and classical philologist Nikola Vulić (1872-1945) in the 1930s (cf. Fig. 1).¹

Therein, he did research on the historical landscape of Macedonia, namely on the areas around Prilep, Bitola and Kavadarci. After the publication of two volumes in German language², his work was interrupted unexpectedly by the Second World War. Although Vulić’s publication contains static data, i.e. archaeological finds attributed to places (i.e. villages) in the area of research, assorted in headwords and marked on an accompanying map, we can still witness a remarkable transfer of cartographic know-how.

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¹ Although Nikola Vulić was one of the most prominent scholars of his time and a corresponding member of the Austrian Academy of Sciences, we still lack a comprehensive biography of his life and a complete list of his publications. Cf. Saria (1953: 269-270), Ferjančić (1997: 320-321); see also the *Annexe* to this article, where Vulić’s dossier, which is preserved in the Archive of the Austrian Academy of Sciences, is published for the first time.

² Vulić (1937); Vulić (1938).



Figure 1: Nikola Vulić (1872-1945). (cf. <http://sr.wikipedia.org/wiki/Датотека:Вулић.JPG>).

It is specifically the map which is of interest to us, because it is a combination of different layers of knowledge available at that time. We could even go so far as to address it as a “mashup” from the 1930s. Initially, Vulić used maps on the scale of 1:100,000 deriving from the *Military Geographical Institute (Vojnogeografski institut)* in Belgrade³ and merged them with German transcriptions of Slavonic place names provided by the older Austro-Hungarian maps on the scale of 1:200,000⁴ (cf. Fig. 2). Since he had written his volumes in German, he tended to create a harmonic picture for the user in this way. Thus, Austrian know-how supported Yugoslav cartography and archaeology before the Second World War.

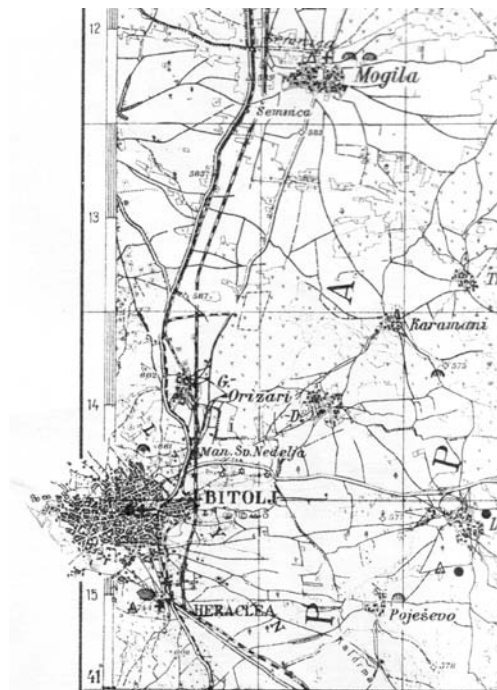


Figure 2: “Archaeologische Karte von Jugoslawien”, Map Prilep-Bitolj (Detail). Vulić (1937).

³ Radojčić (2003: 209-219); Kovács (2009).

⁴ Haardt von Hartenthurn (1897: 80-86); Kovács and Timár (2008); Kovács (2010); Kovács and Timár (2010: 535-544); Popović and Jubanski (2010: 59-61). The system of transcription was developed by: Levačić (1897: 67-74).

Tabula Imperii Romani (TIR) and Tabula Imperii Byzantini (TIB)

Although more than 70 years have elapsed since Vulić's approach, some issues have remained unchanged. For instance, the projects *Tabula Imperii Romani (TIR)* as well as the *Tabula Imperii Byzantini (TIB)* still provide static data to the reader in the form of printed volumes with accompanying maps.

Initially, the above-mentioned project *TIR* served as a model for the *TIB*. The *TIR* was founded in 1928 and was placed under the supervision of the International Union of Academies after the Second World War. Its aim is the publication of an atlas of the Roman Empire on the scale 1 : 1,000,000 with accompanying volumes containing historical and bibliographical data for each locality shown on the maps. Of special interest for the current scholarly work of the *TIB* are the volumes on Naissus⁵ and on Philippi⁶.

