

15th ICA Conference

Digital Approaches to Cartographic Heritage

International Cartographic Association

Commission on Cartographic Heritage into the Digital

online

6-7 May 2021

hosted by the

Institute of Cartography
and Geoinformatics
ELTE Eötvös Loránd University
Budapest

22nd MAGIC Conference

Challenges in Modern Map Librarianship

MAGIC - Map and Geoinformation Curators Group

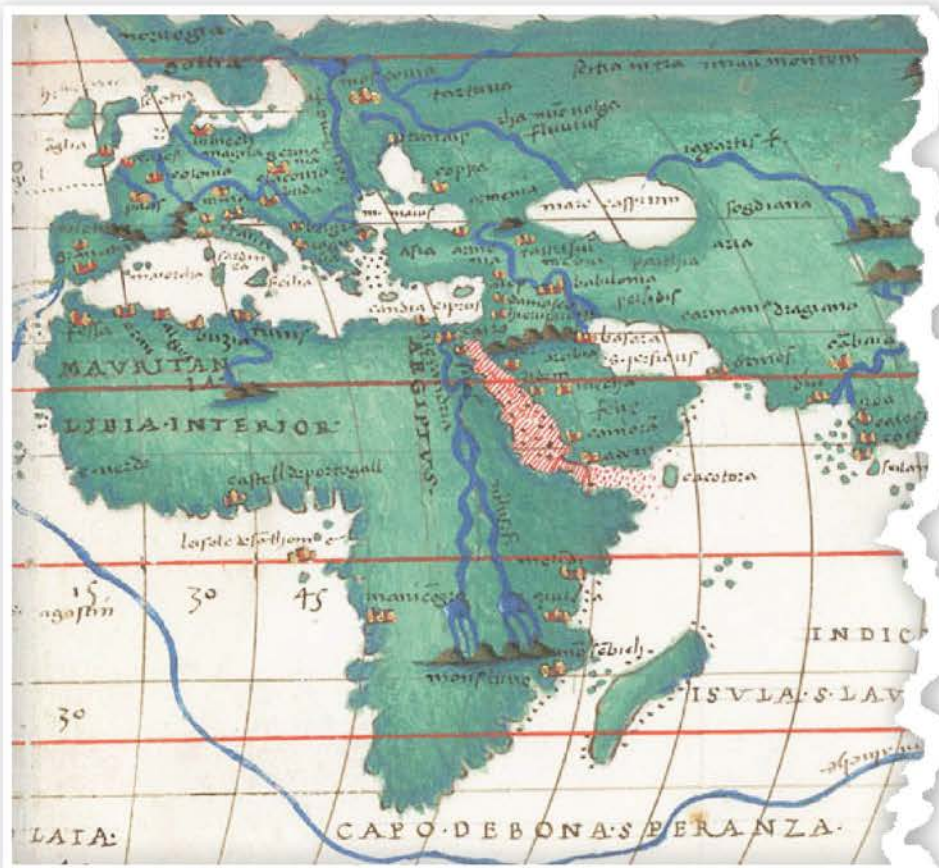
Conference Abstracts

Digital Approaches to Cartographic Heritage

Editors

Angeliki Tsorlini

Chrysoula Boutoura



INTERNATIONAL CARTOGRAPHIC ASSOCIATION
Commission on Cartographic Heritage into the Digital



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Map & Geoinformation Curators Group – MAGIC
22nd MAGIC Conference on Challenges in Modern Map Librarianship
Online Conference, 6-7 May 2021

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Editors: Angeliki Tsorlini, Chrysoula Boutoura
Thessaloniki: AUTH CartoGeoLab – ISSN 2459-3893



The Abstracts volume is part of the Conference Proceedings
distributed to all registered participants of the
Online Conference 2021

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The 15th Conference of the series Digital Approaches to Cartographic Heritage is organised by the ICA Commission on Cartographic Heritage into the Digital this year, jointly with 22nd MAGIC Conference on Challenges in Modern Map Librarianship online on 6-7 May 2021, hosted by the Institute of Cartography and Geoinformatics, ELTE Eötvös Loránd University, Budapest.

15th ICA Conference “Digital Approaches to Cartographic Heritage | 22nd MAGIC Conference on Challenges in Modern Map Librarianship: <http://cartography.web.auth.gr/ICA-Heritage/Budapest2021/>
ICA Commission on Cartographic Heritage into the Digital: <http://cartography.web.auth.gr/ICA-Heritage>
Map & Geoinformation Curators Group - MAGIC: <http://cartography.web.auth.gr/ICA-Heritage/MAGIC/index.html>
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Abstracts

KEYNOTE

6 May 2021 09.30-10.00

NANETTI A. *Singapore*
Nanyang Technological University

'Big Data' in Digital History and Cartographic Heritage into the Digital. Engineering Historical Memory as a Showcase

In today's massive and continuously morphing big digital data sets, what does it mean for Digital History and Cartographic Heritage to navigate the treasure of human experiences and stand on the shoulders of the giants? How can Artificial Intelligence (AI), and especially Machine Learning (ML), empower scholarship? What is the place of history and cartographic heritage? In answering these questions, the keynote will use the interactive system Engineering Historical Memory (EHM) as a showcase for digital history and cartographical heritage into the digital.

Since 2007, EHM is studying and practising "by what means" traditional historical scholarship can supply machine-readable information sets to empower historical sciences with artificial intelligence and machine learning, thus enabling all users to read primary historical sources according to different levels of knowledge and expertise interactively. In the history domain, EHM makes a cross-disciplinary use of established research processes, such as mapping as understood in mathematics and linguistics (i.e., an operation that associates each element of a given set, the domain, with one or more items of a second set, the range) and parsing as understood in computing (i.e., analyse narratives into logical syntactic components) to kick-off the exploration of primary historical sources. Using the operations of mapping and parsing for individual primary historical sources, EHM associates each element of given sets of information provided by the domain of the traditional disciplines (e.g., history, art history, philology, palaeography, diplomatics, codicology, archaeology, epigraphy, sigillography) with one or more elements of the range of machine-readable content management systems (e.g., spreadsheets, computational notebooks). The level of accuracy of this preliminary human activity is directly proportional to that of the aggregations generated and visualised by the EHM algorithms from different sets of similar written or depicted elements in the EHM database (e.g., geographical names, people's names, goods, ships, governments, events, architectures, drawings) and from potentially relevant publications, images, videos, and news retrieved in online repositories.

