CAA Netherlands/Flanders – Annual Chapter Meeting 2019

Leuven, October 28–29, 2019

Meeting Programme

08:30   **Registration**

09:00   **Welcome and introduction**

09:10   **Gary Lock**: Unfolding vistas: moving, seeing and spatial thinking in archaeological GIS.

10:10   **Stef Boogers:** XylArch 2.0: a tool to estimate wood consumption in the past through Monte Carlo analysis in R.

10:35   **Wouter Yperman:** Extracting data and processing ASCII UTF-8 based file formats (aka plain text).

11:00   **Coffee Break**

11:15   **Georgia Panagiotidou, Ralf Vandam, Andrew Vande Moere & Jeroen Poblome:** Visualising Spatiotemporal Settlement Data for Pattern Discovery.

11:40   **Dries Daems:** Modelling the origin of *polis* in Anatolia. From conceptual to computational approaches.

12:05   **Amanda Sengeløv, Giacomo Capuzzo, Sarah Dalle, Rica Annaert, Mathieu Boudin, Guy De Mulder, Marta Hlad, Ioannis Kontopoulos, Charlotte Sabaux, Kevin Salesse, Elisavet Stamataki, Dries Tys, Martine Vercauteren, Barbara Veselka, Eugène Warmenbol & Christophe Snoeck:** Cremations, $^{87}Sr/^{86}Sr$ and ^{14}C: computational approaches to analyse past human mobility in Belgium.

12:30   **Lunch[1]**

13:45   **Roberto De Lima Hernandez, Harco Willems, Toon Sykora, Marleen De Meyer & Maarten Vergauwen:** 'Documenting Djehutihotep's tomb at Dayr al-Barsha: Digital documentation and 3D reconstruction.

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[1] Lunch is not provided by the organisation. There are several options for lunch near the venue.

14:10   Adeline Hoffelinck: Spatial Analysis of a Roman Type of Market Building: Space Syntax as a Tool.

14:35   Ferry van den Oever & Nancy de Jong-Lambregts: Cold case: Kasteel De Middelburg (Alkmaar, NL).

15:00   Manuela Ritondale: Shipwrecks' location and coastal attractiveness: a predictive model for Mediterranean territorial waters.

15:25   Coffee Break

15:40   Danai Kafetzaki, Jeroen Poblome, Andrew Vande Moere & Jan Aerts: Deconstructing the collective reasoning of typology building by means of data and visual analytics.

16:05   Krijn Boom: Teaching through Play: Using video games as a platform to teach about the past.

16:30   Mark Gillings: Spatial Database as Assemblage? Exploring new theoretical frameworks for GIS through the mapping of liminality and affect.

17:30   Closing Drinks (at a nearby pub)

Abstracts

(sorted alphabetically on first author)

XylArch 2.0: a tool to estimate wood consumption in the past through Monte Carlo analysis in R.

Boogers, Stef

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Quantifying the level of wood consumption of past civilizations is a process characterized by large uncertainties that, in previous research, has often been performed through use of a "catch-all" per capita factor. Although a per capita factor is, to a certain extent, a necessity, it does not allow for distinctions other than those caused by changes in population. Even if only orders of magnitude are acquirable, the division of wood consumption into different sectors - each with its own set of relevant parameters and variables - can better allow for comparisons between different localities/periods/… From an ecological viewpoint, preferential use of specific woody species for certain activities can hereby better be taken into account.

In the context of the Sagalassos Archaeological Research Project (Turkey), a tool has already been developed for the calculation of wood consumption from two specific "sectors": the production of Sagalassos Red Slipware and the heating of the local Roman baths in the 2nd century AD. The tool, named "XylArch", was built around the idea of Monte Carlo analysis, whereby values of inputs are not point estimates, but consist of samples from different distributions, resulting in a range of possible wood consumption estimates.

However, the tool was originally only designed for the two aforementioned processes because a relatively high degree of information was retrievable from archaeological research. Therefore, the principle of Monte Carlo analysis is now being scaled up to include a broad range of wood-demanding activities, including construction, household use (heating and cooking), metal working etc. The resulting R Shiny application, XylArch 2.0, will allow users to either fall back on default values for certain variables or to enter their own values, depending on data availability. This contribution aims to showcase the possibilities of the tool, using examples from ongoing analyses on the territory of Sagalassos.

Teaching through Play: Using video games as a platform to teach about the past.

