



Spatial Humanities 2018: Paper Abstracts

Keynote 1: Patricia Murrieta-Flores	Subaltern Spatial Thinking: Reflections on the technological integration of non-western and non-cartographic thinking in Humanities research
<p>Many years have passed since we first used Geographic Information Systems (GIS) in Humanities research. From archaeology to history and literature, GIS has consolidated in the field of Digital Humanities as the primary technological tool of exploration of spatial information. Although its now widespread use can be thought of as a positive advance, the technology and the conceptions in which GIS is rooted are based on the western and colonial/modern understanding of the world. With the rise of the adoption of this and other technologies in the Global South, and taking advantage of the interdisciplinary setting of the DH, it is time to re-visit and transform the perspectives proposed in the 90's by Critical GIS. This will include not only reflecting profoundly on the implications and impact that the use of technology can have in the Humanities, and also addressing the need to substantially increase awareness of DH forms of knowledge that have, through historical processes, become subaltern to the main canon. Exploring how subaltern forms of spatial thinking work, this talk is a call to the field of Spatial Humanities to actively engage in the transformation of our academic work, and the creation of technologies from a 'border thinking' and decolonial perspective.</p>	
1A: Approaches to analysing texts in a geospatial environment	
James O Butler	The Comparative Literaryscape Analysis Encoding (CLAYE) toolset : Creating a schema for literary environment markup
<p>This paper will explore part of the research currently being conducted on the Chronotopic Cartographies for Literature project, relating to the mapping of enviro-narrative engagement. A core component of the project is the design of a custom XML schema for the creation of a small 60-text literary corpus focused around spatial description, depiction, and utilisation; with the aim of generating representative visualisations of literary environments. Many works of fiction step away from the real world, and such spaces present significant issues for traditional mapping models that rely on actual mappable places. Our demonstrative corpus will span a wide range of fictional styles and world designs, and in demanding universal applicability, our custom schema has undergone a significant amount of refinement. It has progressed into a universally-applicable markup model, which can show the complex interactions</p>	

between name, environmental description, and intent of literary engagement, through the space-time aspects of the Bakhtinian chronotope.

In discussing the evolution of an innovative digital methodology, the paper will explore rationales, debates, and cross-disciplinary analytic variation in interpreting the referential qualities that directly impact place-name use and/or development across texts. This session will explore the challenges involved in adapting key critical literary and linguistic theories (such as internal reference to unnamed spaces, metaphoric inference, and degrees of fictionality in the literariscapes) to consistent and codifiable standards. This work highlights the importance of differentiating between the functional roles of literary names, an aspect for which conventional automated Named Entity Recognition systems cannot be trained, nor has the majority of literary onomastic work hitherto engaged with to any notable degree.

Bieke Cattoor, Hans-Rudolf Bär,
Lorenz Hurni

A Simultaneous Approach to Visualizing Story Space and Discourse Space: Development and Applications of a Textual Information System (TIS)

Paper introducing Textualizer, a Textual Information System in-the-making that focuses on interactive analysis and visualization of textual spatiality. Textualizer's capacity to position text selections within two types of coordinate systems, a textual coordinate system and a geographic coordinate system, enables users to simultaneously deal with story space and discourse space.

The first half of our contribution elaborates upon the conceptual scheme that has steered the development of the Textualizer application. Two premises have greatly informed this scheme: the conviction that text analysis and visualization are best considered as processes, and a belief in the value of both close and distant reading approaches. Structured along two axes -a processual axis breaking down the visualization process into smaller tasks, and a methodological axis enabling manual and/or automated processing of these tasks- Textualizer's conceptual scheme proved key to achieving and maintaining flexibility and openness in Textualizer's user environment. The second half of our contribution showcases a set of maps and plots produced with the help of Textualizer, and that visualize different aspects of literary spatiality in Zola's Rougon Macquart series. These visualizations deal with non-fictional, semi-fictional and imaginary geographic locations figuring in the novel series (story), as well as plot particular properties of spatial descriptions and spatial evocations throughout the text (discourse). A review of these maps and plots will highlight Textualizer's potentials and shortcomings in terms of researching textual spatiality. The inclusion of a detailed workflow for each of the visualizations showcased, will clarify the logics behind the Textualizer software, as well as demonstrate the flexibility of its use.

Jie He, Zhaoyi Ma, Shuaishuai Liu

Urban Space Cognition of Capital Chang'an in Medieval China: Sentiment Analysis of a Classical Novel 'The Tale of Li Wa'

Classical novels of Chinese Tang Tales often fill with fictive life scenes in a shell of real geographical space. As one of the typical examples, "The Tale of Li Wa" is often considered as a material of real city life history of capital Chang'an in Tang Dynasty (618 - 907 A.D). The novel uses spatial narratives to tell a story, in

which appears a lot of real geographical positions in the city. In the novel, transformation of these geographical positions often associated with different plots, situations and social attributes.

In this paper, "The Tale of Li Wa" is investigated through text mining and sentimental analysis on classical Chinese to illustrate its narrative strategy in the urban spatial context of Chang'an in Medieval China. The research team structuralize the original texts and created a database through manual annotation. Three basic elements of the novel, which are places, characters, and plots are extracted. Related emotional fluctuations are dictated by statistics and mapped on historical city map of capital Chang'an in the period of the novel described. The study finds that the three basic elements have obvious and regular emotional changes alongside the story development. The data also shows that there are unique characteristics of cognition distribution of different "fang" (street blocks) within the city. The sentiment analysis illustrates both the historical urban phenomena hidden in the narratives as well as the author's passion on various "fang" and the plebeian life in the Medieval Chinese capital.

1B: Text mining and NLP in the Spatial Humanities

Luis Santos, Bruno Martins,
Patricia Murrieta-Flores, Raquel
Licerias-Garrido, Mariana Favila,
Ian Gregory, Diego Jimenez-
Badillo, Katherine Bellamy

Exploring the challenges of Named Entity Recognition in an historical multilingual corpus: Digging into Early Colonial Mexico

The Digging into Early Colonial Mexico (DigCH) project is a collaboration between the Universities of Lancaster (UK), Lisbon (POR), and the National Institute of Anthropology and History (MEX), funded by the Trans-Atlantic Platform for the Humanities and Social Sciences. This project is using, for the first time, advanced computational techniques to extract data and analyse the colonial historical source known as the Relaciones Geográficas de la Nueva España (Geographic Relations of New Spain), a corpus compiled during the 16th century by the Spanish Crown, and particularly those documents related to Mexico and Central America. This corpus is a crucial source of knowledge for the history of America, presenting a complex linguistic structure composed by descriptions in Spanish and indigenous languages, particularly Nahuatl.

While the project will tackle a series of interconnected goals including the development of novel computational methods to explore this historical textual source and extract all sorts of information relevant to solve historical questions, two of our aims are to create the first digital 16th century Spanish-Nahuatl Colonial Gazetteer and a comprehensive Geographic Information System of New Spain. However, this corpus poses a well-known but difficult challenge to the field of Natural Language Processing (NLP): how to better perform Named Entity Recognition tasks in a multilingual corpus, and particularly one with a combination of European and non-European languages.

In this paper, we will present preliminary results of the NLP experiments carried out with this corpus, aiming to understand better how these technologies can facilitate the recognition of proper names in these kind of historical documents and therefore aid in the investigation of the historical geographies of this period.

Jeremy Mikecz	From Invasion to Occupation and Resistance: Mapping Indigenous History during the Conquest and Colonization of Peru
<p>My research blends ethnohistory with the digital and spatial humanities. Ethnohistory - the historical study of indigenous peoples and others commonly marginalized by traditional histories - often involves reading 'between the lines' of colonial texts and the piecing together of fragmentary indigenous texts. This paper highlights some ways digital methods can aid in this effort. In particular, I will describe how I combine data visualizations, Historical GIS, and digital 'sketch maps' to reconstruct historical indigenous activity and spaces.</p> <p>This reimagining and remapping of the indigenous history of conquest-era Peru begins with the structured tagging of a corpus of texts with XML. Then, this study combines automated methods such as named entity recognition (NER) and part-of-speech (POS) tagging with manual corrections to tag all place names, person names, dates, and events. Qualitative coding of key excerpts of texts follows. This encoded text is queried using Python's web-scraping module, BeautifulSoup. These queries are then used to create a variety of data and geo-visualizations.</p> <p>In many cases, however, a simpler method suffices. The creation of 'digital sketch maps' with simple vector-editing software allows the illustration of more impressionistic depictions of spatial activity than is possible in GIS.</p> <p>The distinct nature of conquest and colonial sources, however, requires unique approaches. Typically, the former tell a narrative of events, while the latter record longer-term processes. I will thus conclude my paper with a brief discussion of how to apply the methods described above in different ways to these distinct sets of historical records.</p>	
Alex D B Butterworth	Pub Crawls: Machine Learning the Cognitive Geography of C18th London
<p>The paper will describe and critique an experiment in the application of Natural Language processing to extract data indicative of spatial perception and cognition from part of the Old Bailey corpus. This corpus comprises the proceedings of the Old Bailey court, which record all the sessions held throughout the eighteenth and nineteenth centuries. Taking a section of this corpus covering the period from the mid-eighteenth to early nineteenth century, the project explores how computational methods of text analysis may enable the identification of topographical features within the built environment that served as anchor points for orientation and spatial cognition in the minds of those offering testimony in criminal cases. With an initial focus on the public houses of the city, whose names pose particular challenges for named entity extraction, their relational spatial fields are investigated, individually and comparatively to one another and to other institutional types. Further iterations of the core processes developed may extend the analysis from the purely spatial to the chronotopic, and consider possible distinctions in spatial modelling relative to occupation or social status. The project uses the Method 52 framework, a tool that facilitates the graphical construction of training and classification pipelines to process social media data, while developing specific approaches as required for the analysis of longer and more complex historical texts, alongside other text analysis techniques. The paper will reflect on the digital scholarly hermeneutic involved in classifier training, as well as how the visualisation of cognitive spatial data poses particular</p>	

challenges, weighing the relative benefits of cartographic and diagrammatic visualisations, and of network graphs and conventional mapping.