SESSION I

6 May 2021 10.30-12.15

VAN EGMOND M. *Utrecht*
Utrecht University Library

Visualizing the historical Utrecht skyline

For centuries, the medieval city centre of Utrecht has been surrounded by a defensive moat. Part of it – the Catharijnesingel – was reclaimed in the seventies of the 20th century, but has recently been restored to its former glory. Since the middle of the 16th century, this canal has featured on many old Utrecht town profiles, which provide a striking picture of the development of the urban skyline.

To celebrate the return of water in the Catharijnesingel and the completion of the old canal, the Utrechts Archief ('Utrecht Archive'), in collaboration with the Utrecht University Library, has set up an exhibition of city panoramas and launched an innovative web application to accompany it.

The purpose of the web application is to show Utrecht's skyline development on the basis of the old town profiles. All the buildings mentioned on these profiles are highlighted in text and image. The panoramas are also linked to old and modern plans. This has led to an application prototype, which in the future can easily be extended with other town profiles, old maps and images.

By means of linked open data, descriptions of buildings on Wikidata are linked to old prints in the image bank of the Utrecht Archive. Both the digitized city panoramas and the georeferenced old maps show the most important buildings, which become visible in images and text. This creates an interactive time-space model of

the city of Utrecht, in which the development of the Utrecht skyline and town plans can be followed in detail by means of a timeline between approximately 1550 and today.

In the future, the application may also be used as a geographical interface for the visualization of other types of historical elements with a spatial component, such as linking historical datasets.

In the paper, the realization of the application and the current and future possibilities for use will be discussed.

NANETTI A. *Singapore*

Nanyang Technological University

Interactive Exploration of the Map of Imola (1473-1502, UK, Windsor, Royal Collection, RL 12284)

This paper presents a system for the interactive exploration of the map of Imola (1473-1502, UK, Windsor, Royal Collection, RL 12284) and related secondary literature. This ichnographic city plan is based on a survey that used the Lombard foot (0.43519m) as unit of measurement and a scale of 1:10,000. The Lombard master of bombards and engineer Danesio son of Zuchino de' Maineri—with a long and documented career in surveying, designing, budgeting, building, maintaining and updating fortifications in the state of Milan from 1428 to 1482—can be confidently recognised as the superintendent of a survey of the city of Imola initiated after 7 June 1473 and accomplished by him and/or by members of his Lombard technical staff before 15 December 1473, during the second and longer of his three stays in Imola for the update of the fortification of the fortress (paulo ante 10 March 1472—paulo post 15 December 1473) followed by two other very short visits in 1474, one paulo post 16 May and the other paulo post 3 June. By December 1474, either the survey had collected the measurements necessary for the making of a map or the mapmaker had effectively completed a map of Imola that later assuredly came in the hands of Leonardo da Vinci in his capacity of ducal architect and engineer ("architecto and inzegnero ducal") when he was in Milan (1481-1490) or when he was entrusted with the fortification of Imola in 1499 or when he was in Imola in 1502. Da Vinci contributed additions and notes to an already existing map of Imola or drew the map based on a previous one.

SCHAFFER G. *Tel Hai*

Tel-Hai Academic College

The transformation of a Jerusalem urban brownfield site into an urban park

This research examined the land cover changes around a new redevelopment project, the "Train-Track Park", in Jerusalem (Israel). The old Jerusalem - Jaffa railway track has been redeveloped into a new urban park and opened in 2013. The three aims of this research were: 1. to quantitatively construct and examine the land cover changes of the site and surrounding neighbourhoods in four time periods, 1881, 1945, 1970s, and 2013; 2. to examine whether the railway site has changed along with the changes of the surroundings neighbourhoods 3. to find what were the driving forces which might explain the changes in the land cover. The study revealed that the landscape of the area has changed dramatically, from mostly open space to a dense urban area. Nonetheless, the research has found that two areas have remained similar to the past, one a natural area and one an agricultural area. Moreover, the research has demonstrated that the changes in the railway site and the surrounding neighbourhoods are interlinked. Lastly, while at first the land cover changes have been caused mainly by political forces, later the economic forces had been the more influential ones.

TIMÁR G., N. VARGA *Budapest*

ELTE Eötvös Loránd University, Department of Geophysics and Space Science | Lechner Nonprofit Ltd, Department of Geodetic Networks and State Borders

The border triplex of Hungary, Romania and Serbia – a one-meter-wide stripe of the Yugoslav state and its representation in the border maps

The triple boundary point of Hungary, Romania and Serbia was initially placed in the terrain by the Treaties of Trianon and Sèvres, giving the border line between Hungary, the Kingdom of Serbs, Croats and Slovenes (SHS State; later called Yugoslavia) and Romania.

As the Yugoslavs and Romanian agreed to make some minor modifications on their common frontier, according to the Belgrade Protocol of 24 Nov, 1923, it meant a move of the triple boundary point to some 13 kilometres to SW, as Romania gained two villages at the Hungarian border from Serbia.

Romania and the SHS State, to avoid to involve Hungary in this agreement, agreed to sign an interesting treaty, lending a one-meter-wide stripe of territory to SHS State between the old and new triplexes. The lending agreement was signed for 99 years. This way, in this 13-kilometer-long section, Hungary was legally bordered to Yugoslavia. The cc. 1:5000 scale maps of the Yugoslav-Hungarian borders, the Yugoslav section lasts till Kiszombor as the eastern extreme, however the real triplex is 13 km SW from this, near Kübekháza. Accordingly, the ‘Section A’, the first section of the Romanian-Hungarian border, also drawn in 1:5000 scale maps, starts from Kiszombor.

The legal situation was maintained till the afterwards of the WWII, when the legal situation was resolved, Hungary approved the position of the real triplex. With Romania, a new ‘section N’ was set up and mapped in 1950. The triplex conifinum was set up near Kübekháza, where it is nowadays. However, when a new agreement was signed by Hungary, Romania and the successor of former Yugoslavia 19 Apr, 2006 in Novi Sad, it occurred that the lending agreement is (supposedly) still valid, so it was closed by Serbia and Romania and this was the real, legal end of this unique story.

KREJČÍ J., J. CAJTHAML *Prague*

Czech Technical University in Prague, Faculty of Civil Engineering, Department of Geomatics

Database of extinct historical objects in the Vltava river valley

The Vltava River used to be an important trade and transport route in the past, with its beautiful landscape favoured by many and permanent hydropower essential for the regional economy. Nowadays, it is the river on which the largest dam reservoir system in the Czech Republic was built, with water management, hydropower and recreational use. Landscape along the Vltava river changed intensively, the life in the area as well as many important objects related to the river vanished, they were demolished or just flooded. The main objective of the project supported by the Ministry of Culture of the Czech Republic is to create a comprehensive information system about the Vltava River aggregating and incorporating various historical and modern documents and data. The integral part of this system is a database of cultural, hydrological and other objects related to the river, which disappeared or, on the contrary, were built during the construction of the dam reservoir system. Within the project the database is filled using existing data sources (e.g. specialized database of water mills) or new data are added on the basis of combination of object position on old maps, textual or graphic information in other documents (books, archive material, building plans, photographs, postcards, iconography) and terrain research. The information system uses old and current 2D maps as the elementary positional interface. Moreover, 3D models of the landscape or detailed 3D models of selected objects are being created and will be linked with the database and easily accessible through the system. Last but not least, geolocated couples of old and present photographs (taken during low water level) are a great complement of the data-base entries.

