CHECK OBJECT INTEGRITY

Institute of Archaeology of Jagiellonian University
Polish National CAA Chapter

JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Conference held under the honorary patronage of the Mayor of the City of Krakow Jacek Majchrowski

Kraków

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MUZEUM NARODOWE W KRAKOWIE

Muzeum Krakowa

47th Computer Applications and Quantitative Methods in Archaeology

Annual Conference

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KRAKÓW 2019

Check Object Integrity.
CAA 2019 Kraków: ISBN 978-83-948382-6-3,
Publisher: Institute of Archaeology of Jagiellonian University in Kraków

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WITAMY!

Dear CAA Members
and Annual Conference Attendees,

It is with great pleasure to welcome the participants of the Annual CAA Conference "Check Object Integrity", hosted by Kraków and Jagiellonian University. This event is closely connected with the scientific interests developing at our university, especially in the recent advancements in the field of computer technology. For years, we have been championing efforts to improve the quality of archaeological research with the support of computer applications and quantitative methods. The CAA meetings create an excellent platform to exchange ideas and experiences in this area. I would like to express my gratitude to all participants of the conference and its organizers for maintaining the tradition of these meetings and to ensure that they are being kept at the highest scientific level. I am convinced that Kraków with all its heritage of centuries-old cultural development, history and intellectual achievements, will provide a conference with appropriate atmosphere for the scientific discourse. I wish you all a successful meeting and a pleasant stay at Jagiellonian University.

Prof. **Paweł Valde-Nowak**
Head of the Institute of Archaeology of
Jagiellonian University in Kraków

Dear Colleagues,

It is a great pleasure to welcome you all here in Kraków, at Jagiellonian University to the 47th series of Computer Application and Quantitative Methods in Archaeology conferences. Our city, unlike others, is a great combination of history and tradition with modernity. On one hand, there is the 1000-year history of Kraków with the second oldest university in Central Europe, and on the other hand there are modern research and development centres, intercollegiate synchrotron and tens of thousands of students.

We are delighted that the conference has been organised by our team from the Institute of Archaeology, which is the oldest Polish archaeological research institution. The Institute has been conducting research around the world e.g. from Southern and Northern Americas through Europe and the Middle East, to the Altai Mountains.

It is already the 47th meeting of the CAA community. Throughout this time, since the 1st CAA meeting, archaeologist have been exchanging their experiences of the usage of computers and statistical methods. The CAA conferences have become one of the most crucial events within the archaeological community interested in the development of scientific methods of acquiring and analysing the research of our discipline.

The conference has been prepared for you by the Organizing Committee and a group of volunteers from our Institute. On their behalf, I would like to wish you a wonderful conference but also to have a good time in vernal Kraków.

Łukasz Miszk
Head of Organizing Committee

CITY CENTER MAP

CONFERENCE VENUE
Auditorium Maximum (ul. Krupnicza 33)

WORKSHOPS
Collegium Minus (ul. Gołębia 11)
Collegium Witkowski (ul. Gołębia 13)

ICEBREAKER PARTY
Collegium Maius (ul. Jagiellońska 15)

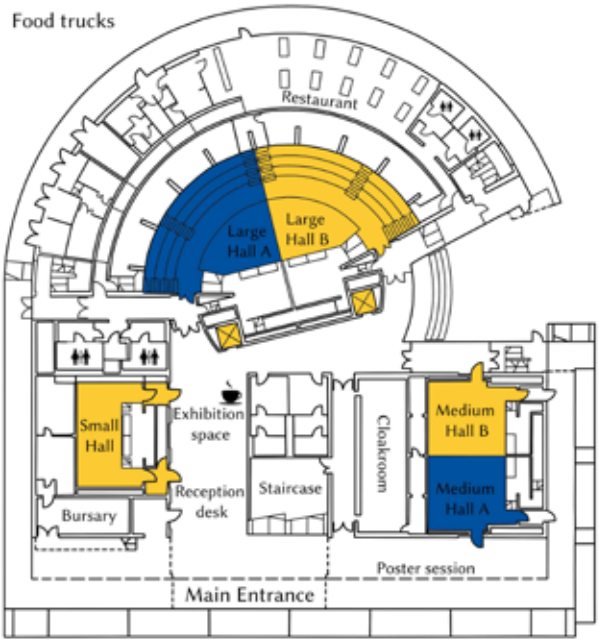
CONFERENCE DINNER
Manggha Museum (ul. Marii Konopnickiej 26)

VENUE

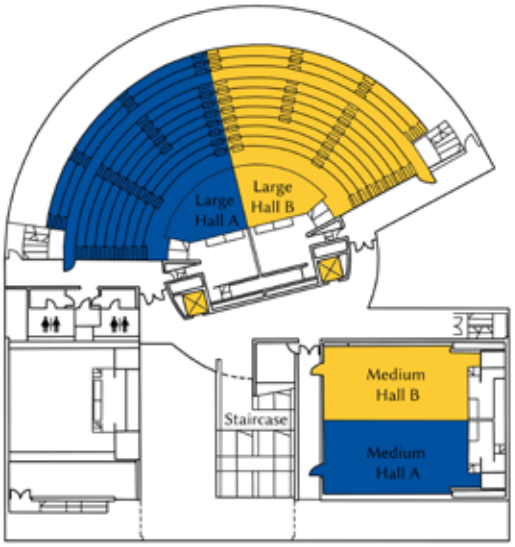
AUDITORIUM MAXIMUM

(address: ul. Krupnicza 33)

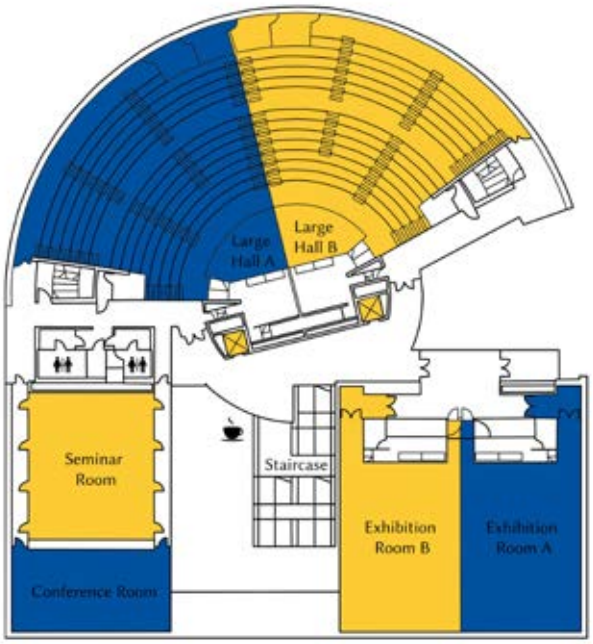
The conference takes place in a modern building of Jagiellonian University located on Krupnicza Street within a walking distance to the Main Square. Opened in 2005, Auditorium Maximum contains various rooms adapted for conference and teaching purposes, including a large amphitheatre hall. Spacious hallways and the lounge are the areas where coffee breaks and poster sessions will take place, providing a nice background for talks and discussions. Having lunch break at the restaurant located on ground floor will be an excellent opportunity for those who prefer to stay in the conference building.



Level 0



Level 1



Level 2

SOCIAL EVENTS

ICEBREAKER PARTY

(Tuesday, April 23th, 17:00-21:00; address: ul. Jagiellońska 15)

On Tuesday, after the workshops, we would like to invite you to the Icebreaker Party which will be held in Collegium Maius, the oldest university building in Kraków, built in 14th and rebuilt in the following century. It is located at the corner of ulica Jagiellońska (Jagiellon Street) and ulica Świętej Anny (St. Anne Street) just a minute walk from the Main Square. Today Collegium Maius serves as a museum of our university and we have prepared a free guided tour for those who would wish to experience the life of a student from Nicolaus Copernicus times. The party will be set on its arcade courtyard and also in the scenic garden.

The access to the event is possible only with yellow dot on the badge.

CONFERENCE DINNER AT THE MANGGHA MUSEUM

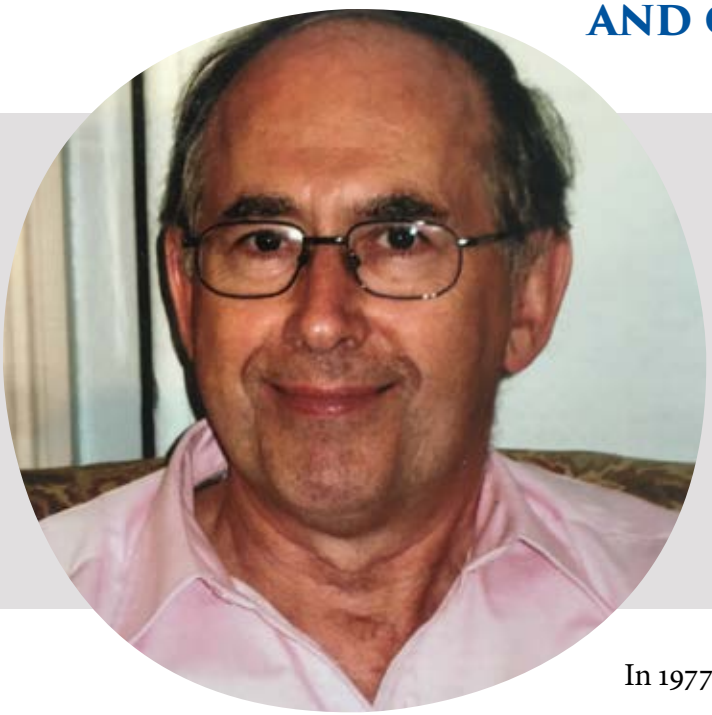
(Thursday, April 25th, 20:00-23:00 ; address: ul. Marii Konopnickiej 26)

On Thursday, we will have a reception at the Manggha Museum of Japanese Art and Technology or in short, the Manggha. Created on the initiative of Polish film director Andrzej Wajda and opened in 1994 as the Manggha Centre of Japanese Art and Technology. The Museum collection consist of artwork donated by the writer and collector of art, Feliks Jasieński to the National Museum in Krakow in 1920. It houses a collection of Far Eastern Art in addition to serving as a host for various cultural events. Manggha is located near the Vistula River, opposite Wawel Castle, which creates a unique and scenic view. The impressive form of the building, reminding the river's meander, was created by the famous Japanese architect Arata Isozaki, in collaboration with Krakow architects. The reception will combine a dinner with a plethora of dishes served buffet-style with a party, with dancefloor and DJ.

The access to the event is possible only with blue dot on the badge.

KEYNOTE

REFLECTIONS ON METHOD AND THEORY AT THE INTERFACE BETWEEN ARCHAEOLOGY AND COMPUTER APPLICATIONS



JOHN
BINTLIFF

In 1977 I took up my first lectureship, in Archaeological Sciences at Bradford University, when the university was encouraging staff to buy their first desktop computer. Since then digital archaeology has been a constant companion in my fieldwork and library research, and although I am not a computer archaeologist, I have always worked closely with those who are. This presentation will focus on the unavoidable, usually fruitful, but often difficult relationship between the approaches favoured by the digital community and the realities of archaeological data and interpretation. The examples given stem from my own experiences from the 1970s to the presentday, and include Sampling strategies, Landscape GIS, Ceramic Study, Big Data, Network Analysis and Virtual Reality.

SCHEDULE

Tuesday

08.00 - 16.00 › **Registration**
10.00 - 16.00 › **Workshops**
17.00 - 21.00 › **Icebreaker Party**

Wednesday

07.30 - 17.00 › **Registration**
09.00 - 10.00 › **Welcome Adresses & Keynote**
10.20 - 18.00 › **Sessions**

Thursday

07.30 - 17.00 › **Registration**
08.40 - 15.00 › **Sessions**
15.00 - 16.00 › **Poster session**
16.00 - 18.00 › **Annual General Meeting**
20.00 - 23.00 › **Conference Dinner**

Friday

07.30 - 17.00 › **Registration**
08.40 - 18.40 › **Sessions**

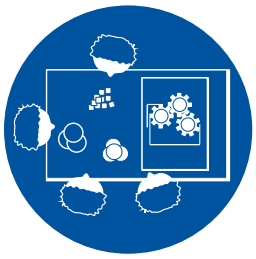
Saturday

09.50 - 18.00 › **Excursions**

TUESDAY, 23 APRIL 2019

WORKSHOPS

(Collegium Minus & Collegium Witkowski, 10:00-16:00)



Conference Workshops will be organised by the Faculty of History of Jagiellonian University. They will take place in two adjacent buildings Collegium Minus (ul. Gołębia 11) and Collegium Witkowskiego (Gołębia 13). These buildings are located in the old city centre in the heart of our university.

The Collegium Minus is one of the oldest buildings of the university, standing next to the Collegium Maius. This building is a burgher house, bought by the university in 1449. Fragments of the former building have survived in the cellars – the Gothic Lecture Hall until today. Today, it houses the Institute of Archaeology.

The Collegium Witkowski was erected in 1908-11. The building is a combination of Gothic-revival, Romanesque-revival and Art Nouveau styles. It was named after August Witkowski - a physicist who worked on physical properties and laws concerning gases especially in low temperatures. In 1910-1911 he was a rector of the university. Originally the building used by the physics department, it now serves the Institute of History.

Philip Verhagen, Steve Stead

WORKSHOP 1: IMPROVING PRESENTATION SKILLS

Gisli Palsson

WORKSHOP 2: FROM SHAPES TO SEQUELS: THE VALUE OF INTEGRATING POSTGIS WITH QGIS

Tomasz Łojewski

WORKSHOP 3: REFLECTANCE TRANSFORMATION IMAGING

Clemens Schmid, Martin Hinz, Carolin Tietze

WORKSHOP 4: CAA SCRIPTING LANGUAGES HACKATHON I – CAN YOU CODE THIS?

WORKSHOPS

Gabriele Gattiglia, Michael Remmy, Holly Wright

WORKSHOP 5: ARCHAIDE. A NEURAL NETWORK FOR AUTOMATED RECOGNITION OF ARCHAEOLOGICAL POTTERY

Eleonora Gandolfi

~~WORKSHOP 6: THE BLOCKCHAIN: MEET THIS "UNKNOWN FRIEND"~~

Stefani Crabtree, Enrico Crema, Iza Romanowska, Colin Wren

WORKSHOP 7: AGENT-BASED MODELLING FOR ARCHAEOLOGISTS

Angus Mol, Aris Politopoulos

WORKSHOP 8: INTERACTIVE HISTORYTELLING WITH TWINE

Serdar Aydin, Zeynep Özge Özdemir

WORKSHOP 9: KILL THE MUSEUM BY DESIGN: A DESIGN APPROACH FOR CREATION AND SHARING OF INFORMATION AND NARRATIVES

Karin Lund

WORKSHOP 10: INTRASIS WORKSHOP

ICEBREAKER PARTY

(Collegium Maius, 17:00-21:00; address: Jagiellońska 15)

WEDNESDAY, 24 APRIL 2019

	Medium A	Medium B	Exhibition A
09:00 - 10:00	**WELCOME ADDRESSES AND KEYNOTE** *Large Hall*		
10:00 - 10:20	**COFFEE BREAK**		
10:20 - 12:40	S02: Progress in WebGIS and DB solutions for Archaeology ***Matsumoto, Uleberg, Hochschild, Märker, Willmes***	S22: Digital Infrastructures for Archaeology: Past, Present and Future directions ***Richards, Wright, Niccolucci***	S24: New methods for stratigraphic modeling ***Andreaki & Barceló***
12:40 - 14:00	**LUNCH BREAK**		
14:00 - 15:40	S02: Progress in WebGIS and DB solutions for Archaeology ***Matsumoto, Uleberg, Hochschild, Märker, Willmes***	S22: Digital Infrastructures for Archaeology: Past, Present and Future directions ***Richards, Wright, Niccolucci***	S24: New methods for stratigraphic modeling ***Andreaki & Barceló***
15:40 - 16:00	**COFFEE BREAK**		
16:00 - 18:00	O29: Our little minions, part 2: small tools with major impact ***Visser, Thiery, Mennenga***	S22: Digital Infrastructures for Archaeology: Past, Present and Future directions ***Richards, Wright, Niccolucci***	S24: cont. S27: Chasing heritage thieves: digital methods and approaches to contrasting trafficking and looting of cultural property ***Traviglia & Giovanelli***

SESSIONS

Exhibition B	Large Hall A	Seminar	Small Hall
WELCOME ADDRESSES AND KEYNOTE *Large Hall*			
COFFEE BREAK			
S05: R as an archaeological tool: current state and directions (vol. II) ***Tietze, Schmidt, Grunert***	S26: Archaeological network research: formal network representation of archaeological theories ***Gheorghiade & Brughmans***	S28: Computational classification in archaeology ***Nakoinz & Hinz***	S41: From Micro to Macro: computer-based approaches for the analysis of big data in the study of artefacts and societies ***Lorenzon & Kaliszewska***
LUNCH BREAK			
S14: Modelling Data Quality in archaeological Linked Open Data ***Bruhn, Mees, Thiery***	S26: Archaeological network research: formal network representation of archaeological theories ***Gheorghiade & Brughmans***	S28: Computational classification in archaeology ***Nakoinz & Hinz***	S01: Student and Early-Career researcher session ***Miles***
COFFEE BREAK			
S46: Spatial Analysis of 3D Archaeological Information: Method and Theory ***Nobles & Raether***	S31: In pursuit of social space. Detecting activity areas in Palaeolithic contexts ***Moreau, Spagnolo, Morera, Wiśniewski, Nieto-Márquez***	R03: Roundtable Scientific Scripting Languages in Archaeology - Limits and Opportunities of Open Research ***Hinz, Schmid, Schmidt***	S01: Student and Early-Career researcher session ***Miles***

THURSDAY, 25 APRIL 2019

	Medium A	Medium B	Exhibition A
08:40 - 10:40	R39: The European Research Council (ERC): funding excellent research in the field of Archaeological Science *Priki*	O23: Taking your GIS onto the field. 'How'-s and 'Why'-s of future survey *Buławka, Campana, Chyla*	R36: User Experience Design in Archaeology and Cultural Heritage *Dolcetti, Perry, Opitz*
10:40 - 11:00	**COFFEE BREAK**		
11:00 - 12:40	S42: New technologies in woodland archaeology: problems and limitations *Niedziółka, Konczewski, Jakubczak*	O23: Taking your GIS onto the field. 'How'-s and 'Why'-s of future survey *Buławka, Campana, Chyla*	R36: User Experience Design in Archaeology and Cultural Heritage *Dolcetti, Perry, Opitz*
12:40 - 14:00	**LUNCH BREAK**		
14:00 - 15:00		O23: Taking your GIS onto the field. 'How'-s and 'Why'-s of future survey *Buławka, Campana, Chyla*	
15:00 - 16:00	**POSTER SESSION & COFFEE** *Level 0 - next to Main Entrance*		
16:00 - 18:00	**ANNUAL GENERAL MEETING (AGM)** *Large Hall*		