Although some similarities exist, it has to be stressed that there are nevertheless substantial differences between the two above-mentioned projects. While the *TIR* puts a strong emphasis on archaeological data with little information on the history of localities and with references to the most important literature, the *TIB* combines the aspects of history, archaeology, bibliography and field research / surveys equally.

The *TIB* carries out systematic research of the historical geography of the Byzantine Empire, which existed from the beginning of the 4th century AD till the 15th century AD, that is from Late Antiquity to the Ottoman conquest, in order to create an atlas of the aforesaid empire.⁷ The main part of each volume of the *TIB* constitutes a catalogue of the Byzantine names of towns, settlements, fortresses, churches, monasteries, fields, mountains, rivers and lakes in alphabetical order, which is extracted for each region / province of the Byzantine Empire from four categories of sources. These categories are the written sources from the above-mentioned period (e.g. historiography, inscriptions, etc.), the archaeological evidence (monuments and their remnants), the toponyms and the geographical classification of natural landscapes.

The collected and sorted information is presented in headwords (i.e. *lemmata*). Each headword contains the localisation (if possible) of a place found in the sources and data on its history and monuments. The used sources and the most important secondary literature are quoted at the end of a *lemma*. There the reader also finds the information, if field research or surveys were conducted *in situ* by the scholars of the *TIB*. At this point it has to be stressed that it has never been part of the project to excavate monuments in the areas of research. The conducted surveys have always had the aim to localise visible monuments and to document their current state by means of photography. Hence, the above-mentioned scholars strongly rely on the collaboration with the archaeologists in the countries to be visited and on their publications of monuments.

Furthermore, each volume of the *TIB* contains introductory chapters on the geography, climate, history, administration, church history, population, lines of communication and economy of the studied region / province of the Byzantine Empire as well as a register.

The results of each volume are presented to the reader on a map on the scale 1:800,000 with the headwords marked on it (cf. Fig. 3). Special symbols and combinations of colors indicate the nature of the monument and its dating. The former Institute of Cartography of the Austrian Academy of Sciences designed a map for the whole Mediterranean on the above-mentioned

⁵ Šašel et al. (1976).

⁶ Avraméa and Karanastassi (1993).

⁷ Cf. on the project *TIB* in detail: Popović (2010: 219-234).

scale.⁸ This enabled a more thorough topographic approach and facilitated the entry of headwords. If it proves to be necessary, a larger scale is applied for some regions (e.g. 1:100,000; 1:400,000). The principal working method and the layout of the *TIB* have remained nearly unchanged since the 1970s.

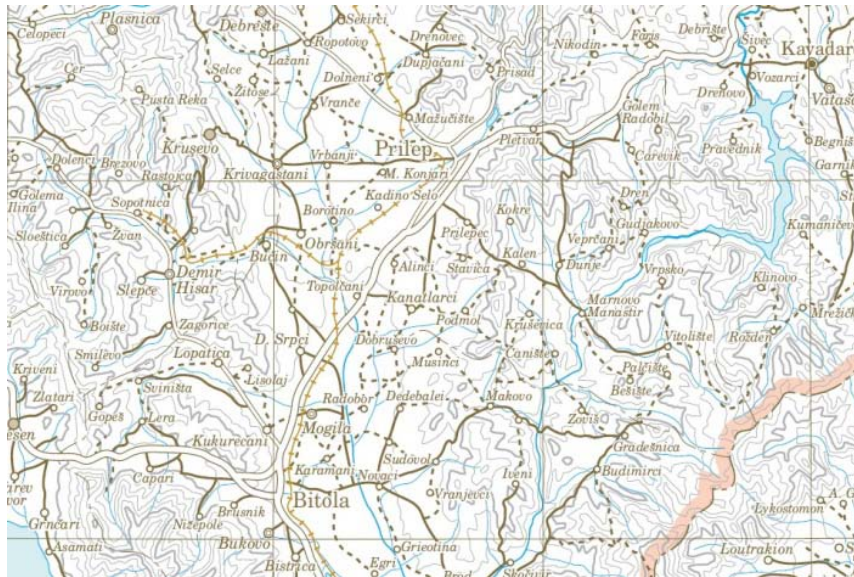


Figure 3: Detail of the Map of the *TIB* on the Scale 1 : 800,000 (Prilep-Bitola). (*TIB* 16, Mihailo St. Popović).