HAJDÚ E., PÁL M. *Budapest*

ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics and Faculty of Science, Doctoral School of Earth Sciences

The digital reconstruction of hiking trail system evolution in the Mátra Mts, Hungary

The Mátra Mts has been one of the most frequented tourist destinations in Hungary for over a century. Famous wine regions, thermal waters, rich cultural heritage, and high natural diversity attract tourist even from other countries. Being the highest mountain range in Hungary, it has been popular among people who prefer winter sports and various natural activities. Because of these, the mapping of hiking and tourism infrastructure have begun relatively early: there are guidebooks with suggested tours and tourist/hiking maps even from the end of the 19th century. The purpose of our study was to analyse and reconstruct the hiking trail system evolution of the Mátra Mts. We have collected (from online sources and libraries) and scanned the accessible guidebooks and hiking maps of the area. The first processed guidebook is from 1897 (written by Kolos Hanák, a co-founder of the first hiker association in Hungary) and the first hiking map is from 1933 (issued by the Royal Hungarian State Mapping Institute). We have georeferenced the maps and digitized the marked hiking trails from all available base material: we got a large database incorporating more than a 100-year history of our sample area (from more than 80 sources). A Leaflet-based webpage has been developed to interactively present the evolution of hiking routes. Visitors can follow the changes from year to year (from data source to data source) with the help of a timeline regarding every different trail sign. This work has a large significance in the tourism

history of the area: all historic data are browsable using one webpage. Besides, it is a good base material to further analyse the development of tourism infrastructure and changes in hiking habits.

SESSION II

6 May 2021 13.00-14.30

GKADOLOU E., P. PRASTACOS *Heraklion*

Institute of Applied and Computational Mathematics - Foundation for Research and Technology – Hellas

Historical maps as a core element in Cultural Heritage applications: A CIDOC profile and an ARCHES application for Candia's historical maps

Scope of this research is to propose and implement a conceptual model for documenting historical maps within the cultural heritage framework. The documentation is based on CIDOC-CRM, the most widely accepted standard for describing cultural heritage information. The CIDOC application profile was developed using the concepts and relations that synthetically constitute the notion of historical maps. In addition to documenting the geographical information depicted on the map it considers the cultural, mathematical, physical and descriptive attributes of the map, all organized within CIDOC'S ontology. The proposed profile describes the relationships of the map with cultural objects, persons, events and procedures thus permitting the integration of maps in cultural heritage applications. Historical maps in addition to being part of these applications, can actually serve as a core element by which and on which cultural heritage objects can be organized, queried, and linked. As a case study, a series of historical maps of Candia (old city of Heraklion in Crete) were documented. For data visualization, a web application was developed using ARCHES, an open software platform for cultural heritage management that supports both CIDOC and geographical information standards, developed by the Getty Conservation Institute and the World Monument Fund.

KUŹMA M., A. MOŚCICKA, A. KUKLIŃSKA *Warsaw*

Military University of Technology

The quality of geographic names in librarian descriptors

Traditional libraries, archives and museums share their resources via digital libraries. These resources often constitute cultural heritage and they include books, old prints, magazines, manuscripts, photographs, maps, atlases, postcards and graphics, and are managed by national institutions, e.g. the National Library of Poland. Currently, mass digitization of archival materials has become a common process. To find an object in a digital library easily, one could use geographic names. Historic names in particular act as a link between archival documents (old prints, manuscripts, manuscripts) and places in modern geographic space. Those geographic names enable discovery and analysis of the past using one additional aspect – the geographical aspect. An interesting database which collects geographic names is geographic descriptors in the National Library of Poland.

The research on the evaluation of the quality of geographic descriptors provided by digital libraries, which are the basis for effective access to archival resources, will be shown in the presentation. Own methodology was developed to assess the quality of descriptors used by the National Library of Poland. Based on a different definition of geographic names, the evaluation criteria for descriptors were put forward. This study aims to present a comparison of descriptor quality based on contemporary databases, archival maps and old register of names in Poland, Lithuania and Russia. The evaluation relies in particular on the analysis of rules connected with space, time, changes of names. The presentation will show how names gathered in geographic descriptors describe names of places, especially toponym (the proper name of any inhabited settlement) and how to add information about the past.

LIU D., Y. XUE, S.-A. CHEONG, V. KHOI, A. NANETTI *Singapore*

Nanyang Technological University

Information Visualisation for Digital History Participatory Solutions for Reviewing Best Practices

In the era of big data, information visualisation enhances the user experience of digital history. Visualisation techniques help researchers to generate new insights from structured historical information and enable scholars and the layman to interact with historical information effectively and instantly. The results of previous research

can be “read” visually and direct the exploration of relevant information. This paper examines five typologies of information visualisation techniques (Radial Tree, Force-Directed Graph, Satellite View, Treemapping, and OpenStreetMap) and reviews some best practices of their use in digital history as examples to engage participation in sharing more best practices and discuss the future of information visualisation for digital history.

NOVAK A., V. OSTASH *Vienna*
University of Vienna

Digitizing Historical Maps and their presentation in Online Map Collections

As technical tools and methods emerged, maps started to be created digitally. Besides this, analogue maps were digitized to preserve them and make them accessible more widely. The approach changed through the years, beginning with microformat media and now with mobile applications. By this, technical and methodical issues from previous projects and current map preservation challenges must be taken in mind to successfully finish a digitizing project and provide the maps via an online platform. One important factor for that is georeferencing, which allows users to easily use maps in their GIS-software and compare different maps. Many digitized maps are provided online for free on different websites. In the last years, an unthinkable number of maps was made available online. They are provided by libraries, scientific institutions or by private projects. Their ways in presenting the maps differ, as libraries take a more storing and describing approach, while other institutions take the maps as the main item of interest. Though maps carry spatial information, they are not always georeferenced, and even if they are available online for free, it makes it therefore difficult to use them for spatial analysis or presentational purpose.

PRIDAL P., J. KUCERA *Unterägeri, Zug*
Klokan Technologies GmbH

OldMapsOnline next generation

This presentation introducing a brand-new version of the popular OldMapsOnline portal, its vision, and future direction. The audience can influence this!