SESSIONS

Exhibition B	Large Hall A	Seminar	Small Hall
R08: Teaching Digital Archaeology *Sonnemann, Kiarszys, Traviglia*	S34: Archaeological Data for Modern Problems. Modern Methods for Archaeological Questions *Crabtree & Romanowska*	O20: Recent Developments in Digital Numismatics – Breaking down barriers *Gruber, Tolle, Wigg-Wolf*	S01: Student and Early-Career researcher session *Miles*
COFFEE BREAK			
R08: Teaching Digital Archaeology *Sonnemann, Kiarszys, Traviglia*	S34: Archaeological Data for Modern Problems. Modern Methods for Archaeological Questions *Crabtree & Romanowska*	R09: Thinking out of the classroom: sharing knowledge and resources for education and training in digital archaeology *Verhagen, Lang, Kondo, Stead*	S01: Student and Early-Career researcher session *Miles*
LUNCH BREAK			
	S34: Archaeological Data for Modern Problems. Modern Methods for Archaeological Questions *Crabtree & Romanowska*	O35: Extreme Data Processing in Archaeology *Cuy, Ducke, Foertsch, Block-Berlitz*	S01: Student and Early-Career researcher session *Miles*
POSTER SESSION & COFFEE *Level 0 - next to Main Entrance*			
ANNUAL GENERAL MEETING (AGM) *Large Hall*			

FRIDAY, 26 APRIL 2019

	Medium A	Medium B	Exhibition A
08:40 - 10:40	S33: Digital Landscapes in Archaeology: From field recording to the reconstruction of human use of space *Herrera Malatesta, Hinojosa-Balino, Hernández Cordero*	S13: Ethics in Digital Archaeology: Concerns, Implementations, and Successes *Dennis*	S21: Challenges and opportunities of machine learning in archaeological research *Brandsen, Kramer, Verschoof-van der Vaart*
10:40 - 11:00	COFFEE BREAK		
11:00 - 12:40	S33: Digital Landscapes in Archaeology: From field recording to the reconstruction of human use of space *Herrera Malatesta, Hinojosa-Balino, Hernández Cordero*	S04: Digital archaeology of modern conflict landscapes *Kiarszys & Kostyrko*	S21: Challenges and opportunities of machine learning in archaeological research *Brandsen, Kramer, Verschoof-van der Vaart*
12:40 - 14:00	LUNCH BREAK		
14:00 - 15:40	S18: Immersive Digital Media in Archaeology: Memory, Place and Performance *Beale, Richards, Smith*	S04: Digital archaeology of modern conflict landscapes *Kiarszys & Kostyrko*	S11: Pre-modern cities and complexity *Paliou, Artopoulos, Romanowska, Crawford, Kalayci*
15:40 - 16:00	COFFEE BREAK		
16:00 - 18:40	S18: Immersive Digital Media in Archaeology: Memory, Place and Performance *Beale, Richards, Smith*	S25: "Real-time" archaeological data. Hyperreality, temporality and materiality of digital archaeological objects *Stobiecka*	S11: Pre-modern cities and complexity *Paliou, Artopoulos, Romanowska, Crawford, Kalayci*

SESSIONS

Exhibition B	Large Hall A	Seminar	Small Hall
S06: Recent advances in spatial statistics for archaeology *Roe & Carrer*	O37: 3D Publishing and Sustainability: Taking Steps Forward *Sullivan, Richards-Rissetto*	S15: Issues of scale in archaeological computational modelling *Davies & Wren*	S01: Student and Early-Career researcher session *Miles*
COFFEE BREAK			
S06: Recent advances in spatial statistics for archaeology *Roe & Carrer*	S17: Empowering Archaeology of the Senses through digital approaches *Landeschi, Richards-Rissetto*	S32: Multiscalar and Multivariate Approaches to Digital Documentation of Archaeological Sites *Ippolito & Rissolo*	S01: Student and Early-Career researcher session *Miles*
LUNCH BREAK			
S45: Virtual Reality and 3D modeling: Where are we now? *Zarmakoupi*	S17: Empowering Archaeology of the Senses through digital approaches *Landeschi, Richards-Rissetto*	O07: Teaching 2.0: Show me how you teach! *Tietze & Hageneuer*	S44: Analysing Shape in the Digital Age: Current Considerations in Archaeological Application of Geometric Morphometrics *Hoggard, Stark, Roth, Janin*
COFFEE BREAK			
R19: Our knowledge is all over the place! *Reilly, Stead, Pouncett*	S40: Argumentation and the Archaeological Record *Gonzalez-Perez, Martin-Rodilla, Pereira-Fariña*	O07: Teaching 2.0: Show me how you teach! *Tietze & Hageneuer*	R16: Where does global meet local? Finding common ground for multiscalar analysis of settlement and land use dynamics *Verhagen & Nuninger*

SATURDAY, 27 APRIL 2018

TOUR 1: WIELICZKA SALT MINE TOUR

The remarkable and breathtaking site the Wieliczka salt mine has been listed on the UNESCO World Heritage List since 1978. The unique "underground town" consists of 300 kilometers of tunnels, shafts, chambers, chapels and lakes. Nine levels of mine's development reaches 327 meters under the surface.

By visiting the mine you can be among the famous visitors such as Nicolaus Copernicus, Johann Wolfgang von Goethe, Alexander von Humboldt and John Paul II who visited the mine and discovered this amazing place. During the tour you will have a chance to learn about history and the development of salt-mining from prehistoric times. English speaking guide will present the local legends and miners' daily life. You will explore the underground lakes, chapels and the monumental St. Kinga's Chapel. The Wieliczka Salt Mine is a must-see place in Poland.

Meeting /Drop off point: Auditorium Maximum, ul. Krupnicza 33
Pick up time: Saturday 27th April 2019 9:50 am
Duration: ca. 4 hours

During the tour you will be assisted by English speaking tour leader. The Salt Mine tour will be carried out by an experienced guide. At the entrance you will be given headsets and receivers since the guide will use the voice transmitter.

Salt Mine regulations:
Please keep in mind that you will have to climb 380 steps down.
The photo fee: 10 PLN.
The temperature in the mine is constant (about 14°C/58°F) please take warm clothes

EXCURSIONS

TOUR 2: THE MEMORIAL AND MUSEUM AUSCHWITZ-BIRKENAU TOUR

KL Auschwitz is the largest former German Nazi concentration and extermination camp. Over 1.1 million women, men and children lost their lives there. Auschwitz-Birkenau has been a symbol of Holocaust since it became the deadliest extermination centre of European Jews. The victims were transported from all over of the Nazi occupied Europe. The complex has been preserved as a memorial museum and has remained as a living monument of genocide and as a warning for next generations, according to quote by George Santayama: "Those who cannot remember the past are condemned to repeat it."

The visit is divided into two parts. Firstly you will pass the gate with the infamous inscription above your heads: Arbeit Macht Frei in Auschwitz I: the concentration camp. You will learn about the everyday life of prisoners. You will see the multitude of confiscated belongings of the Nazi victims. In the extermination camp of Auschwitz II: Birkenau you will experience the horror of the Jews unconsciously led to death.

Meeting /Drop off point: Auditorium Maximum, ul. Krupnicza 33
Pick up Time: Saturday, 27th April 2019 9:50 am
Duration: ca. 8 hours

During the tour you will be assisted by English speaking Tour Leader. The tour will be carried out by a museum guide. At the entrance you will be given the headsets and receivers since the guide will use the voice transmitter. The tour is divided into two parts. In Auschwitz I (Concentration Camp) the tour takes around 2 hours, then the short break is provided. Next you will move to Auschwitz II Birkenau (Concentration and Extermination Camp) by a bus (5 minutes ride) where the visit lasts usually about 1 hour.

Museum Regulations:
At the entrance of the Museum there is a security control (similar to those at airports). You will be asked to empty your pockets and put every metal object onto a basket.
The weapons (knives, scissors), alcoholic beverages, food are not allowed in the museum. Smoking is allowed only in designated areas. Taking photos is allowed (without flash inside buildings).
IMPORTANT: You can carry inside only a small bag.
The allowed dimensions: 30×20×10 (A4 format)

SESSIONS

CAA 2019

Standard session 01:
Student and Early-Career researcher session

***James Miles**, Archaeovision*

Small Hall, 14.00 – 17.40, 24 April 2019
9.40 – 15.00, 25 April 2019
8.40 – 12.40, 26 April 2019

Following the steering committee meeting for CAA-2018, it was decided to create a session for all student and early-career researchers (up to three years post degree) who wish to present at CAA for the first time, aimed predominately for those who may not wish to present in alternate specialised thematic sessions. This session will only be open to students and early-career researchers, with all student papers being automatically considered for our annual Nick Ryan Bursary. Only those presenting in this session will be nominated for this prestige award and will allow for the best student paper to be identified, with the recipient receiving 1000 euros towards the costs of attending CAA-2020. The session will be actively publicised, and it is hoped that it will be well attended, acting as a way for students and early-career researchers to engage with the CAA community for the first time. All members of the reviewing panel for the Nick Ryan Bursary will be present and will be on hand to provide useful feedback around presentation style and the content discussed. The session will include all themes and topics. The aim of this session will be to introduce new members to the CAA community and to create a focussed session that allows CAA members to view all Nick Ryan Bursary nominated papers. In turn this will create a greater review process, with each paper being assessed against the others presented in the session.

24TH APRIL

14.00 – 14.20
No Longer Standing: Digital Applications for the Relocation of the Perrenoud Homestead,
Madisen Hvidberg, Peter Dawson

14.20 – 14.40
Re-visiting of Shivta. Aerial and land surveys on the Byzantine site in the Negev,
Maciej Wacławik, Konrad Górski

14.40 – 15.00
Intersecting Landscapes: A Multi-Model Approach to Understanding Dynamic Spatial Power Relations in an Agricultural Context,
Stefan Woehlke

15.00 – 15.20
Computational Erosion Modeling of San Miguel Island: Preserving Archaeological Sites,
Yesenia Garcia, Isaac I.T Ullah

15.20 – 15.40
General Discussion

COFFEE BREAK

16.00 – 16.20
'Brochs' - built for visibility?
Anna Katharina Loy

16.20 – 16.40
Applying space syntax to insula V ii in Ostia: A comparative assessment of four space syntax methods,
Alexander C.Q. Jansen

16.40 – 17.00
From text to data: a NLP approach to digital archaeology,
Elisa Paperini, Nevio Dubbini, Gabriele Gattiglia

17.00 -17.20
Surveying the Okak Inuit Winter Village using Exploratory Photogrammetry,
James Samuel Williamson, Francois P. Levasseur, Peter Whitridge

17.20 – 17.40
Applying an Agent-Based Sailing Model to the Iron Age English Channel,
Karl Smith

25TH APRIL

9.40 – 10.00
Ideology in Architecture: Analysing the Visibility of Household Shrines in Pompeii,
Max Timothy, Boyd Peers

10.00 – 10.20
'MEETING THE MINOANS' – an Assesment of Visitors' Experience on a Bronze Age Archaeological Site in Crete,
Thérèse Claeys

10.20 – 10.40
Unlocking Roman Houses. Space Syntax Analysis in the nova urbs of Italica (Baetica),
Sarah Al Jarad

COFFEE BREAK

11.00 – 11.20
Issues of preservation of archaeological material in the process of creation of accessible data sets,
Stepan Stepanenko

11.20 – 11.40
Using XRF spectrometry and Statistical Analysis to determine the provenance of Ancient Egyptian Faience,
Michelle F Whitford, Damian Gore, Timothy D Murphy, Michael Alderson, Paul Pigram, Michael J Withford

11.40 – 12.00
Maps as Bodies, Bodies as Maps in 3D GIS,
J. Alyssa White, John Pouncett, Rick Schulting

12.00 – 12.20
Comparison of ground control points surveying techniques for photogrammetric documentation of archaeological excavations,
Joachim Pawliński, Adam Wala, Edyta Puniach, Paweł Ćwiąkała

12.20 - 12.40
A GIS-based approach for understanding landscape-scale mobility using stone artefacts,
Matthew Barrett

LUNCH BREAK

14.00 – 14.20
An Automated Approach to Segmentation and Refitting of Fragmented Faunal Remains Using Differential Geometric Methods,
Katrina Yezzi-Woodley, Jeff Calder, Peter Olver, Martha Tappen, Reed Coil, Anthony Yezzi, Cheri Shakiban, Pedro Angulo-Umaña, Riley O'Neill, Bo Hessburg, Jacob Elafandi

14.20 - 14.40
Dorset Harpoon Head 3D Morphometric Variability in the Eastern Canadian Arctic and Subarctic,
Francois P. Levasseur

14.40 – 15.00
Recycled Blessings? Investigating a Votive Animal Mummy using Non-Destructive Neutron and X-ray Imaging,
Carla Adele Raymond, Joseph J Bevitt, Yann Tristant, Ronika K Power, Anthony William Lanati, Christopher Davey, John Magnussen, Simon Martin Clark

26TH APRIL

8.40 – 9.00
Comparison of the quality of models created from different photogrammetric data and used to present cultural heritage in virtual reality,
Jakub Łobodecki, Kamil Choromański, Jakub Kaczorowski, Aleksandra Podbielska

9.00 – 9.20
Exploring Early Neolithic materialized identity networks,
Petr Pajdla

9.20 – 9.40
Graves of war crimes in areas of Poznań. Identification using remote sensing methods,
Kuba Łada-Siwiec

9.40 – 10.00
Using Digital Photography to Identify Chemical Relationships between Objects,
Heather R. Christie

10.20 – 10.40
Data analysis on series of medieval wooden plates and bowls from northern Poland,
Katarzyna Barucha

10.20 – 10.40
General Discussion

COFFEE BREAK

11.00 – 11.20
Photogrammetric documentation of architectural details in condition of archaeological field research: a case study,
Justyna Elżbieta Ruchała, Edyta Puniach

11.20 – 11.40
Depopulation and devastation. Linking GIS data for estimating changes in archaeological landscape of Kharaib el-Desht (Kuwait),
Paweł Lech, Marek Truszkowski, Piotr Zakrzewski

11.40 – 12.00
Why The Implementation Of Modern Technologies In Museums To Popularise Archaeology Still Fails To Reach Out To Millennials,
Benjamin Hanussek

12.00 – 12.20
The shoreline remains; A landscape study of Fire cracked stone heaps,
Amanda Saga Jeppsson

12.20 – 12.40
Structure from Motion as a documentation technique. A critical approach to 3D modeling of discs at Plain of Jars 52, Laos,
Zuzanna Kowalczyk, Joanna Koczur

Standard session 02:
Progress in WebGIS and DB solutions for Archaeology

***Mieko Matsumoto**, Museum of Cultural History, University of Oslo*
***Espen Uleberg**, Museum of Cultural History, University of Oslo*
***Volker Hochschild**, University of Tübingen, Department for Geography,*
***Michael Märker**, Deparment of Geography, University of Tübingen*
***Christian Willmes**, Institute of Geography, University of Cologne*

Medium Hall A 10.20 – 15.40, 24 April 2019

In this session we would like to bring together scientists presenting new ways to visualize and contextualize spatial data in archaeological databases. Digital field documentation is to varying degrees becoming more and more available as the significant analytical tool for archaeologists. This provides larger and far more complex datasets ever before that can be accessed and analysed. Detailed documentation of structures and contexts on the field can now be directly linked to artefact catalogues and results from digital data analyses. Authority lists and Linked Open Data will widen the range of potential utilities even more. Demands for data management plans, and the fact that many institutions move towards adhering to the FAIR data principles (that data should be Findable, Accessible, Interoperable, Re-useable), will also open new sphere of challenging, unforeseen areas of data exploitation.

The presentations could also include solutions that pass geographic, geodetic and 3D-data to visualization tools. Consideration should preferably be given to unconventional ways of combining georeferenced data from several open sources, and presenting them in unique and innovative ways.

Creating and providing context for archaeological databases, for example, by relating paleoenvironmental information or fresh ideas for spatial analysis, equally increases understanding of these databases and thus leads to progress. Presentations re-using or re-contextualizing existing archaeological datasets, as well as presentations of tools and interfaces like WebGIS (web based portal services and GIS-systems) that allow the visualization of such datasets, are also welcomed.

This session is a succession of nearly 10 years tradition at CAA. We have been presenting our own projects through this period, and invited many other researches to discuss the most updated methods and theoretical background. We believe that work with digital field documentation for visualization and contextualization of archaeological spatial data is one of the most basic, hence fundamental issues in archaeological database research.

10.20 – 10.40
Preparation of a comprehensive palynological norwegian dataset for digital re-analysis and publication as Open Data,
Christian Willmes, Espen Uleberg, Mieko Matsumoto, Helge Hoeg

10.40 – 11.00
UNESP/LARP-MAE/USP WebGIS: a Brazilian initiative to approach the Roman-Byzantine Period at East Mediterranean,
Marcio Teixeira-Bastos, Maria Isabel D'Agostino Fleming, Vagner Carvalheiro Porto

11.00 – 11.20
«Special areas» in the settlement system Iron Age - Middle Ages cultures of the East European Plain,
Sergey Chaukin

11.20 – 11.40
Early Christian Baptisteries: Geocoding, Exploring and Analysing a Spatiotemporal Dataset,
Adam Mertel, David Zbíral

11.40 – 12.00
Combining scientific and interpretive approaches to archaeological data: multi-proxy database and Web-GIS for East Europe,
Leonid Vyazov, Maxim Efimov, Timur Mardanov, Timur Timerkhanov, Ramil Sabitov, Natalia Selezneva, Julia Salova, Ayrat Sitdikov

12.00 – 12.20
Web-based data integration. A case study of Medieval coins in a multileveled perspective,
Steinar Kristensen, Ermias Beyene Tesfamariam

12.20 – 12.40
Extending the Nordic contribution to ARIADNE+,
Jens-Bjørn Riis Andresen

LUNCH BREAK

14.00 – 14.20
De facto standardisation: template database models as a path to adoption,
Ian Johnson

14.20 – 14.40
Current status of georeferenced metadata visualization in Norwegian,
Stone Age, Mieko Matsumoto, Espen Uleberg

14.40 – 15.00
Deir el-Bahari Projects : objective, realization, plans. Integration of data in the Database Digger,
Jadwiga Iwaszczuk, Iwona Zych, Tomasz Zalewski

15.00 – 15.20
Where have all my data gone, and how do I find them again?
Evy Berg

15.20 – 15.40
Making excavation reports available,
Jens-Bjørn Riis Andresen, Bolette Ammitzbøl Jurik

Roundtable 03: Roundtable Scientific Scripting Languages in Archaeology – Limits and Opportunities of Open Research

***Martin Hinz**, Institute of Archaeological Sciences, Bern University*
***Clemens Schmid**, Römisch-Germanisches Zentralmuseum Mainz*
***Sophie Schmidt**, University of Cologne*

Seminar Room 16.00 – 17.40, 24 April 2019

At last year's CAA, during the session on R in Archaeology, a suggestion was made to set up a Special Interest Group on Scientific Scripting Languages in Archaeology (SIG SSLA). We would like to comply with this proposal at this year's CAA. We would also like to take advantage of the forum to discuss the SIG's goals and agenda in a round table.