Boom, Krijn

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The video game market forms a major part of the current popular media landscape. Its financial success is for a large part due to its immense reach: millions of players spend their free time in some

form of a digital world, and many of those worlds incorporate some form or variety of digital pasts. The latter comes as no surprise, as 'the past' provides video game developers with recognizable themes, settings, or narrative frameworks, and some developers even hire historians to help them to create authentic worlds.

I argue that the success of these video games provides us archaeologists and historians with a valuable platform to teach about the past in an informative yet fun way. This means that we do not necessarily have to create 'our own' video games - often dubbed 'serious games', but that we can utilize already existing commercial video games to incorporate in our teaching framework. Yet, while using existing commercial games as teaching material provides many opportunities, they also come with caveats. Perhaps the most important factor to consider is that inherent to their nature, these types of games need to be mediated by teachers who don't only understand the historical, or archaeological topics, but also understand what makes a fun video game, in order for them to be used as solid teaching material. Two case studies serve to underline the importance of this mediator role; a study showing how unmediated player empathy leads to false assumptions about the past (Gilbert 2019), and the RoMeincraft project by the VALUE foundation which uses mediators to teach children about Roman heritage using Minecraft. These case studies show both the tantalizing potential of videogames for archaeological education and the potential pitfalls.

Modelling the origin of *polis* in Anatolia. From conceptual to computational approaches.

Daems, Dries
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Cities can be generally considered as a particular form of settlement consisting of a spatial concentration of people. Increasing population density creates pockets of social interaction and information exchange. From a complex systems perspective, these constituent interactions give rise to cities as emergent social units. Urban scaling studies have shown that "energized crowding" effects of social interaction result in increasing returns to scale in economic growth and community formation, but also induce scalar stress leading to community fission. An urban community develops social, economic and political structures in response to positive and negative outcomes of energized crowding.

In recent years, complex systems and urban scaling approaches have started to gain momentum in archaeology. However, for these approaches to gain general acceptance in our discipline, more applications are still needed. For this paper, I wish to present a case study of the development of urbanized and political communities – so-called poleis – in Achaemenid and Hellenistic Anatolia (5th – 1st centuries BCE). I will show how a conceptual model of the origin of polis can be translated into a computational model based on complex systems and scaling perspectives by focusing on key

properties such as social interaction and information exchange between social actors within and between poleis. I will present the preliminary outlines of an agent-based model of polis systems as hubs in a settlement network, pulling in flows of people, information, and resources through the interaction with each other and an overarching Imperial government.

Documenting Djehutihotep's tomb at Dayr al-Barsha: Digital documentation and 3D reconstruction.

De Lima Hernandez, Roberto; Willems, Harco; Sykora, Toon; De Meyer, Marleen & Vergauwen, Maarten

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The archaeological site of Dayr al-Barsha is home to one of the most important provincial elite cemeteries from the Egyptian Middle Kingdom (ca. 2050-1750 BC). Although this necropolis has sparked the interest of several Egyptological and archaeological missions in the past, its monuments remain insufficiently documented. The funerary chapel of governor Djehutihotep in particular deserves special notice because of its highly detailed and relatively well-preserved decoration in paint and relief.

In 2017 a KU Leuven interdisciplinary team started a new program of documentation, research and virtual reconstruction within the framework of the 'Puzzling Tombs' project. Combining digital epigraphy with cutting-edge computational techniques such as Terrestrial Laser Scanning (TLS), image-based digitalization and a custom built 3D visualization environment, a comprehensive record of the monuments will be attained. This will provide researchers with a tool that allows to virtually reconstruct these fragmented monuments and puzzle their original wall decorations back together.

The research presented here features within the 'Puzzling Tombs' project (nr. 3H170337), funded by the KU Leuven 'Bijzonder Onderzoeksfonds' and supervised by Harco Willems, Marleen De Meyer and Maarten Vergauwen.

Spatial Database as Assemblage? Exploring new theoretical frameworks for GIS through the mapping of liminality and affect.

