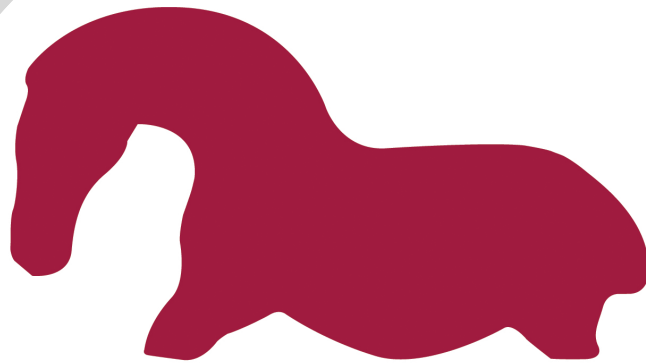


# HUMAN HISTORY AND DIGITAL FUTURE



# CAA

**TÜBINGEN 2018**

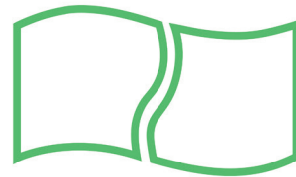
eScience-Center  
Institute for Geography  
ROCEEH (The Role of Culture in Early Expansions of Humans)  
German National CAA Chapter

EBERHARD KARLS  
UNIVERSITÄT  
TÜBINGEN



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# INDEX

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Password:	2018CAA

# HERZLICH WILLKOMMEN!



Photo: Felix König

The Organizing Committee of the 46th Computer Applications and Quantitative Methods in Archaeology Conference (CAA 2018) welcomes you to Tübingen, Germany, March 19-23 2018. We are extremely pleased and excited to host one of the biggest CAA conferences ever with nearly 450 participants and 420 submissions in 40 sessions.

The theme of CAA 2018 is “Human history and digital future” which we chose to represent with the famous Wild Horse of Vogelherd, one of a collection of ivory carvings found in the nearby Swabian Ice Age caves and among the earliest sculptures in the world. With this theme and logo, we hope to capture the essence of the extremely rich archaeological landscape of southwestern Germany, as well as highlight our shared mission and responsibility to use digital tools to document and analyze artifacts, sites, and landscapes, thereby preserving our common human heritage for future generations. It is clear that the future is in good hands as this year’s submissions show an extraordinarily wide range of topics in digital archaeology presented by contributors from all over the world.

We hope that in addition to the lectures and workshops on this week’s schedule, that you have the chance to join us as we explore some of what the town and University of Tübingen have to offer. In the first two evenings, we like to bring you to the University’s oldest buildings. On Monday we will welcome you to the icebreaker party at the Alta Aula, which was built in 1547 to serve as the University’s first main building. On Tuesday, we will have a reception at the Schloß Hohentübingen, established in the 11th century and now home to three of the University’s five archaeological institutes as well as the University of Tübingen’s Museum of Archaeology and archaeological collections. The “Swabian Bierfest” conference banquet is on Wednesday, which will hopefully fulfill your dreams of a German festival with traditional food and beers.

The excursions immediately following the conference will lead you to some of the most exiting archaeological sites of Europe including the Swabian Ice Age caves – the home of the oldest artwork of humankind, the Neolithic lake dwellings on Lake Constance, and to Celtic hillforts on the Swabian Jura.

It is a great pleasure for us to host so many old and hopefully new friends in Tübingen and we are excited to welcome all of you to our small town.

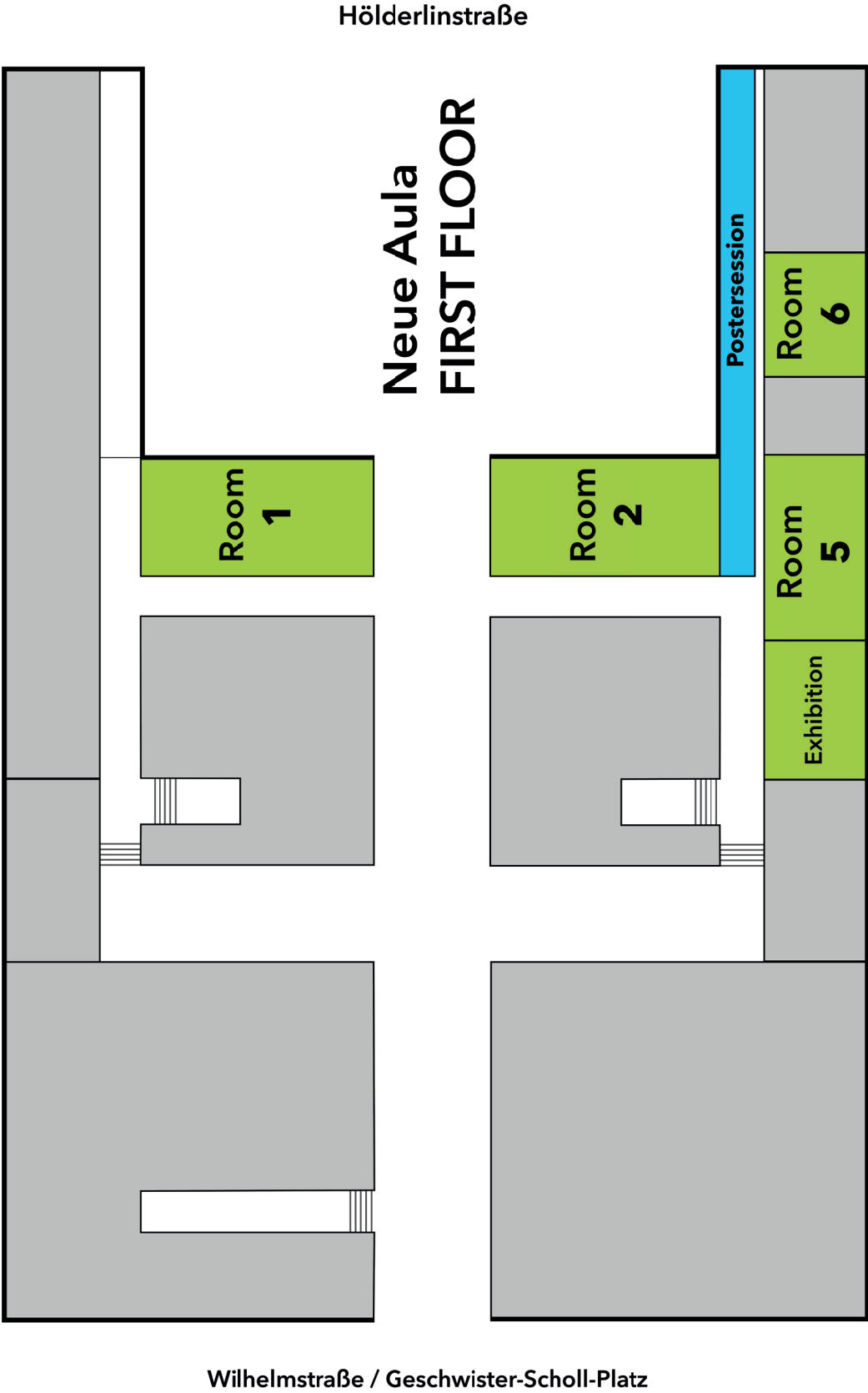
Volker Hochschild and Matthias Lang  
Chairs of the CAA 2018 Tübingen Organizing Committee

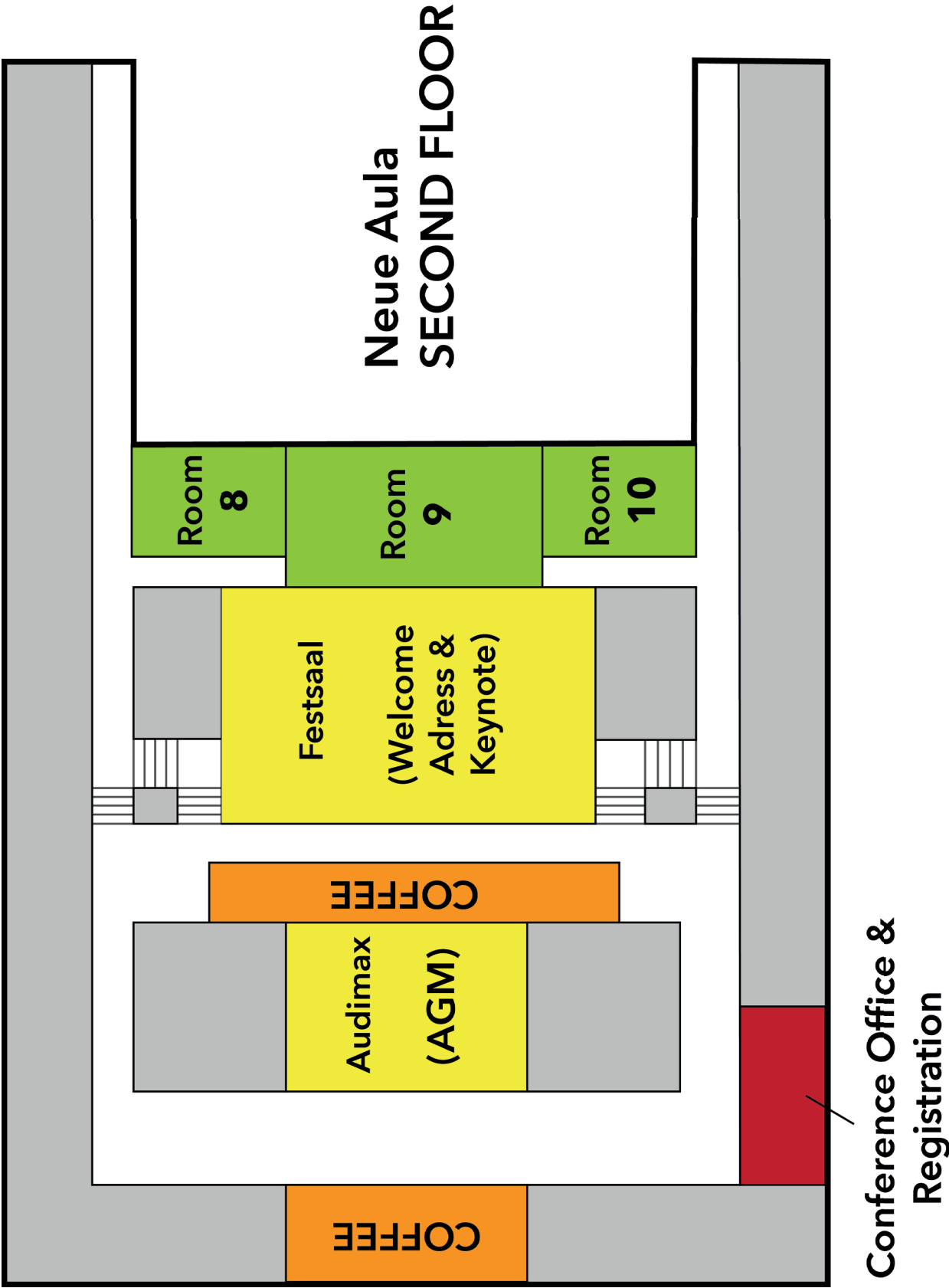
# VENUE

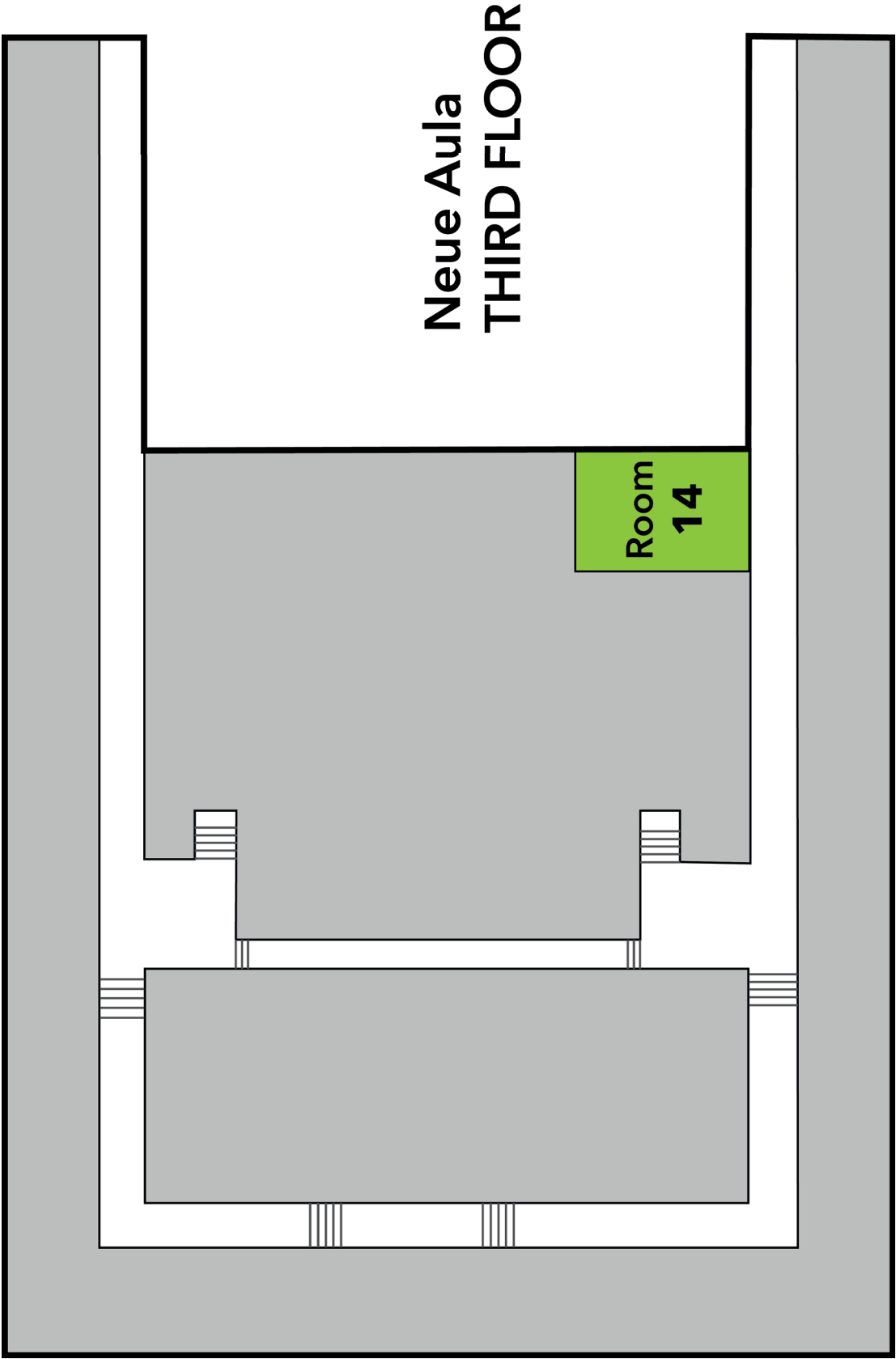


CAA 2018 will take place in Tübingen in the so-called *Neue Aula*. The Neue Aula is located very close to the center of Tübingen in the middle of the campus. Here you will also find the registration office that will be open every day from 7 to 17. The workshops will be held in the lecture rooms of the Geographical Institute. For the social events have a look on page 9.

# FLOORPLAN







# SOCIAL EVENTS

## ICEBREAKER PARTY

*(Monday, March 19th, 18:00-21)*

The opening reception for CAA 2018 will take place at the Alte Aula. This historic University building is just a ten-minute walk away from the conference venue, located in the heart of Tübingen's historic center. Enjoy tasty appetizers (including vegetarian and vegan options), wine, beer, and nonalcoholic beverages as you reconnect with old friends and make new ones. A wide range of bars and restaurants can be found within short walking distance of the venue and are easily accessed following the event.



## RECEPTION AT SCHLOSS HOHENTÜBINGEN

*(Tuesday, March 20th, 18:30-21)*

Registered attendees have the opportunity to visit the archaeological collections of the Museum Alte Kulturen at Schloss Hohentübingen following the day's sessions. Roam the museum galleries as you snack on hors d'oeuvres and quench your thirst at an open bar. Be aware that the road up to the castle is quite steep and that a shuttle can be made available to you upon request. Like the Alte Aula, the castle is centrally located should you be interested in visiting one of Tübingen's bars or cafes after the event.



## SCHWÄBISCHES BIERFEST

*(Wednesday, March 21st, 19-23:30)*

The conference dinner will be held in the students' restaurant at Morgenstelle, the University of Tübingen's science campus. We will enjoy music and a buffet of traditional German food and drinks with vegetarian and vegan options. Chartered busses for Morgenstelle will leave from the Neue Aula shortly after the Annual General Meeting on Wednesday.



*\*Please note that due to space and security restrictions, these events are available only to those who registered for the event upon conference registration.*

# KEYNOTE

## EARTH OBSERVATION AND THE COPERNICUS PROGRAMME IN SUPPORT TO ARCHAEOLOGY AND WORLD HERITAGE PRESERVATION

Archaeologic sites and cultural monuments constitute tangible icons of our human heritage. They should be explored and protected from threats coming from natural influences and human detrimental forces. Various remote sensing techniques are in use to detect and monitor archaeological sites. Space borne Earth observation is of specifically useful in this context when monitoring large area or sites not accessible for ground inspection. Fortunately, satellite Earth observation has made progress in several domains. The number of satellites and the variety of sensing technologies they carry has dramatically increased. This includes many “private” systems, offering geometric resolutions which were only available to national security agencies a couple of years ago. In addition, new Earth observation initiatives, such as the European Union Copernicus programme, are offering petabytes on free and open satellite data per year for the community. This new avalanche of data can now be exploited via machine learning and big data computing. Copernicus is also supporting the application of Earth observation data in Core Services, next to the established six core services, the European Commission is reviewing to invest in new services, including the monitoring of world heritage sites.