A scripting language is a programming language that allows interaction with a software interpreter to perform operations on data. It does usually not require compilation and is therefore associated with a rapid and agile development style that is particularly suitable for research, analysis and visualization of scientific data. Scripting languages may include but are not limited to R, Netlogo, Stan, OxCal, Bash or Python.

The use of scripting languages enables the user to document every necessary step in a research pipeline. Conversely, the resulting scripts can be used to reproduce analyses by other researchers if the input data is also available. Even the initial software environment can be emulated. Scripting languages are therefore ideal for reproducible research. But reproducibility can go even further: ideally it also documents the scientific production process with all inductive and deductive steps of hypothesis formation. A modern and powerful way to achieve this is version control.

There is a clear demand for dialogue in the community to broaden the impact of these improved methodological approaches, considering they still have a quite small number of users. We ovffr a draft Statement of Purpose for the SIG to discuss in this session. It is based on an internet survey following the last international CAA: (https://martinhinz.github.io/sig_sci_scripting_languages/statement.html).

We invite participants to prepare a two-minute statement or comment about this paper in order to start the discussion, which will be divided into two thematic sections. One section will focus on the general topics outlined in the position paper: Which principles are essential for scientific programming? How should they be taught? How can quality control and sustainability be guaranteed? The second section will begin to define more clearly the objectives of the proposed SIG: Which instruments and platforms can be established? What support can be provided for the growth of a more open, inclusive and reproducible research software landscape?

DISCUSSANTS

Martin Hinz,
Institute of Archaeological Sciences, Bern University

Joe Roe,
Centre for the Study of Early Agricultural Societies, University of Copenhagen

Iza Romanowska,
Barcelona Supercomputing Center

Clemens Schmid,
Römisch-Germanisches Zentralmuseum Mainz

Lizzie Scholtus,
UMR 7044 Archimède Université de Strasbourg

Standard session 04:
Digital archaeology of modern conflict landscapes

***Grzegorz Kiarszys**, Department of Archaeology, Szczecin University*
***Mikolaj Kostyrko**, University of Bamberg*

Medium Hall B, 11.00 – 15.40, 26 April 2019

In this session we are looking to bring together case studies that apply digital archaeology to the research of modern post-conflict landscapes. Conflict archaeology of the recent past is a fast-growing field of knowledge. What 30 years ago would have been considered as new and quite peculiar kinds of archaeological studies have, in the last decade, become common. Today archaeologists study landscapes altered during recent conflicts (WWI, WWII, Cold War etc.) in the same way, as any other period. While doing so, they reach out to digital archaeology - computer aided or based techniques which provide them with a better insight into their study area. Tools that help them to explore (i.e. remote sensing), reveal and analize (i.e. GIS analysis, modeling), share objects (i.e. online databases) of their interest with a wider audience.

What kind of contribution to the study of post-conflict landscapes can digital archaeology provide? How can digital archaeological tools change our (and other's) cognitive experience (enhance or cloud it?), and understanding of conflict sites? We are looking for qualitative and not quantitative case studies that will show the importance or irrelevance of digital archaeology methods in study of recent conflicts, both in its research, as well as in outreach and popularisation of archaeological study.

11.00 – 11.20
The survivorship bias and intimate landscapes of conflict,
Mikolaj Kostyrko, Grzegorz Kiarszys

11.20 – 11.40
After the Strafexpedition: A digital heritage perspective on the Winterstellung trenching system,
Armando De Guio, Luigi Magnini, Giulia Rovera, Andrea Marra

11.40 – 12.00
Jewish religious heritage in the landscape of conflict. Relicts of military operations in the area of the New Jewish Cemetery in Łódź (Poland),
Anna Magdalena Majewska

12.00 – 12.20
"Festung Brünn": Remote sensing and spatial analysis of German World War 2 field fortification in the vicinity of the city of Brno (Czech Republic),
Jiří Zubalík

12.20 – 12.40
Hold position: Case study of non-destructive archaeological survey and spatial analyses of Austro-Hungarian trenches from april 1915 at Staviska hill (Polish-Slovakian border),
Martin Vojtas, Martin Fojtík, Jiří Zubalík, Jakub Těsnohlídek, Jan Petřík, Peter Tajkov, Martin Drobňák, Radim Kapavík, Richard Bíško

LUNCH BREAK

14.00 – 14.20
Landscapes of disappearance in São Paulo: data modelling and visual analytics to understand repression practices,
Patricia Martin-Rodilla, Marcia L. Hattori, Cesar Gonzalez-Perez

14.20 – 14.40
An open online minor on the archaeology of conflicts,
Wilko van Zijverden

14.40 – 15.00
Past Landscape of Pomeranian Army (1939), a remote sensing perspective,
Filip Wojciech Wałdoch

15.00 – 15.20
Nuclear "Soldiers of Freedom". Remote sensing of Cold War landscapes in Poland,
Grzegorz Kiarszys

15.20 – 15.40
The Archaeology of the Cold War in south-eastern Xinjiang (P. R. China),
Kasper Jan Hanus

Standard session 05:
R as an archaeological tool: current state and directions (vol. II)

Carolin Tietze, ISAAK; Christian-Albrechts-Universität zu Kiel
Sophie Schmidt, University of Cologne
Nicole Grunert, Christian-Albrechts-Universität zu Kiel

Exhibition Room B, 10.20 – 12.40, 24 April 2019

The open source, platform-independent and community-driven software environment R has become one of the most important tools for quantitative archaeologists working on a reproducible research approach and developing new packages for their analyses. Following the success of this session at the last international CAA conference in Tübingen we want to encourage scientists using R to either return and show the progress of their work. We also warmly invite new colleagues to demonstrate their fresh and new approaches. As many colleagues have not yet realized the potential of the language and its easy access way to conduct high quality research with the readily available tools in R it is most important to explore its use for different archaeological research questions.

For this session we would like to continue to survey the state of the art and the potential application of R. We invite presentations for this session that focus on questions such as, but not limited to:

- What are the specific benefits of this statistical framework in the eyes of its users?
- What are the possibilities? What are the limits?
- What future directions might the usage of R in archaeology have?
- Which archaeological package has been developed, that might be useful for other researchers as well?
- Which package needs to be developed further to improve the usability of the software for archaeologists?
- What has to be considered to optimize the workflow with R?

We would especially like to attract colleagues who demonstrate their approach with live coding or present archaeological R packages that are ready or in the making. Presentations on works in progress are very welcome. We intend to maintain a productive and inclusive exchange between both young and experienced users of all backgrounds.

10.20 – 10.40
Gorram shiny: an accessible interface for reproducible landscape archaeology with R and fieldwalkr,
Joe Roe

10.40 – 11.00
Using R to Update Minnesota's Archaeological Predictive Model,
Elizabeth Ruth Hobbs, Carla Landrum

11.00 – 11.20
3D stone tool analysis in R: An introduction to the Lithics3D package,
Cornel Marian Pop

11.20 – 11.40
sdsbrowser - an R Shiny Application for visualisation and analysis of SDS stone artefact data,
Clemens Schmid, Christoph Rinne

11.40 – 12.00
Emacs, Org-mode, R and LaTeX: Power tools in the archaeological toolbox,
Robert Mahler

12.00 – 12.20
An R package for inferring patterns of social learning from archaeological frequency data,
Enrico R. Crema, Anne Kandler

12.20 – 12.40
General Discussion

Standard session 06:
Recent advances in spatial statistics for archaeology

***Joe Roe**, Centre for the Study of Early Agricultural Societies, University of Copenhagen*
***Francesco Carrer**, McCord Centre for Landscape,*
School of History classics and Archaeology, Newcastle University

Exhibition Room B, 8.40 – 12.40, 26 April 2019

Questions of space and place concern archaeologists from every branch of the discipline. There are many ways to approach such questions, but the application of quantitative spatial analysis to archaeology has long been an area of particular interest. This body of statistics originated in geography and ecology and was first adapted to archaeology over forty years ago by pioneering scholars such as Hodder and Orton. A "second wave" of renewed interest then came with the widespread adoption of geographic information systems (GIS) into archaeological methodology in the late 1990s and 2000s. In this session, we wish to explore advances in archaeological spatial statistics – from the intra-site to landscape scale – made in the last decade. In particular, we invite papers discussing the state of the art in spatial analysis; the application of new statistical techniques to archaeological contexts; new ways of thinking about spatial data in archaeology; advances in GIS technology; and the development of new statistical tools using scientific programming environments such as R and Python. Speakers are welcome to use archaeological case studies from their research, but the primary focus of papers should be methodological.

8.40 – 9.00
The Application of Local Indicators for Categorical Data (LICD) to explore spatial dependency in archaeological spaces,
Francesco Carrer

9.00 – 9.20
Percolation robustness and the deep history of regionality,
Michael Simon Maddison, Mark Lake

9.20 – 9.40
Analysing settlement dynamics using statistics based on archaeological theory,
Peter Demján

9.40 – 10.00
Bayesian Species Distribution Modelling of Domesticated Plants,
Marta Krzyzanska, Enrico Ryunosuke Crema

10.00 – 10.20
Statistical methods for the exploration of the spatial information in anthropogenic soils,
Jonas Alcaina-Mateos, Carla Lancelotti, Stefano Biagetti, Marco Madella

10.20 – 10.40
General Discussion

COFFEE BREAK

11.00 – 11.20
"Where did they stand?" A probabilistic approach to the study of orientation of enclosed areas in prehistoric structures,
Fabio Silva, Christina Michel

11.20 – 11.40
Spatio-temporal network analysis applied to Roman Terra Sigillata data,
Gabriele Gattiglia, Nevio Dubbini, Francesca Anichini

11.40 – 12.00
GIS and spatial statistics for cultural heritage assessment,
Ionut Cristi Nicu

12.00 – 12.40
General Discussion

Other session 07:
Teaching 2.0: Show me how you teach!

Carolin Tietze, ISAAK; Christian-Albrechts-Universität zu Kiel
Sebastian Hageneuer, Archaeoinformatics, Institute of Archaeology, University of Cologne, Germany

Seminar Room, 14.00 – 18.00, 26 April 2019

Nowadays, the necessity for a top-down hierarchy and presentation-discussion-style seminars are overdue for a remake as the class' content, used technologies and varieties of teaching methods have evolved. Additionally, many seminars now use more and more up-to-date technologies, including 3D, VR or AR applications, which foster an increasingly digital environment for archaeologists. This new digital movement even creates new fields of study like Computational Archaeology or Archaeoinformatics and Digital Humanities. The problem with these new fields is, that they cannot strictly be taught using the same methods as before, presenting lecturers with the need to adapt their teaching methods.

Concepts like inverted/flipped classrooms, MOOCs, blogs, simulations and even archaeogaming are starting to replace classical teaching methods gradually, although it is not quite clear in which ways these will prove to enhance the way we teach archaeology in academia.

This session wants to discuss exactly this problem. We would like to present and discuss modern ways of digital teaching in archaeology with a special interest in the evaluation of the used methods and the exchange of experiences and "lessons learned" from it. We therefore welcome contributors from all fields of archaeology (university, museum, excavation, cultural heritage) who want to share their experiences. Topics may include, but are not limited to:

- New digital approaches (blogs, films, exercises, games, simulations;)
- Evaluative field studies on new and old teaching methods;
- New applications that alleviate a steep learning curve.

This session aims to encourage discussion on the potential, problems and challenges of using new teaching methods that fit the needs of a future-oriented field of study. Participants will be asked to present their very own teaching methods within a 10-minute presentation, following a 10-minute individual discussion on their paper. The session will end with a full hour final discussion summarizing the different papers and debating the pros and cons as well as the general trend of digital teaching in archaeology. Special importance should be given to the implications that the methods presented may have for the students and in which way it might be supporting, enhancing or obstructing the learning process, and how it could inspire the student to creatively apply the new knowledge. We especially encourage presenters to evaluate their experience in order that we are able to compare different methods during the final discussion.

14.00 – 14.20
Active Learning Using VR, Sketchfab, and 3D Printing,
Todd Brenningmeyer, Brian Bergstrom

14.20 – 14.40
An online collaborative museum and associated lessons for secondary school students,
Cesar Gonzalez-Perez, Isabel Cobas-Fernandez

14.40 – 15.00
Creating Immersive Multiplayer Classroom Experiences in Site Reconstructions, *Luke Hollis*

15.00 – 15.20
Teaching with Recogito,
Valeria Vitale, Elton Barker, Rainer Simon, Leif Isaksen, Rebecca Kahn

15.20 – 15.40
A Gaming Odyssey: Improving Video Game Pedagogy in Archaeology and History,
Robert Perry Stephan

COFFEE BREAK

16.00 – 16.20
Development and first experiences with an interactive teaching movie,
Undine Lieberwirth, Axel Gering

16.40 – 17.00
Arcade Teaching: showcasing the use of video games in teaching the past,
Aris Politopoulos, Angus Mol, Csilla Ariese-Vandemeulebroucke

17.00 – 18.00
General Discussion

Roundtable 08:
Teaching Digital Archaeology

Till Sonnemann, University of Bamberg
Grzegorz Kiarszys, Department of Archaeology, Szczecin University
Arianna Traviglia, University Ca' Foscari of Venice

Exhibition Room B, 8.40 – 12.40, 25 April 2019

Courses teaching basic 'digital' methods to archaeologists, from equipment to software use, have surged in recent years, particularly in Europe, with the goal to provide students with a bit of extra knowledge in digital techniques to survive in the market. Supported often only by university politics for its innovative character to help modernise archaeology, in many curricula the digital element is still fighting for a permanent position. While accepted by 'real' archaeologist as a useful tool, digital topics nevertheless often are rare orchids in the vast field of archaeology. This seems particularly true in traditional archaeology courses, where students often choose their career path for very specific, sometimes utopian, reasons with one goal to become a field or dirt archaeologist.

Digital Archaeology offers the opportunity to include a great variety of courses and subjects. At the same time archaeology curricula can be very tightly specified and, in such cases, it becomes more difficult to fit in special topics because of BA restrictions. Additionally, students may question the value of adding such additional course elements: "Is the method being taught fully acknowledged? There can only be so many applied computer courses or introductions to digital techniques, software and programming, that could provide a new view on archaeological topics".

In this session we ask: "What are the digital basics that all students should be equipped with at BA level? How much further should a MA Level course reach? What courses have been particularly successful, which ones failed, and for what reasons? How do students accept the challenge? We want to bring together colleagues who focus on teaching and developing courses on digital archaeology and discuss openly our successes and the problems we can expect to meet. Our goal is to form collaborative networks and hopefully share methods and exercises. We will ask prospective participants, wishing to take part in the session, to fill out a questionnaire. Presentations should be no longer than 10 min with focus on the questions provided.

This session will feed into a Roundtable called "Thinking out of the classroom: developing a strategy for sharing knowledge and resources for education and training in digital archaeology".

8.40 – 8.50
Teaching Digital Archaeology at European Universities,
Till Frieder Sonnemann, Mikolaj Kostyrko

8.50 – 9.00
Education of Digital Archaeology at Polish universities, different approaches,
Roman Antoni Szlązak

9.00 – 9.10
Understanding how everything worked out so well. Teaching computer databases for archaeologist at the University of Warsaw,
Michał Piotr Gilewski, Nazar Buławka

9.10 – 9.20
Teaching Digital Archaeology at Leiden University,
Karsten Lambers

9.20 – 9.30
Teaching Archeomatics at the University of Tours,
Elisabeth Lorans, Xavier Rodier

9.30 – 9.40
Teaching digital archaeology in Italy: still utopia or already reality?
Arianna Traviglia

9.40 – 9.50
Developing a master's degree in Digital and Computational Archaeology: a view from Germany,
Eleftheria Paliou

9.50 – 10.40
General Discussion

COFFEE BREAK

11.00 – 11.10
Challenging students by integrating digital archaeology,
Ronald Visser, Wilko van Zijverden

11.10 – 11.20
Learning to See vs Learning to Understand. Why is Teaching Digital Archaeology so Difficult?
Grzegorz Kiarszys

11.20 – 11.30
Problem- and Project-based Learning in Digital Archaeology: Potential and Challenges,
Costas Papadopoulos

11.30 – 11.40
Teaching 3D archaeological documentation in the field and classroom,
Jari Pakkanen, Ann Brysbaert

11.40 – 11.50
Archeoinformatics and the Archaeological Digital Initiative: Successes and Challenges Teaching Digital Archaeology,
Scott M. Ure

11.50 – 12.40
General Discussion

Roundtable 09: Thinking out of the classroom: sharing knowledge and resources for education and training in digital archaeology

***Philip Verhagen**, VU University Amsterdam, Faculty of Humanities*
***Matthias Lang**, eScience-Center, University of Tübingen*
***Yasuhisa Kondo**, Research Institute for Humanity and Nature*
***Stephen Stead**, Paveprime Ltd & ACRG, Southampton University*

Seminar Room, 11.00 – 12.40, 25 April 2019

In this roundtable, we invite participants to think with us on the future of education and training in digital archaeology. Despite the successes of digital approaches in archaeology, teaching to university students as well as post-graduate teaching is still suffering from a lack of resources. Dedicated curricula are scarce and definitions of best practices are largely absent, resulting in a highly variable proficiency of graduates in digital methods and techniques. We assume that much of this problem is related to the global system of university education, where sharing of educational resources and practices is not actively encouraged, while at the same time putting much burden on individual staff members to develop educational programmes with limited resources. We therefore feel that CAA, as a global organisation, could and should play a pivotal role in setting examples for good education and training and providing a shared knowledge base for its members that can lead to a higher quality of educational practice.

The question that we want to address in this roundtable is how we can profit from the experience of the CAA community to make sure that the available knowledge on education and training is better shared among its members and the wider archaeological community. Topics that could be discussed are the development of Open Access courses and training data sets, the development of specific learning goals and quality criteria for curricula, and the organisation of practical working sessions at CAA and other conferences. On the basis of this debate, we aim to establish focus groups to work on the issues identified.

11.00 – 11.20
Thinking out of the CAA conference,
Philip Verhagen

11.20 – 11.40
The ETO-SIG approach to modularisation: A Position Statement,
Stephen Stead

11.40 – 12.00
Share trainings to improve the skills in digital archaeology,
Xavier Rodier, Elisabeth Lorans

12.00 – 12.20
Don't JUST think archaeology,
Lutz Schubert

12.20 – 12.40
General Discussion

Standard session 11:
Pre-modern cities and complexity

***Eleftheria Paliou**, University of Cologne*
***Georgios Artopoulos**, The Cyprus Institute, Nicosia, Cyprus*
***Iza Romanowska**, Barcelona Supercomputing Center*
***Katherine Crawford**, University of Southampton*
***Tuna Kalayci**, Laboratory of Geophysical - Satellite Remote Sensing & Archaeo-environment Foundation for Research & Technology, Hellas (F.O.R.T.H.) Institute for Mediterranean Studies (I.M.S.)*

Exhibition Room A, 14.00 – 18.00, 26 April 2019

Some of the major challenges in the study of ancient urbanism concern change and evolution in cities and settlement structures. How did socio-political organisations move from simple to complex? What triggers urbanism in human societies through time? How do settlements grow and regional centres emerge? How do cities define and transform the local ecosystems and vice versa? How are movement patterns structured within and between cities?