Katherine McDonough, Matje van de Camp and Ludovic Moncla

Geographical Horizons of the Enlightenment: Using Natural Language Processing to Study Historical Spatial Knowledge

Historical GIS and now Geographic Text Analysis have advanced important spatial analysis methods for humanities research. GTA, in particular, has made significant advances in automating processes of place name identification and georesolution for English texts. However, we face a major challenge in identifying and locating historical places and other geographic features that 1) have no corresponding modern place with an existing gazetteer record and 2) do not conform to the model of a place that can be identified by a unique coordinate position. These challenges are compounded when one works with non-English sources. The current project uses the text of Diderot's Encyclopédie (provided by ARTFL, University of Chicago) and other early modern French geographical dictionaries to experiment with new methods in spatial relation extraction in historical French texts. One solution is to focus instead on contextual clues that can supply information related to different kinds of locational uncertainty. We can then model data about places in a way that captures these relationships and identify probable locational areas. This approach can also assist with disambiguating between places and other entities (people, institutions, events) that contain place names within their names by defining specific relationships between a place and an attached entity. We will present results from tests of different spatial relation extraction methods with our French corpus. By paying attention to NLP challenges in seventeenth- and eighteenth-century French, we hope to provide solutions that will be useful to scholars working in an array of historical languages.

1C: Towns, villages and the countryside in the Spatial Humanities

Ozlem Altinkaya Genel

Deciphering the Spatial Fragmentation in the Marmara Region through the Village Surveys

This study is part of an unpublished dissertation work that focuses on the land-use change in the Marmara Region which is the most populated, densest and the most industrialized region in Turkey, embodying an important number of urban centers such as İstanbul and Bursa. The presentation will focus on a village typologies map that illustrates the socio-economic, geographic and demographic condition of the villages in the Marmara Region at the turn of the 1970's. By benefiting from the village typologies map spatial fragmentation in the Marmara Region will be discussed through the lens of digital humanities, environmental history and historical geography.

The village typologies map is extracted from a diverse set of resources including surveys in the provincial annuals that have been published between 1967 and 1973, 1: 200 000 scale Soviet Military Maps from the 1980s and other regional studies. These resources were digitized and transformed into a matrix of 4000

georeferenced villages and 23 attributes (including information on land-use, climate, demography, infrastructure and social equipment) which was processed in Multiple Correspondence Analysis-which is a data analysis applied to categorical data and is applicable to more than two categorical variables-to find clusters and subsequently mapped in GIS.

Wiesława Duży, Tomasz Panecki

Space and time travelers. Translocations of settlements, changes in semantic manifestations and cartographic representations in Polish territories from 10th to 20th century

At the Institute of History, Polish Academy of Sciences, the project "Ontological foundations for developing historical geographic information systems" is currently developed. The planned effect of this work is a comprehensive ontology concerning historical settlements and administrative units. Chronological and spatial boundaries apply to Polish territories from the 10th to the mid-20th century. Our ongoing research reveal a huge role of change, which influences the formulation of definitions of settlement types, understanding their durability, as well as representation in historical sources. Changes include three characteristics of each locality: location and spatial scale, name, type. The observed changes occur over time and relate to political systems, development or devolution of settlements, as well as a translocation of individual units in space. We understand the change as the lack of continuity of a particular manifestation over time. The aim of the paper is to discuss above-mentioned difficulties and possible solutions to encountered problems using following case studies:

1. Translocation of Nieszawa, city in Cuiavia in the Middle Ages, combined with a change of the character and status of its first location with a castle of Dybów.
2. Change of the semantic scope of the castle as settlement with its functions on the example of the Grodziec in Będzin, southern Poland.
3. Cultural and administrative landscape changes in Nowy Tomyśl plain (Greater Poland) related with Dutch-type villages which were being established in 18th century on swampy and woody areas, yet exploited by local people with their pre-industrial and temporary settlements.

Oskar Gudlaugsson

The Household Economy of Early Eighteenth Century Iceland

Research on the early modern agrarian economy in Iceland has mainly focused on landownership and the tenancy system whereas our knowledge is much more limited on the economics of farm households. This paper presents an ongoing research project, The pillars of rural society: Family and household economy in early eighteenth century Iceland, which aims to provide a comprehensive and detailed analysis of the peasant household economy, households and families in a social, economic and geographic setting in early 18th century Iceland. The focus is on the household size and structure, the resources available to

households, the principal types of income and expenditure, and landlord-tenant relations, including different forms of wealth extraction.

The study draws on extensive national household-level data from three sources dating from 1702-1714: a census, a land register, and a livestock census, aiming to construct a detailed GIS database of Iceland's social and economic landscape. Though the census and land register have received considerable attention by Icelandic historians, they have not until now been integrated, and the little known livestock census has not been used before for significant historical analysis. The study is highly spatial in nature and benefits from existing GIS data of farm locations and administrative borders of early 18th century Iceland.

In the paper we outline the overall research project and take a close look at the part of the project that deals specifically with the household economy.

2A: Geospatial approaches to historical and literary writing

Stuart Dunn

'The Eye of History': Chorographic prologues and the origins of the Spatial Humanities

Abraham Ortelius (1527-1598) described Geography as "the Eye of History". In doing so, he encapsulated an intellectual innovation of his time, in which antiquarians such as John Leland, William Camden and Peter Heylen began using new platforms of movable type and mass printing to document and describe place in new ways. As such, they pioneered the reinvention of "chorography", close narrative observance of the landscape and its antiquities, first postulated in Classical antiquity by geographers such as Strabo and Ptolemy. Their works Leland's *Laboryouse Journey and Search* (1549), Ortelius's *Thestrum Orbis Terrarum* (1570), Camden's *Britannia* and Ellis's *Compleat Chorography of England and Wales* contain elaborate prologues, sometimes written by the author, sometimes by their editor or publisher, describing the motivations, preoccupations (reaction against the Cromwellian purges in Heylen's case for example, and a new muscular pan-British nationalism in Camden's) and the thinking framing the narrative. This paper will present a brief survey of these prologues, mainly from chorographic manuscripts the British Library. It will argue that these works represent the emergence of a new, post-Renaissance approach to historical geography analogous to what, today, we might call "spatial history". Before, the past could be accessed only through reading Classical and Biblical texts; but with Ortelius's "Eye of History" and the works of the chorographers, we first see an appreciation that to understand the past, we must also understand its geography. I conclude with some reflections on how recognizing this appreciation can help inform frameworks for applying GIS to historic texts today.

Greg J McInerny, Amanda Thomson, Kat Brown, Robert Fletcher

Information Front: A pen and paper GIS established during World War II

During World War 2 the Anti-Locust Research Centre (ALRC) attempted to establish an early warning system for Locusts invasions across Africa, India and the Middle East. Long before GIS, this 'international information service' relied on telegrams and posted correspondence, hand drawn maps and pseudo-spatial methods.

Our AHRC funded project has studied the ALRC, based on archival material, as it transitioned from behavioural experiments to applied, pancontinental biogeographical research of the Desert Locust (*Schistocerca gregaria*). Military invasion and occupation facilitated new data channels, placing locust officers in new territories, an information front that tightly followed the allied front. We present interdisciplinary perspectives of the ALRC as an improvised, human GIS.

Alongside a preliminary prosopography of the archive correspondence, and exploratory data analysis and visualisations of the ALRC's predictions and correspondence (using R), our research uncovers the spatiality of human narratives and experiences that are interwoven in the data collection that followed colonial methods. Whilst some of this work use GIS tools, our interdisciplinary project embraces a plurality of methods and practices in order to understand this emergent GIS and to critique the certainty of scientific claims emanating from the ALRC.

Following the World War 2, and various international agreements, the UN FAO (United Nations Food and Agricultural Organisation) took on the responsibility for Locust research and formalised it within modern GIS technologies to store, manage, process, analyse and visualise spatial data relating to Locust Swarms. Our research provides new insight into what came before this - GIS before GIS.

Raphael Joseph

Transnationalism in Modernism: Mapping Place Names in Novels Using Digitally Assisted Methods

Literary modernism coincides with the expansive stage of British Empire and novelists of the period responded or inevitably incorporated the 'non-native' in their texts. Literary modernism is also marked by transnational ethos and transcending of national boundaries and modernist texts quite often refer to marginalized European and non-European cultures. The increased cross-cultural interaction during the modernist period was a result of the colonial expansion coupled with new forms of transportation and communication technologies. This paper attempts to map transnational places in a selection of modernist novels and show how modernist novelists imagined and represented non-native places in their works. The texts are read using digitally assisted methods to extract place names and then they are mapped. Both close reading and distant reading methods are employed to understand the novels and the expectation is to explore the various ways in which non-native place names emerge in the narrative of novels. The paper also attempts to interpret how different authors describe and use non-native places in their writings. The challenges and methodological problems faced during the research for this paper will also be briefly discussed.