OldMapsOnline.org is the largest search engine for high-resolution historical maps on the Internet. It has already indexed over 500 thousand scanned maps from the institutions all over the world and serves millions of online visitors.

Thanks to partners such as The British Library, Stanford’s David Rumsey Map Center, National Library of Scotland, and of many others - amazing archival maps can be discovered with just a few clicks, and can be browsed via a map search, timeline, or found with Google.

A new team is now improving the service, working on the design, user-interfaces, and supporting the community and partnerships formed over the last decade.

The refreshed site will integrate the Compare and Georeferencer tools, becoming the single entry-point to conduct online research, connect Linked Data, embed the maps and stories in third-party websites and blog posts, or share them across the web. Visitors can explore and be inspired by the rich history of map archives from across the world.

We aim to further grow the community around OldMapsOnline and attract the young generation to be interested in old maps and valued historical collections, while encouraging visits to physical map libraries to see the real beautiful archival documents in person, when possible.

The mission of the OldMapsOnline project is to breathe new life into old maps, and increase their accessibility through the online environment. Map libraries and cultural heritage institutions are encouraged to participate and help this project with its mission.

SESSION III

6 May 2021 14.45-16.15

VARDAKOSTA I. *Athens*

Harokopio University Library & Information Centre

Cooperation as a policy factor for strategic development of a geographical collection: the case of Greek academic libraries

Policies implementation has always affected Map/GIS libraries. Those policies influence their operation and determine the type and level of the provided services. The conduction of a collaborative partnership among libraries can be considered as a policy action, a characteristic that indicates their dynamic nature. Recently, the global financial crisis engaged libraries to develop synergies in order to achieve benefits for their users.

Although Greek libraries have significant geographical collections, of both contemporary and cultural heritage maps, the public and private sectors create and publish large sets of geospatial data, the general public finds difficulties in accessing and using the appropriate material. Surveys, in particular, highlight the discomfort of geographical information users about the collections and services offered by libraries. Meanwhile, librarians in Greece appear to be unable to adequately guide their users to the proper geographical sources and tools to process the geographical data they need.

This paper, points out the importance of collaborations towards an organized development of geographical collections using as a case study the Greek academic libraries.

More specifically, there are academic libraries that serve departments where geographic information is an essential component of the educational and research process. Those particular libraries have built coordinated collaborative efforts regarding the organization, development and dissemination of their collections. The aforementioned collaborations will be displayed. Additionally, the paper will present the main purpose of the collaboration movement, the basic principles that underpin it, the achievements that the members managed to succeed and its future activities.

ZINCHUK L. *Moscow*

Russian State Library

Digital collection of maps is an integral part of the National Electronic Library of Russia

The idea of creating digital collections of maps that are the cultural heritage of any country has become very widespread in recent decades. Archives, museums, libraries scan their cartographic collections and provide open access to these collections on-line. Similar attempts were made by the Russian State Library (Moscow): over a thousand maps and atlases are scanned and presented in the Library's electronic catalogue. Approximately the same number of maps is presented by the Russian National Library in St. Petersburg on-line. A small part of the maps from the mentioned libraries is displayed on-line by the Yeltsyn Presidential Library (St. Petersburg).

However, until recently, the country did not have a single electronic resource on which the cartographic heritage of the country was presented.

Since 2019, the Ministry of Culture of Russia has initiated a project to create a unified Register of book monuments (monuments of written culture), in which a separate independent part is the digital collection of maps belonging to the cartographic heritage category.

The Russian State Library and the Russian National Library are the main operators of the project. The cartographic collections of these two libraries are taken as a base of the content of the Register. The holdings of libraries of the Ministry of Culture will also be presented in digital form in the Register.

The digital collection will reflect printed and handwritten maps and atlases of the XVII - mid XIX centuries. The collection will include national maps and atlases, as well as cartographic documents of the so-called cartographic Rossica, stored in the library collections of the Ministry of Culture.

The project is planned for 8 years. The first batch of documents is available online since the beginning of 2020 (<https://kp.rusneb.ru/item/thematicsection/maps-17-19>).

BRACKE W. *Belgium*
Royale library of Belgium

Deposit or donation? Transfer policies in the framework of cartographic patrimony enrichment

Over the last years the Royal library of Belgium has been confronted several times with the request by other institutions to take over their library holdings. The Map room has thus been responsible for the integration in its collection of important map collections from the Foreign Office and the National Geographical Institute. Especially in the latter case, this is causing enormous organizational problems, because of the collection's importance, the lack of an inventory or catalogue and the sometimes-poor conservation conditions. Within the Map room, and consequently within the library as a whole, the question has thus arisen of what kind of policy should be adopted in these cases, what best practices could or should be in handling these requests. Indeed, if the first reaction has been one of enthusiastic acceptance, as curators do want to enrich their institute's patrimony and do feel obliged to accept these collections as part of our conservation mission, but reality quickly confronts them with problems of personnel, logistics, preservation, inventory, even restoration. Donation is often considered to compensate all efforts needed from the institute's staff to integrate a collection, but is this really so? This question will be addressed in the background of the NGI experience.

DENIS L., M. JANOWIECKI, R. CHANO MURRAY, L. POOLMAN, M. BLAKE *Baltimore, MD*
Johns Hopkins University

Making Cultural Heritage Interoperable: Lessons in Standardizing Metadata for Paper Maps, Geospatial Data, and Open-Source Software

The Johns Hopkins University's Sheridan Libraries Map Collection is home to the largest collection of Baltimore city maps, atlases, and aerial photography, among other imagery and plans, as well as an authoritative representation of the state of Maryland in general. Currently, the system of discovery and access for the Map Collection is focused on storage and preservation, connecting viewers to scans from the Libraries' digital collections repository using URLs composed of numeric identifiers, without image previews or robust searching capabilities. Seeking to build a more user-friendly experience, staff from the Map Collection's home department (Data Services) have been working on a cross-Libraries initiative to improve digital access with staff from Technical Services, Library Applications, Data Management, and many others who curate and maintain digital collections. This project has entailed implementing new platforms for the digital access and discovery of maps, using Islandora 8 for image storage and display in conjunction with GeoBlacklight for geographic discovery and access to geospatial data. Preparing our maps for these new systems has required extreme flexibility and balance to create interoperable and standardized metadata, without sacrificing the discoverability found in high-quality metadata record formats and controlled vocabularies used for cartographic description. To strike this balance effectively, we analysed user experience data and best practices from our inter-institutional colleagues, prizing titles and concatenated descriptions more than traditional vocabularies or fields, and automating the metadata creation process as much as possible. The result is a lean but easily facetable data model recognizable to map experts, but easily comprehended by our end users.