The idea that cities are highly complex systems tied together through interactions between various factors was introduced in urban studies and archaeology many years ago, but it is only in the last decade or so that there have been more consistent efforts to examine this complexity using quantitative and computational tools – the so-called "new science of cities". This new synthesis of urban studies builds strongly on complexity science, social physics, urban economics, transportation theory, regional science, urban geography and network science. A number of computational tools and methods that have been used by archaeologists fall under this emerging interdisciplinary field, but there are also numerous underused techniques that show high potential for furthering our understanding of past cities and the activities that occurred within.

This session invites papers that seek to examine past cities, urban life, and urban mobility as complex phenomena by applying computational methods, for example:

- spatial interaction models;
- settlement scaling;
- space syntax;
- transportation network analysis;
- pedestrian simulation;
- analysis of urban morphology (fractals);
- agent-based modelling.

Or any other digital techniques designed to study interactions, flows, urban dynamics, morphology and scaling. We also welcome papers that use quantitative methods and spatial analysis to interpret urban data, as well theoretical papers that discuss the prospects and challenges of the science of cities in archaeology

14.00 – 14.20
Settlement scaling theory, agent based models, and ancient trade,
John William Hanson

14.20 – 14.40
Using the Energetic Calculator for Ancient Buildings (EnCAB) to Understand the Growth of Cities from the Perspective of Labor Capacity,
Federico Buccellati

14.40 – 15.00
Re-investigating the long-term dynamics of urban hierarchies in Italy in the Iron Age and Republican and Imperial periods through rank-size analysis: Continuity or change?
Francesca Fulminante, J.W. Hanson

15.00 – 15.20
Modelling the origin of polis in Anatolia. From conceptual to computational approaches,
Dries Daems

15.20 – 15.40
To Move as One: Simulating Crowd Movement Dynamics in the Ancient City,
Katherine A Crawford

COFFEE BREAK

16.00 – 16.20
Modelling spatial relations at Choirokoitia,
Georgios Artopoulos, Iza Romanowska

16.20 – 16.40
The evolution of the historical transport networks of the Iberian Peninsula,
Pau de Soto

16.40 – 17.00
Interlocking Geographic and Social Urban Mobility. The Social Network of Etruscan Elites during the Romanisation: a Strategy of Resilience?
Raffaella Da Vela

17.00 – 17.20
Who lived in that Roman house? Computational models applied to the differentiation of typologies of Roman houses,
Ada Cortés, Pau de Soto

17.20 – 17.40
Measuring the city – methods of layout reconstruction of regular medieval locations in Central Europe,
Anna Maria Kubicka, Maria Legut Pintal

17.40 – 18.00
Untangling Complexities of the Cretan Postpalatial Built Environment,
Tia Sager

Standard session 13:
Ethics in Digital Archaeology: Concerns, Implementations and Successes

L. Meghan Dennis, University of York

Medium Hall B, 8.40 – 10.40, 26 April 2019

An increase in digitally derived data and digitally situated methodologies has brought with it a new set of ethical concerns. CAA has attempted, as one intervention, to address these considerations with the creation of a code of ethics. This code was formally adopted by the membership at the 2018 Annual Conference. Though the contents of this code provide guidance to digital archaeologists, on-the-ground realities can prompt scenarios of ethical confrontation that require creative thinking and adaptations of practice.

This session aims to provide a venue for sharing experiences of ethical consideration in digital archaeology, both within the academic and private sectors. Papers will discuss the application of ethical theory and ethical guidelines to past and present projects. In addition, papers will examine initiatives for addressing ethical concerns within future projects. A synthesis of experiences over the first year of CAA's Code of Ethics and reflections on growth in ethical consideration within the sector will be made, and necessary adaptations and evolutionary changes in ethical decision making within the digital sphere will be discussed.

8.40 – 9.00
Where are the Codes of Ethics for Digital Archaeology?
L. Meghan Dennis

9.00 – 9.20
Towards A Digital Ethics of Agential Devices,
Jeremy Huggett

9.20 – 9.40
Ethics and the Big Data Paradigm,
Lorna-Jane Richardson

9.40 – 10.00
Models and Metadata Revisited: Changes in Online Digital Bioarchaeological Practice,
Priscilla Ulguim

10.00 – 10.40
General Discussion

Standard session 14:
Modelling Data Quality in archaeological Linked Open Data

***Kai-Christian Bruhn**, i3mainz – Institute for Spatial Information- and Surveying-Technology, University of Applied Sciences Mainz*
***Allard Mees**, Römisch-Germanisches Zentralmuseum*
***Florian Thiery**, Römisch- Germanisches Zentralmuseum (Mainz, Germany)*

Exhibition Room B, 14.00 – 15.40, 24 April 2019

Today, increasing quantities of data are published by archaeological institutions. At the same time, interconnecting these data following the concept of "Linked Data" is becoming more and more popular. The current evolution from "Linked Data" via "Linked Open Data" (LOD) towards "Linked Open Usable Data" enables a wide array of archaeological applications. However, this development of an increasing LO(U)D-cloud implies challenges in handling complex facets of data quality. Therefore, modelling the handling of data quality becomes an increasingly important issue. This is especially valid for archaeological data, which are based on a complicated network of concepts from different knowledge domains.

Even very carefully compiled datasets can contain errors and ambiguities. Unrecognised errors multiply exponentially in scenarios of data reuse: not only incorrect data and conclusions are the result, but possibly also a loss of confidence in web-based resources. Moreover, modelling data quality to share knowledge about uncertainty is necessary to produce and publish transparent Linked Open Usable Data.

The success of the session "Guaranteeing data quality in archaeological Linked Open Data" at CAA International 2018 has raised awareness of many challenges related to this topic and encourages pursuing the debate.

For this session we invite contributions that addresses e.g. following issues:

- Identifying and strategies for correcting inconsistencies within the data;
- Identifying sources and dangers of incorrect or ambiguous data;
- Identifying duplicates across different LOD sources;
- Keeping track of the provenance of data as a means of solving errors and identifying their source;
- Defining metrics in order to rate data in respect to their quality;
- Setting up methodologies and tools in order to label or certify data sets based on their quality;
- Compiling trust levels based on various inputs such as provenance and quality level;
- Modelling uncertainty and vagueness in LOD (e.g. thesauri and CIDOC CRM);
- Dealing with ambiguities resulting from multiple links in the LOD cloud;

W encourage presenters to derive the problems from real-world datasets and to formulate proposals for solutions, preferably demonstrating (prototypes of) realised data driven web applications. As we target a broad and diverse audience because of the thematic relevance, the challenges described should also be integrated into their archaeological context (excavation, museum, archive, etc.).

14.00 – 14.20
Uncertain information, the Dark Matter of archaeology – use cases from numismatics,
Karsten Tolle,David Wigg-Wolf

14.20 – 14.40
Traceability of archaeological data, from excavation to publication,
Olivier Marlet, Xavier Rodier

14.40 – 15.00
Linked (Open) Data with Provenance for Prehistoric Mining Archaeology,
Gerald Hiebel, Annette Hornschuch, Leandra Reitmaier-Naef, Phillip de la Casa, Gert Goldenberg, Klaus Hanke, Erica Hanning, Markus Staudt, Thomas Stöllner, Peter Thomas, Manuel Scherer-Windisch

15.00 – 15.20
ARS3D - Documenting facts and interpretations of African Red Slip Ware,
Florian Thiery, Ashish Karmacharya, Louise Rokohl

15.20 – 15.40
General Discussion

Standard session 15:
Issues of scale in archaeological computational modelling

***Benjamin Davies**, The University of Auckland*
***Colin Wren**, University of Colorado - Colorado Springs*

Seminar Room, 8.40 – 10.40, 26 April 2019

Archaeology aims to interpret and explain patterns in the material record. That patterning may occur at a wide range of spatial scales, from microscopic traces in sediments and residues to global scale patterning in the distribution of technologies and material culture. These patterns may develop in an instant or accumulate over millennia, and are subject to change through time. The explanatory models that archaeologists develop must not only incorporate these spatial and temporal scales but must often operate across them to accommodate the emergence of wide scale patterning in the present from individual scale actions in the past. Whether represented using GIS, ABM, networks, equations, or otherwise, considerations of scale are fundamental to the venture of archaeological modelling, creating sources of frustration and inspiration for understanding the past. In this session, we aim to bring out some of the challenges of computational modelling in archaeology, particularly with respect to issues of scale. We interpret this broadly: scale can pertain to the behaviours under study, the analysis being undertaken, or representation as a model. Whether spatial, temporal, organisational, or even computational, we welcome papers that can provide insights into issues of scale in archaeological modelling.

8.40 – 9.00
Where local meets global. Reconsidering the trajectory of settlement development in Central Asiatic oases in pre-Achaemenid and Achaemenid times,
Nazarij Buławka

9.00 – 9.20
From picking up a sea snail to models of long-term occupation of the South Africa Middle Stone Age coastline,
Colin D. Wren

9.20 – 9.40
Issues of Social Scale in Archaeological Models of Exchange,
James R. Allison

9.40 – 10.00
Estimating Neolithic spread rates at different scales: Europe and the Near East versus the Western Mediterranean,
Joaquim Fort

10.00 – 10.20
Complex data over large spatial and temporal scales: local understandings of national significance,
Chris Green, Anwen Cooper

10.20 – 10.40
Sharpen the image: Determining scales for questions of hominin dispersal and migration,
Ericson Hölzchen, Christine Hertler, Christian Sommer, Christian Willmes

Roundtable 16:
Where does global meet local? Finding common ground for multiscalar analysis of settlement and land use dynamics

***Philip Verhagen**, VU University Amsterdam, Faculty of Humanities*
***Laure Nuninger**, Chrono-Environnement UMR 6249 CNRS / ModeLTER - MSHE C.N. Ledoux USR 3124 CNRS*

Small Hall, 16.00 – 17.20, 26 April 2019

Spatial modelling of regional settlement systems has made great strides since the introduction of GIS in the 1990s. Many regional datasets were created and completed, allowing for quantitative and spatial analysis of settlement patterns from a landscape perspective. Also, the study of settlement patterns has recently seen important advances with the introduction of statistical simulation methods to model and analyse chronological uncertainty.

However, the comparison of settlement systems between regions in order to understand long-term social, environmental, economical and political change at a national, continental or even global scale is a field where methodological progress has been slow. Current approaches seem to either favour a simulation modelling approach, trying to fill the gaps between sparse data points, for example using advanced diffusion models or agent-based modelling; or they rely on reducing the complexity of archaeological and palaeo-environmental data to produce standardized spatio-temporal analyses of large data sets.

In this roundtable, we invite participants to explore with us new and effective approaches to analyse and model settlement and land use trajectories within a multiscalar context. In particular, we want to address the following questions:

- How can we exploit existing datasets, stemming from different scientific and heritage management traditions, for cross-border and cross-disciplinary studies? Current developments in data collection and curation, spurred on by the 'linked open data revolution', have led to an increasing availability of all kinds of data. However, the analysis of LOD for scientific research is still highly experimental and successful examples are dependent on the creation and maintenance of a common ontology.
- How can we develop common procedures for diachronic analysis, applicable to both large-scale questions and regional settings? Regional settlement data is fine-grained and needs local expertise to be exploited to full effect. What are the shared characteristics of local datasets that will allow for comparison on a larger scale, and are these useful for understanding questions of social, environmental, economical and political change? What ways are available to model and predict the characteristics of coarser-grained data sets, or even of zones where data is absent, and can these be combined in a common analytical framework?

- How can we build a bridge between different theoretical and conceptual frameworks? For example, to what extent can large-scale simulation modelling results be tested with regional archaeological data sets? And how can we connect settlement data to data sets that cover very different aspects of past land use and settlement, like palaeo-environmental data, transport and communication networks, or other off-site activities?

16.00 – 16.20
The fabric of a rural landscape, round trip from space to field survey (Loir-et-Cher, France),
Clément Laplaige, Nathanaël Levoguer, Xavier Rodier

16.20 – 16.40
Multi-scale insight into the archaeological study of an Andean archipelago settlement system,
Thibault Saintenoy

16.40 – 17.00
Attempting to make agent-based models more applicable to regional settlement models,
Colin D. Wren

17.00 - 17.20
General Discussion

Standard session 17:
Empowering Archaeology of the Senses through digital approaches

Giacomo Landeschi, Lund University
Heather Richards-Rissetto, University of Lincoln-Nebraska

Large Hall A, 11.00 – 15.40, 26 April 2019

A major challenge of contemporary archaeology is to build formal-based narratives about the Past that allow for human perception and agency. Archaeologists are making use of digital tools and technologies to develop innovative approaches to take a situated perspective of human interactions in ancient landscapes. By "placing" human actors in specific physical and cultural contexts, we can explore the role of built and natural environments in structuring ancient experiences, which in turn, influence social, political, economic, and ideological interactions. While material culture together with other data sources provide the basis for bridging modern experiences with potential experiences of past peoples within landscapes, few formal methods exist to construct these narratives; however, recent advances in archaeological computing are affording new approaches.

In recent decades, archaeologists have begun to employ digital methods to simulate and quantitatively explore human experience in the past, or at least, to get some clues about the ways by which humans manipulated ancient spaces to convey symbolic messages, create identity, and structure interaction. Human senses, as defined by Aristotle, act as an important proxy to investigate the social dimensions of ancient spaces and places. Sight and hearing, but even smell, touch and taste can now be captured, analysed and reproduced in a digital environment through state-of-the-art technology that can contribute to deeper explorations of spaces and their relation to constructing a sense of past places.

The purpose of this session is to foster discourse on the way different digital tools and technologies such as Virtual Reality (VR), Augmented Reality (AR) Mixed Reality (MR), haptic devices, Geographic Information Systems (GIS), and more can lead to the development of formal methods that help create multi-sensory narratives to provide deeper insight into the study of ancient space and place. We invite all those specialists interested in applying advanced digital tools in the field of Cultural Heritage to present papers on the human sensorium as a possible gateway to the Past and as a way to foster discourse on methodological and interpretative challenges to building formal-based narratives that allow for human perception and agency. We solicit presentations on a range of issues such as, but not limited to, formal methods, research applications, technological challenges and affordances, and theoretical frameworks.

11.00 – 11.20
Back again to GIS? The need of mapping multisensoriality,
Giacomo Landeschi

11.20 – 11.40
The claim markers of the Bronze Age; A study of viewing and understanding the fire cracked stone heaps in Sweden,
Amanda Saga Jeppsson

11.40 – 12.00
Re-imagining the First General Assembly: How 3D Modeling and Archaeology are Shedding Light on the Beginning of American Democracy at Jamestown,
Lisa E. Fischer, William Balderson, Cynthia Deuell, Mary Anna Hartley

12.00 – 12.20
Visual acuity and 3D GIS as means for investigating visibility of iconographic programs in historic churches - St. John the Theologian cathedral in Nicosia (Cyprus) as a case study,
Martina Polig, Despina Papacharalambous, Sorin Hermon, Nikolas Bakirtzis

12.20 – 12.40
General Discussion

LUNCH BREAK

14.00 – 14.20
See Augustus (?) Visual communication and political change in the Roman Forum between late republic and early principate: A 3D computational approach,
Alexander Braun

14.20 – 14.40
Immersive Archaeological Data Visualization and Interpretation in the Field and through VR Classroom Experiences,
Luke Hollis

14.40 – 15.00
Multisensory Experiences & Narratives in Archaeological Landscapes—Sound, Vision, and Movement in GIS and Virtual Reality,
Heather Richards-Rissetto, Kristy Primeau, David Witt, Graham Goodwin

15.00 – 15.40
General Discussion

Standard session 18:
Immersive Digital Media in Archaeology: Memory, Place and Performance

***Gareth Beale**, University of Glasgow*
***Julian Richards**, Archaeology Data Service University of York*
***Nicole Smith**, University of Glasgow*

Medium Hall A, 14.00 – 17.40, 26 April 2019

The emergence of immersive digital media (including VR, AR and other forms of mixed reality) has created a wealth of new opportunities for archaeological storytelling and data representation. However, immersive media and mixed reality technology remain in a state of rapid flux. Archaeologists are innovating and experimenting with these technologies and archaeological applications of immersive media have been quick to emerge. With a rich history of media innovation and non-digital immersive storytelling archaeology seems uniquely well placed to produce new and exciting immersive media forms. This session will ask:

- How do immersive experiences contribute to our ability to conduct and communicate archaeological research?
- How can archaeological expertise contribute to the innovation and development of rapidly evolving immersive media forms?

The goal of the session is to explore the diversity of immersive media practice within archaeology and to recognise the unique contribution which archaeology is currently making to the development of these media. We invite participants with experience of practical or theoretical research in the use of immersive media to contribute papers to this session. We welcome submissions from those working in areas outside of archaeology including media arts, heritage, human computer interaction, interactive media design, animation and games.

Our intention is to use this session as the basis for a co-authored publication on immersive media in archaeology, heritage and the arts.

14.00 – 14.20
Using immersive acoustics to communicate archaeological narratives: Listening to the Commons and the Voice and Vote Exhibition,
Catriona Cooper, Damian Murphy

14.20 – 14.40
Evoking memory through immersion: the case of the Laocoon cast at Glasgow School of Art,
Stuart Jeffrey, Mark Breslin, Lauren Glasgow, Steve Love, Matthieu Poyade, Damien Smith, Jordan Trench

14.40 – 15.00
'Riddle Mia This' – A Mobile, Augmented Reality, Museum Puzzle Experience,
Samantha Thi Porter, Colin McFadden

15.00 – 15.20
Experience Castlegate: Augmented reality and the possibilities of heritage-led urban regeneration,
Dawn Hadley, Steve Maddock, Nick Bax, Matt Leach

15.20 – 15.40
Digital Archaeoludology,
Cameron Browne, Eric Piette

COFFEE BREAK

16.00 – 16.20
Developing and using immersive experiences at Caistor Roman town,
Will Bowden, Pat Brundell, Natasha Harlow, Adam Martin-Jones, Alex Mullen

16.20 – 16.40
Within the Walls of York Gaol: Immersive media and archaeological storytelling,
Gareth Beale, Nicole Smith, Anthony Masinton

16.40 – 17.00
Lochbuie, a Bronze Age focal point of astronomical knowledge,
Gail Michele Higginbottom, Vincent Mom

17.00 – 17.20
Virtual Avebury: an immersive partnership,
Kate Welham, David Burden, Rosamund Cleal, Elizabeth Falconer, Ralph Hoyte, Phill Phelps, Neil Slawson, Nicola Snashall

17.20 – 17.40
Contextualizing Cultural Heritage with Augmented Reality - The Temple of the Weather God in Aleppo, Syria,
Arie Kai-Browne, Thomas Bremer, Kay Kohlmeyer, Sebastian Plesch, Susanne Brandhorst

Roundtable 19:
Our knowledge is all over the place!