The *Tabula Imperii Byzantini* (*TIB*) and Digital Humanities

The *TIB* has recently embraced the need to leave the exclusive static imagery to a certain extent and to turn to user oriented visualisation as well. In my FWF Austrian Science Fund stand-alone project “Economy and Regional Trade Routes in Northern Macedonia (12th-16th Century)” (P 21137-G19) I focused on the transportation networks, on the economic centres and on the areas of resources in the part of the historical region of Macedonia, which lies today on the territories of the Republic of Bulgaria and of the Former Yugoslav Republic of Macedonia (FYROM).⁹

The scholarly results, which I have achieved during the duration of the stand-alone project, lie on two levels – a macro- and a micro-level – of research. On the macro-level the central transportation routes were reconstructed, the development of fairs in the Late Byzantine and Ottoman periods was retraced and the mines were localised for the entire area of research. On the micro-level mediaeval and Ottoman written sources were analysed in order to reconstruct exemplarily the settlement patterns of two river valleys (namely of the Strumica and of the Kriva Lakavica) in the south-east of the Former Yugoslav Republic of Macedonia. The findings based on the sources were consequently transferred into the model of the modified “Central Place Theory” in order to comprehend the local hierarchies of markets. Moreover, settlement typologies (village, hamlet, etc.) as well as lost settlements were correlated with political events of the mentioned centuries, local transportation routes, nomadism and migration.

An integral part of the stand-alone project formed the application of Historical Geographic Information Systems (HGIS) to various groups of sources. I processed written sources,

⁸ Kelnhofer (1976).

⁹ Cf. <http://www.oeaw.ac.at/byzanz/routes> and <http://oeaw.academia.edu/MihailoPopovic> (both accessed 2 July 2012).

archaeological evidence, pictorial sources (maps of towns and other maps of the region from the 19th century), geodata (GPS waypoints, GPS tracks) and data deriving from surveys in the area of research with HGIS. Thus, regressive models were created, with which mediaeval transportation routes were reproduced or “predicted” (“least-cost path”-models), timelines of settlement processes were programmed via Google Earth and the loss of settlement structure in towns was determined via the georeferencing of old maps. Furthermore, factors of centrality of nodes in transportation and settlement networks were calculated with network analytical computer software.¹⁰ Hence, my stand-alone project contributes significantly to the development of the fields of Byzantine Studies, South East European Studies and Historical Geography towards the Digital Humanities.

How the *Tabula Imperii Byzantini* (*TIB*) could go online

It is at this point that the contribution turns to the second case study, which will explain the vital steps towards an Internet presentation of the project *TIB* with the aim to foster an intense transfer of historical geographic knowledge to worldwide users. Thus, a methodical framework will be given, how the different layers of data of the project (printed volumes, maps, slides, digital photographs, GPS-waypoints etc.) should be arranged and combined in order to achieve the best result with regard to the task.

Plan A

Based on my project-related experience I elaborated an outline in February 2011, which I name *Plan A* for the time being. According to *Plan A* the Internet presentation of the *TIB* should include all headwords (i.e. *lemmata*) of the published volumes *TIB* 1 to *TIB* 10 and *TIB* 12.¹¹ This data was written with different word processing programmes (WordPerfect, Microsoft Word, etc.).

Scanned versions of the published volumes or pdf-files of the available Word data should be linked to the presentation. In this way the users could scroll through the headwords. Furthermore, it is intended to take the map of the *TIB* on the scale 1 : 800,000 as cartographic basis of the Internet presentation (cf. Fig. 4). This map has to be vectorized in the near future in order to enable the user to zoom in and out. It should be embedded in 2D with all headwords (symbols) marked onto it.