COWEN D. *Columbia, SC*
University of South Carolina

The Evolution of GIS Support in Academic Libraries

This report focuses on the role that academic libraries play in the provision of GIS related services. An extensive review of the literature chronicles a steady evolution in the complexity and scope of GIS services. This literature suggests that the evolution follows the classic model for the diffusion of innovation. The rate of adoption has been impacted by the demand for services, the motivation of the librarians, the enabling technology and the availability of resources. While there were a few early adopters at some major research institutions the general pattern has been for librarians to offer new services after technology has been proven. The literature clearly identifies the role that Esri has played in fostering a greater presence by the library community. Of note is the Association of Research Libraries (ARL) GIS literacy project in the early 1990's. Esri has also been the catalyst for change through its university site licensing program and transformation to online, cloud-based services. The current environment has eased the pain for traditional map librarians who were reluctant to accept new group of users. This is fostered by familiarity with exciting new GIS -lite application such as

Story Maps. The recent literature highlights a remarkable transformation. Now, in many cases, the library has taken the lead to serve as the focal point for GIS support across the campus. These changes have been spurred on by the research community's need to provide long term data management plans and exciting new types of data catalogues. The report suggests that academic libraries that are safe, friendly and neutral places on a campus are poised to take a major role in expanding GIS applications. The feedback from a survey of major academic libraries in North America suggests that they have the potential to promote new understanding and knowledge through collaboration.

SESSION IV

7 May 2021 09.00-10.30

PAZARLI M., K. DIAMANTIS, V. GERONTOPOULOU *Thessaloniki, Athens*
General State Archives of Greece-Cartographic Heritage Archives | Onassis Library/Onassis Foundation

Hackers in the Onassis Library! Unriddling Rigas Velesinlis' Charta of Greece (1796-7)

Onassis Library was created in 2009 by the Onassis Foundation and it accumulates special collections of old books, artworks and archives. In this paper, we will present the fruitful collaboration between this historical library and the Cartographic Heritage Archives of General State Archives of Greece in order to motivate children and teenagers to explore, interact and bring to life Rigas Velesinlis' Charta (Map) of Greece (1796-97). Each one of the aforementioned institutions possesses a well-preserved copy of this emblematic map of the so-called Neohellenic Enlightenment of the 18th c.

Since 2016, the Onassis Library has inaugurated a series of digital educational activities for families, showcasing its collections of cultural heritage treasures. Specifically, in 2018 it designed an educational program for teenagers involving Rigas' Charta called "The Map through a VR mask" which in 2020 evolved to four courses of digital workshops for high school students entitled "Hack the Map" using VR, AR, Digital Storytelling and 3D Video Game technologies, in collaboration with the Cartographic Heritage Archives and the Department of Geography of Harokopio University. The success of all these innovative programs led to the announcement of the Panhellenic Student Competition "Hack the Map: Charta of Rigas Velesinlis" (school year 2020-21) and to the development of an open access digital platform (<https://classroom.onassis.org/>) so as to encourage the involvement of secondary schools in this process. Furthermore, the two institutions in cooperation with the famous Greek author-illustrator Leda Varvarousi, created a book for primary school children aiming at decoding the symbols and the myths printed on Rigas' Charta, which will be launched both in digital and print form in March 2021.

All the above initiatives encourage the new generation to interact with the cartographic heritage and prepare them to face the technological challenges of the future.

GROPP H. *Heidelberg*
Heidelberg University

The Lazarus map and its historical context

The Lazarus map of 1528 is not the earliest printed regional map of Central Europe, but perhaps the most discussed one with quite some open questions to discuss. The oldest one is a map of Bohemia drawn by Klaudyán and printed in Nürnberg in 1518. There is map of Poland of 1526 by Wapowski in Kraków. Three years earlier, in 1523, Aventinus produced a map of Bavaria which was printed in Landshut. Between 1517 and 1522 he had written a history of Bavaria (*Annales ducum Boiariae*) and later between 1526 and 1533 another one (*Bairische Chronik*) which goes back far beyond the time of the Romans.

In 1528 the Lazarus map (or *Tabula Hungariae*) was printed also in Ingolstadt and is called the oldest map of Hungary. It was drawn around 1515 and shows also parts of neighbouring countries. In 2007 it entered the UNESCO World Register of Heritage.

In this talk open questions will be discussed such as the biography and origin of Lazarus, his cooperation with scholars in universities, his relation to Ingolstadt, the names of towns and other toponyms, but also of other inscriptions and the corresponding languages involved. In this context the Lazarus map is a map of Hungary, but is it a Hungarian map, drawn by a Hungarian? This leads to a final discussion about such maps and their national embeddings, now and then, and not only for the case of Hungary. What was the purpose and use of

such maps, and what is it today? It is remarkable that an early map of Saxony was not produced in order not to show details of the landscape to potential enemies.

ROBLES MACÍAS L. *Brussels*
Université Libre de Bruxelles

Reconciled at last? Grids of latitude and longitude on two Ottoman portolan charts

Two unusual Ottoman maps of the Mediterranean, one kept at the Sylvia Ioannou Foundation and the other sold at Christie's to an unidentified buyer, have become known to historians of cartography only since 2009. Both are large anonymous manuscript maps, probably from the 17th century, drawn on paper but otherwise consistent with the style of the portolan chart tradition. Their most outstanding feature is that they include complete grids of latitude and longitude, something extremely rare on contemporary portolan charts.

This paper studies those grids in detail, comparing each of them with the geographical information contained in the underlying charts. Hypotheses are formulated about how each chart was drawn, as well as the sources that may have been used to locate their parallels and meridians.

The findings of the study suggest that the two analysed artefacts are the results of experiments with different approaches to reconcile the Mediterranean tradition of nautical charting with the astronomical-mathematical cartography of Ptolemaic inspiration that at the time was increasingly dominant in Europe, a problem that hitherto had had no satisfactory theoretical or empirical solution. These experiments also represent one noteworthy achievement in the long process of Ottoman interpretation, assimilation and adaptation of Western cartography.