***Paul Reilly**, University of Southampton*
***Stephen Stead**, Paveprime Ltd & ACRG, Southampton University*
***John Pouncett**, Institute of Archaeology, University of Oxford*

Exhibition Room B, 16.00 – 18.40, 26 April 2019

During CAA2018 Huggett et al (2018) issued a grand disciplinary challenge to produce a consensus-based, end-to-end, digital archaeology knowledge map with which to locate evolving archaeological practices without stifling digitally creative disruptive developments. In a hugely complex and expanding knowledgescape, digitally-enabled knowledge maps will give practitioners a better chance to share our collective disciplinary knowledge (both by giving and receiving), while avoiding unnecessary duplication, exposing gaps, and fostering greater resilience in our knowledge sharing practices and knowledge bases. They are intended to digitally enhance questions of the generic form: "what do we already know about ... where does it reside, and how can I gain access to this knowledge/tool/method/ insight/expertise/etc?"

This round-table seeks to seed a pan-archaeology forum to produce a preliminary high-level model of digitally-enabled archaeological knowledge practices (explicit and tacit) and capabilities and begin the process of mapping our assets, resources, communities, best practices, and gaps. Maps are not static entities and can be rendered in many different projections. They are contingent on need. We therefore fully expect a variety of (evolving) mapping approaches. In under 5 minutes each, participants will present a single-slide a map (model) which encapsulates the scope of knowledge practices and capabilities required to operate effectively within their competency/sector (inter alia, commercial unit, GLAM, research organisation, funding agency, government agency, etc). These maps will provide the initial inputs for a discussion aimed at developing a broader (e-2-e) composite model of the digitally enhanced archaeological enterprise that can be taken to the broader CAA community and beyond to be refined and expanded. Our ambition in this session is to provide a framework onto which digital methods and approaches for specific practices in different archaeological contexts can be mapped and then harnessed to support day-to-day work practices and research.

References:

Huggett, J., Reilly, P. and Lock, G., 2018. Whither Digital Archaeological Knowledge? The Challenge of Unstable Futures. *Journal of Computer Applications in Archaeology*, 1(1), pp.42–54

DISCUSSANTS

Our Knowledge is all over the place! - So What?
Paul Reilly, Stephen Stead

A Brasilian Perspective in the Wake of a Knowledge Catastrophe,
Pricilla Ulguim

On the Current Impossibility of Creating Digitally-enabled Knowledge Maps,
Tuna Kalayci

Queering digitally mediated access to archaeological knowledgemaps,
Katherine Cook

Feminist perspective on digital access to Archaeological Knowledgemaps,
Colleen Morgan

A Public Archaeology perspective on digitally mediated access to KnowledgeMap,
Lorna Richardson

People Telling the Stories, the Stories Telling about the People,
Daria Hookk, Nikita Pikov, Vsevolod Bumastrov

Knowledgemaps focussing on excellence and precarity within the academy,
John Pouncett

Korean perspective on digitally mediated knowledgemaps of archaeology,
In-Hwa Choi

Mapping the bibliography of Citânia de Sanfins (Portugal). New methodological approach for a historiographic model
Natália Botica, Sílvia Maciel, Rebeca Blanco-Rotea, Manuela Martins

Other session 20:
Recent Developments in Digital Numismatics – Breaking down barriers

***Ethan Gruber**, American Numismatic Society*
***Karsten Tolle**, University of Frankfurt*
***David Wigg-Wolf**, Römisch-Germanische Kommission (RGK) des Deutschen Archäologischen Instituts*

Seminar Room, 8.40 – 10.40, 25 April 2019

Numismatics has seen significant advances in the digital sphere in recent years. Whereas initially computer applications were mainly restricted to statistical analysis and modelling (e.g. estimating the size of coin issues, or the analysis of coin finds), and recording collections or inventories of coin finds in stand-alone databases, the discipline has very much embraced the manifold possibilities that technical advances in the last decade have offered.

In particular, the nature of coins as mass-produced, serial objects with relatively standardised core data mean that with projects such as nomisma.org numismatics is very much at the forefront of the development of the application of Linked Open Data and the Semantic Web in the Digital Humanities. Other fields which have seen intense activity include the application of 3D-modelling as a means of documenting and presenting coins (the digital replacing the long-standing analogue practice of 3D-documentation with plaster casts), and of image recognition, not just for the automatic identification and classification of individual coins but, for example, also as a means of automatically identifying objects in the fight against the illegal trade in coins (e.g. the FP6 project, COINS: Combat on-line illegal numismatic sales).

The aim of the session is to present examples of recent work and advances in Digital Numismatics. In the past numismatics has often been seen as an isolated discipline with little (interest in) interaction with other fields. Therefore the session will place a particular emphasis on examining how the lessons learned from the various numismatic projects can be applied to other areas of the Digital Humanities, and how Digital Numismatics can be better integrated into the broader field of archaeology as a whole.

The session will take the form of a series of short presentations (c. 5 minutes), followed by a moderated discussion. Presentations are particularly invited from non-numismatic domain experts with a view to also examining what lessons numismatics can learn from the experience of those working in other fields.

8.40 – 8.45
U Eight Years of Nomisma.org: Past, Present, and Future
Ethan Gruber, Sebastian Heath, Andrew Meadows, David Wigg-Wolf

8.45 – 8.50
Recording barbaric psuedo-legends in digital databases
Adam Degler

8.50 – 8.55
British Celtic Coins Online,
Chris Green, Courtney Nimura

8.55 – 9.00
Applying Linked Open Data to non-standardised typologies: the example of Celtic coinages,
David Wigg-Wolf, Karsten Tolle

9.00 – 9.05
Breaking down barriers between detectorists and professionals - the Danish recording scheme for metal detector finds DIME (dime.au.dk),
Andres Dobat

9.10 – 10.40
General Discussion

Standard session 21:
Challenges and opportunities of machine learning in archaeological research

***Alex Brandsen**, Leiden University*
***Iris Kramer**, University of Southampton*
***Wouter Baernd Verschoof-van der Vaart**,*
Faculty of Archaeology / Leiden Centre of Data Science, Leiden University

Exhibition Room A, 8.40 – 12.40, 26 April 2019

For over two decades there have been sporadic presentations of diverse machine learning (ML) applications to digital archaeology at the CAA. In recent years there is a notable increase of papers using ML in archaeology, which may be ascribed to the success of Deep learning and Convolution Neural Networks (CNNs) across various disciplines that were previously described as being too complex for using machine learning. Applications using deep learning now show high performance on challenging tasks ranging from computer vision to natural language processing. In digital archaeology we have seen and foresee applications of these techniques including automated object detection in remote sensing data, artefact image classification, use-wear analysis, text mining, paleography, predictive modeling, 3D shape analysis and recognition, and typology development.

Our aim for this session is to bring together the previously scattered ML research to discuss practical as well as theoretical approaches for ML in digital archaeology.

For practical approaches we would encourage a critical dialogue to identify individual and shared problems, opportunities, and solutions. We invite authors to provide a thorough explanation on their approach and engage on some of the following questions: How do you structure archaeological datasets which are often small, incomplete, and noisy? What considerations applied to your choice of ML technique and how did was this technique tuned to your particular research? Which threshold do you find appropriate to determine the success of your method? What was your desired outcome and how did your final results compare to this? If your outcome resulted in a lot of new data that needs further manual validation, how do you plan to verify this? Do you foresee other applications for your method within archaeology or in other fields?

Our request for theoretical approaches can be more broadly interpreted. Some examples include: creation of annotated benchmark datasets, sharing of developed methods, data (or data structure), and code, data science challenges, conventions for data structure and performance metrics, need for collaboration or special interest groups, insights from ML fields outside of archaeology, ethics of ML in archaeology, education of ML in archaeology, rapid publishing of new ideas, future gazing.

8.40 – 9.00
Combination of machine learning methods of image and natural language recognition on ancient coin data,
Sebastian Gampe, Karsten Tolle

9.00 – 9.20
Improving the discoverability of zooarchaeological using Natural Language Processing,
Leontien Talboom

9.20 – 9.40
On seriation and clustering of pottery deposits: from methodological aspects to predictive modelling,
Danai Kafetzaki, Jeroen Poblome

9.40 – 10.00
From manual mapping to automated detection: developing a large and reliable learning data set for archaeological object detection,
Ralf Hesse, Wouter Baernd Verschoof-van der Vaart

10.00 – 10.40
General Discussion

COFFEE BREAK

11.00 – 11.20
Developing the Durham University Museum Artefact Collection (DUMAC) for Machine Learning Applications in Cultural Heritage,
Matthew Roberts

11.20 – 11.40
SkyEye, a machine learning software to detect archaeological structures in LiDAR Dataset,
Nathanaël Le Voguer, Clément Laplaige, Xavier Rodier

11.40 – 12.00
Application of object detection and semantic segmentation in structure-from-motion mappings of historic mining sites,
Wilhelm Hannemann, Jessica N. Meyer

12.00 – 12.20
Use of convolutional networks for archaeological feature detection in geophysical surveys,
Martin Olivier

12.20 – 12.40
General Discussion

Standard session 22:
Digital Infrastructures for Archaeology: Past, Present and Future directions

***Julian Richards**, Archaeology Data Service University of York*
***Holly Wright**, Archaeology Data Service University of York*
***Franco Niccolucci**, PIN*

Medium Hall B, 10.20 – 17.00, 24 April 2019

This session invites papers reflecting on the direction of development for research infrastructures in archaeology at the project, local, regional, national or international level. The successful completion in 2017 of the first phase of ARIADNE, an EC Infrastructures-funded project spanning 23 partners in 18 European countries, produced a greater understanding of how large-scale infrastructures can contribute to the development of archaeological knowledge (www.ariadne-infrastructure.eu). This spanned a variety of deliverables, and featured the ARIADNE Portal (portal.ariadne-infrastructure.eu). It also resulted in a better understanding of how project-based, local, regional and national infrastructures can work together to support and strengthen their own internal efforts, and participate in cross-border initiatives. The lessons learned within ARIADNE have informed the structure of the next phase of the ARIADNE infrastructure (ARIADNEplus), which will focus on broadening participation across Europe, and understanding best-practice worldwide. This session will be an opportunity to reflect on the results of the first phase of the ARIADNE project, to provide context with contributions from local, regional, national, or project-based infrastructures to discuss ongoing challenges, accomplishments, and wishes for the future. It will introduce the next phase of ARIADNE, and create a forum for ongoing discussion of the role, and direction of development of archaeological infrastructures in coming years.

10.20 – 10.40
Introduction

10.40 – 11.00
Where is the data?
Ulf Jakobsson

11.00 – 11.20
My data manager is a robot!
Valentijn Gilissen, Hella Hollander

11.20 – 11.40
The ARIADNE project at INRAP: inception, implementation and future,
Kai Salas Rossenbach, Amala Marx,

11.40 – 12.00
OpenArchaeo: an application to query archaeological data via CIDOC CRM,
Olivier Marlet, Xavier Rodier, Thomas Francart, Béatrice Markhoff

12.00 – 12.20
Czech archaeology in the Digital Environment – Digitizing Archaeological Agenda in Theory and Practice,
Jan Hasil, David Novák

12.20 – 12.40
ZBIVA web application,
Benjamin Stular

LUNCH BREAK

14.00 – 14.20
Archaeological Map of Bulgaria in ARIADNE and ARIADNEplus,
Georgi Nekhrizov, Nadezhda Kecheva

14.20 – 14.40
'A puzzle in 4D': using semantic technologies for the integration of resources from a long-term excavation project,
Edeltraud Aspoeck, Gerald Hiebel

14.40 – 15.00
The Swedish Digital Archaeological Workflow in Action,
Marcus J. Smith

15.00 – 15.20
The ADED project - a Norwegian infrastructure for excavation data,
Christian Emil Smith Ore, Espen Uleberg, Jakob Kile-Vesik

15.20 – 15. 40
Ísleif: a network-based approach to site survey,
Adolf Fridriksson, Gisli Palsson

COFFEE BREAK

16.00 – 16.20
ARIADNEplus for public/community archaeology,
Andres Dobat

16.20 – 16.40
CENIEH: A relevant source of digital paleoanthropological datasets for ARIADNEplus,
Mohamed Sahnouni, Maria Isabel Sarro Moreno, Cecilia Calvo Simal

16.40 – 17.00
Prospects and Potential for the National Digital Repository of Archaeological Site Reports,
Yuichi Takata, Akihiro Kaneda, Miyu Konuma, Sadakatsu Kunitake

Other session 23:
Taking your GIS onto the field. "How"-s and "Why"-s of future survey

***Nazarij Buławka**, Institute of Archaeology, University of Warsaw*
***Stefano Campana**, University of Cambirige*
***Julia Chyla**, Antiquity of Southeastern Europe Research Centre University of Warsaw*

Medium Hall B, 8.55 – 15.00, 25 April 2019

Have you ever wondered if it is possible to create field documentation using only your mobile phone? Can you imagine that you have just one tool to measure coordinates, take photos, create 3D models, plan your drone path and fill in the artefact database? Well, it seems that we are on the edge of a technological revolution: in the next few years, we are going to face a breakthrough in the GNSS technologies.

In April 2018, India successfully launched its eighth satellite (IRNSS-1I), Galileo should have reached its full capability soon. The first GPS 3 satellite will be sent to the orbit. This next generation satellite is thought to introduce a fourth GPS signal (L1C). As David A. Turner – Deputy Director Office of OES/SAT - has pointed out, one of the key topics discussed in the modernization of GPS is to "encourage compatibility and interoperability among global and regional systems". There is already a response to this in the smartphone industry as well: The BCM4775X is stated to be the first GNSS chip designed for smartphones to provide dual L1 and L5 frequency. Moreover, Android 7 OS has been equipped with tools to measure the carrier phase, which is a major ingredient in differential GPS. This capability is not available in every type of smartphone yet, but it is possible that future non-professional hardware could have better performance in GNSS.

We are facing changes in the professional hardware as well, as the current operating system used for most PDAs is being withdrawn from the market and replaced by others. GPS signals are going to change from codeless into a modernized civil-coded transmission, which is not going to be usable by all equipment currently used by archaeologists. A new era of modernized GNSS is approaching. We can face it when it is there in the 2020s or we can start preparing for it now. This is the question behind this session in which we will discuss both technical and methodological problems of field surveys which exists today and might occur tomorrow.

This session will consist of short (10-15 minute) case-study papers (10-15 minutes) and a longer, final discussion, in which we would like presenters to address the issue from their research point of view. The main goal of the session is to engage in a broad discussion on this topic involving international experts with the aim of establishing standards and guidelines that

may serve as "good practice" for Mobile GIS usage in archaeology. By "good practice" we aim to discuss topics such as:

- Why is Mobile GIS necessary for archaeology?
- What can be studied via Mobile GIS and how?
- What types of efficient workflows exist for data collection of sites and other landscape elements?
- How best to use mobile GIS on different geographic scales of details: Intra-site and off-site?
- What can archaeologists expect from Mobile GIS' cooperation with other tools, such as geodetic equipment, drones, and sensors?
- What is the ground truth of the collected data (precision, accuracy, and quality of crowdsourcing) and what is needed for the collection of archaeological datasets?
- Security of the archaeological data while using Mobile GIS applications (data loss and theft; access to data by the public; sharing of data);
- The problem of crowd data collection: how to check the quality of the collected data?

After discussing these questions through case studies and arguments we have to answer one last question: What is impeding the use of mobile GIS within archaeological community?

8.55 - 9.00
Opening

9.00 - 9.20
QField and the future of QGIS on mobile devices,
Marco Bernasocchi

9.20 - 9.40
Quantifying and objectifying archaeological survey data : the Archeotracker android app,
F. Hautefeuille, N. Poirier, E. Hautefeuille

9.40 – 10.00
Intensifying extensive survey: a digital workflow for rapidly assessing ancient settlements across large geographical areas 1,
A.Green, A. Alam, L. Green, A. Ranjan, R. Nath Singh, C. Petrie

10.00 – 10.20
Approaching Neolithic and Early Bronze Age "flint-scapes" in Orońsko Commune (Poland) through Mobile GIS,
S. Buławka, K. Kerneder-Gubała, N. Buławka

10.20 – 10.40
Mobile GIS application for field prospection. Case study of archaeological sites in Huarmey Valley, Peru,
J.M. Chyla

COFFEE BREAK

11.00 – 11.20
Enough paperforms - a web and a mobile app for GIS-based field surveys in Bulgaria,
N. Kecheva, T. Branzov, L. Nedyalkov

11.20 – 11.40
Taking not only your GIS onto the field: how to merge our individual documentation types into one archaeological knowledge system,
E. Schönenberger, K. Kruse, P. Wiemann

11.40 – 12.00
Seven years of FAIMS Mobile: Strategies for field recording infrastructures,
S.A. Ross

12.00 – 12.20
Barriers to the Adoption of Digital Systems in Field Research,
A. Sobotkova, S.A. Ross

12.20 – 12.40
Mobile GIS in the field: what people asked for and what they used, a retrospective on seven years of FAIMS,
B. Ballsun-Stanton, A. Sobotkova

LUNCH BREAK

14.00 – 14.20
The Present and the Future of Field-Surveys: are we aware of the digital limitations?
P. Janouchova, A. Sobotkova

14.20 – 14.30
Placing Mobile GIS in the archaeological field survey,
N. Buławka, J.M.Chyla

14.30 – 14.40
Opening the discussion
S. Campana

14.40 – 15.00
Discussion

Standard session 24:
New methods for stratigraphic modeling

Vasiliki Andreaki, Universitat Autònoma de Barcelona
Juan Barceló, Universitat Autonoma de Barcelona

Exhibition Room A, 10.20 – 16.20, 24 April 2019

Various ways have been developed through years showing the necessity to represent visually archaeological stratigraphic sequences. Starting from the classical two-dimensional Harris diagrams to modern three dimensional reconstructions based on photogrammetry and microtopographic data, computers are now the fundamental to process the huge quantity of field data necessary to understand time at the archaeological excavation.

This session has been created to integrate the most recent advances in using computer modelling for data acquisition, processing and presentation of stratigraphic units and sequences. We would like to invite papers presenting different ways to create analytic models of stratigraphic sequences, including:

- data capture and photogrammetry in the field,
- database recording of depositional events,
- extended Harris matrix methods,
- 4D Wheeler diagrams in geoarchaeology
- microtopographic modelling and surface interpolation,
- solid modeling of archaeological excavation
- geomorphology and advanced methods for structural geology
- models of "living floors",
- Directed Acyclic Graphs (DAG) and Bayesian Networks,
- Allen's Algebra and equivalent ontologies for temporal representation,
- Virtual reality systems, teleimmersive systems and cyberarchaeology.
- Ubiquitous computing and portable devices in the field

Especially important is the integration of relative chronology (stratigraphic ordering) and radiometric dates, as modern methods of bayesian chronology ask for stratigraphic data to define boundary events.

We think that stratigraphic modeling, in all its possible incarnations is a domain that needs a new theoretical background to allow the development of new techniques and technologies for understanding the formation processes of archaeological sites.