2B: Digital Infrastructures for the Spatial Humanities

Arkadiusz Borek

Indxr- GIS tool for historical sources edition

In my communication I want to present Indxr, a webapplication, which provide a method of editing historical sources based on a GIS technology and on a relational database. The method and specific technological solutions were developed in the Department of Historical Atlas of Institute of History of Polish Academy of Science. The base for working with Indxr is treating scans of historical sources analogical as maps rasters, on which we put vector layers with data describing marked by polygons fragments of a source. Data are stored inside a relational database and can represent any attribute of content marked on raster – full transcription of a text, date of an entry, colour of ink or comment to map's symbols. That only depends on a source and used database schema. Using GIS technologies allowed us to benefit from rich and tested solutions, which are developed all the time, only with adapting them to our needs. Also thanks to using most basic data standards projects created by Indxr are compatible with others GIS applications. In effect we can create a source edition that can be published in the Internet in form close to that known from webGIS applications. I will start my presentation with describing problems, which were impulse to create Indxr – such as search of new forms of editions in digital age and issue of editing sources, which were problematic to prepper as full-text editions. Also I will tell about basic technical specification and interface of Indxr. Next I want to present in more detail its practical apply in a projects concerning creating indexes to polish courts records from 16 c.

Nuno Ramanlal, Luís Freixinho,
João Monteiro, Patricia Murrieta-
Flores, João Moura Pires, Bruno
Martins

Machine Learning for Processing Historical Photos Envisioning Spatial
Humanities Applications

This paper describes two currently ongoing projects related to the application of machine-learning approaches for processing historical photos. These projects adapt and extend recently proposed methods for (a) automatically geo-referencing photos into the corresponding coordinates of latitude and longitude, or (b) producing land-coverage maps with basis on ground-level geo-referenced photos, instead of aerial imagery. Stage-of-the-art approaches for handling the aforementioned problems leverage convolutional neural network (CNN) architectures, requiring huge amounts of training data (e.g., model training and evaluation relied on very large collections of modern geo-referenced photos gathered from Flickr). In order to process historical photos, we propose to combine network components for automated geo-referencing (i.e., a CNN model based on the MobileNet architecture) and land-coverage estimation (i.e., a similar CNN model, combined with a recurrent layer for modeling the sequence of photos whose coordinates are more proximate to the target cell of the land-coverage raster), with a fully-convolutional network component for automatically coloring the historical photos. This way, old photos can be transformed in order to more closely resemble the modern ones, and the neural networks can be pre-trained with modern photos collected from Flickr. The paper details the models considered for addressing the two problems, discusses applications and limitations of the proposed methods, presents examples of the obtained results, and reports evaluation experiments leveraging existing collections of geo-referenced historical photos (i.e., the datasets from the Old San Francisco and Old New York projects), and existing maps of historical land-coverage (e.g., the CONUS dataset from the USGS EROS center).

<p>Yasmine Boudili, Pierre Boymond, Maud Desjardins, Carmen Brando, Eric Mermet, Emmanuel Désveaux</p>	<p>Automated geolocation and classification of photographs for the study of Alpine architecture</p>
--	---

Mainly appeared in the XVIth century, alpine architecture knew how to be known beyond its borders thanks to its chalets. Today, in the context of the project SOURVA "At the source of diversity or cultural variation" coordinated by anthropologist Emmanuel Désveaux, a study is being carried out to understand the temporal and spatial evolution of these architectural specificities across the Alps. In this context, it was necessary to develop a tool for the geolocation of a corpus of 4000 photographs of alpine chalets taken between 2006-2016 through the Alpine arc. For image processing, we employed statistical methods and also train neural networks to classify the photographs according to architectural criteria. In particular, anthropologists are interested in identifying the proportion of wood and stone in the exterior of the chalet. The geolocation tool achieved an accuracy of 88% and the success rate of the image classification methods is up to 96%. The open source tools were developed in Python here: <https://github.com/PSIG-EHESS/valleesAlpines>. The tool output is easily integrated into the software QuantumGIS which allows for spatial analysis of the corpus within a GIS environment. In our talk, will describe the aforementioned methods along with the difficulties of dealing with our corpus. We will present thematic and exploratory maps in order to motivate our work. Future work includes taking into account the dates of shooting for improving the geolocation algorithm and the implementation of new image classification methods for detecting other architectural criteria such as roof slopes of chalets.

<p>Michael Page, Carmen Brando, Patricia Murrieta-Flores, Katherine Hart Weimer</p>	<p>Building Geo-Community through the ADHO GeoHumanities Special Interest Group</p>
---	---

The Alliance of Digital Humanities Organizations (ADHO) was formed in 2005 in pursuit of coordinating the activities of regional digital humanities around the globe. The alliance, serving as a community-based advisory force, promotes and supports digital research and teaching across all arts and humanities disciplines. In 2013, the GeoHumanities Special Interest Group was assembled with focus on spatial, spatial-temporal and placial perspectives in the digital humanities and community building across disciplines. As a SIG of ADHO the convenors communicate monthly and members of the group meet annually at the ADHO conference. Since founding, the group has hosted workshops and discussions at the international conference including Gazetteers (2014), Peer Review of GeoHumanities Projects (2015), and A Place 4 Places (2016) on historical digital gazetteers. Beyond the annual meetings, during the past four years the SIG has compiled a list of GIS Humanities projects and submitted annotations to the geographically inflected tools contained in the online directory, Digital Research Tools (DiRT). Utilizing working groups within the SIG, goals include editing and maintenance of these two lists and in developing content regarding peer review in the digital landscape, publishing syllabi content and tutorials on methods, and establishing a directory of consultants and mentors in order to connect people. With a recently evolving leadership, this paper seeks to outline the philosophy behind the conceptualization of

the SIG by its founders, Karl Grossner and Kathy Hart Weimer, reports on the work of the past four years, and convey goals for future development of the SIG.

2C: Spatial Humanities and the Urban: Applied studies 1

Frank T Proctor

Mapping Black colonial Mexico City

ArcGIS and GEPHI (a social network visualization tool) allow me to visualize the relationships of enslaved persons of African descent across the urban space of colonial Mexico City, 1629-1634. As Catholics, enslaved people had the right to marry in Spanish colonies. Their marriage applications include valuable information as each bride, groom, and wedding witness listed their name, their race and/or ethnicity, their age, the length of their relationship with the prospective bride and groom, and the name and occupation of their owner, if enslaved. Scholars, like myself, have used this information to explore the contours of the social worlds inhabited by enslaved peoples.

However, these sources also include an interesting piece of information - street of residence - that scholars have yet to find a way to analyze, until now. As I recently discovered, those street names referred to a single city block allowing us pinpoint the residences of individual slaves in Mexico City. Using ArcGIS, we georeferenced colonial street maps and generated a feature class with the correct names of colonial streets. This data not only allows us to visualize where slaves actually lived throughout the cityspace, but also to generate gps coordinates (longitude-latitude) for each residence. GEPHI, then, allows us to visualize the connections between members of each wedding party; and, to compare all of those relationships across the city-space for the 1500-2000 slaves who appear in the 400 extant marriages from 1629-1634 (see <http://www.martingrandjean.ch/wpcontent/uploads/2015/10/Gephi26.png> for an example that visualizes letter writing across Europe).

Mads L Perner

Residential segregation in a pre-industrial city: the case of Copenhagen, c. 1700-1850

The walled, pre-industrial town has been dubbed the 'walking city' since all socio-economic layers of society were living in close proximity, and the distances between them could easily be covered by foot. This has led some historians, particularly scholars of the industrialising city, to assume that spatial differentiation was absent prior to large-scale public transport infrastructure. If residential segregation did exist it was vertically rather than horizontally, with floor-level differentiation within houses. Until recently, this view has been left unchallenged due to a scarcity of data on early modern towns. With this paper I seek to shed light on the issue through the case of Copenhagen c. 1700-1850. Property-level occupational data are available as early as 1711 and regular censuses are available from 1787. To quantify socio-economic status occupations in the dataset were classified using the HISCLASS-system, which makes comparison across time and space possible. The information was then geo-coded with a set of reconstructed and digitized cadastral maps from 1689 to 1806. Aggregated to levels of blocks and streets, the data shows considerable socio-economic differentiation in 1711, with the patterns changing towards the end of the period. By 1845 a large, coherent cluster of low-status (mostly manual labour occupations) house blocks had formed in the northern part of the city, while some earlier poor areas now displayed

signs of gentrification. This is an indication that the social morphology of the pre-industrial town was much more dynamic than prior research has given it credit for.

Duncan Gager

The Use of GIS in Understanding Commuter Patterns in 19th Century London

'Victorian towns were predominantly places for walking, not for riding, for legs not for wheels' has been the assessment of the levels of urban mobility in the 19th century. This paper utilises GIS to examine commuting patterns in Victorian and Edwardian London and test the applicability of this statement to the journeys to work of three middle class occupational groups. It explores both the chronological and spatial development of commuting patterns in this period and their correlation with the growth of London's suburban railway network. The GIS data reveals an uneven pattern of dispersal towards the shifting periphery of the metropolis and challenges the presumption of a straightforward relationship between the development of suburbia and the residential preferences of the middle class. The paper considers possible explanatory approaches and concludes with an evaluation of GIS as a means of assessing their respective merits.