**GUNTER SCHREIER**

German Remote Sensing Data Center - DFD  
Earth Observation Center - EOC  
German Aerospace Center - DLR  
Oberpfaffenhofen  
Germany

**GUNTER  
SCHREIER**

Gunter Schreier is deputy director of the German Remote Sensing Data Center (DFD) of DLR in Oberpfaffenhofen. Since 1985 with DLR, he is now coordinator for large scale projects especially in the context of the European earth observation system Copernicus and earth observation projects with international partners. He worked as national expert at the Joint Research Center of the European Commission, in Ispra, Italy, and was founding Vice President Geomatics of Definiens, Munich (now Trimble). Currently, he is Chairman of the International Astronautical Federation (IAF) Earth Observation Committee, and Chairman of the International Policy Advisory Group (IPAC) of ISPRS. One of the projects, he is currently involved, is using Earth observation for the preservation of world cultural heritage sites.

Gunter Schreier studied geophysics at the University of Munich.

# MONDAY, 19 MARCH 2018

**Computer Pool A****Computer Pool B**

08:15 - 10:00

W6 Remote sensing  
with open source  
tools for geoarcheolo-  
gical survey

*Adel Omran,  
Christian Sommer*

10:00 - 10:30

**COFFEE BREAK**

10:30 - 12:15

W6 Remote sensing  
with open source  
tools for geoarcheolo-  
gical survey

*Adel Omran,  
Christian Sommer*

12:15 - 13:45

**LUNCH BREAK**

13:45 - 15:30

W10 Unlocking the power  
of (linked) metadata:  
Documenting, managing  
and disseminating seman-  
tic relations for cultural  
heritage resources

*Martijn van der Kaaij*

W5 Close range 3D  
data acquisition and  
analysis

*Hubert Mara,  
Paul Bayer,  
Dirk Rieke-Zapp*

15:30 - 16:30

**COFFEE BREAK**

16:30 - 17:45

W10 Unlocking the power of  
(linked) metadata: Documen-  
ting, managing and dissemi-  
nating semantic relations for  
cultural heritage resources

*Martijn van der Kaaij*

W5 Close range 3D data  
acquisition and analysis

*Hubert Mara,  
Paul Bayer,  
Dirk Rieke-Zapp*

# WORKSHOPS

## Seminar Room C

W7 Linking Data from Archaeology, the Humanities, and Ecology: Testing Tools to Encourage Data-Driven Interdisciplinary Research  
*Colleen Strawhacker, Rachel Opitz*

## Seminar Room D

W8 GRAVITATE – A tool for the reunification of cultural heritage objects  
*Sorin Hermon*

## Seminar Room E

W1 Improving Presentation Skills  
*Philip Verhagen, Steve Stead*

## Seminar Room F

W13 The basics of deep learning for archaeological site detection on remote sensor data  
*Iris Kramer, Jonathon Hare*

## COFFEE BREAK

W7 Linking Data from Archaeology, the Humanities, and Ecology: Testing Tools to Encourage Data-Driven Interdisciplinary Research  
*Colleen Strawhacker, Rachel Opitz*

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*Sorin Hermon*

W1 Improving Presentation Skills  
*Philip Verhagen, Steve Stead*

W13 The basics of deep learning for archaeological site detection on remote sensor data  
*Iris Kramer, Jonathon Hare*

## LUNCH BREAK

W12 The Vistorian. An online platform for visualising temporal, geographical and multiplex networks  
*Benjamin Bach, Tom Brughmans*

W3 A Crash Course in Archaeological Data Analysis using Python  
*Iza Romanowska*

W9 The ROAD database as data management and search tool  
*Zara Kanaeva, Andrew W. Kandel*

W11 Processing Radiocarbon Data with R  
*Martin Hinz, Clemens Schmid*

## COFFEE BREAK

W12 The Vistorian. An online platform for visualising temporal, geographical and multiplex networks  
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W3 A Crash Course in Archaeological Data Analysis using Python  
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W9 The ROAD database as data management and search tool  
*Zara Kanaeva, Andrew W. Kandel*

W11 Processing Radiocarbon Data with R  
*Martin Hinz, Clemens Schmid*

# TUESDAY, 20 MARCH 2018

Room 1

Room 2

Room 5

09:00 - 10:00

## WELCOME ADDRESSES AND KEYNOTE

10:00 - 10:30

## COFFEE BREAK

10:30 - 12:15

S14

Setting the automation agenda for Remote sensing: learning to see through a computer?

S13

Digital Documentation Archaeological Ships. What do we do and what do we need?

S19

Agents, networks and models: formal approaches to systems, relationships and change in archaeology

12:15 - 13:45

## LUNCH BREAK

13:45 - 15:30

S14

Setting the automation agenda for Remote sensing: learning to see through a computer?

S13

Digital Documentation Archaeological Ships. What do we do and what do we need?

S19

Agents, networks and models: formal approaches to systems, relationships and change in archaeology

15:30 - 16:45

## POSTER SESSION & COFFEE

16:45 - 18:00

S15

Analysing Historical Transportation Systems from new applications and methodologies

S19

Agents, networks and models: formal approaches to systems, relationships and change in archaeology

# SESSIONS

Room 6

Room 8

Room 9

Room 10

Room 14

## WELCOME ADDRESSES AND KEYNOTE

### COFFEE BREAK

S24  
Computational  
classification in  
archaeology

S1  
Creative  
Disruption in  
Archaeologi-  
cal Theory and  
Practice

S11  
Untapping the  
value of old  
fieldwork records

S29  
Digital Inno-  
vation & Expe-  
rimentation in  
Archaeology &  
Cultural Heritage  
Collections

GEN  
General Papers

### LUNCH BREAK

S24  
Computational  
classification in  
archaeology

S1  
Creative  
Disruption in  
Archaeologi-  
cal Theory and  
Practice

S11  
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S29  
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GEN  
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### POSTER SESSION & COFFEE

S24  
Computational  
classification in  
archaeology

S1  
Creative Disrupti-  
on in Archaeolo-  
gical Theory and  
Practice

S11  
Untapping the  
value of old  
fieldwork records

S5  
Exploring Digital  
Interpretation,  
Argumentation,  
Conflict

GEN  
General Papers

# WEDNESDAY, 21 MARCH 2018

	Room 1	Room 2	Room 5
08:15 - 10:00	S30 Open Digital Infrastructures for Archaeology and Cultural Heritage	S4 Close range 3D data acquisition, processing and querying in cultural heritage	S12 Making the most of film and video in archaeology
10:00 - 10:30	COFFEE BREAK		
10:30 - 12:15	S30 Open Digital Infrastructures for Archaeology and Cultural Heritage	S4 Close range 3D data acquisition, processing and querying in cultural heritage	S12 Making the most of film and video in archaeology
12:15 - 13:45	LUNCH BREAK		
13:45 - 15:30	S6 Our little minions: small tools with major impact	S4 Close range 3D data acquisition, processing and querying in cultural heritage	S26 Sensory GIS: towards a deeper engagement?
15:30 - 16:00	COFFEE BREAK		
16:00 - 17:00		S4 Close range 3D data acquisition, processing and querying in cultural heritage	S2 Islamic History and Archaeology: Linking Data and Ontologies
17:10 - 19:00	ANNUAL GENERAL MEETING (AGM)		

# SESSIONS

Room 6	Room 8	Room 9	Room 10	Room 14
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<p>S38</p> <p>Applicability of Digital Archaeology Tools</p>	<p>S34</p> <p>R as an archaeological tool: current state and directions</p>	<p>S25</p> <p>Do we have a heading? Ah! A heading. Set sail in a... uh... for Mobile GIS direction!</p>	<p>S19</p> <p>Agents, networks and models: formal approaches to systems, relationships and change in archaeology</p>	<p>S3</p> <p>Digital Archaeology Scholars in a Changing World: Problems, Perspectives, and Challenges</p>
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## COFFEE BREAK

<p>S38</p> <p>Applicability of Digital Archaeology Tools</p>	<p>S34</p> <p>R as an archaeological tool: current state and directions</p>	<p>S25</p> <p>Do we have a heading? Ah! A heading. Set sail in a... uh... for Mobile GIS direction!</p>	<p>S19</p> <p>Agents, networks and models: formal approaches to systems, relationships and change in archaeology</p>	<p>S7</p> <p>(Roundtable) What is the Value of Digitally Mediated Archaeology?</p>
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## LUNCH BREAK

<p>S21</p> <p>Structural Analysis for Cultural Heritage: Tools and Methods for Assessing Heritage Monuments and Structures</p>	<p>S20</p> <p>Palaeo-GIS</p>	<p>S40</p> <p>Science and Technology (S&amp;T) for Archaeology and Cultural Heritage in the Eastern Mediterranean</p>	<p>S19</p> <p>Agents, networks and models: formal approaches to systems, relationships and change in archaeology</p>	<p>S7</p> <p>(Roundtable) What is the Value of Digitally Mediated Archaeology?</p>
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## COFFEE BREAK

<p>S21 Structural Analysis for Cultural Heritage: Tools and Methods for Assessing Heritage Monuments &amp; Structures</p>	<p>S20</p> <p>Palaeo-GIS</p>	<p>S7</p> <p>(Roundtable) What is the Value of Digitally Mediated Archaeology?</p>
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## ANNUAL GENERAL MEETING (AGM)

# THURSDAY, 22 MARCH 2018

	Room 1	Room 2	Room 5
08:15 - 10:00	S37 Connectivity: linking and interpreting the archaeological record	S17 Early human land use strategies during Middle and Late Pleistocene glacial and inter- glacial times in Europe	S32 Automation, com- bination and cali- bration: consolida- ting the framework for archaeological geophysics
10:00 - 10:30	COFFEE BREAK		
10:30 - 12:15	S37 Connectivity: linking and interpreting the archaeological record	S10 Expanding horizons: confron- ting issues of scale, resolution, and re- presentation in the study of human expansions	S32 Automation, com- bination and cali- bration: consolida- ting the framework for archaeological geophysics
12:15 - 13:45	LUNCH BREAK		
13:45 - 15:30	S42 Archeology Heritage Infor- mation Modeling. Models construction for documentation and analysis	S8 Untapping the potential of 3D Quantitative Analysis	S9 Show your code: task streamlining, reproducibility and replicability in archaeological computing
15:30 - 16:00	COFFEE BREAK		
16:00 - 17:45	S42 Archeology Heritage Infor- mation Modeling. Models construction for documentation and analysis	S8 Untapping the potential of 3D Quantitative Analysis	S9 Show your code: task streamlining, reproducibility and replicability in archaeological computing

# SESSIONS

Room 6	Room 8	Room 9	Room 10	Room 14
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S35 Ancient Near Eastern and Neighboring Regions: Enlarging Research Horizons through Digital and Computational Practices

S23 New Directions in Archaeological Aerial and Satellite Remote Sensing

S28 Cities of Data: computational and quantitative advances to urban research

S36 Advantages and Limitations of Spatial Applications in Archaeology

S41 Immersive Techniques in Archaeological Practice and Publication

## COFFEE BREAK

S35 Ancient Near Eastern and Neighboring Regions: Enlarging Research Horizons through Digital and Computational Practices

S23 New Directions in Archaeological Aerial and Satellite Remote Sensing

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S23 New Directions in Archaeological Aerial and Satellite Remote Sensing

S28 Cities of Data: computational and quantitative advances to urban research

S16 Play, Process, and Procedure: An Experiential Digital Archaeology

S27 Map management and Webgis applications for archaeological data base solutions

## COFFEE BREAK

S22 Social theory after the spatial turn

S33 Guaranteeing data quality in archaeological Linked Open Data

S39 Heritage Beyond Boundaries: Developing Standards and Storefronts for Immersive Technologies in Archaeology

S16 Play, Process, and Procedure: An Experiential Digital Archaeology

S27 Map management and Webgis applications for archaeological data base solutions

# FRIDAY, 23 MARCH 2018

## EXCURSIONS

### TOUR 1: SWABIAN ICE AGE CAVES



There will be a day tour (Friday the 23th of March) to the Ice Age caves on the Swabian Jura. The caves are the home of the world's oldest 3D-Art and have been recently assigned as a UNESCO World Heritage site in July 2017. The six caves are about one hour east of Tübingen. A bus will depart in the morning and will return in the late afternoon. The price includes the transportation, lunch, entrance to the site, a guided tour and the entrance to the museum in Blaubeuren.

Please keep in mind that the caves will be very cold and slippery. We recommend bringing sturdy shoes and warm clothing.

### TOUR 2: EXPLORING THE HERITAGE OF GERMANY'S SOUTH



The second tour will be a two-day trip visiting the most important sites in Baden-Württemberg including the Pfahlbaumuseum and the Reichenau at the Bodensee, the celtic hillfort Heuneburg and the Limesmuseum in Aalen. We might adjust the destinations to the interests of the participants. We will leave on Friday March 23 in Tübingen and will end on Sunday March 25 at the Stuttgart airport.

Price will only include transportation and hotels, meals have to be paid by yourself. We hope we can get you free entrance to the sites visited. Please contact us directly if you have any further questions.

Also for that excursion we recommend bringing warm and weatherproof cloth – mid march it might still be cold and rainy in Germany.

# SESSIONS

## CAA 2018

- S01 Creative Disruption in Archaeological Theory and Practice
- S02 Islamic History and Archaeology: Linking Data and Ontologies
- S03 Digital Archaeology Scholars in a Changing World: Problems, Perspectives, and Challenges
- S04 Close range 3D data acquisition, processing and querying in cultural heritage
- S05 Exploring Digital Interpretation, Argumentation, Conflict
- S06 Our little minions: small tools with major impact
- S07 What is the Value of Digitally Mediated Archaeology?
- S08 Untapping the potential of 3D Quantitative Analysis
- S09 Show your code: task streamlining, reproducibility and replicability in archaeological computing
- S10 Expanding horizons: confronting issues of scale, resolution, and representation in the study of human expansions
- S11 Untapping the value of old fieldwork records
- S12 Making the most of film and video in archaeology
- S13 Digital Documentation Archaeological Ships. What do we do and what do we need?
- S14 Setting the automation agenda for Remote sensing: learning to see through a computer?
- S15 Analysing Historical Transportation Systems from new applications and methodologies
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- S17 Early human land use strategies during Middle and Late Pleistocene glacial and interglacial times in Europe
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- S21 Structural Analysis for Cultural Heritage: Tools and Methods for Assessing Heritage Monuments and Structures
- S22 Social theory after the spatial turn
- S23 New Directions in Archaeological Aerial and Satellite Remote Sensing
- S24 Computational classification in archaeology
- S25 Do we have a heading? Ah! A heading. Set sail in a... uh... for Mobile GIS direction!
- S26 Sensory GIS: towards a deeper engagement?
- S27 Map management and Webgis applications for archaeological data base solutions
- S28 Cities of Data: computational and quantitative advances to urban research
- S29 Digital Innovation & Experimentation in Archaeology & Cultural Heritage Collections
- S30 Open Digital Infrastructures for Archaeology and Cultural Heritage
- S32 Automation, combination and calibration: consolidating the framework for archaeological geophysics
- S33 Guaranteeing data quality in archaeological Linked Open Data
- S34 R as an archaeological tool: current state and directions
- S35 Ancient Near Eastern and Neighboring Regions: Enlarging Research Horizons through Digital and Computational Practices
- S36 Advantages and Limitations of Spatial Applications in Archaeology
- S37 Connectivity: linking and interpreting the archaeological record
- S38 Applicability of Digital Archaeology Tools
- ~~S39 Heritage Beyond Boundaries: Developing Standards and Storefronts for Immersive Technologies in Archaeology~~
- S40 Science and Technology (S&T) for Archaeology and Cultural Heritage in the Eastern Mediterranean
- S41 Immersive Techniques in Archaeological Practice and Publication
- ~~S42 Archeology Heritage Information Modeling: Models construction for documentation and analysis~~

## S1 Creative Disruption in Archaeological Theory and Practice

*William Michael Carter*

*Neue Aula, Room 8, 10.30 - 18.00, 20 March 2018*

This paper session will explore the use of digital technologies as a means of “creative disruption”, in the construction of new meaning and archaeological knowledge. Archaeologists creatively engage in the archaeological record in their daily practice, but it is the “creative innovation”, that experiential, raw, impactful application of creative thought, tools and techniques, which empowers and enriches archaeological meaning-making, that needs further exploration. Transcending beyond the mere fetishization of digital applications to visualize archaeological data, the proximal goal is to explore and discuss the exemplary applications of creative innovation to disrupt and communicate new ways of archaeological knowledge translation and mobilization through the novel use of archaeological theory, method and practice by creative digital means. Whether it is the application of robotics and drones, the auralization of excavations, the virtual (re)imagination of known and unknown archaeological data or the statistical networking of digital data through closed and open digital networks, this session will aim to engage in near-term and future-proofing discussions to enable theoretical and methodological considerations alongside the practical in-field and post-excavation application of digital techniques through creative means.