10.20 – 10.40
Moving on Up: Combining methods for improved stratigraphical sequencing,
Michal Birkenfeld

10.40 – 11.00
Computing Archaeological Stratigraphies. A State-of-the-Art,
Juan Antonio Barceló

11.00 – 11.20
Surface Correlation and the Sequence of Occupational Floors at La Draga, Banyoles (NE Iberia),
Vasiliki Andreaki

11.20 – 11.40
Simultaneous Horizontal and Vertical Stratigraphic Recording Using Daily UAV Flights,
Kristen Jones, Christopher Radford, George Bevan

11.40 – 12.00
The application of 3D density analysis to archaeological data,
Joshua James Emmitt, Sina Masoud-Ansari

12.00 – 12.20
When Harris met Allen in The Matrix: How can the conceptual modelling of stratigraphic relationships facilitate deeper understanding of archaeological space and time?
Keith May, James Stuart Taylor, Steve Roskams

12.20 – 12.40
Archaeological sequence diagrams, directed graphs and Bayesian chronological models,
Thomas S Dye, Brony C Moody, Keith May, Caitlin E Buck

LUNCH BREAK

14.00 – 14.20
Three-dimensional documentation, reconstruction and visualization of site stratigraphy: A case study of Saruq al-Hadid (Emirate of Dubai, UAE),
Otto Bagi

14.20 – 14.40
Stratigraphy and photogrammetry: the case study of the Basilica Capo Don,
Alessandro Garrisi, Alessio Paonessa, Elia Kas Hanna

14.40 – 15.00
Interactive Visualisation of Stratigraphic Data,
Fabian Riebschlaeger

15.00 – 15.20
Going with the flow - From sediment cores underwater to 3D stratigraphic models in ArcGis to site management,
Niels Bleicher, Tim Wehrle

15.20 – 15.40
Spatial Sequences: The use of 3D GIS for the identification of complex archaeological patterns,
Nicolo' Dell'Unto, Giacomo Landeschi, Andreas Svensson

COFFEE BREAK

16.00 – 16.20
Discovering the time of La Draga,
Igor Bogdanović, Vasiliki Andreaki, Joan A. Barceló, Raquel Piqué, Xavier Terradas, Antoni Palomo, Núria Morera, Oriol López

Standard session 25: "Real-time" archaeological data. Hyperreality, temporality and materiality of digital archaeological objects

***Monika Stobiecka**, "Artes Liberales" Department, University of Warsaw*

Medium Hall B, 16.00 – 17.40, 26 April 2019

From data-gathering, through computing and rendering, to simulations, the notion of "real-time" is widely present in digital and cyber archaeology. A term that originated in computer applications has analytical potential for digital archaeological theory.

"Real-time" simulations problematize the questions of reality, hyperreality, representation, subjectivism and objectivism. When digital archaeological objects are being rendered in real-time, they encourage us to investigate the actual character and status of obtained data. What does is mean for an artifact or an archaeological site to be recorded in the real-time? What is the relation between the referent and the referred in this case? How can we examine a disturbing rupture between real-in-reality and real-in-hyperreality?

"Real-time" inspires us to rethink the problem of time, temporalities, and events. Real-time objects, treated as events, have multiple temporalities. While using real-time, we are registering "events". What is an "archaeological event" in this context? What kind of temporalities does it refer to? What is the relation between temporality and materiality of archaeological objects and sites? Assuming that archaeologists are working on vibrant matter (Bennett 2010) and/or performative materialities, we can investigate the relation between real-time technologies and materiality. Is real-time truly a form of registering unstable reality, or rather a form of capturing a temporal moment in time?

Another aspect of "real-time" has to do with objects themselves. Adopting Yuk Hui's (2016) identification of digital objects as composed of data and metadata subjects matter of philosophy, we may pose specific questions in relation to archaeological digital artifacts and sites. We may reflect on their ontological status and consider bridging the gap between two apparently distant phenomena – digital turn and ontological turn.

Treating discussions about "real-time" as an interesting platform, I invite proposals that deal with the theoretical, methodological and practice based problems of reality and hyperreality, time and temporality, matter and materiality, epistemology and ontology of digital archaeological objects.

16.00 – 16.20
Archiving realtime archaeological (para)data or archiving archaeological (para)data realtime?
Isto Huvila

16.20 – 16.40
Beyond regular temporality: Faster than eye,
Michal Piotr Gilewski

16.40 – 17.00
Disrupted temporalities of digital archaeological artifacts,
Monika Stobiecka

17.00 – 17.20
Real-time Performative Negotiations of the Archaeological Unknown within Digitally-born Objects and Landscapes,
William Michael Carter

17.20 – 17.40
General Discussion

Standard session 26: Archaeological network research: formal network representation of archaeological theories

***Paula Gheorghiade**, University of Toronto The Archaeology Centre, University of Toronto Material Entanglements In the Ancient Mediterranean and Beyond Project, Johns Hopkins & National Hellenic Research Foundation*
***Tom Brughmans**, University of Oxford*

Large Hall A, 10.20 – 15.40, 24 April 2019

In this session we aim to discuss and encourage the explicit representation of archaeological theories as network data, and the explicit theoretical motivation of network science method selection.

Formal network science methods are increasingly commonly applied in archaeological research to study diverse aspects of past human behaviour. The vast majority of these applications concern the use of exploratory network analysis techniques to study the structure of a network representation of an archaeological dataset, which often leads to a better insight into the structure of the dataset, help identify issues or missing data, and highlight interesting or surprising data patterning.

Less common is the explicitly formulated theoretical motivation of exploratory network analysis tool selection. What tools are appropriate representations of my theorized assumptions? What tools violate my theoretical framework? Equally uncommon is the formal representation of archaeological theories (rather than archaeological data) as network data. What network data pattern do I expect to see as the outcome of a theorized process? What does a theorized past relational phenomenon look like in network terms?

Taking explicitly formulated theories rather than datasets as the starting point of archaeological network research is useful for a number of reasons. It forces the researcher to specify the theory that will enable its formal representation, and possibly improve or modify it through this process. It allows for understanding the behaviour and data predictions of a theory: in exploring the structure of the theorized relationships, the implications for processes taking place on theorized networks, and the evolution of theorized network structure. It facilitates the selection of appropriate network analytical tools that best express the theory or that are appropriate in light of the assumptions inherent in the theory. Finally, it allows for comparisons of data patterns simulated as the outcome of a theorized network process with archaeological observations, to evaluate the plausibility of the theory.

This session welcomes presentations on the following topics:

- archaeological network research: applications, methods or theories;
- network representation of archaeological theories;
- testing archaeological theories with network science;
- using network configurations, motifs and graphlets for representing theories;
- exponential random graph modelling;
- agent-based network modelling;
- spatial network modelling.

10.20 – 10.40
First steps towards ontological geography: experimenting with topographic networks,
Zoran Čučković

10.40 – 11.00
Movescape: towards a formal representation of multiple pathways,
Laure Nuninger, Philip Verhagen, Xavier Rodier, Rachel Opitz, Thérèse Libourel, Clément Laplaige, Catherine Fruchart

11.00 – 11.20
Explicit Knowledge Representation and Cultural Transmission in an Abstract Agent-based Model with Networks, Time and Space,
Frederik Schaff

11.20 – 11.40
Cutting the network, knotting the line: anticipating emergent properties from multimodal networks,
Gisli Palsson

11.40 – 12.00
Evaluation of Probabilistic Graphs or Networks in Archaeology,
Lutz Schubert, Martina Trognitz

12.00 – 12.20
Network analysis of an archaeological research project: A graphical monitoring of the developing interdisciplinary co-authorship of the PaleoAsia project, *Yasuhisa Kondo, Yoko Iwamoto*

12.20 – 12.40
Imposing a free-market present on the Past: Is homo economicus stalking archaeology theory?
Raymond John Rivers, Tim Evans

LUNCH BREAK

14.00 – 14.20
Exposing Economic Complementarity through Archaeological Network Analysis,
Kayeleigh Sharp

14.20 – 14.40
Structure, hierarchy and network dynamics of the complex chiefdom societies of "Germania libera" during the Roman period: The Middle Danube region borderlands,
Marek Vlach, Balázs Komoróczy

14.40 – 15.00
Creating and Analyzing Networks of Interdisciplinary Conceptualizations of 'Change' for the Sagalassos Archaeological Research Project,
Georgia Panagiotidou, Jeroen Poblome, Jan Aerts, Andrew Vande Moere

15.00 – 15.20
Detecting networks among population groups in Early Archaic Sicily,
Emma Nicole Buckingham, Samuel Heroy

15.20 – 15.40
General Discussion

Standard session 27: Chasing heritage thieves: digital methods and approaches to contrasting trafficking and looting of cultural property

***Arianna Traviglia**, University Ca' Foscari of Venice*
***Riccardo Giovanelli**, Università degli Studi di Milano VEiL Project Università Ca' Foscari Venezia*

Exhibition Room A, 16.40 – 18.00, 24 April 2019

Looting and trafficking of cultural heritage, especially archaeological, is now a global scale phenomenon, the origins of which are rooted in history. Since the '70s, despite the 1970 UNESCO convention, plundering and illicit trade of cultural property has become an increasing trend with major consequences to internal security, economies and even loss of cultural identity, which exists without distinction at all latitudes, in the most advanced economies of the planet as well as in less wealthy countries. More recently, the phenomenon has been further exacerbated by conflict and turmoil in areas where political stability is compromised. Studies draw a firm connection between increased looting with the political destabilisation of the states.

The last decades have also witnessed several initiatives, promoted by a diverse set of actors engaged in the protection of endangered cultural heritage and halting illicit trade, that rely increasingly on technological and digital advances to combat such illegal activities. This session aims to take stock of ongoing initiatives and bring together emerging digital practices aimed at understanding the complexity of the phenomena of pillage and illicit trade in archaeological objects and evaluate them. We invite participants to discuss approaches and methods that are being adopted (or proposed) to foster remediation and resolution. This includes (but it is not limited to) established practices such as the use of remote sensing to detect looting activities, the role of network analysis to model illicit antiquities trade, the establishment of (local or global) databases of lootable or looted items, together with less explored (but highly promising) methods such as quantitative analysis, predictive modelling, data mining (especially on the dark web where looted properties are often traded), statistical analysis, deep learning, block chain technologies, and even apps and social media.

The session is organised within the framework of the H2020 Netcher project (NETwork and digital platform for Cultural Heritage Enhancing and Rebuilding) that aims at creating a structured network of actors engaged in this fight.

16.40 – 17.00
Towards best practices for monitoring and quantifying archaeological looting with SAR and optical satellite time series,
Deodato Tapete, Francesca Cigna

17.00 – 17.20
Assessing manual, unsupervised, supervised and automatic change detection methods for detection of looting in Apamea, Syria,
Francesca Cigna, Deodato Tapete

17.20 – 17.40
Satellite based extraction of archaeological looting patterns: from visual inspection to automatic procedure. Overview and case studies,
Nicola Masini, Rosa Lasaponara

17.40 – 18.00
JCHC: an editorial and social media project as a collection and dissemination tool in contrasting Crimes against Cultural Heritage,
Serena Epifani, Michela De Bernardin

Standard session 28: Computational classification in archaeology

Oliver Nakoinz, Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität zu Kiel
Martin Hinz, Institute of Archaeological Sciences, Bern University

Seminar Room, 10.20 – 15.40, 24 April 2019

To make inferences on archaeological material that goes beyond the individual object we always have to decide what is similar or equal and what is not. This reasoning is at the heart of the archaeological method since its beginning and describes what we understand as meaningful categories such as a type and what we try to achieve with a typology. We group and label objects on the basis of more or, in most cases, less defined criteria. Predominantly this is still done in an "impressionistic" or "intuitive" manner since more "objective" and "standardised" methods, combined with automated recording of the artefacts, have not found a wide reception within archaeology. The reason for this might be that most approaches are considered to be complicated, general or reductionistic.

According to the growing interest in pattern recognition, machine learning, and data mining, classification plays again a significant role in quantitative archaeology. This development could be seen in the classification session at the CAA2018. Now, we focus on two specific aspects of computational classification:

1. Automatic processing of considerable amounts of data. The production of local, regional and supra-regional data sets during the last decades left us with a big amount of data to analyse. Computational classification is an important approach for forwarding the acquired information into the process of archaeological reasoning. The given data, research questions, and theories in different case studies require specific classification methods which will be discussed in this session. Pattern recognition, machine learning and data mining approaches used on large data sets, heterogeneous data or used for supra-regional analysis are topics of this focus.
2. Method validation and reproducibility. Currently, there is not only a huge amount of data but there are also many classification algorithms and approaches available. This requires a much deeper understanding of the theoretical and methodological basics. In this session we will try connecting theory and method, evaluate different methods and estimate range, limitations and methodological constraints of different approaches. Furthermore, we hope to discuss standards of method description and reproducibility. We invite papers on new developments and methodological issues in computational classification.

The aim of the session is to provide a better understanding of classification methods and algorithms and of validation techniques since sound methodological knowledge is required to choose the right approaches among many competing approaches. In particular, a tight connection between method and theory which is essential for a valid interpretation of the results has to be based on this kind of knowledge rather than on methodological fashions.

10.20 – 10.40
An Archaeological Perspective on the Classification of Categorical Data,
Erik Gjesfjeld

10.40 – 11.00
A method for automatic classification of archaeological artefacts using computer vision and machine learning algorithms,
Diego Jiménez-Badillo

11.00 – 11.20
Point and Line to Hyperplane: Set and Graph Theory for Parsing Systemic Contexts and Assemblages,
James Scott Cardinal

11.20 – 11.40
To perceive or to compute? Comparison of impressionistic and computer-aided vessel shape classification based on completely preserved late Neolithic pottery of Central Europe,
Martin Hinz, Caroline Heitz

11.40 – 12.00
How deep or random is your forest? Some thoughts about making the right (algorithm) choice,
Agnes Schneider

12.00 – 12.20
Recovering Commonalities and Highlighting Differences in Aegean Sealings,
Bartosz Bogacz, Nikolas Papadimitriou, Diamantis Panagiotopoulos, Hubert Mara

12.20 – 12.40
A re-evaluation of the concept of type in coroplastic studies based on 3D shape analysis of terracotta figurines from Ayia Irini, Cyprus,
Valentina Vassallo, Sorin Hermon, Andreas Scalas, Michela Mortara, Michela Spagnuolo

LUNCH BREAK

14.00 – 14.20
Comparing sites, based on ceramic finds spectra,
Vincent Mom

14.20 – 14.40
An object-based predictive model for "control places" location in Alpine Environment (Northern Italy),
Luigi Magnini, Armando De Guio, Cinzia Bettineschi

14.40 – 15.00
From the photo to the size groups: Seeking relationships between artefact fragmentation and the use of the living space,
Michaela Prišťáková, Petr Dresler, Vojtěch Nosek

15.00 – 15.20
An Automated Approach to the Classification of Fragmented Faunal Remains using Differential Geometric Methods and Machine Learning,
Peter J Olver, Katrina Yezzi-Woodley, Jeff Calder, Martha Tappen, Pedro Angulo-Umana, Bo Hessburg, Riley O'Neill, Jacob Elafandi, Reid Coil, Chehrzad Shakiban

15.20 – 15.40
General Discussion

Other session 29:
Our little minions, part 2: small tools with major impact

***Ronald Visser**, Saxion - University of Applied Sciences*
***Florian Thiery**, Römisch- Germanisches Zentralmuseum (Mainz, Germany)*
***Moritz Mennenga**, Lower Saxony Institue of Historical Coastal Research*

Medium Hall A, 16.00 – 17.40, 24 April 2019

In our daily work, small self-made scripts, home-grown small applications and little devices significantly help us to get work done. These little helpers often reduce our workload or optimize our workflows, although they are not often presented to the outside world. Instead, we generally focus on presenting the results of our research and silently use our small tools during our research. This session will focus on these small helpers ("little minions",) and we invite researchers to share their tools so that the scientific community may benefit and – perhaps – create spontaneously special interest groups. This session aims at short presentations – "minion talks" (max. 10 minutes including discussion) – of small software or hardware solutions, not only focusing on field work/excavation technology, associated evaluation or methodical approaches in data driven archaeology. Each "minion talk" should explain the innovative character and mode of operation of the digital tool. The only restriction is, that the software, code or building instructions are open and freely available (e.g. GitHub). Proprietary products cannot be presented (but tools designed for them). We invite "minion talks" that present small tools or hardware inventions related but not limited to the following subjects:

- data processing;
- measuring;
- digital documentation;
- GIS-Plugins;
- hands-on digital inventions (for excavations);
- Linked (Open) Data tools;
- ... etc.

We invite speakers to submit an abstract. But after last years spontaneous success of "Stand-up-Science", there will also be an opportunity to spontaneously participate and demonstrate what you have on your stick or laptop. If you want to participate without an abstract in the spontaneous section of the session, please send an email to us (even shortly before the conference). This is however not obligatory.

Please come and spontaneously introduce your little minion!

16.00 – 16.10
A Linked and Open Bibliography for Aegean Glyptic in the Bronze Age,
Martina Trognitz

16.10 – 16.20
My little text mining minion,
Ronald Visser

16.20 – 16.30
Taming Time Tools: Alligator and Academic Meta Tool,
Allard Mees, Florian Thiery

16.30 – 16.40
Serial, fast and low cost 3D pottery on site documentation,
Fanet Göttlich

16.40 – 16.50
CpyPst3D: a tool for direct exchange of 3D features with attributes between GIS, 3D-modeling environment and CAD,
Bart Vissers

16.50 – 17.40
General Discussion

Standard session 31:
In pursuit of social space. Detecting activity areas in Palaeolithic contexts

***Gwénaëlle Moreau**, University of Liège (Belgium)*
***Vincenzo Spagnolo**, Università degli Studi di Siena (Italy) - Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente - U.R. Preistoria e Antropologia*
***Nuria Morera Noguer**, Universitat Autònoma de Barcelona (UAB)*
***Andrzej Wiśniewski**, Institute of Archaeology, University of Wroclaw,*
***Irene Ortiz Nieto-Márquez**, Universidad Complutense de Madrid*

Large Hall A, 16.00 – 18.00, 24 April 2019

The label "Palaeolithic site" encompasses a wide range of settlement organizational patterns, which are related to the mobility and economic strategies adopted by hunter-gatherer groups. The evidence of space management by hunter-gatherers constitutes a precious tool for the reconstruction of Palaeolithic settlement dynamics.

Usually, the only structuration elements of space that we can still see are zones with gradient densities of lithics and faunal remains. The introduction of GIS in Archaeology significantly increased our ability of detecting the structured components of space, reducing the subjectivity of the visual approaches, thanks to the parameterizing of data and application of the geostatistical methods.

In the intra-site scale of Palaeolithic sites, the Minimum Spatial Units represent the Activity Areas and their relations with possible features and structures in the site (both evident and latent). Detecting these Spatial Units requires a complex analytical protocol, including a taphonomic premise, as well as the palimpsest dissection (aimed to achieve a high-temporal-resolution) and the elimination of background noise (aimed to obtain a more refined reading of the evidence). In this regard, GIS is confirmed as the best analytical tool, due to its integrated structure and its scientific background in the field of spatial studies. Despite a wide variety of choices, in terms of analytical methods (e.g. KDE, Spatial autocorrelation, K-means, …), we are still far from a common study protocol which can produce effectively comparable results from different sites. However, our analytical methods must be flexible and context-specific, and adapt to differences in preservation, variability and temporal meaning of Palaeolithic sites (e.g. palimpsest-effect, functionalities of sites, …).