SVENNINGSEN S.-R., M.-L. PERNER, G. LEVIN, G. GROOM *Copenhagen*
Royal Danish Library | Aarhus University

Investigating land area categories in large-scale historical topographic maps in relation to analysing landscape change: From 19th century military assessment of landscape trafficability to 21st century land use and land cover categories

Analysis of historical land cover and land use change (LULCC) of pre 1950s landscapes primarily relies on cartographic documents as the source of spatially explicit information. Methodologically, most historical LULCC studies utilizing historical cartographic documents report on the geometrical precision and correctness of georeferencing and vectorization. However, less often attention is devoted to careful interpretation of land area categories. Thus, information in historical maps is taken for granted or seen as self-explanatory. This paper presents an analysis of land area categories in Danish historical large-scale topographic maps from the second half of the 19th century in relation to a recent research project focused on development of automated methods for vectorization of historical maps. The analysis reveals that the classification of land area categories is complex and that categories in the legend cannot necessarily stand direct comparison to modern LULC categories. Despite a similar appearance (i.e. sharing the same name as categories in current official geo-data), the categorization of land in the maps discussed here rested on a military oriented assessment of landscape trafficability. This result implies that thorough analysis of categories in historical maps is needed if data are to be used for LULCC studies. Thorough historical analysis of the development of the mapping and representational practices of land area categories in historical maps can reveal both a more consistent understanding of the relationship between map categories and the historical LULC, but it can also assist the development of automated methods for extracting vector data.

RANZI R., M. BALISTROCCHI, S. BARONTINI, M. PELI *Brescia, Modena*
University of Brescia | University of Modena and Reggio Emilia

Land cover changes since the 19th century detected from old maps for environmental applications: toward a CORINE 1800 project

The value of cartographic heritage for environmental applications is demonstrated with a test case in the Central Italian Alps. Land cover changes since the early 19th century are detected from sample maps in Lombardy of the Second Military survey of the Habsburg Empire (1816-1821), available on the portal mapire.eu. They are compared with 1954 aerial surveys and successive land use classification until 2018. Issues as land use classes homogenization, data vectorization, georeferencing errors are addressed. The dynamics of four main

land-use classes (woods, meadows, crops and urbanized areas) are investigated and the potential use of this exercise for hydrological applications is explored. The impact of the observed natural afforestation on changes of hydrological losses due to evapotranspiration and its influence as a likely cause of the decrease of runoff monitored since 1845 in the Adda river basin are assessed. The proposed test case can pave the road of a project extended at European scale, a sort of “CORINE 1800 land use” Geographic Information System which can have several environmental, cartographic and socio-economic applications.

SESSION V

7 May 2021 10.45-12.15

TIMÁR G. *Budapest*

ELTE Eötvös Loránd University, Department of Geophysics and Space Science

Georeference of Map of Denmark by Bugge and Wessel (1762-1777)

The first systematic map survey covering the Kingdom of Denmark was carried out in the second half of the 18th century, using the experience of the cartographic works by C-F Cassini in France. The head surveyor was Thomas Bugge, who has great contributions from the mathematician Caspar Wessel, the inventor of the complex number plane. 16 sheets of the resulted map product covered the Jytland peninsula and the main Danish isles with a scale of (cca) 1:120000 and another sheet with double scale (1:60000) shows the island of Bornholm. The western part of the series, covering the peninsula, is consisting of 11 sheets of 2 columns, connecting at the meridian west of Copenhagen by 3.2 degrees. These 11 sheets are uniform in extents and connecting the each other at the edges. The other 5 sheets are different in shape and size; however, the scale is the same to each other and to the western sheets. The coordinates of 23 original survey points, published by Bugge, were coupled with their locations in WGS84, and the Cassini (with a centre at the Red Tower in Copenhagen; latitude=55.6842 degrees in local datum; 10.2615 degrees east from Paris) and Mercator-Sanson (sinusoidal) projections were tested to provide best fitting results. Parameters of the local datum are: sphere of Picard (R=6372056 m); dX=+11970 m; dY=+1201 m; dZ=-18400 m. Using the results, a georeference method is suggested for the western sheet system, while the original point list can be applied for the eastern ones. The error of georeferenced goes up to cca 700 meters at less accurate regions.

KUCERA J., D. MIKITOVA *Unterägeri, Zug*

Klokan Technologies GmbH

Georeferencing scanned maps with online community

OldMapsOnline Georeferencer is a powerful online tool that allows users to assign the geographical location of scanned historical maps. Once maps have been georeferenced, the whole map collection becomes geographically searchable, which offers a new way of discovery to researchers, students, and the general public.

Users can literally see the old map in the right place.

Map libraries can present their map collections in an exciting interactive form to visitors of their websites or exhibitions. Each scanned map processed with Georeferencer can be visualized with Overlay, Grid, Compare, Swipe, or 3D view. Georeferenced maps are searchable via the GeoSearch application, which can be integrated into the map library website.

With the OldMapsOnline Georeferencer online tool, the process of georeferencing is very simple. With the old map on the right and its modern counterpart on the left, a side-by-side view makes it very easy to assign points on a historical map and then the corresponding points on the modern map. With the autosave function, users don't need to worry about losing their work.

To encourage the number of visitors, who help map archives with georeferencing, crowdsourcing tools can be implemented into the website. Progress bars, top contributors, map density visualizations, geosearch, and other features increase georeferencing project success.

Improved web administration and collection management allow to simply create and import map collections, review the maps and keep track of ongoing georeferencer project.

Georeferenced maps can be easily imported into the OldMapsOnline.org search engine, boosting the number of visits and awareness of map collections of participating map libraries and archives.

WALT R. *Zurich*
ETH Zurich, ETH Library

Use the crowd - georeferencing of historical maps at ETH Library

ETH Library has a long tradition in the use of GIS technologies in the indexing and mediation of its map holdings. GIS-based applications have been used since the 1990s for both cataloguing and access to the map inventory, and in recent years they have been consistently further developed in various projects together with cooperation partners and external service providers (e.g. Toporama, Kartenportal.CH, MapSeries, Map on App).

A special aspect is the inclusion of the "crowd", the general public, in the enrichment of existing data with additional spatial information. As part of the digitization projects at ETH Library, historical maps have been digitized since 2013 and presented on the e-rara.ch platform (www.e-rara.ch). Since map holdings at the ETH Library are completely indexed via single sheet cataloguing, the catalogue data available when the holdings were digitized are already provided with precise coordinates. Georeferencing is intended to make the digital copies accessible for research and teaching in a form that allows them to be directly processed in projects or courses.

This enrichment with spatial information is complex although there is a high degree of cataloguing. For this reason, the georeferencing of historical maps was carried out at the beginning of 2017 in a pilot experiment using the crowd and the Georeferencer application operated by Klokant Technologies. Almost 1'000 digitized maps were published and georeferenced by the public for three months. Since the enriched maps are provided in particular for research and teaching, particular attention was paid to the quality of the georeferenced maps. The digital copies provided were georeferenced by the crowd within a very short time and with high precision which fulfilled the given requirements. The positive experiences from this pilot project at the ETH Library led to a further georeferencing of 1'172 digitized historical maps in 2020.