**Digital Creativity or Digital Dark Age? A scenario analysis of archaeological knowledge production in an insecure world, *Jeremy Huggett, Gary Lock, Paul Reilly***

**“Not Just a Pretty Picture”: Interpretive Visualisation as Design Practice in Archaeology, *Alice Watterson, Mhairi Maxwell***

**A Computational Decipherment of Linear B, *Katie Paxton-Fear***

**Epoiesen and ODATE: Small Acts of Disruption in Archaeological Publishing, *Shawn Graham***

**A Conceptualization of Image-based 3D Recording in Field Archaeology, *Matteo Pilati***

## LUNCH BREAK

Lived lines: a lineological approach to network analysis, *Gisli Palsson*

An antidote to the digital? Exploring the space between digital and non-digital in creative post-conflict reconstruction, *Zena Kamash*

When Archaeological and Artistic Practices Meet Halfway: generative 'close encounters', *Paul Reilly, Stefan Gant*

Digital Other: The Creative Use of Digital Avatars in Virtual Reconstructions, *Kristian David Howald*

Vampires vs Puffins: culture and nature on the Isle of Staffa, *Stuart Jeffrey, Derek Alexander, Sian Jones, Daniel Rhodes, Shona Noble*

## COFFEE BREAK

Documenting archaeological knowledge construction as distributed information practices, *Zack Batist*

Towards an autoarchaeological archiving of practice within contextual and spatio-temporal meta-databases, *Andrew Gryf Paterson*

Chatbots for museums and heritage sites: all hype or promising strategy? A case study in building ChatÇat, a 'bot of conviction' for Çatalhöyük, *Angeliki Tzouganatou, Sierra McKinney, Sara Perry*

Creative disruption in Central European archaeology – reflexive or thoughtless?, *Jens Crueger*

Design, Deployment and Dissection of an Archaeological Reconnaissance Robot at el-Hibeh, Egypt, *Namir Ahmed, Jimmy Tran, Alex Ferworn, Jean Li, Carol Redmount, William Michael Carter*

## S2 Islamic History and Archaeology: Linking Data and Ontologies

*Kurt Franz, Mathias Piana*

*Neue Aula, Room 5, 16.00 - 17.00, 21 March 2018*

While Islamic Archaeology is intensively making use of computer applications and quantitative methods, especially with regard to spatial information, these so far play a much lesser role in the study of Islamic history, which is by and large based on texts and qualitative interrogation. Islamic History and Archaeology, however, have a huge potential to interact since their perfect chronological and geographical intersection outright calls for relating their diverse evidences to each other. This already happens on the level of individual projects, but still the Islamic Middle East could be much more fruitfully conceived as a common field of interdisciplinary study. As concerns computer applications in particular, not so many intersections have so far been tested, and even less are accessible to the research communities or visible to the public. Part of the issue is the dearth of open-access data platforms that are specific to, or appropriately include, the Islamic Middle East. Aiming at more collaboration and future visibility, this session wants to stimulate interdisciplinary exchange and the discussion of how data can be shared and bridging ontologies can be built. Some basic questions concern: – Methods and interdisciplinary relevance of current IT-based projects – Different evidences and potential ontological interfaces – Uses of mapping, gazetteers, and other databases for collaboration – Present and future platforms for shared and linked (open) data – Dynamic data publication formats and the issue of crediting – Digital Humanities, a common ground?

*OpenOttoman and the Challenge of Building an Ottoman Gazetteer, Amy Singer*

*Feature vs. Name? Identification and Localization Strategies for Linked Open Data on Islamic Places, Kurt Franz*

*Creating Thematic Layers on the Spatial History of Medieval Empires in the Levant: The GIS Mapping of the Network of Roads and Fortifications in the Syrian State of Nūr al-Dīn, Mathias Piana*

### **S3 Digital Archaeology Scholars in a Changing World: Problems, Perspectives, and Challenges**

*Eleftheria Paliou, Jeremy Huggett, Konstantinos Papadopoulos*

***Neue Aula, Room 14, 08.15 - 10.00, 21 March 2018***

Advances in the use of digital and computational methods in archaeology have encouraged great hope among archaeological computing practitioners regarding the potential of digital archaeology to transform archaeology as a discipline. Such an optimism was apparent in the diverse response received at the “Challenging Digital Archaeology” sessions organised in CAA 2014 and CAA 2015 (Huggett 2015 <https://www.degruyter.com/view/j/opar.2014.1.issue-1/opar-2015-0003/opar-2015-0003.xml>). Nonetheless, positive views on the future of digital archaeology often come into contrast with the reality in academia for most archaeological computing practitioners, who sometimes face significant challenges in making their work accepted as genuine archaeological research and are often considered as “hybrid scholars”. Digital archaeology specialists often find themselves into an in-between space comprised of two or more disciplines, trying to create their own distinct identity, demonstrate their value, and get credit for their contributions to these fields. Academic hierarchies, conservatism, and established processes and practices are only a few of the challenges that hinder digital archaeologists from securing their status in academia. At the same time, digital and computational approaches to archaeology have created continuous needs for new modes of research, evaluation, collaboration, teaching, and publication that don’t always conform well with traditional academic practices. The focus of this session is on the role of digital archaeology scholars in a changing world with constant transformations in the academic ecosystem. Participants in the session are expected to contribute short papers of no more than 10 minutes. A ten-minute discussion will follow after each talk, while the session will conclude with a general discussion (30 minutes). Contributions that discuss philosophical and theoretical aspects of digital practice and scholarship are especially encouraged, as well as reflective works drawing from personal experience in distinct digital archaeology fields. Some relevant topics include but are not limited to: -What is the value or potential of digital archaeology research and how this is reflected in

or contrasted with perceptions of digital scholarship in the wider discipline of archaeology? -To what extent are digital outputs and digital creations (e.g agent-based models, virtual worlds etc. ) accepted as genuine archaeological research? -What is the contribution of digital archaeology to new forms of research (e.g. crowdsourcing) and teaching practices (e.g. MOOCs, SPOCs, serious games etc)? -In what ways trends in computational archaeology for open data and open software policies, as well as reproducible research, could transform archaeological scholarship and publication practices? -To what degree the role of Digital Archaeology practitioners ties in with the concepts of hybrid-scholars and alt-academics discussed in Digital Humanities?

*Resilient Scholarship in the Digital Age, Jeremy Huggett*

*The Dark Side of Digital Archaeology, Juan Antonio Barceló*

*Against the wall of words: the last barricade before science, Iza Romanowska*

*“...it’s Animation...but for Archaeology!”, William Michael Carter*

## S4 Close range 3D data acquisition, processing and querying in cultural heritage

*Dirk Rieke-Zapp, Diego Jiménez-Badillo, Vero Moitinho de Almeida, Mona Hess*

*Neue Aula, Room 2, 08.15 - 17.00, 21 March 2018*

This session collects contributions concerned with 3D data in cultural heritage and how they are employed to tackle research questions or for proficient presentation to stakeholders. While much attention has been paid in recent years to evaluate different methodologies of data acquisition, compare algorithm for data processing or querying of 3D data, much less attention was given to provide information on metric data quality required to solve specific questions like: What resolution is required or useful to display data in a 3D viewer? What precision is needed for comparative study of gypsum casts? What do we learn from comparative studies with regards to required data quality? This session particularly invites presenters working with 3D data that can provide feedback towards the process of acquisition to optimize data collection and to identify best data collection procedure for a given project. At the same time we welcome contributions that are predominantly application based or based on acquisition methodology. Close range 3D data includes mostly, but not exclusively triangulation based acquisition techniques, i.e. structured light scanning, close range photogrammetry, triangulation laser scanning. Works based on 3D data from CT-scan, digital microscopy, and the like, are also welcome.

*A browser-based 3D scientific visualisation of the Keros excavations, Dante Abate, Marina Faka, Sorin Hermon, James Herbst, Evi Margaritis, Michael Boyd, Colin Renfrew*

*Recreating an ancient marketplace with geophysical and topographical data, Jona Schlegel, Thomas Schenk, Kay Kohlmeyer, Bilge Hürmüzli, Arie Kai-Browne*

*Close range photogrammetry for field documentation of the ongoing excavations - experiences from Paphos Agora Project, Łukasz Misk, Wojciech Ostrowski, Weronika Winiarska*

*Lasergrammetry and high precision topography measurements to study a complex fortified building: Tour de la Pelote (Besançon, France), Thomas Chenal, Damien Vurpillot, Laure Nuninger, Marie-Laure Bassi, Amélie Berger, Laurent Desjardins*

## COFFEE BREAK

The Application of Digital Survey Techniques to the Recording of Burials: A Reassessment of Standard Recording Practice, *Damien Campbell-Bell*

Practical SfM Balancing: How Acquisition Parameters Affect Computation Time and Reconstruction Quality, *Christian Seitz, Benjamin Reh, Silvan Lindner*

Visualising Heat-Induced Change in Burned Bone: 3D data acquisition methods for novel surface analysis, *Priscilla Ferreira Ulguim*

A Multi-Scalar Approach to Structure-from-Motion Site Documentation at Crvena Stijena, Montenegro, *Samantha Thi Porter, Colin McFadden, Gilbert Tostevin*

Is 3D scanning a suitable monitoring solution for supporting the lending management? – Recent projects, experiences and discussion, *Thomas Reuter, Liane Albrecht*

## LUNCH BREAK

Archaeology of Sicily in 3D: An interdisciplinary Italian-American collaborative research project, *Michael Decker, Davide Tanasi, Elisa Bonacini, Cettina Santagati, Filippo Stanco, Mariarita Sgarlata*

Combination of color and 3D information,  
*Dirk Rieke-Zapp, Erica Nocerino, Elisabeth Trinkl*

Automatic Geometry, Metrology and Visualization Techniques for 3D Scanned Vessels,  
*Claudia Lang-Auinger, Vera Moitinho de Almeida, Stefan Spelitz*

Beyond 3D Modelling: Analysis of archaeological artefacts based on a morphing algorithm,  
*Diego Jiménez-Badillo, Salvador Ruíz-Correa, Mario Canul Ku, Rogelio Hasimoto Beltrán*


Energetic Cost Calculator for Ancient Architecture (EnCAB) and Open Context – Combining a Digital Tool and Digital Data to Explore Ancient Architecture,  
*Federico Buccellati*


## COFFEE BREAK

Architectural energetics with help of virtual Reconstruction, *Sebastian Hageneuer*

Close – range digital 3D data acquisition from UAV of a medieval keep in Montecorvino (Italy), *Luca d’Altilia, Pasquale Favia, Roberta Giuliani*


Hybrid Modelling Workflow for the Representation of Destroyed Heritage Monuments, *Wissam Wahbeh*



  
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## S5 Exploring Digital Interpretation, Argumentation, Conflict

*Cesar Gonzalez-Perez, Patricia Martín-Rodilla, Ruth Varela*

*Neue Aula, Room 10, 16.45 - 18.00, 20 March 2018*

Archaeological knowledge is usually constructed through interpretation from material evidence and today is increasingly mediated by computers and quantitative methods. Interpretation, therefore, plays a central role in digital archaeological practice, and understanding how it works and how it can be computationally assisted may help us improve our capacity to value other people's conclusions, revise our own, and produce better results overall. Also, archaeological interpretation usually occurs in scenarios where multiple agents have a voice, such as multiple researchers working on the same site, managers and professionals negotiating how to excavate and when, mediators working to reconcile the interests of local communities and government agencies, or professionals employing different computing approaches and techniques. In situations like these, argumentation is crucial to the generation of solid and reliable interpretations. Sometimes however when conflict arises, the clashing views of different agents must be reconciled. This session aims to address the interpretation, argumentation and conflict phenomena that occur within archaeological practice as mediated by computing approaches, analysing the cognitive, linguistic, philosophical and archaeological factors that may influence them. Papers that address combinations of theoretical and applied issues are welcome. Major research areas that are welcome in the session include (but are not limited to) the following:

- What theories exist to explain digitally mediated interpretation, argumentation, and conflict?
- What connections exist between discourse and their underlying ontologies?
- How can interpretations and argumentations be computationally analysed to obtain a better understanding of them?
- How can we build databases, ontologies or data repositories that support interpretative and argumentative processes?
- What natural language processing techniques can be applied to the analysis of interpretation and

argumentation, and what can they offer?

- What computing techniques, such as data-to-text or data mining, can be used to support multivocal argumentation in archaeology?
- What real-life scenarios exist where discrepancies and resolution have been exemplified with regard to digitalised archaeological knowledge and entities?
- How can digital mediation techniques help in reconciling arguments from different agents regarding archaeological heritage?

Explaining Archaeological 3D Visualisations from the perspectives of Polyrepresentation and Boundary Objects, *Isto Huvila*

Computer-Assisted Analysis of Combined Argumentation and Ontology in Archaeological Discourse, *Cesar Gonzalez-Perez, Patricia Martín-Rodilla, Martín Pereira-Fariña*

An experiment in multi-user linked system for the co-creation of environmental reconstruction and the documentation of the interpretative process, *George Alexis Pantos*

Exploratory and Comparative Analysis of Archaeological Excavation Databases, *Fabian Riebschlaeger*

## S6 Our little minions: small tools with major impact

*Moritz Mennenga, Ronald Visser*

*Neue Aula, Room 1, 13.45 - 15.30, 21 March 2018*

In our daily work the scripts, small applications and little devices help us the most to get the work done. These little helpers often reduce our workload or optimize our workflows, although they are not often presented. Instead we generally focus on presenting the results of our research and happily use our small tools during our research under and above water. This session will focus on these small helpers and we invite researchers to share their tools so that we all may benefit. This session aims at short presentations (10 minutes) of small software or hardware solutions, focusing on field work / excavation technology and the associated evaluation. The fields of application are not further restricted. Each presentation should explain the innovative character and mode of operation of the digital tool. The only restriction is, that there are open source or open access tools or the building instructions are freely available. Proprietary products can not be presented. We invite papers that present small tools or hardware inventions with the focus on application before, during and after fieldwork, for example

- data processing
- measuring
- digital documentation
- GIS-Plugins
- Hands-on digital inventions (for excavations)
- ...

*Numismatic Reconciliation APIs for OpenRefine, Ethan Gruber*

*Paperless mapping and Cave Archaeology: An application review,  
Konstantinos Prokopios Trimmis*

*ProfileAAR – a small tool helping to rectify archaeological profiles in QGIS,  
Moritz Mennenga, Kay Schmütz, Nils Hempel, Christoph Rinne*

## S7 What is the Value of Digitally Mediated Archaeology? (Roundtable)

*Daria Hookk, Paul Reilly, Jeremy Huggett, Irina Grevtsova, Sorin Hermon, Franco Niccolucci*

*Neue Aula, Room 14, 10.30 - 17.00, 21 March 2018*

For more than six decades archaeologists have been exploring the power of computer-based methods and digital technologies to advance archaeological inquiry and practice. Successive cohorts of CAA members have been, quite rightly, anxious to articulate the relevance and impact of their work to archaeology in general. However, Costopoulos in 'Digital Archeology Is Here (and Has Been for a While)' *Frontiers in Digital Humanities* 3:4 (2016) <http://dx.doi.org/10.3389/fdigh.2016.00004> suggests that there has been too great a focus on debating digital approaches and tools as objects of study and argues that far more emphasis should be placed on articulating the practical benefits of deploying digital tools in archaeology. In this Round Table session we ask "what is the value of digitally mediated archaeological practice?" We will question whether digital archaeology is merely the latest ephemeral fashion – just another technological fetishism, a significant upgrade to traditional methods, or an important new paradigm for archaeological practice. This round table welcomes participants from all segments of archaeological practice including but not limited to university-, state-, museum-, commercial unit-, and public-archaeology. This format of this Round Table will be a series of pairs or triplets of presenters offering short points of view (c.15 minutes or less) followed by periods of moderated discussion, chaired in rotation by the organisers. We also welcome 'flash statements' (less than five minutes). The session will be concluded with an open dialogue based on the accumulated discussion and a wrap-up report by one of the organisers, summarising the discussion and suggesting follow-ups. Some potential discussion points: What benefits does digital archaeology offer? How do we evaluate it? How should we evaluate effectiveness and impact compared with traditional techniques? How might we best monitor and track progress? What new benefits could we propose to archaeology more generally? How does digital archaeology better connect us to other disciplines, the heritage sector and the public? Please contact the organisers if you wish to offer a point of view or flash statement.

*Making, Meaning-Making and Archaeological Cabling, William Michael Carter*

## S8 Untapping the potential of 3D Quantitative Analysis

*Konstantinos Papadopoulos, Eleftheria Paliou*

*Neue Aula, Room 2, 13.45 - 17:45, 22 March 2018*

The increasing availability of 3D datasets produced by photogrammetry, laser scanning, and procedural modelling in the last decade have offered new opportunities for the recording, documentation and visualisation of archaeological environments and artefacts in three dimensions. Although these developments have greatly enriched the archaeological record and have encouraged new types of public engagement with archaeological data, the potential of 3D datasets to be subjected to formal quantitative analyses aiming at better supporting archaeological interpretations still remains largely untapped. Works on three-dimensional computational simulations and analyses that explicitly aim to produce new research outputs remain few and far between, despite often producing promising results. This session would like to invite scholars with an interest in archaeology, architecture, material culture, cultural heritage and computer graphics to present works that demonstrate the potential of formal analyses of 3D datasets to contribute to advances and new directions in archaeological research. It welcomes presentations on quantitative analysis of SFM and scanned models of archaeological artefacts and spaces, formal visibility, acoustic and lighting analysis of archaeological environments, analyses of immersive VR experiences (e.g. via the use of eye tracking devices etc), 3D GIS analysis, volumetric, structural and statistical analysis of 3D data. Besides presenting their work on 3D quantitative analyses, participants are encouraged to critically evaluate any methodological and theoretical issues posed by these approaches.