3A: Mapping the Humanities and Arts

RJ (Rombert) Stapel

A New Historical Atlas of the Low Countries (ca. 1350-1795)

This paper will concern the process of creating a new, uniform digital GIS map of historical boundaries of cities, parishes, heerlijkheden (lordships), and other meaningful entities in the Medieval and Early Modern Low Countries. Such a process involves the selection of sources, including historical maps, the drawing of digital maps, and the creation of a data model for the maps and related historical statistics. As the project is expanding, issues such as data curation and data access need attention as well. The principal reason for creating these maps is the desire to be able to tie socioeconomic developments to specific geographic contexts. The map creates the conditions to geographically define historical statistics much more precise than before. Current emphasis in the project lies on linking the maps to all available Late Medieval surveys stating the number of hearths and/or houses in the various parts of the Low Countries. These surveys have also turned out to be a crucial element in the methodology for the creation of the GIS maps.

Currently, maps have been created for Holland, Utrecht, Guelders, Cleves (partially), Brabant, Ponthieu, Vermandois, Boulonnais, Artois, and various smaller areas. Maps of Flanders, Cambrésis, Tournaisis, Hainaut, Namur, Liège and Luxembourg are almost finished. The Duchy of Brabant is the first region that is fully implemented in the new spatial database structure.

The ultimate goal is a digital GIS map of historical boundaries, stretching from the north of France to the Waddensee, which can be used for various historical research.

Emma Tonkin	Modern perspectives on art through the ages: mapping institutional perspectives on large collections
<p>In this paper, we describe the aggregation, preprocessing and investigative analysis of a large dataset of artworks collected from online collection resources held by several museums. This resource is used to explore the public-facing presentation of the various materials held, alongside those textual materials that accompany views of the work and indicate any categorisation or contextualisation published by the institution. We apply text mining methods on accompanying materials to geoparse the text, situating the origin of each object in time and space. This enriched dataset affords various forms of visualisation and analysis. The application of a geotemporal visualisation methodology to the dataset, working against a contemporary world-map, presents an accessible visualisation of the extent and limitations of coverage, spanning in aggregate coverage over five thousand years and 169 nations. The dataset additionally permits a data-led analysis and reflection on the extent to which museum practice reflects Paul Oskar Kristeller's famous identification in <i>The Modern System Of The Fine Arts</i> of the eighteenth century as the origin of the modern concept of art i.e. the separation of 'fine art' from 'craft'. Does the museum's presentation reflect James Young's 2015 suggestion of a close overlap between the ancient conception of the imitative arts and Batteux's 'system of the arts' - when - and where - is 'fine art' applied as a rubric?</p>	
Catherine Walsh	Mapping Sculpture around the Early Modern Mediterranean
<p>In <i>Istoria delle Pietre</i> (1597), Agostino del Riccio (1541-1598) catalogued 132 stony substances, including many types of marble, sandstone, porphyry, stalactites (spugne), and volcanic rock (peperino). Borrowing from ancient, medieval, and sixteenth-century writers, Agostino vividly characterized the stones' physical properties alongside information about their alleged geological origins. Milky white stalactites came from Hungary, and both lustrous yellow marble and water-, wind-, and frost-resistant porphyry from Egypt. In addition, he enumerated a host of places where readers might encounter sculptures or buildings made with these materials, from Venice to Palermo to Alexandria. Giorgio Vasari (1511-1574) also wrote about such materials, theorizing applications of them and explaining the technique with which various fifteenth- and sixteenth-century artists harvested and worked them. And early modern artists and patrons generated rich documentation about the excavation and transportation of stones for sculptures and architectural projects -- Michelangelo's (1475-1564) correspondence about Pietrasanta marble quarried for San Lorenzo is notable. Drawing from these and other primary sources, my paper considers the potential for GIS technology to illuminate aspects of the material and spatial history of early modern sculptures. Using CARTO to visualize data from these sources, my project interrogates the stones' travel between geological origins -- like mountains or caves -- and artists' workshops. The visualizations describe geographical statuses and physical properties of the stones and differentiate types of knowledge about these stones and their movements. This pan-Mediterranean spatial history of sculpture draws attention to the dynamism both of the materials and of our understanding of them.</p>	
<p>3C: Spatial Humanities and the Urban: Applied studies 2</p>	

Andrea Ballatore, Fiona Candlin	Where was the UK Museums Boom?
<p>The number of museums in the UK boomed in the late twentieth century, rising from around 600 in 1960 to an estimated 2,500 by the early 1990s. The majority of these new venues were small, independent, and were generally established by special interest and community groups, businesses, and private individuals. In the heritage debates of the 1980s and 1990s, these new museums were usually understood to be a symptom of deindustrialisation, but there is very little hard evidence about when exactly numbers of museums started to rise, if there were regional or national variations, or about possible links between location and subject matter. There is even less information about how the sector has subsequently changed.</p> <p>The Mapping Museums research project addresses this history and aims at analysing the emergence and development of independent museums in the UK from 1960 until the present day. In this paper, we focus on the spatial and temporal distribution of museums across the UK. Using new data collected by the project team, and harnessing methods and concepts from the arts, history, geography, and GIScience, we examine the varying pace of museum openings in relation to place, exploring the role of socio-economic factors in urban, suburban, and rural contexts. Our findings suggest that the museums did not boom everywhere or for everyone within the UK.</p>	
Elizabeth Colantoni, Blair Tinker, Daniel A Weiner	Digital Analyses of Ancient Rome's Temple of Jupiter
<p>The temple of Jupiter was the most important temple in ancient Rome. First built in the sixth century BC and located on a prominent hill, the large temple would have been a particularly distinctive monument in Rome's skyline throughout the ancient period. Furthermore, the temple was dedicated to the all-powerful god Jupiter Best and Greatest, and it was the focal point of many of ancient Rome's most significant rituals and religious practices. For instance, Roman leaders visited the temple before setting out for war, and the most successful generals on the battlefield were granted the right to hold a triumph, a ritual procession that culminated in a sacrifice at the temple of Jupiter. Despite the importance of the temple, there is much that is not known or understood about the physical form of the building, and little scholarly attention has been given to the placement of the temple and the vantage points from which it could have been seen.</p> <p>In this paper, we present a series of digital reconstructions of the temple of Jupiter made with SketchUp modelling software and based on ancient written descriptions and the extant archaeological remains of the building. We then use classic GIS analyses, augmented with 3D visualizations and game engine technology, to bring new data to debates about the size of the temple and about the route of the triumphal procession, both topics that have been disputed to the point of stalemate by modern scholars.</p>	

<p>Terezia Porubcanska, Philippe Meers, Daniel Biltreyst</p>	<p>Spatializing cinema exhibition: Methodological challenges in the geographical visualization of film circulation and cinema location</p>
<p>Over the past few years, many historical research projects adopted an approach rewriting cinema history ‘from below’ (Maltby, 2006) by focusing not on the strategies of production and distribution companies, but zooming in on the local practices of cinemas, film exhibition and consumption (Maltby, Biltreyst and Meers, 2011). The use of spatial analysis and visualization of local historical cinema cultures, however, has been very rare as research practice. The circulation of films between cinemas is one aspect of the wide range of research questions within this field, with a considerable spatial dimension. Tracking films and their trajectories through the cinemas around the city forms a part of several cinema historical studies (e.g. Lotze and Meers, 2013; Verhoeven, 2013), but the relations to the geospatial context are developed only occasionally.</p> <p>In this paper, we will focus on the methodology of tracing the paths of films and visualizing them on maps with the help of the open source geographic information system, QGIS. The central objective is to establish whether the methodology of mapping to analyze the circulation of films is efficient and strong, and to identify its benefits as well as limitations. At the same time, we look for hitherto unknown relations between cinemas and the patterns of films moving in a city. For this paper, we will rely on data coming from a large-scale research project on historical cinema cultures in Antwerp and Ghent in Belgium (1952).</p>	
<p>4A: Deep Mapping in the Spatial Humanities</p>	
<p>Trevor Harris</p>	<p>Deep mapping the lived world: sensuous GIS, immersive geographies, and the virtual umwelt</p>
<p>People live in a multidimensional, sensuous, and spatially complex lived world – the umwelt. Cartographic mapping and geographic information systems (GIS) strive to capture, record, and communicate the spatial components of this lived world through pseudo-objective representations of space primarily in the form of 2D mapping. Such images are powerful and yet have significant implications for representing and communicating knowledge about the lived world for they are based on the allure of reductionist technologies. Grappling with multiple realities and creating meaning from non-reductionist human complexity through deep mapping is challenging. The lived world of place comprises multiple unfolding spatial narratives and experiences that are sensual and emotional, and represent associations based on perception and the experience of space. These deep mappings are difficult to capture, map, express, represent, or comprehend. Recent technological advances in 3D GIS, stereo-enabled virtual immersion, scenting and tactile devices, and serious gaming engines now enable powerful multi-sensory spatial platforms to be created. These interactive virtual platforms immerse the user in a sensuous 3D environment capable of recreating elements of the lived world – the virtual umwelt. Additional geosensory inputs contribute substantially to enhancing and experiencing a sense of both space and place than is possible through a 2D visucentric map focus. These experiential GIS environments enable the spatial analytic aspects of space to be communicated within a collaborative setting alongside the cognitive, experienced, emotional, and associative qualities of place.</p>	