The paper explains the individual steps of the 2017 and 2020 georeferencing projects and highlights the experiences and advantages, but also the differences and challenges in the context of cataloguing and providing digitized maps via the crowd at the ETH Library.

GEDE M., G. VASSÁNYI, V. ÁRVAI *Budapest*
ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics

Experiences of MRCNN in automatized map vectorization

The authors experimented on using Mask Regional Convolutional Neural Network (MRCNN) for automatic feature extraction from old topographic map sheets. Two types of symbols were targeted: point-like features (churches, elevation points, watermills) and areal features having hatch or pattern fill (marshes, water bodies, built-up areas). The neural network architecture used for point symbols was the ResNet101 network improved with Feature Pyramid Network for better multi-scale performance. Google Colab was used as development environment.

The results for point symbols largely depend on the symbol type (catholic churches were recognised with almost 90% accuracy, while some objects were not recognised on the full map sheet at all). The recognition accuracy of areal features shows less variance: it is between 80–85% for the various sur-face types.

GROOM G., G. LEVIN, S.-R. SVENNINGSSEN, M.-L. PERNER *Copenhagen*
Royal Danish Library | Aarhus University

Dune Sand – Object based image analysis for vectorization of a dotted signature in Danish late 1800s maps

The geography and history of the 300 km coastal zone of western Jutland is marked by the role of dune sand. Tides, currents and waves deposit marine sand as beaches. During low water, the prevailing winds and frequent storms drive the beach sand inland. For much of this coast, a zone of high dunes forms a natural coastal defence, backed by several kilometres of landscapes of windblown sand, which are Denmark's main semi-natural wilderness areas. These have experienced widespread modern era changes, with establishment of plantation forests and holiday homes. Documentation of the changes and analysis of their effects requires digital geo-data of the former extents of the dune sand. The Danish Høje Målebordblade (HMB) set of historical maps surveyed from 1870-1899 record the earlier distribution of dune sand. In these maps, dune sand is signatred

as fine black or dark grey dots with a relatively even spacing. The dune sand signature itself has no colouration, but dune sand dots locally overlay the colourations applied for the HMB heath and wetland legend items. A demonstration project of the possibilities for automated vectorization to digital geo-data of HMB map land categories has had dune sand as one of its target classes. Automated mapping of dune sand has involved use of a sequence of object-based image analysis methods, including use of a raster of the distance to each dot. The resulting dune sand vector layer, for a 200 km² coastal test area in NW Jutland has, assessed against a 100 m spaced set of control points, a false-negative rate of under 5% and a false-positive rate of around 10%.

SESSION VI

7 May 2021 13.00-14.30

JOVANOVIĆ D., D. ORENI *Milan*

Polytechnic University of Milan, Department of Architecture, Built environment and Construction Engineering

Diverse uses of historical cartography: From urban analysis to the educational tool

The research project draws the attention to the historical cartography as the main material that should be collected, analysed and understood so that could be used in the preservation management projects for enhancing widespread heritage (ital. *partimoni diffusi*) in Northern Italy. In a search of methodological approach of understanding selected historical cartography, which will begin with a collection of maps of Second Military Survey of the Hapsburg Empire (1818-1829) collected by MAPIRE project (Timár et al., 2019) as a starting common point and will support other maps from various scales, periods and themes to be confronted and compared.

Importance of historical cartography was discussed in the past years by many authors, and interest for understanding and developing methodologies which will better explain it is raising but somehow there is a vast gap of connecting the use of historical cartography in preservation projects or urban analysis. The question "what is a map?" is very complex and depends on many factors. Since the maps are present in various spheres of studies, to get the right image of what map can represent and closely defining what map is, the one should keep the eyes and mind wide open.

Collecting and understanding the historical cartography with the developed methodology will lead to the part of digital humanities which concerns managing metadata of historical documents and digitalization, geo-referencing, and publishing maps through the interactive geographic information systems (GIS) respected the standards and guidelines of Italy and European Union. This project presents ways in which digitalization and systematization of these maps can foster public and professional engagement with heritage (Garcia-Esparza et al., 2020), contributing to UNESCO/UBC Vancouver declaration (2012) which draws attention to the importance of digitalization of historical documents but also intangible qualities of urban spaces.

POLO-MARTIN B. *Valencia*

Valencian International University

The study of accuracy of historical maps in Spain through GIS and MapAnalyst: digitalization and analyse of a relevant city from 19th to 20th century and its extrapolation to others

Burgos –in Spain-, due to its geographical and historical importance, which made it a politically, militarily and administratively key city in the configuration of Spain along the history of the country, has a large number of cartographic documentations. Therefore, in the development of the article has been necessary to carry out different phases of work to collect and analyse the cartography available about the city as well as to specify the maps and plans that would be used to convey and structure the research topic. However, we must take into account in any study that, despite the advances in technology, including machines used to digitize these artifacts have a degree of error, so the display of the map that the researcher observes is not as reliable as it should be. Taking into account the hypothetical character of the accuracy of the maps collected and used in this study, and in order to achieve the goals, it is proposed a thematic analysis through selection, geolocation and comparison with the current city map based on different criteria. Thanks to the rich number of materials, its case can be extrapolated to other cities in the country and know in a deeper way the process of making-up a map during 19th and 20th centuries.

SŁOMSKA-PRZECH K. *Warsaw*

Tadeusz Manteuffel Institute of History, Polish Academy of Sciences

The urban plot on a city plan – from cartographic source to historical map

The project Historical Ontology of Urban Spaces (HOUSE) aims at developing a domain ontology and model of a database for comparative studies of towns. Data collected according to the scheme developed in the project can be used, among others, to develop historical maps. As plots are one of the core elements of the structure of the city, while being aware of both the importance and the difficulty of this task for the project, we decided that should be one of the first definitions in the HOUSE ontology.

The ontology developed in the project is tested in the database of objects from the city of Warsaw. The database is created, among others, based on old city plans. Thus, while building the definition for ontology we wanted to not only rely on existing literature on the topic but also explore how plots were depicted on historical cartographic sources. The need for the unambiguous definition also arose from the problem encountered during the vectorization of the old city plans used in the project for the needs of the database, as there were difficulties in the precise delineation of plots. These problems resulted, inter alia, from the inconsistency of the source, unclear relationship between the plots and the other two main elements of the city plan according to the Conzenian tradition – streets and buildings, changes in the urban space, the degree of preservation of the cartographic source.

Plots are often the primary point of reference for urban studies analyses, and the same understanding of terms by researchers is necessary to conduct comparative studies. Therefore, we believe that referring to cartographic sources during the work on the plot definition will also contribute to the enhancement of the HOUSE project results.