Entries of special interest could be highlighted. This approach would imply the creation of a GIS-database, which would contain the data corresponding to each headword (symbol). Clicking on a symbol on the map would open a window with additional information containing for example a cross reference to the headword (i.e. *lemma*) in the respective volume of the *TIB*, an abbreviated description of the monuments without footnotes, the most important bibliography and a series of photographs of the monuments deriving from the image archive of the *TIB* from the 1960s until today.

The question of the language, which should be used for the description of the monuments in the Internet presentation of the *TIB*, remains a debated issue within the overall project. The respective

¹⁰ These results will soon be published in a monograph, which is at the same time my professorial dissertation (‘Habilitation’): M. St. Popović, Von den Quellen zum Visuellen in der historischen Geographie. Zentrale Orte, Siedlungstheorien und Geoinformatik, angewendet auf die historische Landschaft Makedonien (13. bis 16. Jahrhundert) [From the Sources to the Visual Display in Historical Geography. Central Places, Settlement Theories and Geoinformatics applied on the Historical Landscape of Macedonia (13th-16th Century)] (in press).

¹¹ A complete list of all volumes can be found following this link: <http://www.oeaw.ac.at/byzanz/tibpr.htm> (accessed 2 July 2012).

volumes of the *TIB* were written in German. Even the volumes which are in preparation at the moment are written in German. Nevertheless, English should be given preference in the case of the additional information. This would facilitate the access of worldwide users to the data presented. Moreover, furnishing the website with a counter would allow to gather statistical data on the users and would help to justify the overall project of the *TIB* in times of bibliometric approaches.

The next step would be the creation of a form, in which the additional information should be filled in with a limited number of words, which would guarantee a consistent and succinct presentation. Then the forms would be integrated into the above-mentioned GIS-database.

All technical aspects as well as the maintenance of the server needed for the Internet presentation would have to be outsourced to a project partner specialised in this field.

In the wake of a paper entitled “On the Value of Historical Geographic Information Systems in History, Cartography and Historical Geography”, which I presented at the National Archives of Romania in Bucharest on 19 January 2012, I discussed the above-mentioned *Plan A* with Bogdan Şandric, who developed a technical proposal, which we call *Plan B* for the time being.

Mihailo St. Popović

Plan B – WebGIS Platform for (Historical) Maps

The WebGIS system will provide the general user with a simple interface to use and to analyse (historical) maps. All the (historical) maps will be georeferenced. This will allow the overlaying with up-to-date maps like Google Maps, Bing Maps, Open StreetMap etc.

In terms of technical requirements, the following will be needed:

- a) Hardware: server with 4 cores, minimum 8GB RAM and about 1-2 terabytes for storage. The storage depends on how much data will be gathered through time. We believe that the hardware that we have at CIMEC - Institutul de Memorie Culturala (Bucharest) can be used for a startup project.
- b) Software: if we acquire sufficient funding, we can buy ArcGIS server, otherwise we can use GeoServer [cf. <http://geoserver.org/display/GEOS/Welcome> (accessed 2 July 2012)].
- c) The platform that we intend to build will have the following functionalities:
 - a simple and intuitive web page to visualize the maps
 - the option to overlay the historical maps onto up-to-date maps provided by any other international or local provider
 - an ontology service using GEMET Thesaurus [cf. <http://www.eionet.europa.eu/gemet/about> (accessed 2 March 2012)] or similar solutions
 - an advanced web page where specialists can make notes and create their own data. This will be provided only for people that are logged into the system.
 - to use WebGIS services in Open Geospatial Consortium (OGC) format: Web Map Service (WMS) and Web Map Tile Service (WMTS)
 - a geoportal for historical maps, where other users can search or publish their websites, WebGIS services etc.