Gillings, Mark

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Whilst we have been quick to realise the methodological possibilities of GIS and worked hard to develop them, we have perhaps paid too little attention to the theoretical frameworks that underpin our GIS-based analyses. Too often we are content to simply co-opt a convenient pre-existing theoretical package; either bolting it on or using it in a post-hoc fashion to justify what we have already done – cultural ecology, phenomenology, optimal foraging theory to name but a few. I intend to argue

that to get the most out of the computational methods we are developing, we need to not only build methods and tools, but we also need to build theory. And now is the ideal time to do this, as we find ourselves in the midst of a subtle (yet radical) revolution in archaeological thought, as a raft of new ideas and ways of conceiving past worlds are beginning to gain traction. My aim is to demonstrate how computational techniques such as GIS are uniquely placed to make a proactive contribution to current theoretical debates regarding themes such as ontology, alterity, relationality and affect. This is by treating the spatial database less as a filing cabinet of static data layers, and more as an active, effective assemblage.

Spatial Analysis of a Roman Type of Market Building: Space Syntax as a Tool.

Hoffelinck, Adeline

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One of the objectives of my doctoral research is studying the spatial organization of an economic relevant building in Roman towns, the macellum, to which fresh goods must have been transported on a regular basis and which was visited by the city's inhabitants daily. Until now research on the macellum has mostly been focused on what happened inside the building, neglecting its 'outside' organization, namely how movement towards the building was actually organized. We can imagine that, to facilitate the delivery of goods and the access, not only of inhabitants but also of people visiting the city, the market building must have been located in a highly accessible spot. To test this hypothesis, two major angles were chosen. First of all, I have compiled all the town plans where the location of the macellum is known, after which I have analysed the embedment of the building into the street network and its relationship with other important town features, e.g. major streets, gates, harbours and public buildings. Second of all, and this will be the main topic of my talk, I have selected some of these town plans, the best preserved ones, to study more thoroughly with Space Syntax. Already in several other archaeological studies, Space Syntax has proven to be an excellent tool in revealing the streets that were chosen most as destination within the city and the streets that were chosen most to reach this particular destination. Thus, Space Syntax has the potential to detect the most used traffic axes. By using this technique, and more specifically segment analysis, I hope to gain more information on the accessibility of the macellum within several Roman towns. In this talk I will present the data I have processed so far and I would like to focus on several problems I have encountered while using this type of spatial analysis.

Deconstructing the collective reasoning of typology building by means of data and visual analytics.

Kafetzaki, Danai, Poblome, Jeroen; Vande Moere, Andrew & Aerts, Jan
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Tangible remains are usually abundant in archaeological excavations and ceramics are probably the most common type, from late prehistoric times onwards. Material specialists study a plethora of artefacts and develop an understanding of the finds which allows arranging these towards a typological classification model. This arrangement starts with describing the objects employing a suitable set of variables, and continues with defining exclusive classes for each group of objects based on necessary and sufficient conditions. Commonly (but not uniquely), the conceptual analysis begins with the identification of the fabric class, followed by functionality and the definition of types and variants. The ultimate categorization depends on the subtlety of the finds and the research questions, and uses geometrical and decorative characteristics that material specialists can visually discern. The processes of grouping and classification therefore involve the assessment of multiple factors which makes typology building a complex task.

Such a classification model was published in 1999 for Sagalassos Red Slip Ware, a Roman Imperial to Early Byzantine tableware produced at Sagalassos (SW Turkey), combining conceptual, practical and analytical approaches. In this paper, we use the same ceramic artefacts to tackle the objective of typological arrangement in a data-driven approach. We develop exploratory models to ascertain patterns of associations among the dimensions of the dataset and seek for statistically significant factors and interactions in multiway tables. We do not distinguish between response and explanatory classification variables to impose no restrictions in the rationale of material sorting from scratch. Given the fuzzy and complex aspects of the task, we employ visual analytics to initiate the interpretation, assess the model validity and define leverage points. With this paper, we deal with the complexity of typology classification using statistical and visual means and we endeavour a semi-automatic solution to boost the initiation of this task.

Unfolding vistas: moving, seeing and spatial thinking in archaeological GIS.

Lock, Gary
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It is a given that archaeology is a spatial discipline as underlies the massive increase in the use of GIS and related technologies. This talk will start by taking a step back and considering the wider context of spatial thinking and spatial analysis and how these relate to quantitative data and qualitative questions. Briefly referring to some basic concepts such as models, landscape and scale we will move on to look in more detail at visibility and movement studies and how they have attempted to

'humanise' GIS-based archaeological landscapes. It will be argued, however, that to think spatially visibility needs to be integrated with movement rather than the two working independently.

Visualising Spatiotemporal Settlement Data for Pattern Discovery.