TSORLINI A., C. BOUTOURA, A.-P. PAGKALIDIS, M. PSAROGIORGOS *Thessaloniki*

Aristotle University of Thessaloniki, Laboratory of Cartography and Geographic Analysis – CartoGeoLab

Visualizing historical facts on maps designed combining information from different sources

A map depicting historical data can provide information about our history, representing changes taken place over the years or even important historical events or facts such as battles or physical disasters, connecting them with the geographical space they happened. Such information is usually found in textual form in books and most of the times is not depicted extensively on maps, although there are historical maps of different time periods which can be used in these cases. The study of these maps using digital technologies is of great interest for a wide range of disciplines, since it can be a very useful tool for researchers to comprehend better the history, to get more information for the geographical space and maybe the influence it has to a reported change or a historical event, giving in this way to researchers the opportunity to expand their studies on other scientific directions.

Combining historical data in different forms from different sources is a demanding and challenging procedure for different reasons, mainly due to the data which should be combined properly and its visualization on the map in a way that allows the map reader to get important information from it and to understand its meaning. Important role in this, play also the topographical and morphological characteristics of the geographical space which influenced sometimes the evolution of a historical event such as a war or a battle or even a natural catastrophe.

In this paper, in an attempt to visualize with different ways historical events on maps, we combine data from different sources to design and produce maps to depict historical events of two campaigns in Greece: the Asia Minor campaign, called also Greco-Turkish War of 1919–1922, in Asia Minor (Turkey) from May 1919 to October 1922 and the Italian Campaign in Greece, called also Greco-Italian War, in northwest part of Greek mainland from October 1940 to April 1941. The study is based on historical maps depicting each area at that time, and on textual data and descriptions, which provide information about the time period, the two respective wars, the battles, the position of troops and their movements during the military operations, as well as other descriptive and statistical information about the opponent armies. All this information is combined to each other and it is visualised on thematic maps in a way that allows the map readers to better understand these particular historical facts and to get important information about them in a more comprehensive way.

IRÁS K., I. FARAGÓ *Budapest*

ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics

Atlas of Medieval Settlements of the Hungarian Kingdom

The Golden Bull was an edict issued by King Andrew II of Hungary in 1222. This document establishes the rights and obligations of the Hungarian nobility for the first time in the Hungarian history. The Institute of Cartography and Geoinformatics of ELTE Eötvös Loránd University has been working on a special atlas as a cartographic contribution to the celebrations of the 800-year long existence of this fundamental document.

The aim of the atlas is to depict all the settlements with their names and name variations of the Hungarian Kingdom that existed until 1526. This was the year of the Battle of Mohács (a town at the southern region of Hungary) when the Hungarian army suffered a fatal defeat in the war against the Turkish troops. After the battle Suleiman the Great took control in the central regions of the Kingdom. The majority of the Hungarian settlements at those lands vanished during the c. 150 year long Turkish rule. Historical documents preserved useful toponymical and geographical information on the then destroyed and also on the still existing settlements.

In our presentation, we would like to show historical, cartographic and toponymical sources, to describe the special cases of the settlements and of the geoinformatic database that this project is based on, and to present the layouts of the Atlas.

SESSION VII

7 May 2021 14.45-15.45

GUSEV D., S. STAFEYEV *West Lafayette, IN, Moscow*

Purdue University | Rosgeolfond

Visualization and GIS Analysis of Ptolemy's One-Sided Globe in the Old and Modern Contexts

In this paper, we frame the results of our multi-year project devoted to georeferencing and visualization of data from Claudius Ptolemy's seminal 'Geography' in the context of other ancient, medieval and modern cartographic sources, some of which were influenced by or derived from Ptolemy's massive and widely venerated classical work. Our GIS analysis involves such relevant old sources as Konrad Miller's consolidated Tabula Rogeriana by Muhammad al-Idrisi, Tabula Peutingeriana, Hellenic Ptolemaic maps, and the Alfonsine tables. We also discuss the challenges of visualizing Ptolemy's one-sided globe of oikouménē, the 'known world' of the ancients, using such modern GIS tools for development of 3D virtual globes as Google Earth and Cesium.

PANECKI T., A. BOREK, T. KRÓLIK *Warsaw*

Institute of History, Polish Academy of Sciences

Development of the digital edition of Charles Perthées's cartographic works from the end of the 18th century

Charles Perthées was the geographer of the king Stanisław August and at the end of the 18th century was given a task to prepare detailed maps of the Polish Crown. The method of maps' elaboration was based not on the field surveys, but on the so-called parish questionnaires. Prepared by the parsons, listed all of the topographic features within the parish along with their approximate geographical location. These questionnaires were a basis for semi-cartographical sketches made of each of the parishes, and eventually, maps of each of the palatinates (major division units of the Crown). Unfortunately, the majority of questionnaires did not survive the IIWW unlike sketches (approx. 5300 pages) and maps (12).

In the talk, we would like to briefly present the idea behind the development of the digital edition of Charles Perthées's cartographic works and some preliminary results. The edition is a part of a larger, ongoing project devoted to the cartography of Poland at the end of the 18th century as well as preparing a historical atlas for this period for which the sketches and maps are primary sources. The main assumption of the edition is to build a comprehensive framework for data collection from the sketches which combine the nature of cartographic and written sources and maps which are not yet accurate and cannot be vectorized using a standard GIS approach. We treat all the material rather as a drawing than a map and use GIS tools to gather the data without prior georeferencing which is done at further stages along with data integration and harmonization. The nature of both sources requires two different yet connected data models.

STAMNAS A., O. GEORGOULA, P. PATIAS *Thessaloniki*
Aristotle University of Thessaloniki, School of Rural and Surveying Engineering

Mapping a cinematic journey: Christos G. Sakellaris trip to Greece in 1933

Map archives, historical photographs, films and text documents are certainly valuable sources of data for landscape change studies.

Moreover, Geospatial technologies have a huge impact on the preservation and promotion of cultural sites and landscapes, the management of tangible and intangible heritage and the analysis and visualization of various forms of information.

At the same time, Geographic Information Systems (GIS) and advanced mapping techniques provide new ways to study both real and fictional spatial worlds, integrate cinematic universes with the real world and facilitate the understanding of cinematic experiences.

These two functions of geospatial technologies meet and interact with each other while studying archival film heritage such as travelogues, cinematic journeys exploring different countries and cultures since the late 19th century.

Taking as a starting point such a film (Christos G. Sakellaris trip to Greece in 1933) one can examine various aspects of recording and mapping a cultural landscape in order to examine the diversity of the cultural heritage and identity and the relation between film, place and memory.