Bogdan Şandric

Conclusion

This contribution delivers a first insight into the line of thought, how the extensive analogue data of the historical geographic project *Tabula Imperii Byzantini (TIB)* of the Austrian Academy of Sciences could be transformed from its static display into a user oriented visualisation.¹² The herein presented ideas are only the first step towards the accomplishment of this task. Nevertheless, the discourse has to continue and it will continue. Colleagues working on similar historical geographic projects throughout the world are facing the same challenges and obstacles. Two examples have to be mentioned at this point. At the moment Professor Dr. Anton Escher and his team of scientific co-workers at the University of Mayence are preparing a GIS of the whole Byzantine Empire.¹³ The project “Mapping the Jewish Communities of the Byzantine Empire” at the University of Cambridge aims to map and interpret Jewish life in the Byzantine Empire using GIS.¹⁴ In order to achieve the common goal of combining historical geographic studies and visualisation a joint effort is needed. This will help to develop a functioning technical basis and standards, on which different scholarly projects could build upon in the future.

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¹² The following two publications are very inspiring in this context: Barceló (2000: 9-36); Bodenhamer and Corrigan and Harris (2010).

¹³ Cf. <http://www.byzanz-mainz.de/> and <http://www.staff.uni-mainz.de/escher/> (both accessed 2 July 2012).

¹⁴ Cf. <http://www.mjcb.eu/> (accessed 2 July 2012).

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Annexe

Archive of the Austrian Academy of Sciences (AÖAW, Vienna), Personalakt Nikola Vulić

[page 1]

AKADEMIE DER WISSENSCHAFTEN IN WIEN
Wien I., Universitätsplatz 2

Euer Hochwohlgeboren !

Die Kanzlei der Akademie der Wissenschaften in Wien erlaubt sich, die Bitte auszusprechen, behufs Feststellung der Personalien für den "Almanach" die nachstehenden Rubriken dieses Zirkuläres auszufüllen und dieses möglichst bald wieder an die Akademiekanzlei (Wien I., Universitätsplatz 2) zurücksenden zu wollen.

Hochachtungsvoll ergebenst

Die Kanzlei der
Akademie der Wissenschaften.

AKADEMIE DER WISSENSCHAFTEN IN WIEN
Wien I., Universitätsplatz 2

Vor- und Zuname : Nikola Vulić

Akademische Grade und Titel: Universitätsprofessor in Belgrad,
Ozd. Mitglied der Akademie d. Wiss. in Belgrad, Kor. Mitglied der Acad.
emie des Inscriptions et Belles Lettres in Paris.

Wissenschaftliches Fach: Alte Geschichte

Geburtsdatum und Geburtsort: 1872 den 27. November in Skutari

Adresse: Belgrad, Jug-Bogdana 15

Figure 4: First Page of Vulić's Dossier
(Archive of the Austrian Academy of Sciences, Vienna)

[page 2]

Professor Nikola Vulić ist in Skutari am 27. | November 1872 geboren. Volksschule und Gymnasium hat er | in Serbien, Universität in Belgrad und München (wo er dok- | toriert hat, 1896) studiert. Im J.[ahre] 1897 ist er Professor der Alten | Geschichte an der Belgrader Universität geworden. Seine wis- | senschaftliche Tätigkeit bewegt sich hauptsächlich auf dem Ge- | biete der römischen Vergangenheit der jetzt zu Jugoslawien | gehörenden Länder. Er hat in Serbien viele archäologische | Reisen unternommen und mehrere Ausgrabungen (archaische | Nekropole bei Trebenište, römisches Theater von Scupi, rö- | misches Kastell bei Stojnik, u. a.) veranstaltet. In der letzten | Zeit hat er sich der Forschung des serbischen Donau- | limes gewidmet. Vulić hat Aufsätze in verschiedenen | Sprachen, besonders aber serbisch, veröffentlicht. Eine grosse | Sammlung griechischer und römischer Inschriften stammt | von ihm.

Vulić ist Mitglied der Académie des Inscriptions et Belles Lettres à Paris, der Rumänischen Akademie der Wissenschaften in Bukarest und der Accademia Virgiliana in Mantua, ferner Doctor honoris causa der Universitäten in Padua und in Clermont-Ferrand, schliesslich ordentliches Mitglied der Archäologischen Institute in Wien, Berlin, Sofia, Konstantinopel und korrespondierendes Mitglied der Prähistorischen Gesellschaft in Wien, Société de Géographie in Marseille usw.

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