**The potential of multidimensional visualization in stratigraphic analysis,**  
*Vasiliki Andreaki, Juan Antonio Barceló Álvarez*

**Masterhand identification in 3D - Case studies from Archaic and Classical Greece,**  
*András Patay-Horváth*

**A multidisciplinary survey of ground stone tools surface,** *Giusi Sorrentino, Martina Polig,*  
*Carole McCartney, Sorin Hermon*

Death and decay in 3D: using 3D modelling for quantitative analysis, and as an educational and outreach tool in funerary archaeology, *Hayley Mickleburgh, Sarah Gluschitz*

Point-based Visual Analytics and Virtual Taphonomy: A Case Study involving the Submerged Late Pleistocene Cave Site of Hoyo Negro, Mexico, *Dominique Rissolo, Vid Petrovic, Alberto Nava Blank, James C. Chatters, Blaine W. Schubert, Patricia A. Beddows, Pilar Luna Erreguerena, Falko Kuester*

## COFFEE BREAK

Mapping Skeletal Trauma: A Tour of Violence in 3D GIS, *Julia Alyssa White, John Pouncett, Rick Schulting*

The 3D Survey of the Basilica of S. Apollinare in Classe, *Gianluca Foschi*

Villa di Poggio a Caiano by Giuliano da Sangallo. 3D Reverse models for HBIM to study a witness of the Renaissance, *Cecilia Maria Bolognesi, Simone Garagnani*

The use of 3d modelling in the process of the reconstruction of the prehistoric wooden and clay architecture from the Roman Period settlement in Rzemienowice site 1, voiw. Świętokrzyskie, Poland, *Jan Bulas, Jędrzej Bulas*

Auralizing past places: Repurposing visual datasets, *Catriona Cooper*

3D GIS: The road ahead (part 2), *Gary Nobles*

## S9 Show your code: task streamlining, reproducibility and replicability in archaeological computing

*Benjamin Davies, Iza Romanowska*

*Neue Aula, Room 5, 13.45 - 17:45, 22 March 2018*

Once a fringe component of archaeology, digital data and methods are rapidly becoming commonplace, changing how we learn about and discuss the past (Bevan 2015). This presents many technical challenges, but also an opportunity to reshape archaeological science by automating many of the most tedious tasks while encouraging reproducibility and replicability of computer applications. This session will be part seminar and part live-coding demonstration to which we invite anyone with a working piece of code that automates or streamlines any task that may be undertaken by an archaeological practitioner. We ask participants to show their code, explaining what the code does and how it works to make it easier for others to use it (Eglen et al. 2017). In doing so the session will showcase the principles and benefits of open science (*sensu* Nosek et al. 2015). We invite demonstrations from all points in the production of knowledge, from building and using archaeological databases, to statistical analyses and modelling (simulation, GIS, etc), to dissemination and public engagement. We also welcome more traditional papers that can bear on the following issues: -Improving usability and discoverability of code; -Communicating coding results with non-experts; -Managing concerns regarding intellectual property and data ownership; -Maintaining code and data in the long term; -Using code examples for teaching archaeology. Whether you are producing grand-scale syntheses of big data or those bits of programming that make life just a little easier, we want to see your code! All programming languages welcome.

References: Bevan, Andrew. 2015. "The Data Deluge." *Antiquity* 89 (348): 1473–84. doi:10.15184/aqy.2015.102. Eglen, Stephen J., Ben Marwick, Yaroslav O. Halchenko, Michael Hanke, Shoaib Sufi, Pdraig Gleeson, R. Angus Silver, et al. 2017. "Toward Standard Practices for Sharing Computer Code and Programs in Neuroscience." *Nature Neuroscience* 20 (6): 770–73. doi:10.1038/nn.4550. Nosek, B. A., G. Alter, G. C. Banks, D. Borsboom, S. D. Bowman, S. J. Breckler, S. Buck, et al. 2015. "Promoting an Open Research Culture." *Science* 348 (6242): 1422–25. doi:10.1126/science.aab2374.

Not all data are born digital: Workflows to facilitate data integration and rapid 3D visualization of landscapes, *Heather Richards-Rissetto, Zachary Day, Shane Bolan, Isaac Beddes*

Streamlining 'big data' – adapting workflows for the extraction and management of large volumes of social media data for digital heritage research,  
*Marta Krzyzanska, Chiara Bonacchi*

The Big Problem with Big Data: automating social media harvesting and interpretation for cultural heritage audience insight, *Lawrence Shaw*

Standalone Photoscan VS Photoscan Cluster Processing, *Jad Aboulhosn, Anais Guillem, Nicola Lercari*

Towards 3D modelling as a replicable and intellectually transparent process: A rule-based approach to archaeological visualizations, *Chiara Piccoli*

## COFFEE BREAK

EDIT DISTANCE - Software tool for analysing epigraphic data, *Iza Romanowska, Daniel Martín-Arroyo Sánchez*

Defining archaeological Site Exploitation Territories (SET) using the open source statistical language R, *Jan Johannes Ahlrichs, Philipp Gries, Karsten Schmidt*

Hypothesis modelling in R, using shared data, *Lizzie Scholtus, Loup Bernard*

Agent-based modelling for archaeology classes: sampling, *Grégoire van Havre*

Automating heritage reporting tasks with R, *Benjamin Davies*

## S10 Expanding horizons: confronting issues of scale, resolution, and representation in the study of human expansions

*Benjamin Davies, Nicholas Conard*

*Neue Aula, Room 2, 10.30 - 12.15, 22 March 2018*

Panelists of this roundtable session will discuss theoretical and methodological issues associated with the study of prehistoric human expansions and computational methods used to represent them. From the earliest hominin expansions in Africa and Eurasia, to the settlement of Australia and the New World, to explorations of the world's oceans: the historical record of humanity is structured by the movements of people over the earth. Human expansions have been facilitated by changing environmental conditions, technological innovations, and shifts in the social relationships between different human groups, all of which have consequences for patterning observed in the archaeological record. Many major human movements occurred at spatial and temporal scales that differ from that of both archaeological investigations and many conceptions of human culture, leaving room for a good deal of uncertainty and presenting challenges to the construction of prehistoric narratives. Computational modelling approaches like GIS, network analyses, and agent-based models, offer opportunities to place these narratives in a framework where different potential historical processes can be assessed and uncertainty can be quantified. How we represent our ideas about the past in computational form involves trade-offs between realism and generality, as well as negotiations between different areas of expertise. This roundtable will include panelists from a range of research specialisations in order to expose common issues in the field of modeling human expansions and generate ideas about how best to bring together these areas of expertise.

**Modeling Movement on Water: Generating past mobility corridors on the sea,**  
*Emma Slayton*

**No two ancient migrations are the same: constructing null models at different scales of analysis,**  
*Iza Romanowska*

**Route selection and number of exits: Quantifying “Out of Africa”,**  
*Ericson Hölzchen, Christine Hertler*

**‘Out of Site’: Problems in Understanding Hominin Dispersal Caused by Site Centrism and Predictive Models,**  
*Patrick Cuthbertson*

**Diffusion versus dispersal wave-of-advance models and Neolithic spread,**  
*Joaquim Fort*

## S11 Untapping the value of old fieldwork records

*Dorina Moullou, Isto Huvila, Costis Dallas, Arianna Traviglia, Antonia Davidovic, Rimvydas Lauzikas, Henriette Roued-Cunliffe, Colin Wallace*

***Neue Aula, Room 9, 10.30 - 18.00, 20 March 2018***

In recent years an increasing number of new discoveries have taken place due to the re-examination of previous archaeological finds and documentation. The purpose of this session is to examine how, with new technologies and methodologies, archival data (including photographs and drawings), artifacts and other materials from past excavations and fieldwork in general can be analysed in order to glean information that was either not recorded or was unavailable due to previous limitations in the technologies and knowledge of the time. Because some excavations and/or structures are either not available now (backfilled/collapsed etc.) or have degraded severely through time, the ability to examine them and their materials as they were when excavated can breath new life into old digs. Approaches such as photogrammetric 3D modelling of past excavation data, geophysical prospection, archaeometric analysis and crowd sourcing based solutions can serve to “virtually restore” the excavation, the monuments and the context of artifacts. Presenters are invited to reflect on the use of these technologies, what are their benefits and implications and whether they enhance the overall archaeological process with a more holistic record. The session will follow a standard format for the first half with papers being presented on. The second half of the session will involve four 15 minute flash discussions on ideas and approaches to prepared questions. Each discussion is open to audience input and finishes with a panel summary. Discussion One: What purposes can revisited materials be used for? This discussion will revolve around possible uses and benefits of new data produced from legacy data and materials. What is currently being done in the reexamination of materials as well as proposals of other possibilities for newer technologies or the repurposing of existing methods? How can their application benefit both archaeological research and its presentation and promotion to the public? Discussion Two: Crowdsourcing based solutions Unfortunately many archaeological sites have not been adequately documented either at the time of their excavation or prior to changes or even their destruction. While “Virtual

restoration” can be augmented using internet sourced materials, crowd sourcing may yield a greater selection and quality of materials as in the example of the NewPalmyra project. The discussion will focus on what kind of results can be achieved through this method as well as ways to maximize public input. Discussion Three: Digital preservation and curation of legacy datasets Digital preservation and curation of legacy datasets in archaeological archives such as ADS are aimed at maintaining such datasets in a form amenable for further access, analysis and research. Discussion will include how to make such datasets (and artefact databases) amenable to information integration, i.e. to consolidate such data across different excavations and the possibilities of using NLP and semantic technologies. Discussion Four: Solutions in Using Archival data This discussion will focus on the problems involved using archival photos, plans and data and what solutions participants have succeeded with or suggest in order to achieve best results in “virtual reconstructions” of past excavations.

Exploring the villa maritime of Sora (Torre del Greco - Italy) through the integration of old and new maps, *Angela Bosco, Andrea D'Andrea, Francesca Forte, Massimo Osanna, Fabrizio Pesando, Luana Toniolo, Rosario Valentini*

Viability of Production and Implementation of Retrospective Photogrammetry in Archaeology, *Colin Allan Bruce Wallace, Dorina Moullou*

Bad Photogrammetry: Using Nonoptimal or Archived Photographs for Constructing 3D Models, *Robert J. Bischoff, James R. Allison*

Getting the Measure of Brochs: Using survey records old and new to investigate Shetland's Iron Age archaeology, *Li Sou, Julie Bond, Stephen Dockrill, Val Turner, Andrew Wilson, Lyn Wilson*

Reconstructing excavations ? Photogrammetry on 1980's Photos, *Thomas Wolter*

## LUNCH BREAK

Utilising Text Mining to Unlock the Hidden Knowledge in Dutch Archaeological Reports, *Alex Brandsen, Milco Wansleben, Suzan Verberne*

The Big Data Challenge. Integrative Big Data Approaches towards a Hybrid Archaeology in the Eastern Mediterranean, *Francesca Chelazzi, Simone Bonzano*

Legacies Ancient and Modern: Hybrid Approaches to Digital Presentation of Legacy Data at Poggio Civitate and Sardis, *Theresa Huntsman, Eric Kansa*

Synthesizing old excavation records and new archaeo-metallurgical data through functional, spatial and temporal dimensions, *Marion Berranger, Rémy Jeannot*

A GIS procedure to study settlement patterns from site-based survey datasets, *Anita Casarotto*

## COFFEE BREAK

The long-range record of the Temple of the Sun in Heliopolis (Egypt), *Kai-Christian Bruhn, Christopher Breninek, Klara Dietze, Dietrich Raue, Evgenia Tachatou*

Assessing the value of legacy pre-digital landscape and survey data, *Emeri Farinetti*

Digging in excavation diaries: digital re-assessment of stratigraphy in 3D GIS. The sanctuary of Ayia Irini, Cyprus, *Valentina Vassallo, Giacomo Landeschi, Nicolò Dell'Unto, Sorin Hermon*

Dirty Dishes for the WIn: Old museum collections as a source for new chemical analyses, *Jennifer A. Loughmiller-Cardinal*

## S12 Making the most of film and video in archaeology

*Kathryn Rogers, James Miles*

*Neue Aula, Room 5, 8.15 - 12.15, 21 March 2018*

Despite the fact that archaeologists have experimented with various forms of filmmaking for a century we are still yet to develop a pragmatic approach to how best to integrate actuality film and video recording, editing, and archiving into our research project designs. As mediums merge and digital platforms multiply, as coders begin to replace film editors, as media technologies, standards, laws, and conventions shift – now is a timely moment to take stock and consider how we can make better use of actuality film and video in archaeological contexts. Key challenges include how to address the disconnected digital archives of historical archaeological film footage increasingly available online; how to better integrate drone, underwater, and site videography into archaeological research design and dissemination strategies; and how to better foster media literacy and skills among archaeologists tasked with researching, designing, recording, editing, managing, distributing, and digitally archiving film and video material. This session seeks to cross industry and disciplinary boundaries by inviting archaeological scholars and computing specialists to problematise and bring fresh perspectives to the above issues by suggesting future directions for how we can make the most of digital actuality film and video in archaeology. Suggested themes and topics include but are not restricted to:

- o Approaching film and video as archaeological data.
- o The challenges of digital archiving, database management, and accessibility for archaeological films and videos.
- o Working with video files – what archaeologists need to know.
- o Using film and video in academic publishing.
- o The pros and cons of vlogging, social media, and online video platforms for archaeology.
- o Merging the mediums: approaches to combining actuality footage with animation, VR, AR, and more.
- o Coding: the future of film editing? How can we futureproof digital archaeological storytelling?

Please note: the term ‘actuality’ is borrowed from the documentary industry and used here to describe non-fiction films and videos of actual people, places, and events – as differentiated from animated or fiction films and videos.

Archaeological Documentaries from Scratch - Recording and Presentation of a research project, *Till Frieder Sonnemann*

SCHARP Focus: film making as an integral part of a wider community based project, *Tanya Kinston, Freke Venture*

Low cost video making! Can it counter scarcity of resources while contributing to enhance visibility?, *António Batarida Fernandes*

VR and the death of the frame: Filmmaking in an age of immersive technology, *Kieran Baxter*

## COFFEE BREAK

Bringing Archaeology into the 21st century: social media and resource potential, *Rachel Anne McMullan*

“Story first, technology second.” Exploring the archaeological affordances of iDocs, *Kathryn Rogers*

Archiving film: what can we achieve?, *James Miles*

## S13 Digital Documentation Archaeological Ships. What do we do and what do we need?

*Amandine Colson, Kristofer Gamstedt, Pat Tanner, Toby Jones, Heidi Hastedt, Thomas Luhmann*

*Neue Aula, Room 2, 10.30 - 15.30, 20 March 2018*

Ship Archaeology is by essence international and ships have always been the medium of goods and knowledge. Over the last 15 years, projects using different methods flourished all over the world to document and monitor digitally archaeological ships. The oversize of these kind of artefacts justifies the use of modern technologies for the documentation and long-term monitoring. In fact, digital methods enable on the one hand new assessments that are not possible with traditional methods, but also a higher precision (Jones; 2015). Several initiatives show the path using coordinate measurement machines (Jones; 2015) or Total Station Theodolite (van Dijk; 2016), and Laser Scanners (Tanner; 2012) but also Photogrammetry (Wiggenhagen; 2004). Nevertheless, these different initiatives were not looked at globally from a technical stand point. Our aim with this session is to get an overview from the current state of digital documentation and long-term monitoring of ships in Archaeology. We like to think that the data collected is usable in other context by other disciplines. However, given the variety of methodology applied as well as mind-sets, is this goal achievable? Is it realistic to believe that the data collected by an archaeologist will serve the needs of a conservator? Is it realistic to believe that the data collected by a conservator will serve the needs of an engineer? We should be looking at the issue from a broader distance and realise that guidelines and standards are necessary to structure the knowledge collected. Guidelines are needed to provide a common ground for effective interdisciplinary discussion. A framework for the digital documentation and monitoring of ships in Archaeology shall be discussed with the session participants. References: Jones, T., 2015. Three-Dimensional Digital Recording and Modelling Methodologies for Documentation and Reconstruction of the Newport Medieval Ship. PhD Thesis submitted at University of Wales Trinity Saint David, Great-Britain. Tanner, P., 2012. 3D Laser Scanning in Boat Recording. Nautical Archaeological Society Newsletter. Van Dijk, N., et al., 2016. Monitoring archaeological wooden structures: Non-contact measurement systems and interpretation

as average strain fields. *Journal of Cultural Heritage*, 17, pp. 102-113. Wiggenghagen, M., et al., 2004. Repeated Object Reconstruction of the Bremen Hanse Cog. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (IntArchPhRs)*, pp. 54-58.