In this session, we would like to discuss activity area identification and interpretation processes. Our goal is to set up the basis required for the development of a common model of spatial-functional analysis within Palaeolithic contexts. We warmly invite papers in which integrated and multidisciplinary approaches are applied to gaining new meaningful data on Palaeolithic behaviour. Applications in different contexts, such as open-air, rock-shelter and

cave sites, living floors, short-term or long-term palimpsests, will be welcome. The results must encourage a better integration and comparability of spatial studies in Palaeolithic research.

16.00 – 16.20
A spatial analysis protocol to detect human's activity areas of Middle Palaeolithic open air sites from Northern France,
Gwénaëlle Moreau, Jean-Luc Locht

16.20 – 16.40
Hidden data. The spatial analysis process, from data definition to functional areas identification. Examples from some Italian Middle Palaeolithic sites,
Vincenzo Spagnolo

16.40 – 17.00
GIS spatial analysis of the Middle Palaeolithic site from SW Poland. Integrated approach,
Andrzej Wiśniewski, Marcin Chłoń

17.00 – 17.20
The Gravettian Levels from Arbreda Cave: Understamding the Formation of Residential Contexts of Pre-Late Glacial Maximum Hunter-Gatherers,
Isaac Rufí, Núria Morera, Joaquim Soler, Lluís Lloveras, Narcís Soler

17.20 – 17.40
Palaeo-GIS of chocolate flint mining area in Orońsko, Southern Poland,
Katarzyna Marta Kerneder-Gubała, Nazar Buławka, Sylwia Buławka

17.40 – 18.00
Geomorphometry in Palaeo-GIS applications: What landform analyses can contribute to the study of Palaeolithic landscapes,
Felix Henselowsky, Patrick Cuthbertson

Standard session 32: Multiscalar and Multivariate Approaches to Digital Documentation of Archaeological Sites

***Alfonso Ippolito**, "Sapienza" University of Rome*
***Dominique Rissolo**, Center of Interdisciplinary Science for Art, Architecture, and Archaeology University of California, San Diego*

Seminar Room, 11.00 – 11.40, 26 April 2019

Specific research objectives or priorities as well as unanticipated opportunities and challenges in the field often dictate that each portion of an archaeological site might not be documented at the same level of detail or via the same documentation modality. Either by design or by circumstance, data can vary greatly in terms of scale and, consequently, density or resolution. With the widespread adoption of photogrammetric techniques, new issues of data quantity and quality have come to the fore.

This session explores topics related to massive data acquisition, scalar diversity, and creation of hetergenous models. Digital images or image-derived data are commonly integrated into (and/or compared with) data acquired from laser scanning for the purpose of validation or texturing. However, imaging modalities need not be deployed in tandem to be considered complementary – as different objects, deposits, features, or structures (or components thereof) may call for the use of one technique versus another based on documentation objectives or situational realities. This session hopes to stimulate discussion on the potential benefits and limitations of integrative multiscalar approaches while evaluating the effectiveness and efficiency of practices currently in use.

11.00 – 11.20
Developing a digital documentation toolkit for the recording of coastal archaeology under threat,
Anthony Corns, Robert Shaw, Gary Devlin, Sandra Henry, Edward Pollard, Toby Driver, Louise Barker, Daniel Hunt, James Barry, Kieran Craven, Sarah Davies, Patrick Robson

11.20 – 11.40
Complex Study of Exogenous and Antropogenic Impact within Territory of Volga-Bulgar Fortified Settlements (Tatarstan, Russia),
Iskander Gainullin, Bulat Usmanov, Artur Gafurov, Alexey Kasimov

Standard session 33: Digital Landscapes in Archaeology: From field recording to the reconstruction of human use of space

***Eduardo Herrera Malatesta**, Leiden University*
***Israel Hinojosa-Balino**, CIESAS/Durham University*
***Moisés Hernández Cordero**, IKAnt, Institute for the Study of the Ancient Culture*

Medium Hall A, 8.40 – 12.40, 26 April 2019

Since the early processualist approaches to the post-processual trend and the contemporary integration of disciplines, the study of landscapes in archaeology has been a long and fruitful sub-discipline. Within this development, the impact that Geographical Information Systems and spatial statistics have had on the contemporary advance of landscape research is undeniable. In particular, we have seen the creation of bridges between a wide range of disciplines such as cartography, environmental sciences, history, archaeology, geology, anthropology, computers sciences, among others. Computational methods have brought new avenues for research to the reconstructions of past landscapes, not only for the reconstructions of the ancient past but from contemporary landscapes and their (re)presentations in the context of community archaeology and heritage studies.

With this session, we aim to bring together researchers interested in reflecting on and debating the role of GIS-led research for the future of landscape archaeology, using cutting-edge methods for analysis of distributional patterns, understanding movement, digital reconstructions, etc. Contributions may deal with many aspects of this productive relationship, ranging from the collection of data in the field (small finds and landscape survey) and editing, processing, storing, sharing or visualizing it; to theoretically reflect the possibilities and scope for landscape reconstruction or analysis within GIS-led research.

We have no restrictions on the temporal or spatial contexts of case studies. However, we strongly encourage authors to reflect upon the session's issues using concrete case studies.

8.40 – 9.00
The missing landscape of the Mycenaean Argive Plain,
Victor Klinkenberg, Riia Timonen

9.00 – 9.20
Exploring GIS methods for reconstructing boundaries,
Irmela Herzog

9.20 – 9.40
Using LiDAR as a tool for remote archaeological prospection: the case of Salas and Cobertoria's barrow landscapes (Asturias, Spain),
Fernando Rodríguez Del Cueto, Miguel Carrero Pazos

9.40 – 10.00
Indigenous Landscapes in the Caribbean: Using network analysis and spatial statistics to revisit colonial representations of territory,
Eduardo Herrera Malatesta, Lewis Borck, Maroussia Favre Carlen, Jan Christoph Athenstaedt, Corinne L. Hofman

10.00 – 10.20
(De)constructing the Iron Age and Roman Landscape of Citânia de Sanfins (Portugal) through Geospatial tools. An interpretative model,
Sílvia Maciel, Rebeca Blanco-Rotea, Natália Botica, Manuela Martins

10.20 – 10.40
Prediction of paleolithic sites in KwaZulu-Natal, South Africa using remote sensing, digital landscape analysis and statistical classification,
Christian Sommer, Viola Schmid, Gregor Bader, Manuel Will, Michael Maerker, Nicholas Conard, Volker Hochschild

COFFEE BREAK

11.00 – 11.20
GPS Technology in Field Survey the MYCENAEAN SPERCHEIOS-VALLEY ARCHAEOGEOPHYSICAL PROJECT (MY.SPE.AR. Project 2018-2022),
George Malaperdas, Vayia Panagiotidis, Adrianos Psychas, Christofilis Maggidis, Nikolaos Zacharias

11.20 – 11.40
Cosmological conceptions that transformed the Nile Delta. A hydrological approach from pre-dynastic Egypt to the rise of Islam,
Israel Hinojosa-Balino

11.40 – 12.00
GIS-based approach in cultural landscapes investigations. The case of Dobużek Scarp microregion (E Poland),
Maksym Mackiewicz, Tomasz Jacek Chmielewski, Piotr Demczuk, Mirosław Furmanek, Igor Pieńkos, Jan Reder, Józef Superson, Mateusz Zawadzki, Paweł Zawiślak

12.00 – 12.20
Affordances and Purpose: Modelling Social Behaviour in the Landscape Using GIS,
David Novák

12.20 – 12.40
General Discussion

Standard session 34: Archaeological Data for Modern Problems. Modern Methods for Archaeological Questions

***Stefani Crabtree**, Pennsylvania State University*
***Iza Romanowska**, Barcelona Supercomputing Center*

Large Hall A, 9.40 – 15.00, 25 April 2019

Challenges faced by modern societies like climate change, epidemics, mass migration, or uneven wealth distribution may seem insurmountable, but they have their analogues in the past. The scale of the challenges may be different, yet the scope of the problems remains the same. Past peoples dealt with anthropogenic change, population shifts, disease, and famine, and the myriad other issues similar to the ones we face today. Some of them were successful in combating these challenges, some of them less so. With the onset of big data, robust computational analysis, scientific approaches to data collection, sampling and modelling, the notion that archaeology is a modern scientific discipline that can contribute useful insights to today's problems has gained momentum. With the technological shift it is no longer regarded as naive to suggest using archaeological and historical data to extend and calibrate our understanding of the present and to try to provide more informed predictions for the future. The question, though, is how do we do that?

In this session we welcome papers from archaeologists whose computational analyses have implications for understanding one of the following broad topics:

- climate change and resilience;
- migration;
- health science;
- wealth distribution;
- cultural identity.

The goal of this session is to encourage researchers to actively use their case studies to approach modern challenges and/or to use their data to bear on influencing public policy. Thus, each of the segments of the session will be followed by an invited discussant – a researcher outside the domain of archaeology who will comment on how data and models from past systems could help with modern challenges.

This session will be punctuated with several breaks for discussion, and the organizers will work as facilitators to bridge questions between practicing archaeologists and economists, climate scientists, public health experts, urban planners, and other scientists whose work could

benefit from dialogue with archaeologists. It is the ultimate goal that this session will lead to constructive collaborations between archaeologists and scientists from other disciplines to solve the largest of today's problems.

9.40 – 10.00
Ecological Marginality and Internal Migration on the Mesa Verde North Escarpment,
Kelsey M Reese

10.00 – 10.20
Promoting human and environmental health by tailoring evidence-based action to local context,
Ross Alan Hammond

10.20 – 10.40
Is Now a Good Time? Bridging Past and Present with Models and Modeling,
John T. Murphy

COFFEE BREAK

11.00 – 11.20
Using the Deep-Time of Archaeology to Understand the Interface of Human and Environmental Health,
Stefani A. Crabtree

11.20 – 11.40
Off they went! What past migrations can teach us about the present and the future of Homo sapiens,
Iza Romanowska

11.40 – 12.00
"Don't put all your eggs in one basket": modelling cropping strategies and climate change in the Indus Civilisation,
Andreas Angourakis, Cameron A. Petrie

12.00 – 12.20
Open Science, Networks, Archaeology and Physics,
Marc Santolini

12.20 – 12.40
General Discussion

LUNCH BREAK

14.00 – 14.20
Programing Human Behavior. Towards a Library of Universal Algorithms,
Florencia Del Castillo Bernal, Juan Antonio Barceló, Xavier Vila

14.20 – 14.40
The climate changes on the Boreal-Atlantic transition in the Tyrol highmountain area as a factor influencing Mesolithic people up-down migrations,
Albert Wydrzycki

14.40 – 15.00
General Discussion

Other session 35:
Extreme Data Processing in Archaeology

Sebastian Cuy, Deutsches Archäologisches Institut
Benjamin Ducke, Deutsches Archäologisches Institut (DAI)
Reinhard Foertsch, German Archaeological Institute
Marco Block-Berlitz, University of Applied Sciences Dresden (HTW Dresden) Germany

Seminar Room, 14.00 – 15.00, 25 April 2019

Computational tractability (in practical terms: the question of whether it is possible to compute useful results within an acceptable time frame) is a decisive factor in many areas of archaeological data processing. Examples for this include high-resolution geophysical surveying, remote sensing, terrestrial and aerial laser scanning, image processing and image-based 3D reconstruction, high-detail simulation models and cost-distance based GIS analyses.

Obtaining the best possible results from the processing of extremely large volumes of data requires engineering skills, creativity and sound knowledge of optimization techniques: The limits of available resources define the possibilities of data analysis and scientific inquiry more often than would be desirable. Knowing how to push these limits becomes a hallmark of cutting edge research.

The predominant constraints of "practical computability" tend to fall into a relatively small but persistent number of categories:

1. The available resources are insufficient for the tasks at hand.
2. Automated solutions are not available for the entire processing chain.
3. Sensor speeds and resolutions advance faster than (affordable) processing and storage technologies.
4. Some processing tasks are of (presumably) intractable mathematical nature ("NP-hard" problems).

Frequently enough, such issues occur in concert and interact with each other to create technically challenging scenarios. The great efforts that the archaeological community invests into addressing and overcoming these challenges are often underrepresented (if not to say absent) from the forefront of academic discourse and publications. This session aims to make a contribution towards creating stronger awareness of the immense technical skill sets at work behind the scenes of many archaeological research projects and exposing their vital contributions to modern research.

We invite speakers willing to showcase working solutions to the challenges of extreme data processing in archaeology, including "brute force approaches" to hardware and software engineering (such as concurrent/parallel processing pipelines and GPU-based processing), "soft approaches" (employing smart heuristics, sampling strategies and divide-and-conquer

approaches), but also creative and efficient solutions for automating time-consuming manual tasks.

Important notes on session format: This session is meant as an open forum for the immediate benefit of all participants. Contributors should be prepared to give full technical details and insight into their approaches and technical solutions. This includes (where applicable) granting looks into program and/or scripting code, as and if requested by the participants. Contributors are asked to reserve at least one half of their time slot for impromptu technical discussion (with the participation of the audience), detailed showcasing and live demonstration. All accepted contributors are strongly encouraged to contact the session organizers well in advance to discuss the technical and procedural requirements of their contribution.

14.00 – 14.30
Can we process all data we capture on the field? The limits of processing high detail Structure from Motion data on Late Antique urban sites,
Moises Hernandez-Cordero

14.30 – 15.00
What's missing? Comparing large-scale magnetometry results with excavation datasets,
Gábor Mesterházy

Roundtable 36:
User Experience Design in Archaeology and Cultural Heritage

Francesca Dolcetti, University of York
Sara Perry, University of York
Rachel Opitz, University of Glasgow

Exhibition Room A, 8.40 – 12.40, 25 April 2019

Despite the widespread dissemination of digital tools and applications in both archaeology and heritage, relatively little is known about their real effectiveness and impact on diverse audiences (specialists and lay publics alike). A new iterative design workflow, involving end users and stakeholders from the outset, as well as an accompanying design evaluation methodology, may open new avenues for engagement while, at once, constructively influencing our research objectives and epistemologies.

In this Roundtable session, we seek to bring together a multidisciplinary group looking at different aspects of archaeological knowledge production to discuss theoretical and methodological issues in the field of participatory design and user experience, fostering a critical understanding of how this knowledge is used and its social impact. The aim is to convene researchers and practitioners in a dialogue that is focused on examples of interdisciplinary co-creation and user testing of Augmented, Virtual and Mixed Reality (AR, VR, and MR) and related digitally-mediated experiences for museums, archaeological and cultural heritage sites, and varied teaching and research contexts. We are particularly interested in practical experiences around how to integrate archaeological data, storytelling and digital platforms to create experiences truly tailored to the needs and expectations of users.

The format of this Roundtable is a series of flash position papers (10 minutes maximum) followed by periods of moderated discussion. The session concludes with an open floor discussion and a wrap-up report summarising the discussion and suggesting follow-up activities. Position papers will be submitted in advance to the session chairs and shared with all panelists. The session welcomes participants from different sectors including but not limited to digital humanities, archaeology, museology, design research and Human-Computer Interaction (HCI).

8.40 – 8.50
Ksar es Said: Building Tunisian young people's critical engagement with their heritage,
Paola Di Giuseppantonio Di Franco, Mark Winterbottom, Fabrizio Galeazzi, Michael Gogan

8.50 – 9.00
From heterogeneous data to heterogeneous public: thoughts on transmedia applications for digital heritage research and dissemination,
Damien Vurpillot, Perrine Pittet, Johann Forte, Benoist Pierre

9.00 – 9.10
User Interface Design and Evaluation for Online Professional Search in Dutch Archaeology,
Alex Brandsen

9.10 – 9.30
Discussion

9.30 – 9.40
Unintended Outcomes – VR, Heritage and User Engagement,
William Michael Carter, Rhonda Bathurst, William Ciaran Lim-Carter

9.40 – 9.50
Engaging visitors with 'invisible' heritage: lessons learned on the impact of digital media, immersion, sound and storytelling,
Jenny Wilkinson

9.50 – 10.00
Mixable reality, Collaboration, and Evaluation,
Erik M Champion

10.00 – 10.40
Discussion

COFFEE BREAK

11.00 – 11.10
Design thinking in Cultural Heritage,
Neil Jakeman

11.10 – 11.20
Managing Engagement Design Risk through Creative Constraints,
Claire Boardman

11.20 – 11.30
Creating a unified design system across web, mobile, AR and VR,
Damir Kotorić, Luke Hollis

11.30 – 11.40
Inclusive Digital Engagement for Heritage,
Eleonora Gandolfi, Grant Cox

11.40 – 12.00
Discussion

12.00 – 12.40
General Discussion

Other session 37:
3D Publishing and Sustainability: Taking Steps Forward

Elaine Sullivan, University of California Santa Cruz
Heather Richards-Rissetto, University of Lincoln-Nebraska

Large Hall A, 8.40 – 10.40, 26 April 2019

3D technological innovations are being used successfully at varying scales of analysis in archaeology, cross-cutting regions, time periods, and theoretical frameworks. Historic reconstruction modeling, photogrammetry, LiDAR, procedural modeling virtual environments, and serious gaming are all now part of the archaeologist's toolkit. For example, museums are harnessing 3D data capture to record objects in their collections for public engagement and conservation analysis. Archaeological field work is transforming, with fully digital and 3D recording of excavation units as part of the daily workflow on sites all over the globe. Scholars are testing out theories relating to historic architecture, ancient landscapes, visibility, movement, and lighting in virtually (re)constructed "worlds."

While exciting, the adoption of 3D technologies for visualization, documentation, interpretation and analysis of material culture in Archaeology creates many new questions about the dissemination and curation of scholarly products. Can 3D scholarship be published and sustained in a robust and accessible way for the future? How can new platforms and technologies allow for more comprehensive forms of interactive publishing, allowing readers to query and critique the 3D content? What new formats could allow readers access to the decision-making processes of the author, so their interpretations can be peer reviewed? Can we push forward academic journal and monograph publishing to include 3D scholarly content in ways that bring it to the fore, not use it as fancy illustrations to a traditional textual argument? How can archaeologists promote the development of open-source platforms for sharing 3D content and contribute to its future preservation and sustainability? As web-browsers, software and hardware rapidly change, how will 3D information be archived into new formats for future access?