James L Smith	Deep Mapping the Spiritual Waterscape: The Case of Lough Derg, County Donegal
<p>Veronica Strang has called our spiritual fascination with water ‘hydrolatry’, a lingering veneration that goes beyond religion affecting social behaviour in an era of scientific instrumentality and commodification. It is part of the Irish psyche, and contains a reservoir of spiritual history waiting to be delved. As Jamie Linton puts it, ‘[w]e mix language, gods, bodies, and thought with water to produce the worlds and the selves we inhabit’. There is a need to provide histories that reveal this admixture in greater depth, and make it accessible to a variety of interpretations.</p> <p>This project builds a vision of water spanning Ireland’s long spiritual history that will strengthen the cultural resonance of place and space in the face of unprecedented bio-ethical, heritage, environmental, and climate challenges. The methodology is deep mapping, the capture of a wide range of spatio-temporal material focused on a small geographical area. The final result will be an online archive consisting of literary, social science, natural science, and multi-media collections.</p> <p>The 2018 pilot study focuses on Station Island, site of the Sanctuary of St. Patrick. This essay will explore the spatial humanities-derived methodological underpinnings of the project, and the use of Omeka and its Neatline plugin to create the pilot.</p>	
Christina Williamson	Festival hubs. Deep-mapping sanctuaries in the ancient Greek world
<p>In the ancient Greek world, religious festivals were used to establish the identity of a community but also to create ties with other communities. Such festivals, their gods, sanctuaries and rituals, are often seen as part of religious history, or resulting from state formation processes, or are considered for their architectural layout, yet rarely are they considered as a whole in all their complexities. Festivals were multi-vocal, they could operate at multiple scales as contests were held, delegates were exchanged, rulers were often involved, as well as local elite, but also 'the crowd' of spectators and worshipers. All of these sought to connect their own identity to that of the festival, and its sacred spatial setting, at some level, whether this was through new civic architecture, honorific monuments, pious dedications, or graffiti and stories remembered. Using the sanctuary of Asklepios on Kos as case study, this paper aims to set out a framework for a new approach to such sanctuaries in the vital Hellenistic period (c. 300-30 BC), as it seeks to understand them through the lens of place-making. The project, part of a larger approach to festival networks (www.connectedcontests.org), envisions a GIS environment where a wide range of material and immaterial data can be 'geo-tagged' and located in chronological layers that should together reveal the larger and multi-vocal spatial narratives, a deep map that will lend itself for further network and social analyses.</p>	
<p>4B: Spatial Humanities and the Urban: New Technologies</p>	

Allison Muri	The Grub Street Project: A Digital Edition of 18th-century London
<p>I propose to present on my "Grub Street Project" (http://grubstreetproject.net/), a spatially oriented "edition" of London which I have also described as an enhanced Google Maps for scholars. The project investigates and demonstrates how digitally mapping could enhance our understanding of the history of literature and material print culture, of networks of people, places, and written works.</p> <p>Current objectives of the project are (1) to continue development of the database of topographical features, works, people, and trades in 18th-century London; (2) to determine and provide methods to mark up and display scholarly editions online as part of a social and topographical network of texts); and (3) provide visualizations of social and spatial networks of the city.</p> <p>This work is premised on the proposition that digital publications are suited to present not merely standalone editions of particular documents or works, but also--intrinsically--relationships through a network of linked documents. Following D.F. McKenzie's <i>The Bibliography and the Sociology of Texts</i> (1985), Jerome McGann has frequently articulated a social theory of text proposing that the scholar's attention should be directed not only toward the "text"--the linguistic features of a document--but toward the composite "semiotic fields" of documents and social relations in literary production and reception. Expanding on McGann's concept of the social text, this research tests how a digital edition might consist of not only a single work, but instead a network of documents with spatial, social, material, and textual or artistic relationships.</p>	
Ralph R Pite	Romantic Bristol: Walking and Writing a Digital City
<p>ROMANTIC BRISTOL: WRITING THE CITY is the name of a smartphone app, developed over the past 2-3 years, with funding from the World Universities Network and Bristol's Institute for Advanced Studies. It places historical and present-day materials, connected with the city and its cultural legacies, on a number of maps (dated 1828 to the present). The materials are available in a number of themed layers which the user can combine or separate. It allows the user to walk with the phone and be alerted to points of interest; there are no set tours or guided walks. The initiative behind the app was an interdisciplinary inquiry into a) the role of digital technology in incentivising walking among residents of the city, with the known health benefits walking brings and b) frequently unnoticed, hidden obstacles to walking -- including unfamiliarity with altered cityscapes (among the elderly); absence of identification with city (among the young). The app was developed as an attempt to address these issues. The paper summarises briefly the development of the app i-- its successes, limitations and possibilities for further development -- before reflecting on the process, . In particular, I will consider how urban spatiality is opened up in new ways by the app, through its layering of content, and the forms of access it gives to cultural and historical materials. I will ask to what extent space needs constantly to be written and rewritten in order to become place, and secondly whether the cultural legacies of a city, likewise, are best sustained through and amidst everyday processes of living and walking.</p>	

Rebecca L Hutcheon	Gaseous oxyd, celestial tandems and a Learned Pig: the evolution of a walking app
<p>Romantic Bristol: Writing the City is a smartphone app, first begun in 2015, which maps the literary and cultural heritage of Bristol. It contains six themed layers of sites plotted onto real-world maps (dating from 1828 to the present). This paper examines the app’s evolution from a basic two-tiered beginning to its current multi-layered and more geographically varied form. In the first version, completed in 2016, sites of Romantic era interest sat alongside poetic responses from local, present day writers. The second version, completed in 2017, combines layers on provincial theatre history, women writers, and the industrial revolution, and stretches out to include the city of Bath – itself a centre of eighteenth and nineteenth century culture. The paper goes on to describe how mapping the past became just as much about what is no longer there. For instance, my research revealed streets filled with livestock, performing animals, menageries, the sale of exotic creatures, which gave a sense of an other or animal city. I will illustrate how my archival research began building a picture of a hidden, forgotten or absent city. I will ask if and to what extent the digital world can help not only regain or reconceive vanished places, but also to imagine and visualise alternative, other spaces.</p>	
<p>4C: Spatial Humanities and the Lake District</p>	
Joanna Taylor, Olga Chesnokova, Ross Purves	The English Lake District’s Changing Soundscape: A Multidisciplinary Approach
<p>This paper reports on ongoing work that explores the representation of the English Lake District’s soundscape in historical and contemporary texts. By extracting references to sound from the Corpus of Lake District Writing and a collection of descriptions of contemporary georeferenced images, we consider how authors writing in different genres construct a cultural soundscape by recording salient perceived sounds.</p> <p>To do this, as the paper explains, we have trained Random Forest automatically to classify texts into four primary categories: the biophony (e.g. birds calling), the geophony (e.g. wind), the anthrophony (e.g. mining or roaring jets), and apparent silence. We then disambiguated the texts with the Lesk algorithm and WordNet, allowing us to explore how different sounds have migrated across these categories over time, and ask what such changing definitions reveal about socio-cultural understandings of and responses to the Lake District’s soundscape. The paper concludes with an evaluation of how combining various digital and traditional humanities approaches to the study of these corpora can illuminate the multi-sensory habits that define historical and contemporary responses to the natural world.</p>	
Carly J Stevens, Rob Smail, Ian Gregory	Reconstructing the vegetation of the Lake District: mapping vegetation from 1700 to present day

Since 1700 there has been considerable change in the natural, agrarian and urban landscape of the UK. Changes as a result of agricultural land reform and improved agricultural technologies have occurred alongside industrial and technological development, an increase in the proportion of the population of the population living in cities and massive population growth. All of these changes have resulted in significantly altered land use and vegetation composition. Understanding how species composition has changed as a result of landscape change is a key part of understanding man's long-term impact on the environment and helps us to predict what will happen in the future. Despite this we currently know very little about vegetation change in the UK prior to the early to mid-twentieth century. As part of a pilot study we tested an approach applying natural language processing techniques and corpus linguistic methods to the extraction of plant species information from historical text. A sample corpus comprising 85 historical diverse historical texts published between 1682 to 1904 was formed. To explore the potential of this corpus a sample of 24 plant species was selected. Identification and extraction of species recorded as found in the Lake District was undertaken using collocation analysis, a Gazetteer of all OS place names for Cumbria and Lancashire to assign a latitude and longitude. Results from this pilot project will be presented together with plans for a larger project in the future.

Alex Reinhold

Generating Representations of Historic Landscapes: A Deep Map of Tarn Howes

Changing landscape presents a problem for conservation and education at heritage sites. We looked at the site of Tarn Howes in the English Lake District National Park, a site which has had significant landscape change over the past 200 years, from changing tree coverage, to the merging of three lakes into one. We created an automated process that combines an elevation map and a vegetation map to build a 3D representation of the landscape. We used this tool to create a 3D Deep Map of Tarn Howes, representing the sites landscape at multiple periods in time, allowing them to be viewed side by side and explored in an interactive environment. This Deep Map provides an educational resource for site authorities to educate the public about the historic environment, with imbedded multimedia in the application to provide additional information to users that might be disruptive or impractical to display on site. The Deep Map also provides a tool for conservators to plan site maintenance to best maintain the integrity of the historic landscape without negatively impacting visitors experience of the iconic site.