Reconstructed one more time - The Bremen-Ship, *Pat Thomas Tanner*

Monitoring concept for deformation estimation of the Bremen Cog,  
*Heidi Hastedt, Amandine Colson, Thomas Luhmann*

Monitoring protocol for the preservation conditions of the barge Arles Rhône 3 (France),  
*Daniela Peloso*

From the Macro to the Micro; Digital shipwreck datasets and their inter-disciplinary  
application in managing potentially polluting shipwrecks, *Camilla Moore*

## LUNCH BREAK

New insights from the historical events in Nydam by 3D-GIS, *Karin Göbel*

A Comparative Structural Analysis of Shell-first and Frame-based Ship Hulls of the 1st  
Millennium AD, *Nathan Helfman*

## S14 Setting the automation agenda for Remote sensing: learning to see through a computer?

*Arianna Traviglia, Dave Cowley*

*Neue Aula, Room 1, 10.30 - 15.30, 20 March 2018*

The application of automated procedures in Remote Sensing archaeology is entering a new phase of widespread acceptance and adoption, as made evident by a number of research projects focused on the development of computational approaches to streamline the processing and examination of RS data. Technical or theoretical drawbacks (such as the great variation in the morphological and spectral expressions of archaeological features) are being overcome by adopting approaches successfully implemented in other fields (such as medical imaging, face recognition, surveillance, social media) where automated image processing and classification is routine. In particular methods involving deep convolutional neural networks (e.g. CNN), cognitive reasoning, self-learning algorithms, adaptive template matching, feature extraction, pattern recognition, and pattern matching (to name just the most effective) are showing great potential in dealing with the variability in the manner in which of archaeological objects are expressed in RS data. These approaches directly address previous limitations of spectral and object-based methods and enable recognition of landscape objects and patterns produced by a variety of natural and artificial elements. This session aims to further the discussion of applications of automation methods to identify landscape features and/or patterns in remote sensing data. This dialogue will include exploring the interfaces between traditional methods, such as observer-directed survey, observer-driven aerial photo and remote sensing data interpretation, and the potential of automated processing and object detection. Here, the explicitness of archaeological understandings of objects and their component parts is absolutely fundamental, and an area where automated approaches present a direct challenge to archaeologists to unambiguously define how they see what they see. Such processes are key to choosing the most productive trajectories for development, built on a shared and clear understanding of founding principles and therefore of what outputs mean in 'real world' terms. The session has also a specific interest in exploring ways of building infrastructures and base layer datasets that are

at the foundation of future discipline developments. Central to this agenda is how we generate datasets that can be used for machine learning (that is to fit the parameters of the classifier), how crowd-sourcing might be developed and how transferable, flexible toolkits might be developed.

LiDAR-based automated detection of cultural heritage in Westphalia,  
*M. Fabian Meyer, Ingo Pfeffer, Carsten Jürgens*

Semi-automatic detection and extraction of complex burial monuments in Arabia from  
high-resolution multispectral satellite imagery, *Giacomo Fontana*

Extraction of linear structures from LIDAR images using a machine learning approach,  
*Clément Laplaige, Xavier Rodier, Jean-Yves Ramel, Bai Shuo, Ronan Guillaume*

Archaeological Object Detection in Airborne Laser Scanning Data Using Convolutional  
Neural Networks, *Bashir Kazimi, Frank Thiemann, Katharina Malek, Monika Sester*

Semi-automatic mapping of cultural heritage in Arran, Scotland, using deep neural  
networks on airborne laser scanning data, *Øivind Due Trier, David Cowley,  
Arnt-Børre Salberg*

## COFFEE BREAK

The use of Convolutional Neural Networks in the automated detection of archaeological  
objects in remotely sensed data, *Wouter Baernd Verschoof-van der Vaart, Karsten Lambers*

Detection of Bomb Craters in WW2 Aerial Images Using Convolutional Neural Nets,  
*Sebastian Zambanini, Simon Brenner, Robert Sablatnig*

Tackling the Small Data Problem in Deep Learning with Multi-Sensor Approaches,  
*Iris Kramer, Jonathon Hare, Adam Prugel-Bennett*

Deep learning for the benefit of archaeological remote sensing data interpretation?,  
*Christopher Sevara, Geert Verhoeven*

Teaching a computer to 'see': training sets in Remote sensing archaeology,  
*Arianna Traviglia*

## **S15 Analysing Historical Transportation Systems from new applications and methodologies**

*Pau de Soto*

*Neue Aula, Room 2, 16.45 - 18.00, 20 March 2018*

In the last years there has been a growing interest in the development of new methodologies to model and recreate the mobility and transport in historical periods. The use of GIS, but most important, the increase of Network analysis applications, has allowed several researchers to deal with the study of transportation networks from different perspectives and frames. In this context, it is important to apply all kind of new approaches to the analysis of historical infrastructures in order to understand the transportation systems and the territorial organisation of different territories in diverse timeframes. The use of new methodologies and approaches to these analyses is offering brand new data that seems to be very useful to obtain better reconstructions of the historical transport conditions and network morphologies. Between these new approaches we can find the modelling of travel costs and times or the analysis of the road networks structures in order to obtain new knowledge about the territorial configuration. The results of such applications provide us with new information to understand the distribution of commodities, product competition and the role of the ancient economies, such as Rome or Medieval Kingdoms, in the configuration of historical territories. The ability to see graphically and quantitatively those results which until now they could only be guessed, can open new perspectives and justifications to the speeches made about the Ancient world up to now. At the same time, it is possible to observe how the construction of a complex communication network meant an important element for the integration of new territories into a bigger domain. For a better understanding of the morphology of these infrastructures, Network Analyses and other approaches are applied to understand the configuration and performance of the Roman networks in these territories. In this research context, with this session we want to offer a public space where researchers can share their experiences with the use of this new methodologies and approaches applied to historical transport and create a positive debate about their optimal application and generation of results.

GIS-based Spatial Analysis of the Defensive System of Juyongguang of the Great Wall of Ming Dynasty, *Jie He, Wenpeng Song, Shanshan Liu*

Understanding past territorial dynamics through the integrated study of movement, pathways and transport networks, *Laure Nuninger, Philip Verhagen, Rachel Opitz, Damien Vurpillot, Frédérique Bertoncello, Zoran Cuckovic, Elise Fovet, Fruchart Catherine, Mark Groenhuijzen, Ziga Kokalj, Maurice de Kleijn, Benjamin Stular*

Dynamic Fastest Sea Route Computation in Support of Seafaring in the Ancient Eastern Mediterranean Serious Game, *Elias Frentzos, Phaeton Kyriakidis, Dimitrios Skarlatos*

Modelling spatial and quantitative aspects of the Roman military intervention to the Germanic territory during the Marcomannic wars, *Marek Vlach, Balázs Komoróczy*

A comparison between network models for the calculation of least-cost paths: towards an open toolbox to facilitate future research, *Mark Groenhuijzen*

## S16 Play, Process, and Procedure: An Experiential Digital Archaeology

*Meghan Dennis, Lennart Linde, Megan von Ackermann, Tara Copplestone*

*Neue Aula, Room 10, 13.45 - 17.45, 22 March 2018*

Videogames and virtual worlds have increasingly become areas in which archaeological research is situated. These emerging venues straddle the divide between analogue past and digital present, asking the archaeologist to consider where that divide exists in their own archaeology, or whether it exists at all. Through this session, researchers are asked to look towards these new settings for how process, procedure, and play are being incorporated into digital archaeology, and what challenges to traditional archaeological practice can be overcome by embracing spaces of play as research arenas. Designed as an experiential exercise, each participant is asked to condense their presentation into 15 minutes, and one digital slide. Immediately following the presentation of papers, a working session to incorporate the themes of the session into prototype archaeological experiences of play will see participants creating together, and making the results of their collaboration available for further comment and discussion during the conference.

**A Hologram word: Process Drama and Performative Archaeology in the Digital Age,**  
*Konstantina Kalogirou, Konstantinos Prokopios Trimmis, Alexandra Kormari*

**Beyond the Virtual Reconstruction of an Archaeological Settlement,** *Sergi Cebrián Gres, Núria Morera Noguer, Juan Antonio Barceló Álvarez, Igor Bogdanovic, Oriol Lopez Bultó, Ivan Campana, Antoni Palomo Pérez, Raquel Piqué Huerta, Jordi Revelles López, Xavier Terradas Batlle, Josep Lluís Arcos, Juan Antonio Rodríguez-Aguilar, Anton Bogdanovych, Simeon Simoff, Tomas Trescak, Inmaculada Rodríguez Santiago, Anna Puig Puig*

**BibNum : reflections on a systematic approach to structure and disseminate archaeological digital data,** *Quentin Verriez*

**Advanced Visual Education in Archaeology using OpenSim: The Experience of the Time Maps Project,** *Dragos Gheorghiu, Livia Stefan*

## COFFEE BREAK

Romans, Polar Bears, and Beach Huts: Crowd-imagining the Dutch Limes in RomeinCraft, *Angus A. A. Mol*

Archaeogaming as Queergaming, *Florence Claire Smith Nicholls*

Objects, tangibility and immaterial space, *Megan von Ackermann*

Playing with Ethics: Preliminary Results of a Study of Public Perceptions of Archaeological Representation in Games Media, *L. Meghan Dennis*

The Game of Making an Archaeology Game: Proposing a Design Framework for Historical Game Design, *Juan Francisco Hiriart*

## **S17 Early human land use strategies during Middle and Late Pleistocene glacial and interglacial times in Europe**

*Michael Bolus, Angela Bruch*

*Neue Aula, Room 2, 8.15 - 10.00, 22 March 2018*

The transition from the Middle to the Late Pleistocene is characterised by the transition from a distinct glacial cold phase (MIS 6) to a distinct interglacial warm phase (MIS 5e; Eemian sensu stricto). While changes in climate, environment, vegetation and fauna are obvious, this session aims at identifying possible differences or continuities in Neanderthal hominin performances, resource space and range between MIS 6 and MIS 5e. Several research questions have been addressed by researchers of the project ‘The Role of Culture in Early Expansions of Humans (ROCEEH) and will be discussed during the session. What did climate, environment and vegetation look like during a distinct cold phase and a distinct warm phase? Did corridors and barriers change? Are resource space and dietary breadth greater during a warm phase? Did changes between glacial and interglacial times have any impact on Neanderthal lifestyles and behaviours? Is there a relationship between changing climatic and environmental conditions and the distribution of Neanderthal sites? Can we observe different site preferences in Middle and Late Pleistocene Neanderthals? Did human land use strategies change? Are tool diversity and mobility different between MIS 6 and MIS 5e? Does an interglacial – or rather a glacial with stronger challenges – trigger an expansion of cultural capacities and/or performances? Do glacial or interglacial phases lead to specific cultural adaptations? Several computer-assisted methods from different scientific fields that have been (or might be) applied to answer such questions shall be discussed. They include, among others, measurements of tool diversity, tool-flake-core ratios and artifact density; agent based modelling; modelling of climate and vegetation; GIS-based analyses and modelling of geographic parameters. Colleagues from all scientific fields are invited to contribute to the session.

**Tool Diversity and Mobility: Deducing Neanderthal Land Use Patterns from the Analysis of Lithic Assemblages, *Michael Bolus, Knut Bretzke, Andrew W. Kandel***

**Expansions – How to create links between Neanderthal behavior, ecology and environment, *Christine Hertler, Susanne Haupt, Ericson Hölzchen, Angela Bruch***

**Neanderthals on the move: An agent-based modeling approach to simulate Neanderthal migration, *Ericson Hölzchen, Philipp Mendgen, Christine Hertler, Christian Sommer, Michael Märker, Michael Bolus***

## S19 Agents, networks and models: formal approaches to systems, relationships and change in archaeology

*Iza Romanowska, Tom Brughmans, Benjamin Davies*

*Part I: Neue Aula, Room 5, 10.30 - 18.00, 20 March 2018*

*Part II: Neue Aula, Room 10, 8.15 - 15.30, 21 March 2018*

Even if much ink has already been spilled on the need to use formal, computational methods to represents theories, compare alternative hypotheses and develop more complex narratives, the idea is still far from being firmly established in archaeology. Complexity Science provides a useful framework for formalising social and socio-natural models and it is often under this umbrella term that formal models are presented in archaeology. It has a particular appeal for researchers concerned with humans, thanks to its bottom-up focus, which stresses the importance of individual actions and interactions as well as relations between system elements. Equally, archaeology is a discipline where long-term, large-scale shifts in social change, human evolution, or interactions with the environment are at the heart of our interests. Complexity Science offers an arsenal of methods that were developed specifically to tackle these kind of research questions. This session will provide a forum for archaeological case studies developed using Complexity Science toolkits as well as for more methodological papers. We invite submissions of models at any stage of development from the first formalisation of the conceptual model to presenting final results. Possible topics include but are not limited to applications or discussions of the following approaches: – Agent-based and equation-based modelling, – Network science, – System dynamics, – Game theory, – Long-term change in social systems, – Evolutionary systems, – Social simulation in geographical space, – Complex urban systems, space syntax, gravity models.

*Part I: Neue Aula, Room 5, 10.30 - 18.00, 20 March 2018*

**Agents, networks and complexity - an introduction to the session,**  
*Iza Romanowska, Tom Brughmans*

**Simulating the past: From Virtual Reality to SocioPhysics,**  
*Juan Antonio Barceló, Florencia Del Castillo Bernal*

Explicit Knowledge Representation in Archaeological ABMs, *Frederik Schaff*

Predicting the Past: Computer Simulations in Archaeology, *Fan Zhang*

Using ABM to explore the role of socio-environmental interactions on Ancient Settlement Dynamics, *Frédérique Bertonecello, Marie-Jeanne Ouriachi, Célia Da Costa Pereira, Andrea Tettamanzi, Louise Purdue*

## LUNCH BREAK

Evaluating simulation platforms to describe ancient work processes, *Florencia Del Castillo, Ivana González Bagur, Joan Anton Barceló*

Simulating (In)experience at Sea: Building an Agent-based Model for Iron Age Channel Crossings, *Karl Smith*

Socio-Ecological Responses to a Changing Environment: The Mid-Holocene Elm Decline, *Micheál Edmund Butler, Phil Murgatroyd, Vince Gaffney*

Transferring knowledge from locational predictive models into spatial Agent Based Models, *Kaarel Sikk, Caruso Geoffrey*

## COFFEE BREAK

The Emergence of the State in Predynastic Upper Egypt: An Agent-Based Approach, *Jessica Nitschke, Geoff Nitschke*

Przeworsk Culture in Widawa Basin (South-Western-Poland). Simulation Modelling and Probable Settlement Processes, *Jan Zipser*

Do Conflicts Drive Urbanity? Spatial Modeling of Conflict and Flows in the Bronze Age, *Lennart Linde*

The key lessons of complexity theory for Archaeology, *Andre Costopoulos*

Towards a conceptually-enhanced archaeological network analytic tool, *Lieve Donnellan, Lutz Schubert*

*Part II: Neue Aula, Room 10, 8.15 - 17.00, 21 March 2018*

Network approaches to the formation of artistic communities in the Orinoco Interaction Sphere, *Phil Riris*

The application of Network Science to the study of Atlantic Rock Art, *Joana Valdez-Tullett, Tom Brughmans*

Networks of things: mapping quantitative and qualitative variables of archaeological artifacts, *Grégoire van Havre, Acilene Mota Sandes*

Virtual Kinship Networks, *James R. Allison*

Christianization of the Roman Empire: Diffusion on a Settlement Network, *Vojtech Kase, Jan Fousek, Eva Výtvarová, Adam Mertel*

**COFFEE BREAK**

Epidemiological Modeling and Impact Evaluation of the Antonine Plague, *Marek Vlach*

Modeling the impact of individual factors involved in the early spread of the cult of Isis and Sarapis across the ancient Mediterranean, *Tomas Glomb*

A Conceptual Model for Social Impact of Cultural Processes, *Rimvydas Laužikas, Darius Plikynas, Leonidas Sakalauskas*

Identifying Late Chalcolithic and Early Bronze Age Metal Communities of Anatolia through Groups and Networks, *Martina Massimino, Michelle de Gruchy, Jelena Grujić, Miljana Radivojević*

Reconstruction of Old Kingdom Administration using Data Mining, *Veronika Dulíková, Radek Marik*

Chronological Network Analysis – A new methodical approach to the chronology of the Southwest German middle Neolithic (c. 4900-4500 BC), *Stefan Suhrbier*