Panagiotidou, Georgia; Vandam, Ralf; Vande Moere, Andrew & Poblome, Jeroen
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One of archaeology's research themes is to understand underlying patterns of human settlements. When working at a regional scale, the primary source material for such an inquiry consists of dated artefact fragments collected from archaeological surveying. Subsequently, the analysis for settlement patterns includes plotting the artefact collections spatially with GIS software. However, these visualisation choices, do not support deeper exploration such as analysis relating to settlements continuity or instability over time. We faced this challenge as part of an ongoing attempt to uncover settlement patterns in the region of Sagalassos where after 30 years of extensive and intensive archaeological surveying, our dataset has evolved into a rich resource with multiple dimensions for exploration.

Through an iterative design approach including both data visualisation specialists and archaeologists, we documented several ways to visualise this data, combining the dimensions of time, location and settlement type. After assessing them for their potential to give insight on both the spatial and temporal patterns, we propose a custom visualisation we call a timeprint to address the aforementioned issues.

We will present our workflow including tools such as R, QGIS and D3 as well as discuss the proposed visualisation in terms of what insights it can communicate and what it occludes. This paper will be of interest for other archaeological projects working with regional settlement data wanting to gain insights beyond the traditional "dots on a map" approach. More broadly, this design study informs the digital humanities on techniques for the distant reading of archaeological settlement data.

Shipwrecks' location and coastal attractiveness: a predictive model for Mediterranean territorial waters.

Ritondale, Manuela
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Within the maritime domain there have been very few projects attempting to develop predictive maps for shipwrecks' location, which is a paradox if one considers the many logistic and economic limitations of underwater surveys. This highlights specific problems of data biases preventing the adoption of

inductive approaches, but also a more general distrust of an approach accused of oversimplifying complex phenomena in order to produce quantifiable outcomes. This distrust reflects a mistaken notion of what formal modelling in general, and predictive modelling in particular are, and what they should achieve.

While presenting the final results of a PhD-project aimed at developing both a suitable theory and a new GIS-based methodology for the prediction of wreck-events in Mediterranean territorial waters, I will focus on the main challenges and shortcomings of current archaeological predictive models in maritime context, which the research has attempted to overcome. Foremost among these are the problematic incorporation of cognitive and cultural factors and the controversial way that 'coastal navigation' has been theorized and modelled, both of which turn out to be sides of the same coin.

Indeed, in order to model coastal navigation one should first wonder what makes a navigation 'coastal', and which are the considerations leading a mariner to approach the coastline or rather to stay far from it. This means considering, from a historical and cultural perspective, advantages and disadvantages connected to coastal proximity. Historical sources and archaeological sites from antiquity to the Middle Ages have been examined to this end. The resulting GIS implementation for optimizing archaeological shipwreck prediction within the twelve nautical miles zone will be presented. The model is developed at two scales of analysis in order to meet the need for both a general spatial planning tool, and a detailed research tool for historical and archaeological analysis.

Cremations, ^{87}Sr/^{86}Sr and ^{14}C: computational approaches to analyse past human mobility in Belgium.

Sengeløv, Amanda; Capuzzo, Giacomo; Dalle, Sarah; Annaert, Rica; Boudin, Mathieu; De Mulder, Guy; Hlad, Marta; Kontopoulos, Ioannis; Sabaux, Charlotte; Salesse, Kevin; Stamataki, Elisavet; Tys, Dries; Vercauteren, Martine; Veselka, Barbara; Warmenbol, Eugène & Snoeck, Christophe
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A growing interest into recognizing movements of people, objects and ideas in the past has been characterizing the scientific community in the last decades. The CRUMBEL project aims at innovating this field, studying the collections of cremated bone found in Belgium dating from the Neolithic to the Medieval period using state of the art analytical and geochemical analyses.

In this paper, we want to integrate different techniques and kinds of data, such as strontium (Sr) measurements, radiocarbon dates and network analyses to detect people movement in prehistoric Belgium. A bioavailable Sr map of Belgium will be created to link the analysed individuals to certain locations. Different vegetation (grass, shrubs, and trees) of ca. 300 points in Belgium will be sampled to estimate the local 87Sr/86Sr signature of each area. Different variables will be taken into account

such as geology, soil type, elevation, climate, etc., which could influence the local 87Sr/86Sr signature. By combining all data using statistical analyses in R, a Sr isocape of Belgium will be generated.