Sally Bushell

From Lakescraft to Litcraft: Mapping Real and Imaginary Place and Space

This paper is centred on the relationship between real and imagined places and describes the development of a Minecraft-based immersive experience of literature out of a prior pilot project entitled Lakescraft. Lakescraft used the OS map of the Lake District to create various interactive educational elements within the landscape, including a module on Arthur Ransome's *Swallows and Amazons*. Ransome famously set all of his Lake District series in the Lake district using a merged (real/imaginary) landscape. He tells us:

Their lake is not altogether Windermere, though Rio is, of course, Bowness, because I had to take a good deal from Coniston. No island on Windermere has quite so good a harbor as that among the rocks at the south end of Peel Island on Coniston . . .

Interactive tasks relating to Ransome’s “wild cat island” in the book led to the development of an entirely new set of island worlds in Minecraft: Litcraft. This paper will discuss the two first islands created: Treasure Island and Kenzuke’s Kingdom and their potential for re-engaging children with the classics of English Literature.

5A: Virtual Interiors and Deep Maps of Amsterdam of the Dutch Golden Age

Harm Nijboer

Mapping migration movements of seventeenth century Netherlandish artists

The Ecartico database maintained at the University of Amsterdam and the Huygens Institute for Dutch history contains structured biographical data on more than 8000 painters and engravers working in the Low Countries before ca. 1725. Because all work locations of these artists have been identified, recorded and geocoded, it is relatively easy to reconstruct the migration networks in which these artists operated. However, mapping these networks in a meaningful manner, is not that straightforward. Typical for such networks is that they tend to have a very dense core and a very sparse periphery. Making sense of such networks requires visualization techniques and analytical tools that go beyond the standard features offered by GIS packages and mapping libraries. In this paper we will explore some of these techniques and evaluate them against the historiography on the migration of early modern Netherlandish artists.

Charles van den Heuvel

Virtual Interiors and Deep Maps of Amsterdam of the Dutch Golden Age

The Semantic Web needs interfaces for critical, trustworthy readings of Big Data for humanities research. By (re-)using data on the production and consumption of cultural goods, geodata, maps and building plans of the Dutch Golden Age, the project Virtual Interiors as Interfaces for Big Historical Data Research: Spatially Enhanced Publications of the Creative Industries of the Dutch Golden Age aims at unlocking the research potential of big historical data in a geospatial context. Virtual reconstructions of interiors of houses and their locations in Amsterdam of the Dutch Golden Age will not only provide insight in socio-spatial aspects of the cultural production and consumption of the creative industries, but also contribute to the development of spatial humanities and digital hermeneutic methods. The Amsterdam case study focuses on the implementation of these methods by enhancements of GIS with applications of “deep/thick maps” and historic reconstructions in virtual 3D/4D “Hyperspaces” with multiple perspective views and visual representations of uncertainty

Weixuan Li

Beyond Location: Deep mapping artist’s workshops in early modern Amsterdam

Although geospatial technologies have repeatedly demonstrated their potential for humanities scholarship, art history still dwells in the early stages of exploring how spatial methods can transform its

scholarship. Using Bodenhamer's concept of deep mapping, this research focuses on the question how spatial technologies can enrich art historical research and aims to trace the locations of painter's workshops in Golden Age Amsterdam from 1500 to 1650. Layering artists' biographies and inventories on top of historical and cadastral maps, this research seeks to pinpoint the artist's workshop to a specific location and virtually reconstruct the spatial networks in neighborhoods where clusters of artists lived, worked, and socialized in 1650.

This research will further focus on the painter's neighborhood around St. Anthonisbreestraat in Amsterdam where Rembrandt resided. The 1631 tax registration and property transaction data will be linked to the very detailed 1625 map of Amsterdam by Balthasar Florisz. van Berckenrode, and further layered on top of the first geo-referenced cadastral map of Amsterdam from 1832. This enables us to assign the tax registration data to the specific houses on both the historical and the cadastral map. With painters' workshops pinpointed on the cadastral map, this research will connect existing artists' biographical information with their works produced during their periods of residence as Rembrandt's neighbors. This research also seeks to locate the spatial uncertainties within artists' clusters across time in the deep/thick map and to explore means to present the uncertainties for scholarly purposes.

5B: Gazetteers and Linked Open Data in the Spatial Humanities

Bruno Martins, Patricia Murrieta-Flores, Raquel Liceras-Garrido

Development of an Historical Place-Name Gazetteer for the Viceroyalty of New Spain

This paper describes ongoing work within the Digging into Early Colonial Mexico (DigCH) T-AP Digging Into Data project, concerning the development of a spatially and temporally comprehensive database of significant locations in the context of the "Relaciones Geográficas" (i.e. an important 16th century source for colonial history, consisting of the responses to a questionnaire issued by the Spanish government in 1577 to local officials in the Viceroyalty of New Spain). DigCH will use natural language processing to extract information from the Relaciones, e.g. cross-linking place-names mentioned in the text to other information sources. A comprehensive place-name gazetteer is of particular importance to the objectives of the project, and a specific subtask is addressing the development of one such gazetteer, taking inspiration on previous projects such as the World-Historical Gazetteer or the Alexandria Digital Library Gazetteer (i.e., we re-use the data model from the ADL Gazetteer project, which already considered the association of places to multiple alternative place-names, feature-types, detailed geographical extents, quality and provenance information, and temporal ranges for all the aforementioned elements). The Relaciones, and thus also our gazetteer, contain information pertaining to the territory of present-day Mexico, Guatemala and Central America. This paper describes the main principles behind the development of the gazetteer, the process used for collecting and integrating data from multiple sources (both modern and historical), the resulting software for managing and exporting the data (available as open-source at <https://goo.gl/fvBT8q>), and lessons learned from our efforts that can be useful for the development of similar gazetteers.

Karl Grossner, Ruth M Mostern	World-Historical Gazetteer
<p>Gazetteers are proving invaluable for historical researchers in many fields within the humanities and social sciences. Historical gazetteer data is being developed in various contexts and scales: for example, in the course of research (Map of Early Modern London), and as "digital humanities infrastructure" (Pleiades). As these data proliferate, efforts at sharing and linking them are bearing fruit. The Pelagios project has led the way by aggregating data about place attestations and related annotations from multiple sources, and providing a search interface in its Peripleo web application. Their work has to date focused on the ancient Mediterranean.</p> <p>The World-Historical Gazetteer project is undertaking a similar effort, however with a global spatial scope. Its temporal scope is not strictly bounded, but will focus on the centuries after 1500CE. We are coordinating with Pelagios to ensure our data formats for contributions are mutually intelligible. We view the ground-up nature of the emerging "Linked Pasts" network as essential elements of its growth, so fostering a community of interest is a core goal.</p> <p>In this talk we introduce the project and outline its distinctively world-historical focus on connections between places in terms of movement, setting, and relations. Historical routes and route systems will be a featured place type, and we will actively solicit annotations of data about journeys (pilgrimages, exploration, etc.) having waypoints within the gazetteer. Further, the environmental context of inhabited places will be highlighted, and we will actively gather and solicit time-indexed data to expose relationships between places falling within named regions of all kinds.</p>	
Sarah Middle	Linking data based on place: a tale of two projects
<p>Linked Data technologies connect digital objects based on features they have in common, and the concept of place is central to many Humanities resources. When place information is described using Linked Data, places mentioned in a variety of sources can be viewed on a single map, revealing relationships between resources that could not otherwise be determined.</p> <p>In this paper I will explore two projects that link data in this way. Pelagios (http://pelagios.org/) began by annotating places mentioned in ancient texts with the uniform resource indicators (URIs) of those places in the Pleiades gazetteer (https://pleiades.stoa.org/). It has now expanded its temporal and geographical scope, based on the same principle of connecting digital materials to corresponding entries in online gazetteers.</p> <p>Recently, I conducted a smaller-scale project on data about appeal cases heard by the Judicial Committee of the Privy Council (JCPC) between 1860 and 1998. The JCPC is the final court for British overseas territories; as such, appeals originated from a wide variety of places, many of which underwent significant political and geographical boundary changes. While I was able to convert the data to Linked Data, I found that no existing gazetteers fully represented each place at the time each judgment occurred. My experience demonstrates how linking place data effectively requires accurate identification of what is meant semantically, historically, politically and geographically by the concept of each place.</p> <p>This paper will start with a brief overview of Linked Data, before discussing Pelagios, the JCPC project, and the wider issue of place identifiers.</p>	

Arno Bosse	EM Places: An enriched, early modern geo-gazetteer
<p>The accurate identification of people, places, and dates is fundamental to historical research. For places, this ideally requires capturing data describing changes both in the manner in which places are named and how these are nested within other entities. But most widely used modern gazetteers (e.g. GeoNames, Getty TGN) capture very little of this historical complexity. In particular, they lack chronologies for the multiple contexts a given place has occupied throughout its history.</p> <p>In recent years, in parallel with the adoption of standards for creating a ‘semantic web’ of linked web resources, more attention is being paid to enriching and integrating gazetteers (Berman, 2016). Specialized gazetteer projects (e.g. Pleiades), conceived from the outset not just for human readers but also for computational research, are establishing means for querying and exchanging their datasets and models capable of representing temporal places (e.g. WHG) and different types of hierarchies (e.g. GOV).</p> <p>Building on these developments, and the recommendations from the COST Action ‘Reassembling the Republic of Letters’, the ‘Cultures of Knowledge’ project at the University of Oxford and the Huygens Institute in Amsterdam are preparing a collaboratively populated, Linked Open Data geo-gazetteer (EM Places) directed at the needs of early modern researchers. The new resource will, for example, be able to capture multiple (administrative/political, ecclesiastical, military, and judicial) temporal contexts, and the spatial and temporal distribution of relevant (e.g. Julian) calendars. The paper will provide an introduction to EM Places, and an overview of our future plans for the project.</p>	
5C: Communicating spatial humanities approaches to student and other audiences	
Emily McGinn, Meagan J Duever	GIS in the Undergraduate Classroom
<p>This presentation discusses using ESRI’s ArcMap in the undergraduate History classroom as an example of innovative research and as a method for integrating Digital Humanities directly into humanities pedagogy. With this approach, students benefit from the immediate application of DH to traditional humanities objects of study and these methods aid them in the pursuit of new modes of learning.</p>	
Jakub Wabiński, Albina Mościcka	A concept of 3D-printed historical tactile map
<p>We are currently living in the Information Age. Searching, browsing, downloading and archiving data has never been easier. Much of the data has its spatial reference and the best way to present that kind of data are maps. Most of the maps are being read by the sense of sight, which is the best way to perceive them. Unfortunately, disabled people who perceive world with different senses can’t use this data. Among these people are blind and visually impaired. They require special type of maps, called tactile maps that can be read by the sense of touch.</p>	