**LUNCH BREAK**

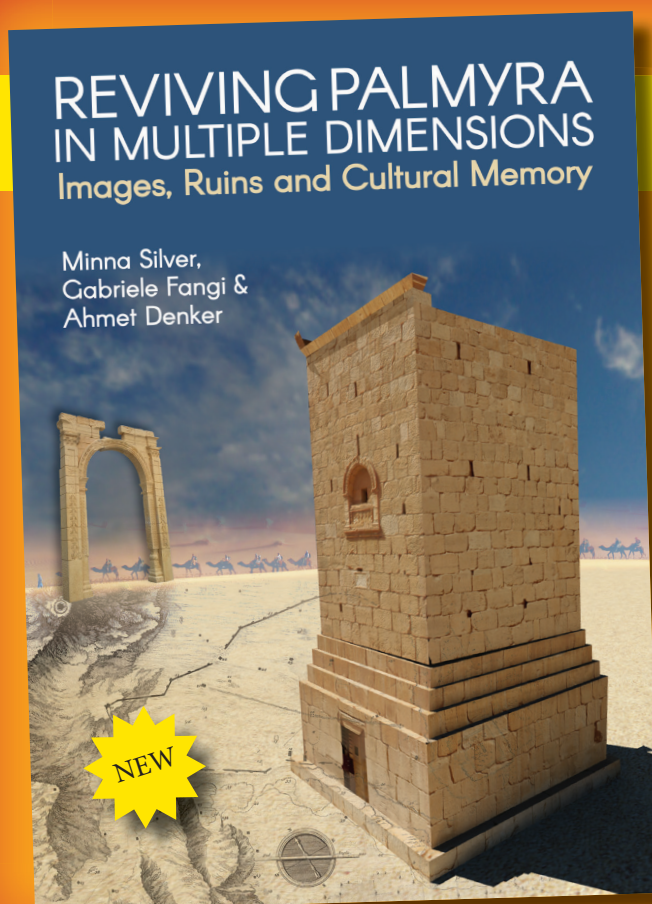
What's geography got to do with it? A networked, agent-based model of exchange in Polynesia, *Benjamin Davies*

Viewshed network analysis of the Cochasquí site, Ecuador, *Irmela Herzog, Alden Yépez*

Networks of Meshworks: emerging social structure and communities in Kaushi, Taiwan,  
*Mu-Chun Wu, Tom Brughmans*

Analysing the effect of spatial distribution of two populations over the genetic  
composition of their hybrids, *Carolina Cucart-Mora, Sergi Lozano*

Poster: Exploration of Hierarchical Prehistoric Settlement Networks - case study of late  
Iron Age settlements, *Betka Danielisová, Jan Procházka, Kamila Štekerová*



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## S20 Palaeo-GIS

*Patrick Cuthbertson, Peny Tsakanikou*

*Neue Aula, Room 8, 13.45 - 17.00, 21 March 2018*

The use of Geographic Information Systems (GIS) in Palaeolithic research is growing rapidly. A wide variety of innovative applications, published in recent years, offer new and alternative ways of conceptualising the Palaeolithic landscape and exploring several aspects of landscape use by early humans. The nature of the Palaeolithic record, however, requires unique consideration within geospatial archaeology due to the vast spatio-temporal scales involved in its formation as well as the fragmentation and paucity of available data, especially for the earlier periods of the Palaeolithic. These records are often time-aggregated, and deal with scales of behaviour that have little or no meaningful corollary in other prehistoric or historic periods. Typical Palaeolithic contexts such as river terrace palimpsests, multi-context cave sites, and deflated surface assemblages provide unique challenges to archaeological interpretation and geospatial analysis. Despite the frequent and multiple use of GIS in Palaeolithic contexts, it is our contention that there have been only limited attempts to identify or integrate the specific concerns of Palaeolithic researchers within geospatial archaeology generally, or even to account for the breadth and variety of Palaeolithic work currently being undertaken using GIS. A presentation session focused specifically on Palaeolithic applications of GIS would be beneficial in bringing together practitioners to consider the methodological and interpretive challenges that are unique to this topic area, and also exchange ideas and experiences. The CAA International 2018 conference in Tübingen could provide a survey of current work in the field, and form a basis for furthering the topic area of Palaeolithic GIS at future CAA events.

Palaeolithic mining and processing complex in Orońsko (Masovian Voivodship, Poland) in the light of GIS analyses, *Sylvia Buławka, Katarzyna Kerneder-Gubała, Nazarij Buławka*

Contribution of Geographic Information System in definition of human activity areas in Middle Palaeolithic. Examples of Caours and Beauvais (France), *Gwénaëlle Moreau, Jean-Luc Locht, Marylène Patou-Mathis, Patrick Auguste*

Palaeo-geography of the Channel Plain and its influence on Neanderthal lithic and landscape behaviour, *Samuel Griffiths*

Using Taphonomy, GIS, and Photogrammetry to reconstruct site formation and carnivore-hominin interaction at Dmanisi, Georgia, *Reed Coil, Martha Tappen, C. Reid Ferring, Maia Bukhsianidze, David Lordkipanidze*

The Last Interglacial period and its implications for AMH dispersal: GIS-based Palaeo-Map of Egypt, *Felix Henselowsky, Christian Willmes, Christian Sommer, Dorothee Lammerich-Long, Karin Kindermann, Michael Märker, Olaf Bubenzer*

## COFFEE BREAK

Corridors or Barriers? A GIS model to classify biome distributions in the late Pleistocene Europe, *Christian Sommer, Christian Willmes, Ericson Hölzchen, Michael Märker, Volker Hochschild*

Moving Around and Settling Down – Reconstructing Palaeolithic Land Use with GIS, *Taylor Otto*

Challenges in Palaeolithic Spatial Analysis: Two Eurasian Case Studies, *Patrick Cuthbertson, Peny Tsakanikou*

## S21 Structural Analysis for Cultural Heritage: Tools and Methods for Assessing Heritage Monuments and Structures

*Michael Hess, Rebecca Napolitano, Dominique Rissolo*

*Neue Aula, Room 6, 13.45 - 17.00, 21 March 2018*

Ever present in the world of cultural heritage are the challenges associated with assessment, diagnosis, and preservation of as-built infrastructure with potentially unknown materials, techniques, or damage. Historical buildings, monuments and sculptures require delicate handling. Therefore, the techniques used to capture the existing conditions must be non-destructive, though at the same time must acquire accurate information at the surface, subsurface and volumetric levels. Interdisciplinary collaboration between engineers, scientists, historians, and other stakeholders can reach beyond documentation and visualization towards the production of actionable data on the current “state of health” of buildings, monuments, and artworks as well as predict how structures or their constituent elements might respond to theoretical stresses in the future. Presentations concerning new tools, methods and treatments being researched and developed for understanding and diagnosing heritage buildings, monuments and sculptures are encouraged. Potential topics include novel approaches for translating laser scanning or photogrammetry data into 3D models for structural analysis, new methods for robust investigation of structural systems, as well as recent updates in structural monitoring and lifecycle management. Technology must be leveraged to aid in modeling and simulating problematic aspects such as heterogeneous materials, existing damage patterns, seismic vulnerability, and unknown construction techniques. Structural engineering methods and software tools better enable cultural heritage practitioners to make informed decisions through understanding how the built environment responds to the always present forces that shape it.

Digitizing the heritage of Palmyra, *Natalia Solovyova, Jegor Blochin, Sergei Solovyev*

Utilization of Point Clouds for Quantitative Analysis of Heritage Structures: Challenges and Approaches, *Michael Hess, Rebecca Napolitano, Vid Petrovic, Falko Kuester*

Numerical methods for understanding and quantifying crack propagation in complex masonry constructions, *Rebecca Napolitano, Michael Hess, Rachel Coe-Scharff, Branko Glisic*

Proportion Analysis of Ancient Egyptian Funerary Monuments,  
*Anja Wutte, Peter Ferschin*

## COFFEE BREAK

A new methodology for the structural analysis of 3d digitized cultural heritage through FEA, *Gabriele Guidi*

Advanced Numerical Models for Seismic Evaluation of Masonry Heritage Monuments: The Case of Diocletian's Frigidarium in Rome, and Andahuaylillas Church, Cuzco,  
*Renato Perucchio, Christopher Muir, Raphael Aguilar*

Site Reconstruction from Partial Information,  
*Lutz Schubert, Robert Warden, Thomas Guderjan*

## S22 Social theory after the spatial turn

*Chiara G. M. Girotto, Lennart Linde*

*Neue Aula, Room 6, 16.00 - 17.45, 22 March 2018*

The past has always offered new and interesting insights that could be simulated, modelled and evaluated with computational approaches. In recent years the applications of advanced geospatial statistics, as well as modelling have become a central methodological framework to analyse past human behaviour and societies in general. However, often archaeological applications falls short on the capacities of these methods or massively overestimate their potential. On the one hand it is clearly related to the pursuit of model and test assumptions. On the other hand causal expectations are strongly simplified and in general more basic statistics are used. Predominantly, this leads to rather simple, purely environmentally constraint versions of reality, neglecting the presence of more than a topographical landscape with certain resources. Other factors, such as a “landscape of ancestors”, differing perception of space, or unknown human factors are mostly ignored in the models. The social sciences have constantly stressed the complexity of human decision making and have successfully implemented complex statistical procedures, such as sophisticated self-learning algorithms in order to achieve a better representation of reality. However, societies modelled in archaeology are often devoid of this cognitive human factor, which cannot be represented in the predominantly deterministic, almost Darwinian models. Furthermore – if at all – theoretical frameworks which were long since updated in social sciences are used to retrospectively interpret the model’s outcome. In this session we wish to address and discuss this problem in current archaeological human behavioural research with an interdisciplinary approach of archaeology and sociology. We welcome theoretical as well as practical contributions on the inclusion of social theory in geospatial analyses and predictive modelling, new ideas for a theoretical framework, and how archaeology can deal with the fuzziness of human decision making, which is never purely environmentally driven.

Is 'culture' a buzzword? Ontological challenge of an interdisciplinary project on the cultural history of early modern humans in Asia,  
*Yasuhisa Kondo, Hideyuki Onishi, Yoko Iwamoto*

In the mind of a Roman farmer: social interaction and predictive modelling in Northern Gaul, *Nicolas Revert*

Dissecting the Neolithic Dwelling Through the Application of Geostatistics Techniques,  
*Nuria Morera, Juan Antonio Barceló, Antoni Palomo, Raquel Piqué*

'Taking the Hobbits to Isengard': Testing common practices of spatial modelling in fictional worlds, *Chiara G. M. Girotto, Lennart Linde*

## S23 New Directions in Archaeological Aerial and Satellite Remote Sensing

*Jesse Casana, Elise J Laugier*

*Neue Aula, Room 8, 8.15 - 15.30, 22 March 2018*

While archaeologists have long relied on aerial and satellite remote imagery to aid in investigations, a new and ever growing array of technologies, sensors, and analytic tools are rapidly changing how we use these methods to discover, map, and interpret sites and landscapes. This session seeks to highlight recent technological developments and emerging applications in archaeological aerial and satellite remote sensing. We encourage papers that present on the deployment of innovative analyses using new sensor technologies in aerial, drone-based, or satellite imagery for remote sensing of ancient cultural landscape features.

**Stereo-Satellite Imagery for Management of UNESCO World Heritage Sites in Jam and Bamiyan (Afghanistan), *Georgios Toubekis, Michael Jansen, Albert Moll, Jarke Matthias***

**Powerful Pictures: Uncovering Data in Aerial Photogrammetric Imagery, *Scott M. Ure***

**Remote-sensing tools to detect architectural structures in northern Iberia urban sites (6th – 3rd cent. BC), *Maria Carme Belarte Franco, Joan Canela Gràcia, Núria Otero Herraiz***

**Archaeological Prospection using Drone-acquired Thermal and Multispectral Imagery, *Jesse Casana, Austin Chad Hill, Elise Jakoby Laugier***

## COFFEE BREAK

**Exploring the Mesopotamian landscape: integrating geophysics and drone-based multi-sensor remote sensing for offsite, land use investigations, *Elise Jakoby Laugier***

Investigating Continuous Archaeological Landscapes of Northern Mesopotamia through Multispectral Data from Aerial and Orbital Platforms,  
*Jason T. Herrmann, Matthias Lang, Paola Sconzo*

Towards an automated model for archaeological site detection in Eastern Botswana, an eCognition Model, *Forrest Follett, Adam Barnes, Carla Klehm, Katie Simon*

Multidimensional Data Fusion For Archaeological Research - The Isparta Archaeological Survey, *Arie Kai-Browne, Kay Kohlmeyer, Thomas Schenk, Thomas Bremer, Bilge Hürmüzli-Kortholt, Sebastian Plesch, Jona Schlegel*

## LUNCH BREAK

Earth observation technologies and cultural heritage needs through the „ATHENA TWINNING PROJECT“, *Andreas Christofe, Diofantos Hadjimitsis, Athos Agapiou, Vasiliki Lysandrou, Argyro Nisantzi, Marios Tzouvaras, Christiana Papoutsas, Rodanthi-Elisavet Mamouri, Christodoulos Mettas, Evagoras Evagorou, Kyriacos Themistocleous, Rosa Lasaponara, Nicola Masini, Gunter Schreier, Daniele Cerra, Ursula Gessner, Maria Danese, Maria Sileo*

Earth Observation and Space-based monitoring of the environment in the Eastern Mediterranean ‚Excelsior Teaming Project‘ : current capabilities, limitations and future perspectives for the Cultural Heritage, *Diofantos Hadjimitsis, Andreas Christofe, Athos Agapiou, Argyro Nisantzi, Marios Tzouvaras, Christiana Papoutsas, Rodanthi-Elisavet Mamouri, Christodoulos Mettas, Evagoras Evagorou, Kyriacos Themistocleous, Kyriacos Neocleous, Georgia Kouta, George Melillos, Silas Michaelides, Gunter Schreier, Haris Kontoes, Albert Ansmann, George Komodromos, Ioannis Papoutsis, Eleni Christia, Vasiliki Lysandrou, Milto Miltiadou*

Remote sensing analyses on Sentinel-2 images: looking for Roman roads in Srem region (Serbia), *Sara Zanni*

## S24 Computational classification in archaeology

*Oliver Nakoinz, Martin Hinz, Benjamin Serbe, Caroline Tietze, Ben Marwick, Christoph Rinne, Clemens Schmid, Daniel Knitter, Franziska Faupel, Karin Kumar, Moritz Mennenga, Nicole Grunert, Nils Müller-Scheeßel, Wolfgang Hamer, Camille Butruille, Dirk Seidensticker, Joana Seguin*

***Neue Aula, Room 6, 10.30 - 18.00, 20 March 2018***

To make inferences on the archaeological material that go 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 wider reception within archaeology. The reason for this might be that most approaches are considered to be complicated, general or reductionistic. What is a classification good for if it can not inter-subjectively evaluate how similarity and dissimilarity are defined, if the typology can not be duplicated by other studies due to imprecise specification, and a new object can not easily be integrated into the original classification? These issues are perfectly well handled when a statistical, computer based classification is applied. Especially the growing interest in pattern recognition, machine learning and the classification of information emerged within the last years, led by major information processing companies (eg. search engines and social networks). Many new and interesting approaches to this topic were developed that hopefully find their way into archaeological reasoning. In our session we would like to survey the current state-of-the-art research for the classification of archaeological datasets. The aim of the session is to provide a better understanding of classification methods and algorithms and of validation techniques since a sound methodological knowledge is required 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. We would like to welcome presentations on recent applications of machine learning, clustering approaches, and related regression methods in the

field of archaeology. Presentations will explore methods for evaluating the accuracy of classifications, and investigating the implications of different classification methods for archaeological interpretation and understanding. Reports on how to deal with the challenges of applying modern computational methods to sparse and problematic archaeological datasets will also be included in this session. The session is organized by the ISAAKiel group ((Initiative for Statistical Analysis in Archaeology Kiel: <https://isaakiel.github.io/>))

Computational classification in archaeology - an introduction,  
*Oliver Nakoinz, Martin Hinz*

Considerations on archaeologically meaningful Distance Measures for Multivariate  
Analyses, *Georg Roth*

3D Shape Analysis of Ancient Terracottas: Contributions to Automated Object Mining,  
*Alexander Zeckey, Martin Langner*

Classifying vessel shapes using automated shape extraction and unsupervised  
classification, *Martin Hinz, Caroline Heitz*

Digital Pottery Studies of 4th Century Necropolises on the Moldavian plain,  
*Vlad-Andrei Lăzărescu, Vincent Mom*

## LUNCH BREAK

Ceramic profiler – a new tool for classifying of bulks of objects,  
*Max Mehlretter, Fabian Langguth, Anne Sieverling, Michael Goesele, Franziska Lang*

Partitioning Archaeological Chaînes Opératoires (PACO) on R : how to deal with huge  
incomplete categorical datasets ?, *Marie Philippe*

A Model-Based Statistical Classification Analysis for Karamattepe Arrowheads,  
*Tutku Tuncali Yaman*

Computer-aided Classification of British Isles Neolithic Group VI Axes from  
Photographic and Scanned Image Data, *Sally Elizabeth Taylor*

Using Data Mining techniques to evaluate Bronze Age metallic components,  
*Andrés Bustillo, Miguel Angel Arnaiz, Juan Jose Rodrigue*

## COFFEE BREAK

Multispectral image analysis applied to identification of archaeological buried remains,  
*Andrea Gennaro*

Space, typology and mobility: using multivariate clustering technique to explore spatial  
patterning in prehistoric Thrace, *Denitsa Nenova*

Matrix in the Network: assemblage co-expression networks to unlock meaning in  
stratigraphic matrices, *James Scott Cardinal*

## **S25 Do we have a heading? Ah! A heading. Set sail in a... uh... for Mobile GIS direction!**

*Nazarij Buławka, Julia Maria Chyla*

*Neue Aula, Room 9, 8.15 - 12.15, 21 March 2018*

The current trends in Geographic Information Systems hardware and applications suggest that Mobile GIS will be the main mapping tool for future surveying in different fields. Will it be also true for archaeology? Taking into account that the discipline has always followed technological trends, the answer is easy. We would like to discuss how the introduction of Geographic Information System and GNSS mobile applications available on gadgets of everyday use opened a new chapter in archaeological field survey techniques. The most valuable will be case studies and research projects. Thus, we would like to invite topics presenting not only possibilities, but also obstacles encountered during research. The goal of this session is to discuss not only problems which can occur in the field while working, but also to take a step back, and consider methodological approaches that are or should be used while using any type of device with any type of GIS application from a wide spectrum available nowadays. Encouraged by the success of last year's session „Mobile GIS and field survey – current possibilities, future needs”, we would like to continue the discussion on the topic of possibilities in mobile GIS use on the field. We kindly invite all papers exploring the broad question “what is beyond the horizon” of Mobile GIS. Where does it lead us? How does it influence the methodology and field survey strategies? Are there common technical problems and methodological issues and if yes – what kind of solutions are available, or to ask if we are simply trying to approach old problems for which new technology is not a solution?