This session will ask archaeologists already working intensely with 3D content to reflect on the future of 3D publishing. Participants will make 10-minute presentations on their own work, showing how they have grappled with the question of disseminating archaeological 3D content in ways that allow for robust interaction by readers, promoting understanding through the integration of 3D with text, audio, imagery, etc. We encourage speakers to define 2-3 current challenges to 3D publication and dissemination of knowledge, and to offer suggestions to facing these challenges collectively as a field. After each group of speakers (3-5), we will break for group discussion and define clear "pain points" for the community. The last part of the session (45-60 min) will be directed to collectively define some next steps forward to concretely

address how to improve 3D publishing and sustainability in order that the exciting content produced by archaeologists today is accessible to current and future generations in meaningful ways. We ask speakers to particularly focus on issues of sustainability related to open-source vs. proprietary software, a major issue as the 3D industry is currently dominated by private sector corporations. We imagine the results from our group effort as taking the form of collaborative grant applications, coordinating professional groups across the traditional subject divides, and the sharing of resources and knowledge in this quickly shifting field.

8.40 – 8.50
3D publishing of culturally sensitive data: the Tokatuhi project,
Joshua James Emmitt, Gerard O'Regan

8.50 – 9.00
Laser scanning and photogrammetry as a way for detailed documentation, and museum and web-site visualization of an Ancient Pueblo community in the canyons of the Mesa Verde region, Colorado, USA,
Radoslaw Palonka, Boleslaw Zych, Anna Wencel, Vincent M. MacMillan

9.00 – 9.10
3D Models: Unwanted, Unknown, Unloved,
Erik M. Champion, Hafizur Rahaman

9.10 – 9.40
Discussion

9.40 – 9.50
Publishing web-based interactive landscape visualizations of archaeological sites,
Elaine Sullivan

9.50 – 10.00
Dig it, and then Dig it again,
Paola Derudas, Nicolò Dell'Unto, Marco Callieri, Giacomo Landeschi

10.00 – 10.10
What do we want and how do we want it? The logistics of archiving 3D datasets,
Kieron Jamie Niven

10.10 – 10.40
Discussion

Roundtable 39: The European Research Council (ERC): funding excellent research in the field of Archaeological Science

Efthymia Priki, European Research Council Executive Agency (ERCEA)

Medium Hall A, 9.20 – 10.40, 25 April 2019

Established in 2007, the European Research Council's mission is to encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research across all scientific domains, on the basis of scientific excellence. For more than 10 years now, the ERC has been funding promising and/or top-notch researchers in all fields of science, including archaeology, becoming one of the most prominent funding bodies of frontier research worldwide.

The field of Archaeological Science, in particular, is represented in the ERC panel SH6 – "The Human Past: Archaeology and History", and several ERC-funded archaeological projects have been incorporating computational and quantitative methods to the analysis of archaeological materials.

The aim of this session is to provide information to conference participants about research funded by the European Research Council in the field of Archaeological Science, as well as to bring together in dialogue ERC grantees with conference participants, which potentially will include prospective applicants.

The proposed session will feature a short presentation about the ERC, its funding schemes, and success stories of ERC-funded projects in the field of Archaeological Science, as well as presentations by ERC grantees about their ERC-funded research projects and their experience with the ERC both during the evaluation process and during the implementation phase of their project. The presentations will be followed by an open discussion.

Session-format: Short presentations – 10-15 min. – followed by open discussion.

9.20 – 9.35
The European Research Council (ERC) and its funding schemes,
Efthymia Priki

9.35 – 9.50
"Welcome to the Aegean Bronze Age"Computer-enhanced Open Access in archaeological research,
Ann Brysbaert

9.50 – 10.05
Discussant,
Javier Fernandez-Lopez de Pablo

10.05 – 10.40
Open discussion

Standard session 40:
Argumentation and the Archaeological Record

Cesar Gonzalez-Perez, Institute of Heritage Sciences (Incipit), Spanish National Research Council
Patricia Martin-Rodilla, CiTIUS University of Santiago de Compostela
Martin Pereira-Fariña, University of Santiago de Compostela

Large Hall A, 16.00 – 17.20, 26 April 2019

Archaeological knowledge is constructed by making arguments based on material evidence. Interpretation, therefore, plays a central role in archaeological practice, and understanding how it works will help us improve our capacity to value other people's conclusions, revise our own, and overall produce better results. For this to happen, two aspects must be developed in conjunction. On the one hand, we need robust models of the archaeological record, which allow us to reason about the corresponding physical artefacts. On the other hand, we need to understand how argumentation takes place, and how new knowledge is constructed from smaller pieces. Thus, ontology and discourse must be treated in relation to one another; if we treat ontological issues without argumentation, we obtain only a static and fossilized view of the world; if we study argumentation without ontology, we obtain only propositions about unknown entities.

Furthermore, a wide array of computational techniques has been used to model, store and process both ontologies and argumentation as separate artefacts, but none exists that can tackle both aspects at the same time.

This session aims to address the joint modelling of the archaeological record and the argumentations applied to it, and the joint processing of the ensuing data.

Major research areas that are welcome in the session include the following:

- What conceptual models or ontologies of the archaeological record exist, and how useful and robust are they?
- What computational conceptual models of the archaeological argumentation processes exist, and how useful and robust are they?
- How can we successfully trace interpretative conclusions to the original evidence, and how can this be supported by computational approaches?
- How can archaeological conceptual models help us to understand and check the integrity of the associated discourse, and vice versa?
- How can archaeological interpretations and argumentations be formally and computationally analysed for a better understanding?

- How do archaeological models or ontologies evolve during multi-agent argumentation? How can this temporal dimension be captured in databases, corpora, or other computer tools?
- How can we build databases, ontologies, or corpora that support interpretative and argumentative processes about the archaeological record?
- What computing techniques, such as data-to-text, data mining or natural language processing, should we use to support multivocal argumentation in archaeology?

16.00 – 16.20
Enabling the comparability of research workflows: a case study,
Iwona Dudek, Jean-Yves Blaise

16.20 – 16.40
Towards a new methodological framework for statistics in archaeology,
Chiara G. M. Girotto, Lutz Schubert

16.40 – 17.00
Cataloging, classification and interpretation. A new database to digitalize the data of the Baths of Albintimilium (Imperia - Italy),
Paolo de Vingo, Sara Graziano, Alessio Paonessa, Giulia Zavattieri

17.00 – 17.20
How Many Dots? Expanding Beyond Single-Sample Characterizations in Chemical Residues,
Jennifer A. Loughmiller-Cardinal

Standard session 41: From Micro to Macro: computer-based approaches for the analysis of big data in the study of artefacts and societies

***Marta Lorenzon**, University of Helsinki*
***Agnieszka Kaliszewska**, Systems Research Institute, PAS*

Small Hall, 10.20 – 12.40, 24 April 2019

We see steady progress in computational modelling and its application to the detection of patterns in complex datasets. This approach finds application in archaeology, such as in modeling of the settlement patterns, and in the analysis of material culture (e.g. pottery typology). Nevertheless, these applications are still relatively new in the field of archaeology, although their potential to improve our analysis of past societies, in both micro and macro scale, is undeniable.

Archaeological research often deals with large amounts of data of different types. Such datasets are often too complex to be analysed in a traditional way. However, the application of formal computer-based modelling approaches can uncover underlying patterns in large and diverse datasets. These models allow us to combine a multitude of factors that impact the archaeological record (e.g. climate, topography and resources in the case of settlement location), or various characteristics of material culture objects (e.g. shape, material, colour).

Most methodologies, whether they are dealing with the micro or the macro scale, combine the use of model-based approaches with tools such as CAD (2D and 3D), GIS and/or Space Syntax, methods of image recognition, and clustering or classification. The application of such methodologies allows for new lines of investigation, testing of new theories, and the combination of data on multilayered registers passing from the micro (artefact) to the macro (society behaviour and spatial pattern of occupation) scale. Thus, the utility of formal-based computer-generated models becomes of paramount importance, providing a new venue for archaeologists to discuss hypotheses before empirical testing and the development such technologies may help to bridge different approaches and help establish the field of formal methods in archaeology.

In this session we invite contributions using a model-based approach to analyse the archaeological built environment and its material culture, creating a deeper and multilayered understanding of past societies. We also seek case studies showcasing innovative approaches to qualitative and quantitative computer modelling in archaeology, presenting new techniques and expanding the use of computer-based modeling, or providing new forms of investigation of material culture.

10.20 – 10.40
From Local to Global: Nested Interaction and Community in Late Bronze Age Crete,
Paula Gheorghiade, Henry Price

10.40 – 11.00
Handling large pottery assemblages through the application of clustering to 2D profiles,
Agnieszka Kaliszewska, Monika Syga

11.00 – 11.20
From the artefacts to material culture, Statistical modelling using R,
Lizzie Scholtus

11.20 – 11.40
Modeling the Ptolemaic Cultural Export: A Quantitative Evaluation of the Spread of the Isiac Cults in the West Coast of Hellenistic Asia Minor,
Tomas Glomb, Adam Mertel

11.40 – 12.00
Computing Similarity Networks of Maya Glyphs from 3D-Data,
Hubert Mara, Bartosz Bogacz, Felix Feldmann, Christian Prager

12.00 – 12.20
From Point to Pattern. Integration of Spatial Data Analysis Methods for Settlement Pattern Investigation,
Rafał Bieńkowski, Marta Lorenzon, Agnieszka Kaliszewska, Krzysztof Leśniewski, Robert Kłopotek

12.20 – 12.40
General Discussion

Standard session 42:
New technologies in woodland archaeology: problems and limitations

***Kamil Niedziółka**, Cardinal Stefan Wyszyński University in Warsaw*
***Pawel Konczewski**, Uniwersytet Przyrodniczy we Wrocławiu, Katedra Antropologii*
***Michał Jakubczak**, Institute of Archaeology and Ethnology Polish Academy of Sciences*

Medium Hall A, 11.00 – 12.40, 25 April 2019

A vast part of Europe is covered with woods (esp. Central, Eastern and Northern Europe), however, research within woodlands has often been neglected by archaeologists, mainly due to limited accessibility to these areas and the difficult conditions encountered during field investigations. Nevertheless, many forested areas offer unique opportunities to explore well-preserved remains of earlier human activities, traces of which have not been erased or transformed by modern agriculture, industrialisation or urbanisation. For some chronological horizons, there are regions that preserve complete accumulations of deserted cultural landscapes (economic, domestic and funerary) despite the succession of forestation processes. Unfortunately, the presence of dense vegetation has until recently meant that the application of standard archaeological techniques in forested environments, such as surface surveys and excavations, was problematic. However, the development of new technologies can significantly support archaeological investigations in wooded landscapes (e.g. the introduction of ALS data, GPS tools, GIS software, modern geophysics, photogrammetry etc.).

Alas, these new approaches are not without their own problems. For example the frequent lack of GSM/GPS signal caused by the wood cover makes it difficult to properly locate and georeference surface surveys, excavations and other investigations. The woodlands also restrict the deployment of drones and the preparation of photogrammetric plans. Furthermore, the application of geophysics is much more difficult, both from the point of view of conducting field work and the subsequent interpretation of survey data. Of course, these are just a few examples of problems related to woodland archaeology, the full list is much longer.

In this session, we will address topics ranging from non-invasive remote sensing to more invasive ways of archaeological investigations, performed with the use of high-tech methods of documentation and geodetic measurements. We would like to focus especially on specific problems and limitations related to utilisation of concrete modern technologies in woodlands as well as possible solutions. Interdisciplinary approaches are also welcome.

11.00 – 11.20
Airborne laser scanning in Białowieża Primeval Forest,
Michał Jakubczak, Michał Szubski, Janusz Budziszewski, Kamil Niedziółka

11.20 – 11.40
Between traditional and innovative. Case study of deserted forest village Neuhaus,
Radosław Biel, Paweł Konczewski

11.40 – 12.00
Mapping legacies of historic charcoal production on the landscape scale,
Anna Schneider, Alexander Bonhage, Alexandra Raab, Florian Hirsch, Thomas Raab

12.00 – 12.20
Geophysical survey in tropical forest: Results of research carried out at the pre-Columbian centre of Nakum (Guatemala),
Piotr Wojciech Szczepanik, Patrycja Obrempalska-Majdak, Jarosław Źrałka, Wiesław Koszkul

12.20 – 12.40
Terrestial Laser Scaning in the Rainforest: 3D documentation of the site and archaeological excavations of the ancient Maya centre of Nakum, Guatemala,
Bolesław Zych, Wiesław Koszkul, Jarosław Źrałka, Bogumił Pilarski

Standard session 44: Analysing Shape in the Digital Age: Current Considerations in Archaeological Application of Geometric Morphometrics

***Christian Hoggard**, Department of Archaeology and Heritage Studies, Aarhus University, Denmark.*
***Sarah Stark**, University of Southampton*
***Georg Roth**, Institut für Prähistorische Archäologie Freie Universität Berlin*
***Katrien Janin**, University of Cambridge*

Small Hall, 14.00 – 15.40, 26 April 2019

Ordering and analysing objects according to their morphology has been at the heart of archaeology since its very construction as a discipline. And over the last thirty years a new methodology for the quantitative analysis of digitised shapes, Geometric Morphometrics (GMM), has become increasingly popular, leading to case studies around the world. GMM characterises and analyses morphological data directly, resulting in representations of shape (differences) as numeric variables open to combinations with other forms of data, including spatial or chronological frameworks. Additionally, powerful visualisations that partition shape differences into independent components (by PCA for example) allow for hitherto impossible separate interpretations of these differences. Yet curiously, despite positive feedback in its application, GMM still has not reached the attention in archaeology its potential achievements deserve.

This session illustrates the various aspects which GMM offers for the archaeological study of physical object forms, while aiming to highlight current issues in the field of archaeological shape analysis. It aims to provide a forum for debate on how archaeologists apply GMM technologies for research in the physical shape of objects, and how GMM can be further integrated into archaeological analyses.

We are particularly interested in presentations which discuss:

- The current state-of-knowledge of GMM in the discipline;
- Methodological developments (including software, frameworks and recording);
- The innovative application of GMM to object classes beyond lithic, osteological and zooarchaeological data;
- The consideration of GMM with alternative data types and frameworks (including Bayesian modelling);
- Theoretical considerations e.g. bridging the gap between statistical GMM and archaeological significance.

Note: in the interest of transparency, and in aiding discussion and learning, we encourage authors to distribute scripts used in their presentations prior and immediately following the session. Following the conference participants will be invited to collaborate on a review article on GMM for the CAA Journal.

14.00 – 14.20
What can GMM do for you?
Katrien Gwennola Janin

14.20 – 14.40
Geometric morphometrics, visual perception of similarity, gestalt principles and creating groups,
Rachel Opitz

14.40 – 15.00
Bridging morphology and technology: a case study on EUP blade technique in NE Japan,
Atsushi Noguchi

15.00 – 15.20
Differentiating between cutting actions on bone using geometric morphometric and Bayesian analysis of complete 3D cut mark surfaces,
Erik R. Otarola-Castillo

15.20 – 15.40
Rethinking the cultural taxonomy of the European Final Palaeolithic through two-dimensional elliptic Fourier analysis (EFA),
Christian Steven Hoggard, Felix Riede

Standard session 45:
Virtual Reality and 3D modeling: Where are we now?

Mantha Zarmakoupi, University of Pennsylvania

Exhibition room B, 14.00 – 15.40, 26 April 2019

Over the past 20 years virtual reality and 3D modeling technologies have expanded the range of research tools used in the study of the history of architecture. They have enabled researchers to explore multifaceted themes of design and restoration, as well as sensory experience of historic buildings and spaces in virtual space. The excess of 3D and virtual reality representations asks for methodological approaches that will further facilitate their instrumental integration in research. This session invites papers that tackle the use of 3D modeling representations and virtual reality simulations, especially in the fields of ancient Greek and Roman art and architecture, that attempt on the one hand to challenge their limitations and, on the other, to address the ways in which they can be used to develop research questions. Papers can address the challenges that virtual Reality and 3D modeling technologies pose for research today by focusing on specific case studies or addressing broader methodological questions.

14.00 – 14.20
Similarity analysis of African Red Slip Ware (ARS) with modern 3D and 2D processing techniques,
Philipp Atorf, Carina Justus, Ashish Karmacharya, Louise Rokohl, Frank Boochs

14.20 – 14.40
Facing the Challenges: Academic Credit & 3D Archaeological Scholarship,
Costas Papadopoulos

14.40 – 15.00
3D documentation of ceramic vessels with the use of modern measurement technologies,
Edyta Puniach, Paweł Ćwiąkała, Mateusz Boruchowski, Witold Niewiem, Kamila Nocoń

15.00 – 15.20
Mongolian deer stones: a perspective of documenting by photogrammetry,
Daria Hookk

15.20 – 15.40
Digital authenticity: aesthetics of glitch and an interactive user experience design through digital heritage,
Zeynep Özge Özdemir, Serdar Aydin

Standard session 46:
Spatial Analysis of 3D Archaeological Information: Method and Theory

Gary Nobles, University of Groningen
Joerg Raether, Archaeological Museum Hamburg

Exhibition Room B, 16.00 – 17.00, 24 April 2019

Archaeologists and Heritage professionals continue to capture 3D data through photographic and optical methods. While the methods of data collection are well documented, the theoretical and practical aspects of using these relatively new datasets within archaeological practice are in the initial stages. Point cloud processing, web visualisation, spatial thinking, volumetric analysis are a few of the related themes to this broadening topic. This session aims to bring together researchers working with a variety of 3D spatial data. The key aim of this session is to move the discussion beyond purely data capture towards the analytical applications which have been, and continue to be, developed. Papers can take various forms: narratives considering the current and future archaeological requirements for 3D data; analytical applications applied to 3D data with archaeological contextualisation; theoretical conceptual papers which question how we understand the 3D spaces we record; technological developments and innovation applied to 3D archaeological data; or purely 3D spatial analytical applications. The session will conclude with a general discussion indicate the hurdles, technological or theoretical, which limit the use of these kinds of datasets.

16.00 – 16.20
Proportions vs dimensions: shedding a different light on the analysis of 3D datasets,
Jean-Yves Blaise, Iwona Dudek, Gamze Saygi

16.20 – 16.40
Enter the TechnoScape: thinking through our future toolkit,
Gary Nobles

16.40 – 17.00
Skeletons. We've all got one. What next?
George Alexis Pantos

Poster session

***Łukasz Miszk**, Jagiellonian University*
***Wawrzyniec Miścicki**, Jagiellonian University*
***Wojciech Ostrowski**, Warsaw University of Technology*

Poster Space, 15.00 – 16.00, 25 April 2019

Light to measure, light to record: 3D recording of a Roman sundial via Structured Light Scanner,
Arianna Traviglia, Filippo Bergamasco, Mara Pistellato

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Tuesday

08.00 - 16.00 › **Registration**
10.00 - 16.00 › **Workshops**
17.00 - 21.00 › **Icebreaker Party**

Wednesday

07.30 - 17.00 › **Registration**
09.00 - 10.00 › **Welcome Adresses & Keynote**
10.20 - 18.00 › **Sessions**

Thursday

07.30 - 17.00 › **Registration**
08.40 - 15.00 › **Sessions**
15.00 - 16.00 › **Poster session**
16.00 - 18.00 › **Annual General Meeting**
20.00 - 23.00 › **Conference Dinner**

Friday

07.30 - 17.00 › **Registration**
08.40 - 18.40 › **Sessions**

Saturday

09.50 - 18.00 › **Excursions**

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ISBN 978-83-948382-6-3