The biggest disadvantage of traditional tactile map production methods is the high unit cost of the map, especially for small outlays. 3D printing technology was designed for rapid prototyping and is characterized by a small unit cost. Innovative solutions for tactile maps development as well as the methodology of implementation of 3D printing into production of tactile maps have already been tested by the author. However, there were ideas for further project improvements that arose in the course of the work and are connected with creating historical tactile maps.

This is why new solutions were tested to improve final product, such as automation of the manufacturing process, new methods for post-processing and the use of large-format, full-colour 3D printer. They were implemented during production of a historical map presenting the issue of the partitions of Poland in the 18th century. Presented solutions can be applied to production of any other thematic tactile maps in different countries.

Victoria J Garnett

Finding our way: Experiences of using GIS as a pedagogical tool within a multi-disciplinary reading group

The multi- and inter-disciplinary applications of GIS and the spatial humanities are well known, making geo-referencing a popular tool for historians, (socio)linguists, environmental humanists, and engineers alike. A group of researchers at Trinity College Dublin from many career levels and from many different disciplines have formed a reading group to support one another and share knowledge while reviewing the literature around GIS applications, attracted to the potential benefits that GIS can bring to their work. Each member has come to the reading group with different requirements of GIS. Therefore, this group has taken a 'learning by doing' approach and is now engaged in a self-guided multi-disciplinary project that will allow each member to learn a new skill with GIS.

This project is specifically designed to be scalable, based around a collection of undigitised maps of the TCD campus within Dublin city, held within the TCD Glucksman Library. By taking this approach, we are effectively layering our knowledge and skills development in GIS as we pose new questions of the maps. Furthermore, in undertaking this project, the GIS Reading Group is bringing new life to maps held within the Glucksman collection. The project is member-driven, based around the history of public/private space within the TCD campus.

This paper will present the results so far of the GIS Reading Group's work on maps held within The Glucksman Library while simultaneously reflecting on their pedagogical experiences.

Jane M Read, Susan May

Geospatial technologies for spatial storytelling: experiences from research and teaching

This paper brings together a range of research and teaching experiences using geospatial technologies (GIS, remote sensing, digital globes, UAVs) in the geohumanities. Firstly, we will discuss some of our findings, challenges that we have encountered, and opportunities that we see in attempting to use digital technologies to tell stories of a place. Our case study is Onondaga Lake, Syracuse NY, a small and obscure lake, whose story (or stories) touches on indigenous wars and the Great Law of Peace, the writing of the US Constitution, the development of American industry and transportation, legal and technical innovations for environmental recovery, and creative urban planning. A key challenge lies in combining

the idea of space as a spiritual center in indigenous and local knowledge with the more decentered idea of space inherent in digital mapping and GIS. We will then draw on our experiences teaching a new undergraduate course on Spatial Storytelling through the eyes of spatial science and the humanities. The course aimed to explore methods in storytelling, taking into account different media, cultures, and ways of conceptualizing space, time, and realities, and how technologies affect the ways we understand spatial relationships. We will synthesize some of the lessons from our research and teaching, and discuss how newer technologies, such as UAVs, have the potential to further enhance spatial storytelling.

6A: The impossible art of mapping : creating maps based on multi-layered texts as exercises in pragmatic modelling

Øyvind Eide

Mapping of texts : an impossible task well worth performing

The creation of graphical representations of conceptual and physical phenomena is a fundamental part of visual thinking. Much of what we know about the past is accessible to us in textual form only. Making maps based on spatial understandings expressed in texts is therefore an important part of scholarship which is more popular than ever in an age of easily accessible digital mapping tools.

Such mapping activities are far from straight forward. While georeferencing and mapping all the place names mentioned in a text can be a useful exercise it is far from mapping the spatial understanding expressed by the text. Place names is just one way of referring to places, and the way place names are used can be highly complex and multi-layered.

This paper will go through a number of spatial phenomena expressed in texts and show how they are hard to map. Such problems are partly connected to textual modalities which are difficult to translate into a spatial medium and partly to problems of operationalising translations into a digital form. In this study it will be highlighted how all maps, including the ones we make, are based on the context of their making.

Thus mapping of text is seen as a pragmatic modelling process in which each map shows one reading of the mapped text. The paper will call for an openness towards the subjectivity of scholarly mapping. A viable methodology to accomplish this while still upholding the necessary scholarly reproducibility is to produce multiple sets of maps and to further experiment with map dynamics.

Chiara Palladino, Masoumeh Seydi

Mapping spatial narratives in the Premodern Era

Geographical and spatial descriptions in the premodern world are structurally different from the modern era: whereas spatial understanding in modern societies is based on cartographic navigation, premodern societies are not map-based, and offer a different system of knowledge based on spatial narrative. This paper presents an experimental process to tag, retrieve, and identify geographical information as described in premodern primary sources, together with the issues and possible solutions. The proposed method defines specific categories of geographical information and a light-weight and easy-to-use markdown system to mark these categories in a source. Having tagged the data, we extract it and then the

geographical locations and their connections are identified through a heuristic approach: the extracted geographical entities are initially aligned with the existing geographical references and secondary sources. String similarity approaches might provide a fuzzy identification which need to be verified and disambiguated through several steps of control. In this paper, we describe the process of annotation and extraction of geographical descriptions, experiment some toponyms matching metrics, report the results and offer some possible solutions to handle disambiguation through the existing contextual datasets, proposed as test cases: the Antonine Itinerary, a Roman 4th century route across the Roman Empire, and the Best division for the knowledge of the Provinces of al-Muqaddasī, a comprehensive Arabic geography of the 10th century.

Sinai Rusinek

On Nomadic Places: When Mount Carmel came to the Sea

In the framework of KIMA, the Historical Gazetteer, hundred of thousands of historical attestations of toponyms in the various languages written in Hebrew script are collected. The detection of these toponyms, whether manual or automatic, has its challenges; however, even when the database makes a painstaking challenge of joining and disambiguation. Some of the difficulties stem from the characteristics of the languages written in the Hebrew script, some relate to the vicissitudes of history. But there is also, underlying these challenges, a strange tendency of toponyms to move, in more ways than one; and it is not always clear when this make simple case of homonyms: two distinct places sharing a name, and when it is actually one and the same place changing location. Like many problems in data processing for the humanities, this mobility of places is a problem worth exploring.

One could address this problem by delving philosophically into the concept of place, but we could also approach it empirically. In my talk I will draw upon several examples of nomadic places and attempt map their movement, metaphorically and literally.

Marcel Schaeben, Randa El-Khatib

Exploring the Literary Geography of Paradise Lost

John Milton's Paradise Lost creates an extraordinarily rich and complex sense of space. Construing his spatiality on the existing visual tradition of mapping the Bible with cartographical exactitude, Milton consolidates it with the geographies of classical antiquity and of his contemporary world. Sourcing from literary and exegetical writings, he assigns moral valence to geographical entities; these inform readers' understandings of the epic and the space of human history it encompasses.

The digital project explores this spatiality through an interactive, open access map. Temporalities essential to understanding Milton's depiction of moral valence associated with places are delineated by layers of georectified maps (King James Bible paratext map; John Speed's map of "The Turkish Empire" (1626)). Some digital contributions include experimenting with georectification to more neatly overlap layers and employing visualization methods for an easily navigable and readable deep map.

Spatial data extraction and geocoding are carried out manually, since the limitations of present geoparsing techniques with historical place names remain a methodological sticking-point. Rather, this project hones in on visualization complexities, such as how to visualize an entities 'moral valence' when it is associated

with several connotations simultaneously, or what visualization techniques can be used to reflect collected data when most other attributes are utilized.

The project permits users to recover and evaluate nuance (by resituating geographical names in their poetic contexts) even as they seek to apprehend and deduce larger patterns. It also challenges some existing scholarship by engaging with the poem's spatiality more closely.

6B: Researching Space and Time in the Netherlands. Possibilities and Perspectives of the Dutch HISGIS Platform

Jonathan Bos, Thomas GH
Vermaut

Spatial Rural History: Analysing the Frisian Medieval Power Scape in an Interdisciplinary Perspective

Throughout history power relations between people get expressed by means of possession of property and rights to impose taxes and services. When visualized in space these relations may be construed as a so-called power scape. As for the situation in the early 19th century, the cadastre of 1832 has proved to be of great value when delving into these relations. By linking it to earlier property administrations and fiscal registers it can be used as a starting point to uncover even late medieval power relations.