The recent contributions of Mobile GIS in the study of flint mining. On the example of Orońsko Flint Mines Project (Poland), *Katarzyna Kerneder-Gubała, Sylwia Buławka, Nazarij Buławka*

No more endless nights filling in attributes - a web and a mobile app for GIS-based field surveys in Bulgaria, *Nadezhda Kecheva, Todor Branzov, Lyubomir Nedyalkov*

Mobile GIS in primeval woodland landscape. Case study of the Białowieża Forest surface survey, *Kamil Niedziółka, Michał Jakubczak, Michał Szubski, Przemysław Urbańczyk, Joanna Wawrzeniuk*

Evaluating QField as a Mobile GIS Solution for Archaeological Survey, *Adam Pażout*

## COFFEE BREAK

Mobile GIS for Large Scale Excavations, *Weronika Winiarska, Łukasz Misk*

Do we have a heading for hard questions about mobile GIS in archaeology?, *Julia M. Chyla*

**S26 Sensory GIS: towards a deeper engagement?***Giacomo Landeschi**Neue Aula, Room 5, 13.45 - 15.30, 21 March 2018*

Significant improvements recently occurred in the realm of GIS: advanced software solutions along with efficient field acquisition techniques dramatically increased the accuracy of data representation, which was complemented by the introduction of high-performing fully-three-dimensional platforms. This opened up for new ways of representing more exhaustively the complexity of the landscape, in a multi-scalar and multi-temporal perspective. As a consequence, it is now possible to investigate the perceptual dimension of space by taking advantage of reliable datasets that provide a more refined representation of the landscape as it was (presumably) perceived by its ancient inhabitants. Today geometrically-complex 3D models, high-resolution DEMs, together with improved analytical tools let archaeologists to experiment more sophisticated solutions to simulate the perception of space, which takes into account of multiple senses (visual, acoustic etc.). Purpose of this session is to raise a discussion on the way GIS today can facilitate an experiential approach to the ancient space, either the single site or the whole landscape. Contributors are therefore invited to present their papers on theoretical and practical aspects of using GIS as a framework to develop a more 'humanized' form of analysis of the ancient space.

**The structure of experience: modelling landscape visual quality, *Zoran Čučković***

**Bringing Sound into the Picture: Experiencing Ancient Maya Landscapes with GIS & 3D Modeling, *Graham Goodwin, Heather Richards-Rissetto, Kristy Primeau, David Witt***

**Visual perception and landscape: a case study about the cities in roman Hispania, *Mar Zamora Merchán***

## S27 Map management and Webgis applications for archaeological data base solutions

*Michael Märker, Espen Uleberg, Mieko Matsumoto, Christian Sommer*

*Neue Aula, Room 14, 13.45 - 17.45, 22 March 2018*

As a follow up of the last CAA in this session we would like to bring together scientists working on different issues of spatial data visualization and management in archaeological data bases. This comprises the technical prerequisites of DB-systems such as interface solutions that pass geographic, geodetic, and 3D data to visualization tools (e.g. Postgis) as well as tools and interfaces that allow the visualization of these data like web based portrayal services, GIS systems, etc.. On the other hand we want to discuss visualization issues related to the data formats and metadata like, vector, raster and voxel formats and geographic data projections. Especially we will focus on open source solutions and would like to invite presentations on application examples in order to give an overview on state of the art solutions. Finally, we will also discuss how user requirements can be already considered in the design of these systems to guarantee sustainability and acceptability of the targeted user.

Open source solutions for Norwegian Stone Age, Chaos theory, and the ADED-project 2018-2020), *Espen Uleberg, Mieko Matsumoto*

Data Aggregation and Visualisation in archaeometallurgy, *Laura Perucchetti, Peter Bray*

Sometimes a map is not enough: challenges and lessons learned from developing the dataARC data discovery interface, *Chris Angel, Adam Brin, Jackson David Cothren, Rachel Opitz, Colleen Strawhacker, John Morgan Wilson, Tim Sexton*

CLIMA Webgis platform, *Maria Cristina Salvi, Alessio di Iorio, Stefano De Angeli*

**COFFEE BREAK**

The Arches Cultural Heritage Data Management Platform: A flexible and expandable open source system for cultural heritage inventories and beyond, *Annabel Lee Enriquez, Alison Dalgity, Dennis Wuthrich*

Free and open source geospatial software for re-using archaeology open data, *Thierry Chevallier*

Sharing spatial data with a 3D component as a collaborative and dissemination tool for archaeology: conceptual challenges and technical issues, *Damien Vurpillot, Ernest Chiarello, Laure Nuninger, Clément Laplaige, Xavier Rodier*

A Spatial Data Infrastructure for Megalithic Sites in Southwest Iberian Peninsula, *Ivo Figueiras Santos*

## S28 Cities of Data: computational and quantitative advances to urban research

*Hanna Stöger, Eleftheria Paliou, Katherine Crawford*

*Neue Aula, Room 9, 8.15 - 12.15, 22 March 2018*

The use of digital and quantitative methods for studying the evolution of ancient cities and their environments at multiple spatial scales has steadily been increasing in recent years. Large volumes of data on ancient settlements and settlement systems have become more and more accessible as a result of advances in computational methodology and archaeological interdisciplinarity. These datasets are often remarkable in their diversity. Spatial data, often acquired by means of advanced geophysical and remote sensing methods, have not only offered a more comprehensive picture of settlement systems at the regional level, but also detailed data indicating the extent and form of urban and suburban areas. Environmental data (sediment cores, geomorphological data, etc.) have increasingly been used to reveal a finer-scale patterning in the archaeological record. Archaeological publications, national archives, online databases and on-going excavations have provided scholars with an abundance of material culture evidence that are suggestive of social, economic and political change in human settlements over time. At the same time, archaeologists have been using a multitude of quantitative methods to assess and analyse this evidence so as to reach a better understanding of socio-economic and cognitive aspects of past cities and settlements, including: Building Information Modelling (BIM), Space Syntax, 2D and 3D GIS based analysis, spatial interaction models, network analysis, mobility studies, fractal analysis, and urban scaling. This session invites papers that discuss the use of computational methods for the acquisition and analysis of settlement data at various geographical, spatial, or temporal scales. We especially welcome papers on the innovative applications of 2D and 3D spatial analyses to the built environment, works that adopt a comparative and diachronic perspective, “big data” approaches, and projects that aim to bring together diverse sources of evidence, as well as studies that seek to evaluate the theoretical contributions and challenges associated with the use of these computational methods to the study of ancient cities and settlements.

Using Percolation Analysis for investigating the distribution of Hillforts in Britain and Ireland, *Simon Maddison*

The street network of the Roman town of Augusta Raurica – reviewed with the help of space syntax, *Sven Straumann, Urs Brombach, Hans Sütterlin*

Site definition possibilities: Features excavated along a transect, *Sophie Charlotte Schmidt*

From Urban Data to Urban Movement: The application of computational approaches for studying ritual movement at Ostia, *Katherine A. Crawford*

## COFFEE BREAK

Assessing the value of minimal computational models for the study of long term settlement evolution: the case study of the Pontine region (Central Italy) from the Archaic to mid Imperial period (c. 600 B.C. – A.D. 250), *Eleftheria Paliou, Tymon C. A. De Haas*

The urban past through the lens of fractals and visibility, *Hanna Stöger, Lars Schaarman*

Reconstruction without validation? Limitations of computational and quantitative settlement analysis - Hellenistic and Roman Nea Paphos, an interdisciplinary case study, *Nikola Babucic, Łukasz Misk, Sebastian Adlung, Wojciech Ostrowski, Martina Seifert, Weronika Winiarska*

Cognitive Mapping in Ancient Pompeii, *David Fredrick, Rhodora Vennarucci*

## LUNCH BREAK

Reading Rubbish: modelling diachronic change at Tell Sabi Abyad, Syria, *Victor Klinkenberg*

Connecting Iron Age Neighborhoods: An Urban Case study from Kerkenes, *Tuna Kalayci, Dominique Langis-Barsetti, Scott Branting*

## S29 Digital Innovation & Experimentation in Archaeology & Cultural Heritage Collections

*Jennifer Wexler, Dan Pett*

*Neue Aula, Room 10, 10.30 - 15.30, 20 March 2018*

This session aims to look at the impact that emerging digital technology and innovative engagement tools are increasingly playing in how we approach and present cultural heritage data. Digitisation, 3D modeling, 3D printing, and AR/VR experiences have become key working practices in archaeology, increasing accessibility to cultural heritage data, archaeological archives, and museum collections. What are the key challenges in using digital experimentation, digital inclusion, and open access tools in cultural heritage projects? How can use digital innovation democratise access to archaeological and museum collections? How does digital technology impact cultural institutions and their understanding of intellectual property (IP), digital capture, curation and dissemination? This session welcomes papers exploring these themes, aiming to look broadly at digital working practices across the cultural heritage, archaeological, and museum sectors.

**Democratising Access to Museum Collections & Using Digital Innovation to Explore Archaeological Data, *Jennifer Wexler, Daniel Pett, Elizabeth Galvin***

**Virtual Reality and Storytelling for Viking Archaeology, *Gareth Beale, Nicole Beale***

**Digital archaeology in museums: are we getting closer to matter?, *Monika Stobiecka***

**Knowledge Representation and Linked Open Data in Cultural Heritage through design of a Semantic Web enabler Content Management System, *Avgoustinos Avgoustis, Athanasios Koutoupas***

## LUNCH BREAK

**Immersion and the Submerged: The Scapa 100 Project, *Chris Rowland***

**Digital Object-Based Curricula: Teaching History with Underemphasized Archaeological and Cultural Heritage Collections, *Kayeleigh Sharp, Grant Miller, Mark J Wagner***

## S30 Open Digital Infrastructures for Archaeology and Cultural Heritage

*Kai-Christian Bruhn, Sebastian Cuy, Benjamin Ducke, Reinhard Förtsch, Felix Schäfer*

*Neue Aula, Room 1, 8.15 - 12.15, 21 March 2018*

In general, infrastructures encompass “all long-lived facilities or services of a material or institutional nature”. The current transformation toward open science, open source software and open data infrastructures is a challenge that must be addressed in archaeology and cultural heritage. Open and sustainable, digital infrastructures do not only have to be open in themselves, but also have to consist of open ingredients. They should be built from open source software, rely on open formats and protocols and promote open science. They also need to handle data access in a difficult compromise between intellectual property protection, heritage protection and the right of the public to access data and analysis results that belong to the common worldwide portfolio of science and heritage information (and, in many cases, have been funded by public money). The term “open”, after more than a decade of its web-based reinvention, has gathered its own history of use and abuse. But one could argue that short-term software platforms that die with their funding cycle should not be called “open”. The same applies to implementations that use open source software but (due to sheer technological complexity and cost) create asymmetric relationships and dependencies for communities with lesser capacities. From a technical point of view, data-centric infrastructures and workflows mean that monolithic end-user applications become interchangeable and lose their dominance over the workspace. Instead, open data repositories, standardized documentation/metadata and sharing solutions become essential for the long-term survival of research and cultural heritage data. As the bottleneck nature of proprietary data formats, short-lived project cycles and slow, restrictive publication practices becomes ever more apparent, the long-term advantages of open source software, open formats and protocols begin to outweigh any functionality edge that closed source, proprietary software may retain. At the same time, open data repositories open up new possibilities to interact with research results and stimulate innovative interchange with actors from the public as well as the economic sector. Yet, the heterogeneous nature of archaeological data and software applications complicate the development of open standards

and tools that can lead to truly open infrastructures. We invite contributions with a focus on the challenges, prerequisites and ingredients of open digital infrastructures, such as: – long-term data survival using open formats and protocols – “Big Data” and data-centric workflows – long-term sustainability and the commercialization of open source software – centralized versus distributed concepts of open infrastructures – issues of accessibility and re-usability of data – computational reproducibility of data – further technological, economic, academic and social aspects of the “open everything turn”

**Squeezing Radiocarbon Data, *Miquel Colobran, Joan Anton Barceló, Berta Morell***

**The field research database iDAI.field 2.0: Find the balance between interoperability and project specific needs, *Philipp Gerth, Juliane Bonneß, Sebastian Cuy, Daniel de Olivera, Thomas Kleinke, Julian Schierenbeck***

**NormA – Building an Archaeological Information System Around a Normalized Geographic Data Model), *Joerg Raether***

**DIGILAB: E-RIHS’ data and service infrastructure, *Franco Niccolucci, Luca Pezzati, Sorin Hermon, Achille Felicetti, Athanasios Koutoupas***

**Case Studies in Open Context Data Reuse: Implications for Curation, *Eric Kansa, Sarah Witcher Kansa, Federico Buccellati***

## COFFEE BREAK

**SKOPE: Making Paleoenvironmental Data Useful and Accessible, *Adam Brin, R. Kyle Bocinsky***

**New approaches to Open Data in Archaeology: the blockchain revolution, *Eleonora Gandolfi, Grant Cox***

**Metadata and long term data survival in cultural heritage, *Martijn van der Kaaij, Wessel van der Kaaij***

**An Open Source Solution for Synchronising Distributed Archaeological Databases in a Centralised Open Access System, *Felix Kußmaul***

**Poster: Workshop Summary „Digital Excavation Documentation – Objective and Sustainable“, *Reiner Goeldner, David Bibby***

## **S32 Automation, combination and calibration: consolidating the framework for archaeological geophysics**

*Eileen Gloria Ernenwein, Philippe De Smedt, Immo Trinks*

*Neue Aula, Room 5, 8.15 - 12.15, 22 March 2018*

Geophysical survey methods have become a standard part of many archaeological research programmes. Technological advances over the past two decades have not only allowed for a broader range of instrumentation that can be applied, but have increased the speed at which resultant data can be collected and processed considerably. While a first gap may have been bridged through the efficient application of geophysical methods in archaeological field methodology, a remaining challenge lies in fully addressing the interpretive potential of increasingly multidimensional, often larger, and more complex geophysical datasets. Recently, more research effort is being directed towards advanced approaches to collect, process, interpret and communicate geophysical survey data. Researchers are therefore addressing the need to automate steps in data analysis and interpretation, and to render this process more reliable and objective, in order to obtain ever more robust data sets that facilitate archaeological research. For this session we invite contributions that present and discuss new technological and methodological advancements in geophysical archaeological prospection. Proposed topics include: – automation in collecting, processing and interpreting geophysical data; – data fusion and geophysical inversion; – quantifying archaeological feedback. We encourage presenters to underline the interpretive potential and efficiency these advanced methods add to the streamlining of geophysical data into archaeological research. As we target a broad and diverse audience, concluding remarks should go beyond technical aspects, but focus on the relevance of the presented research in resolving fundamental archaeological and anthropological questions. Lastly, conclusions should focus on issues that remain to be addressed in order to further consolidate and streamline the practice of archaeological geophysics.

Is the whole greater than the sum of its parts? Image fusion, analysis and interpretation approaches at the Late Iron Age site of Borre in Norway, *Petra Schneidhofer, Christer Tonning, Erich Nau, Lars Gustavsen, Vibeke Lia, Geert Verhoeven, Monica Kristiansen, Immo Trinks, Terje Gansum, Wolfgang Neubauer, Knut Paasche*

The Roles of Data Fusion in the Scientific Process of Archaeological Remote Sensing, *Eileen Gloria Ernenwein*

Illuminating Haiti's Royal Past: Advancing Analytics and Archaeological Interpretation Through 3D Data Fusion and Machine Learning, *Katie Simon, Christopher Angel, Christine Markussen, J. Cameron Monroe*

Geophysical Correlation: Global Versus Local Perspectives, *Kenneth L Kvamme*

Computer-aided object detection in archaeological geophysics: helpful tool or mirage?, *Lieven Verdonck*

## COFFEE BREAK

A Landscape Scale Implementation of FDEM Survey in Midcontinental North America, *Claiborne Daniel Sea, Eileen Gloria Ernenwein*

'Mark the Graves': Adapting automation for improving the delineation of graves in GPR data, *Ashely Green, Paul Cheetham, Timothy Darvill*

Forgotten but Not Lost: Adapting Simple Magnetic Depth Estimation Techniques to Modern Archaeo-geophysics, *Jeremy Grant Menzer*

The Rediscovery of ancient Hira in large scale magnetometer and archaeological survey data, *Burkart Ullrich, Martin Gussone, Martina Müller-Wiener, Nikolaas Noorda, Ibrahim Salman, Henning Zoellner*

### S33 Guaranteeing data quality in archaeological Linked Open Data

*David Wigg-Wolf, Karsten Tolle*

*Neue Aula, Room 8, 16.00 - 17.45, 22 March 2018*

In the age of open access, increasing quantities of data are becoming available for re-use. While this development is generally to be greeted, it brings with it significant dangers. Just as with all information, source criticism is vital, since even the most carefully assembled data will include errors and ambiguities. If they go unrecognised such errors can, when re-used, multiply exponentially with dramatic effects: not just erroneous data and conclusions are the result, but potentially also a loss of confidence in web-based resources. This session will focus on aspects of data quality, with particular reference to Linked Open Data (LOD), where data is currently often re-used without any form of quality control. Problems and challenges we see include: – Identifying inconsistencies and errors within the data. – Identifying the sources and dangers of erroneous or ambiguous data. – Strategies for correction of inconsistencies and errors. – Identifying duplicates, especially across different LOD sources (objects or concepts represented in different sources by different URIs might represent the same entity). – 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. At the solution level: – To what extent are (semi-)automated solutions to such problems feasible, or even desirable, and what new dangers might they bring? – How can social and management aspects be addressed, incorporating control of data quality at a permanent, process level? – Can community mechanisms be set up to identify and rectify erroneous data, and how could such mechanisms function? Contributions are invited which address these and similar questions; experience of them in different projects and areas, and their solution; as well as the identification of additional risks. These are not problems that are unique to archaeological LOD, and lessons are to be learned from other fields of data management and control.