Several thousands of individual Sr measurements on cremated human bone will become available thanks to CRUMBEL. These near-big data require a mathematical and automated approach. In search for an interpretation method that allows complex visualisation, network analysis is being tested to process and interpret this type of data. Relations between place of origin and final resting place are being studied. This method will help to identify patterns and clustering in the data, to understand how humans preferred to move through the landscape. In order to locate in a precise chronological framework the specific episodes of people movements detected from Sr analyses, a lot of the measured samples are submitted to 14C dating. This will allow to contextualize the observed trends with local archaeological narratives. Geostatistical and Bayesian analyses are implemented in this phase.

Cold case: Kasteel De Middelburg (Alkmaar, NL)

Van den Oever, Ferry & de Jong-Lambregts, Nancy

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Een relatief klein kasteel met beperkt militair nut, zo leek het althans op basis van opgravingen gedaan in 1942 en 1971… Hoe anders bleek het te zijn na uitvoering geofysisch onderzoek , gecombineerd met luchtfotografie WO2 en historisch-archeologisch onderzoek.

In 2018 en 2019 hebben de gemeente Alkmaar en Saricon gezamenlijk uitgebreid inventariserend onderzoek gedaan naar verschillende kasteelterreinen in Alkmaar. Deze presentatie richt zich specifiek op de case kasteel De Middelburg. Hoe digitale methoden een archeologische coldcase nieuw leven hebben ingeblazen en de kijk totaal veranderd hebben.

Er is gebruik gemaakt van een combinatie van geofysische technieken (GPR, 3 verschillende systemen, MAG (gradiometrie) en EMI). Maar zonder bestudering van gegeorefeerde luchtfoto's uit WOII en hernieuwd historisch onderzoek, was zowel de geofysische onderzoeksopzet, alsook de interpretatie van de resultaten niet succesvol geweest.

Wat de resultaten laten zien is niet meer een klein kasteel van beperkt militair nut, maar een geheel nieuwe economische entiteit. Ook de (niet-destructieve!!) vondst van een versterkte voorpoort is heel bijzonder. Nog niet eerder is een Nederland een dergelijke Barbacane bij een kasteel aangetroffen. Ook de Grafelijke rekeningen uit 1445 maken voor het eerst melding van het woord 'Barbelkani' bij kasteel de Middelburg. Vermeend kastelenbouwer Floris V had goede contacten met Edward I van Engeland. Zou hij het Engels kastelenbestek hebben gekopieerd? De Grafelijke Rekeningen zijn een prachtige bron van informatie en geven een kijk op de ambtelijke nijverheid van destijds. Er worden zoveel gebouwen en bijbehorende functies vermeld dat deze naast het kasteel en Barbacane, een

forse voorburcht en haven vergen. Laat de begrenzing van de voorburcht nu weer mooi zichtbaar zijn op luchtfoto's uit 1942. Het onderzoek van deze 'cold case' is nog in volle gang, maar de gangbare visie op kasteel De Middelburg en ook op Floris V als kastelenbouwer is aan een grondige herziening toe.

Voor een impressie van het onderzoek: https://www.youtube.com/watch?v=6pBsHKokd_w

Extracting data and processing ASCII UTF-8 based file formats (aka plain text)

Yperman, Wouter

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In 2018 at the international CAA conference in Tübingen (Germany) there was a session named 'Our little minions: small tools with major impact'. It was a session about small applications, solutions, devices, etc. that were used by archaeologist to make they're live more simple and optimise workflows. At the session there were only two speakers present, so there was an open question for anybody in the session to show anything. There I showed a sample of my little minions. The question was to make my ad-hoc presentation more structural and available for colleagues. So this is it.

My paper is about the method to convert an exported .TXT-file from a GPS into a .DXF-file (CAD-file) by the use of a database application and scripting. The database and scripting is just one way to convert the data, there is no specific need for THIS database or scripting. The basis principals of this method allows to extract data and process any ASCII UTF-8 based file formats to provide solutions for a wide array of situations.

The paper will explain how data from the GPS relates to date of the .DXF-file. This allows for the streamline of both the measurements in the field and the processing of the output plans. By the use of a practical example the paper shows the powerful potential of scripting your way through ASCII UTF-8 based file formats to get the desired output that satisfies the archaeologist without the need of much post-processing of half-baked, default based output files.

A brief touch on other uses will place the example within its broader context.