In this case, the property of the Frisian gentry in the 16th century is researched by analyzing its location. The analysis is put in an interdisciplinary context, in which the landscape is seen by its multilayeredness of substratum, networks and occupation. This paper will present some results and compare these with the outcome of a previous HISGIS project in which the medieval system of serfdom in the region of Twente in the eastern part of the Netherlands was investigated.

Several tools that are used to unlock this information are presented. Tools and data from physical geography (i.e. LIDAR data) made it possible to revive the physical landscape of the past. IT-innovations and advanced mathematics helped to untwine the plethora of interlinked cadastral maps. To this end, a geo referencing tool was developed to accommodate the needs of the system of interlinked maps. Last but not least, parcel data was processed with the OpenStreetMap software stack, in order to produce a clear and readable map.

Hans JA Mol

The Dutch HISGIS 1832 Platform: Development and Perspectives

An already long running Dutch Historical GIS project is the so-called HISGIS nl. It is based on the smallest geographical unit: the parcel. Its main layers are built on the vectorised maps of the early 19th century cadastre with attribute data concerning the size, value, name of the owner etc. of each parcel. The project started about 20 years ago under the responsibility of the Fryske Akademy, intending to disclose for the province of Friesland all information of the Napoleonic survey made up between 1812 and 1832. Though central funding has been lacking, the initiators have been capable to extend the project into an interregional program by cooperating with provincial archives and regional historical associations. The

system now encompasses data on six of the eleven Dutch provinces and on several large towns, like Amsterdam and Leiden, counting more than 1.5 million plots.

After presenting a short overview of the project, this paper first pays attention to the taxation reports on which the valuing of the individual plots was based by the officials. Being very detailed, as to the vegetation, use, revenues etc., these make clear that the taxation of 1832 in diverse categories may function as a reliable starting point for all kinds of long-term research on socio-economic and even ecological themes, rural and urban. Second, the paper addresses the way in which the HISGIS project is to develop into national platform for the analysis of historical geo data and the dissemination of expertise in researching it for the Netherlands.

Thomas GH Vermaut, Mark A Raat

Handling the spatial uncertainty of the 18th and 19th century cityscape by using geo-semantics and Linked Open Data

Developing methods to handle imperfect data is considered to be a great challenge in the Digital Humanities. Concerning the historic city and its residents, administrative sources such as civil registers, censuses and tax records contain a wealth of socio-economic and demographic data. These open up a multi-dimensional window into the past, especially for the 19th and 18th centuries. Dealing with these sources in a digital way however, poses some serious problems as to addressing the spatial uncertainty and the fuzzyness of temporal dynamics. In this paper, a framework is proposed to solve these problems by using a semantic way of describing relations throughout space and time. This is based on an Linked Open Data ontology in which a spatio-temporal unit (p.e. an address) can be related to other such units. Abstracting from the spatial implementation of the unit by describing it on a semantical level, provides an opportunity to link multiple geometrical features (point, line and polygon) to it. Unique georeferenced ID-numbers for example, can be semantically joined to the unit, regardless of spatio-temporal fuzzyness that may exists towards other geometries within the GIS.

Through means of two case-reports, on the large Holland city of Amsterdam and a series of small Frisian towns the framework will be illustrated after the problems have been made clear. It will be demonstrated that the chosen solutions even provide the possibility to connect, compare and uniformise the historical data on these cities, which in the end offers the perspective of disclosing urban networks.

Arie van Steensel

HGIS and Urban History: Leiden's Social Topography and Service Accessibility, c. 1500-1600

The Dutch town of Leiden has a unique source: a set of over a hundred pre-cadastral maps that were drawn by professional surveyors for fiscal purposes in the last quarter of the sixteenth century. Combined with data that can be gleaned from other sixteenth-century fiscal and census records, these (now georeferenced as part of the Mapping Historical Leiden-project) maps enable a refined analysis of the town's social topography. Moreover, the parcels of the sixteenth-century maps can be linked to those of the cadastral map from 1832, opening up the possibility of a diachronic analysis of the urban space. This paper aims, on the one hand, to showcase the possibilities offered by the architecture developed by the HISGIS project team and based on the OSM data model for this project, and, on the other, to demonstrate

the relevance of historical GIS for urban history in general. To this end, it will be first explored how the organisation of urban space related to the distribution of indicators of wealth and status in sixteenth-century Leiden. This approach goes beyond common analyses of social and economic distribution patterns, as it brings in space as a proper explanatory variable. In addition, the urban service access will be measured to establish to what extent the urban spatial organisation produced unequal patterns of service accessibility in Leiden. In sum, this paper underlines the added value of HGIS as a method to answer key questions in premodern urban history.

6C: Sacred Places, Sacred Sources

Ian D Styler

Using GIS to Illustrate and Understand the Influence of St Æthelthryth of Ely

St Æthelthryth was an Anglo-Saxon saint whose shrine at Ely was the subject of veneration from the time her tomb was opened in 695, sixteen years after her death, whereupon her body was found to be incorrupt and a tumour on her neck had miraculously healed to leave just a scar, until her relics were removed during the Reformation over eight centuries later. During this time, the foundation at Ely's fortunes were inextricably linked to those of its saint, and her influence formed an integral part of how the monastic community dealt with events, both external and internal, that impacted it. Evidence of her influence occurs in a variety of forms: textual, archaeological, material, documentary and cartographic, and when considered together they paint a picture of the foundation's fluctuating fortunes throughout the Middle Ages. This paper will demonstrate how this information can be used to illustrate geographically and chronologically the extent of the saint's influence, using GIS techniques to build a series of interpretive maps are then correlated with the wider historical events occurring at the time. My use of GIS to produce these spheres of influence over time therefore also demonstrates a further way of how these geographic tools can be effectively utilised in a historical context.

Richard J Breen, Poul Holm,
Francis Ludlow

Mapping Hiberno-Norse activity in Ireland from the Annals of Ulster

The Annals of Ulster consist of annual entries of events deemed important by contemporary monastic scribes of medieval Ireland, compiled in the late 15th and early 16th centuries, but reliably reporting events from much older (and often now lost) sources. We have surveyed and extracted all entries pertaining to Norse activity in Ireland, including Viking raids and later political and social information about Hiberno-Norse towns. Norse influence in Ireland was immediate; the annals provide much detail regarding conflicts and alliances as Viking raiders settled and became an integral part of Irish culture. Although close reading of the texts can give colour to our perceptions of medieval conflict, mapping activity allows a bird's eye rendering of the annals and their histories, particularly in visualising interpersonal relationships between key characters in Ireland's Norse history and areas of action and influence.

This paper will map Norse activity in Ireland as described in the Annals of Ulster. Our methodology is two-fold; we generate GIS maps from references to identifiable places, and network analyses from a relational

database centred on conflict between characters as described throughout the annals. This project is intended as a proof of concept for the potential of mapping Norse activity in both Ireland and more broadly in medieval Europe. The paper will explore the pedagogical merits of a resource that visualises the evidence of the annals, highlighting the considerations involved in assembling the annals into a digital framework.

Candis Haak

Historical Digital Reconstruction and Analysis of an Early Medieval South Asian Sacred Space

To date, very little exploration of early medieval Hindu architecture, town planning, or landscape design has been done in terms of corporeal experience. Past researchers have, however, discussed elite strategies manifested in South Asian landscapes programmed to assert ideas of kingship and ideologies, though the less-archaeologically visible and local precursors have seldom been sought. To explore this analytical void this paper presents the findings of an exploratory analysis of corporeal development and the material world of the pre- and early imperial (800-1325 CE) site of Vijayanagara City (UNESCO World Heritage Site; Bellary District, Karnataka, India). The pre-imperial landscape of Vijayanagara was a liminal pilgrimage site associated with death rituals and folk deities. Through the use of a geographic information system, coupled with the immersive panoramic capabilities of Google Street View, new insights into the development of religious architecture and devotee corporeal experience have been identified. Consequently, a spectrum of group identities, local and non-local as well as non-elite and elite groups, are distinguishable in a heretofore homogenized pre- and early imperial history. These groups are traceable through their distinct ritual needs that are manifested in the creation, manipulation, and negotiation of space that reflects consistently changing ritual and social needs. By examining the development of the landscape and identifying when and where and how space was altered through digital spatial analytical tools, the political and palimpsestual nature of the area has been made visible.

Keynote 2:

David J. Bodenhamer

The Value (and Future) of Spatial Humanities

The use of spatial theories and technologies within the humanities—the spatial humanities—has led to creative scholarship that has reinvigorated our understanding of space and place in history, literature, archaeology, and allied disciplines. More recently, the spatial humanities also promises to develop a unique postmodern scholarship that accommodates the contingent, fluid, and ambiguous nature of human memories, beliefs, and actions. The goal here is not to sacrifice the rational, logical, and empirical approach to knowledge that has been the hallmark of scholarship since the Enlightenment, but rather to complement it with different ways of discovery.

This presentation explores what we have learned from our application of geospatial technologies to the problems of interest to humanists. It also suggests an agenda for the future of this work, which increasingly will witness the convergence of technologies within new formats, such as virtual reality. One result is likely to be deep mapping, an innovative form of mapping with an emphasis on experiential knowledge that will open scholarship to non-expert audiences. What does this development mean for the spatial humanities as we continue to seek ways to connect matter and meaning on the subjects that interest us?