Data Quality – if not initially, how to solve it later?, *Karsten Tolle, David Wigg-Wolf*

Improving the data quality of a period gazetteer,  
*Wolfgang Schmidle, Sebastian Cuy, Nathalie Kallas, Thomas Kleinke*

Taming Ambiguity - Dealing with doubts in archaeological datasets using LOD,  
*Florian Thiery, Allard Mees*

Guaranteeing data quality in archaeological Linked Open Data, *Francesca Chelazzi*

Data Quality experiences within the project Corpus Nummorum Thracorum,  
*Daniel Althof, Ulrike Peter, Karsten Tolle, Bernhard Weisser*

### S34 R as an archaeological tool: current state and directions

*Clemens Schmid, Ben Marwick, Benjamin Serbe, Camille Butruille, Carolin Tietze, Christoph Rinne, Daniel Knitter, Dirk Seidensticker, Franziska Faupel, Joana Seguin, Manuel Broich, Martin Hinz, Moritz Mennenga, Nicole Grunert, Nils Müller-Scheeßel, Oliver Nakoinz, Wolfgang Hamer, Karin Kumar, Kay Schmütz*

**Neue Aula, Room 8, 8.15 - 12.15, 21 March 2018**

In recent years, R has silently become the workhorse for many quantitative archaeologists. It's open source, platform-independent and can be linked very well with other programming languages. As an interpreted language with simple and flexible syntax it is easy to learn but hard to master. Due to its huge community, spanning from hobbyist to commercial data scientists and researchers from scientific fields like statistics, ecology or linguistics, the catalogue for freely available packages is enormous and continuously growing. The foundation of the R-Consortium, a group of corporations highly invested in R, including Microsoft, IBM and Google, pushed the language and its abilities further ahead. Nevertheless, there are still many colleagues who have not yet realised the potential of the language and how easy it is today to conduct high quality research with the available tools. This is reflected by the fact that the workflow of many students of archaeology is at best still limited to Excel or SPSS. The solutions for archaeological problems in R are already manifold — although maybe developed for a different purpose. For example spatial analysis, multivariate statistics and scientific visualisation are well reflected within popular R packages, which makes it a very useful tool for archaeological research, teaching and publication. R also provides an advanced environment to produce truly reproducible research, which will be of growing importance in the future of scientific dialogue. Within this session we would like to explore the state of the art and the potential application of R in archaeology. We invite presentations for this session that explore questions like (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, and which package still has to be developed to improve the usability of the software for archaeologists? \* What has to be considered to optimise the workflow with R? We especially would

like to attract colleagues who might present archaeological R packages that are ready or in the making and demonstrate their relevance for archaeological analysis. Also we would like to encourage potential presenters to demonstrate their research approaches via live coding, for which we would support them in ensuring that their presentations will work offline and on foreign hardware. If desired, we would like to publish the session and the code in an open online book embedded with runnable code. We hope to foster a productive and inclusive exchange between both young and experienced users from all backgrounds.

c14bazAAR & oxcaAAR -- two R packages for the collection, calibration and modelling of 14C dates, *Clemens Schmid, Martin Hinz*

Analytical Taxonomies for the Study of the Cycle of Dā'lu and 'Anatu: from TEI-XML Markup to Processing Data within R Environment, *Vanessa Juloux*

The Changing Faces of the Dead: Using R to Trace the Shift of Burial Preferences within the Roman Provincial Necropolis, *Carolyn Tietze*

mortAAR: the analysis of archaeological mortality data in R, *Christoph Rinne, Martin Hinz, Nils Müller-Scheeße*

Reproducible research in archaeology using R & rrttools, *Ben Marwick, Sophie C. Schmidt*

## COFFEE BREAK

Aoristic research in R: Correcting temporal categorizations in archaeology, *Nils Müller-Scheeße, Martin Hinz*

Is there anything R can't do?, *Joe Roe*

rkeos: A Toolbox for Archaeological Surveys, *Néhémie Strupler*

Exploring spatial autocorrelation in archaeological spaces using R: state of research and new developments, *Francesco Carrer*

## **S35 Ancient Near Eastern and Neighboring Regions: Enlarging Research Horizons through Digital and Computational Practices**

*Vanessa Juloux, Alessandro di Ludovico*

*Neue Aula, Room 6, 8.15 - 15.30, 22 March 2018*

In the latest years, the use of quantitative and qualitative methods in ancient Near Eastern studies is experiencing an impressive expansion. This is partly due to the situation of the increasing endangerment of the heritage in Western Asiatic and Eastern Mediterranean regions. But this results in two separate profiles of Humanities scholars who hardly work together: some use “traditional” methods, while the others — mostly “young” researchers — digital and computational practices. Thus, the question arises of how to build bridges in order to facilitate dialogue with colleagues who are not accustomed to these “new” practices? This is especially important, since the digital and computational approaches in Humanities are not a field, but methods, and as such their goals are sometimes to optimise the available funds (digitized or not) or the acquirement of information from the available materials and field recordings. Among other answers, one could be to develop open archives and open linked data projects in order to focus on the specific nature of the challenges of ancient Near Eastern and neighboring regions’ studies, e.g.: the particular issues related to Sumerian studies; the specific features of ancient languages and writing systems; the consequences on the archaeological record of the continuous cultural contacts and exchanges in regions like Syria and northern Mesopotamia; the movements of materials and people through differently structured societies, including the (semi-)nomadic ones. To pursue the aims expressed here, it is essential that the contributions that will be presented are able to show the actual progress potential that the application of digital and computational methods and tools can bring. This requires a clear explanation of the theory and performing processes of the systems used in Digital Humanities, but also an explicit comparison between the “new” Humanities’ processes and results and those of other methods. This session is open to all scholars — including non-digital researchers who look to enhance cooperation — of Prehistory through Late Antiquity, whose proposals are related to the adoption of digital tools and theories in any sector of the mentioned fields of study (epigraphy, archaeometry, philology, historical geography, ceramic studies, art history, etc.). The presentation of in progress projects, experimental proposals, and theoretical explanations are also welcome.

Virtual Experimentation - Reasoning on the original appearance and use of a bronze implement from Pyla-Kokkinokremos (Cyprus) with high-resolution 3D models, *Martina Polig, Sorin Hermon, Simon Jusseret, Jan Driessen, Giusi Sorrentino, Athanasia Kanta, Joachim Bretschneider*

The role of modern digital techniques in documenting and rehabilitating the Syrian heritage during the actual conflict, *Youssef Kanjou*

Digital survey and documentation techniques for heritage conservation and enhancement: the Acheiropoietos Monastery, Cyprus, *Alessandro Camiz, Giorgio Verdiani*

The Early Mesopotamia and the Persian Gulf Research Project: An Online Solution for Aggregating Regional Legacy and Contemporary Data for Research, *Robert C Bryant, Steve Renette, Darren P Ashby*

## COFFEE BREAK

Routes and paths in Upper Mesopotamia: the formation of networks as a result of cultural and environmental factors, *Marco Iamoni*

GIS and the perspectives in the studies of the landscape of irrigation. On the example of Iron Age period in oases of Tedjen River (Turkmenistan), *Nazarij Buławka*

Evaluating Arabias trade routes with Least-Cost Path analysis, *Alexander Städtler*

Rebuilding the Oldest Archive in the History of Mankind in Digital Form: the Ebla Digital Archives Project, *Massimo Maiocchi*

## LUNCH BREAK

Structuring multilingual Datasets for Historical Researc, *Doğu Kaan Eraslan*

Advances in Computational Cuneiform Analysis, *Bartosz Bogacz, Hubert Mar*

Digital Practices: How to Bridge the Gap to Encourage Collaboration, *Vanessa Juloux, Alessandro di Ludovico*

### S36 Advantages and Limitations of Spatial Applications in Archaeology

*Geraldine Queneherve, Michael Maerker, Felix Bachofer*

*Neue Aula, Room 10, 8.15 - 12.15, 22 March 2018*

In this session, we want to incorporate the dynamic scale of landscape analysis with traditional archaeological practices. Landscape analyses solve different kinds of former archaeological problems in isolation. Landscapes enables us to perceive and comprehend interdependencies among people's interactions with their environment. GIS is a very powerful tool to study landscapes because of its ability to simultaneously analyse space, time, and form. Geophysics, remote sensing analyses as well as unmanned aircraft systems (UAS) approaches lead to a fast way of spatial analyses of surfaces as well as paleosurfaces. A powerful technique is the use of big data and geostatistics in archaeological research. This session welcomes presentations on theory, experiences and projects related to the theme of landscape pattern analysis. We welcome disciplinary studies such as geophysics, soil analysis, coring, dating, pollen and faunal analyses, laboratory methods etc. Equally, we invite work that links environmental conditions and data with archaeological structures and structures of the paleo-landscape.

**Paleolandscape Characterization: An integrated work, *Geraldine Quénéhervé, Michael Maerker, Felix Bachofer***

**A 3D geo-electric resistivity approach to assess Neolithic/ Palaeolithic sites in the Southern Gargano Area, Apulia, Italy, *Ivano Rellini, Michael Maerker, Patrizio Torrese***

**Europe's Lost Frontiers: To the Limits of Mapping and Modelling, *Andy Iain Fraser***

**A GIS approach to assess coastal geoarchaeological sites vulnerability index. Cases studies from Campania Region coastal area (Southern Italy), *Pietro Patrizio, Pietro Aucelli, Gaia Mattei, Angela Rizzo, Carmen Maria Rosskopf***

**Established, ploughed and buried – spatial analysis of coastal field remains in Northern Estonia, *Andres Kimber***

## COFFEE BREAK

Loessic Landscapes and Past Population's use: a Multidisciplinary Approach,  
*Charlène Morel*

Hunter-gatherer mobility, archaeological research biases and the interpretation of  
Mesolithic settlement patterns in the Alps: a quantitative approach, *Francesco Carrer,*  
*Davide Visentin*

Past settlement structures vs modern archaeological recognition. Case study of Eastern  
Pomerania at the turn of Bronze and Iron Age, *Kamil Niedziółka*

Landscapes of commerce: a spatial approach to local market systems,  
*Eli James Sheldon Weaverdyck*

Relating Norwegian palynological records and archaeological datasets,  
*Christian Willmes, Espen Uleberg, Mieko Matsumoto, Helge Høeg*

## S37 Connectivity: linking and interpreting the archaeological record

*Gisli Palsson, Colleen Strawhacker, Rachel Opitz*

*Neue Aula, Room 1, 8.15 - 12.15, 22 March 2018*

Connectivity, broadly construed, has long played a role in archaeological thinking. Recent, influential volumes such as *Entangled* (Hodder, 2012) and *An Archaeology of Interaction* (Knappett, 2011) provided new theoretical frameworks centring connectedness. The adoption by archaeologists of more formal theoretical and methodological frameworks based on connectivity, such as actor network theory, assemblage theory, graph theory and social network analysis have broadened the influence of the idea to directly affect practice. At the same time, linked open data initiatives in archaeology have brought attention to the importance of shared standards and ontologies in ensuring interoperability between archaeological data produced across the world, and interoperability between active and legacy datasets – another, more contemporary and social form of connectivity. The session aims to bring together a broad range of contributions including, but not limited to, the challenges in creating ontologies of connectivity, the opportunities afforded by linked data, and theoretical implications of centring connections between things in the archaeological record. We are particularly interested in the practical applications of connecting archaeological datasets to datasets within and outside the discipline, and case studies showing of research emerging from such applications.

Driving interdisciplinary search for collaborative studies of long-term human ecodynamics, *Rachel Opitz, Colleen Strawhacker, Philip Buckland, Gisli Palsson, Peter Pulsifer, Lynn Yarmey, Emily Lethbridge, Ingrid Mainland, Anthony Newton, Richard Streeter, Tom Dawson, Jackson Cothren*

Discovering Hidden Connectivity, *Ceri Binding, Douglas Tudhope*

The Grand Challenge of interlinking palaeoenvironmental data and interpretations, *Philip Iain Buckland, Mattias Sjölander, Rachel Opitz*

Peripleo 2: connecting and exploring archaeological data, *Valeria Vitale, Rainer Simon, Leif Isaksen, Elton Barker, Rebecca Kahan*

## COFFEE BREAK

Interoperability of heterogeneous archaeological research databases,  
*Xavier Rodier, Olivier Marlet*

Novel Approaches to the Re-Assembly, Re-Association and Re-Unification of Cultural Heritage Collections – The Gravitate Project Solution, *Sorin Hermon, Michela Spagnuolo, Chiara Eva Catalano, Giusi Sorrentino, Martina Polig, Stefano Modafferi*

Assemblages of networks: tracing the connectivities of the medieval Icelandic farm,  
*Gisli Palsson*

Exploring the movement, exchange and transformation of metal in the Eurasian Bronze Age and Early Iron Age through multi-dimensional arrays, *John Pouncett, Mary Saunders, Peter Hommel, Peter Bray, Mark Pollard*

Learning through doing: an online game for appropriating ontological modelling methodology, *Anais Guillem, George T. Bruseker, Nicola Lercari*

## S38 Applicability of Digital Archaeology Tools

*Lutz Schubert, Gill Hunt, Stephanie Metz, Keith Jeffery*

*Neue Aula, Room 6, 8.15 - 12.15, 21 March 2018*

More and more apps for archaeology appear on the market, more scientific tools are used for data analysis, network analysis etc. and finally more and more databases offer “the” solution to host all records and archaeological data. Frequently enough these solutions are however not really applicable and provide results that may be wrong – this session focuses specifically on discussing the scope of applicability of such tools and where they fail, respectively how to interpret their results. This session is aligned to the SIG on Digital Archaeology Standards and Practices. The results of the discussions will be used in an online database about which tools can be used when, where and how. Authors are expected to submit and present papers on specific tools and methods and an analysis of their applicability, such as e.g. different types of network analysis algorithms for different research questions. Authors should ideally provide a comparison of different tools for one or more application field (era, region) and research question.

The “optimal route” towards a topography based least-cost analysis with push-button GIS tools, *Oliver Vogels*

The weight of functional context in the analysis of ceramic patterns: a Correspondence Analysis test, *Marco Iamoni*

Some tools to prepare, cluster and visualise data, *Martina Trognitz*

The Use of Databases in Archaeological Excavation Teams and By Archaeology Scholars in Turkey, *Tuğçe Köseoğlu*

## COFFEE BREAK

Digitization issues in documenting cultural heritage with drones: the case study of Foinikas, Cyprus, *Kyriacos Themistocleous, Diofantos Hadjimitsis, Jeff Fagerman, Elaine Biggs, Rachel Waugh*

Modelling the prehistoric copper district of the Oberhalbstein in Switzerland: Part I: High resolution 3D documentation of high alpine mining landscapes, *Christoph Walser, Amanda Zwicky, Leandra Reitmaier-Naef, Rouven Turck, Philippe Della Casa, Thomas Reitmaier*

Modelling the prehistoric copper mining district of the Oberhalbstein in Switzerland Part II: 3D documentation of high alpine mining and smelting features, *Rouven Turck, Anja Buhlke, Christoph Walser, Amanda Zwicky, Leandra Reitmaier-Naef, Philippe Della Casa, Thomas Reitmaier*

### ~~S39 Heritage Beyond Boundaries: Developing Standards and Storefronts for Immersive Technologies in Archaeology~~

*Timothy Murtha, Alex Klippel*

~~Neue Aula, Room 9, 16.00 – 17.15, 22 March 2018~~

In only a decade the technological advancements associated with immersive capture of first person experience in archaeological sites and settings, has transformed how quickly and efficiently we can present visualizations of landscapes, sites, and artifacts. This session collects contributions concerned with developing processes and standards for not only the acquisition of immersive archaeological experience, but also best practices for producing, presenting, and archiving these data in accessible formats. Ideally the session will be presented in two sessions with adequate discussion time each. First, narratives and case studies about data acquisition challenges and standards will be presented along side papers discussing best standards for processing and producing visualizations from these case studies. Papers should be prepared for a technical audience interested in applying these technologies in a variety of archaeological and ecological contexts. In the second session, papers should focus on how a combination of technologies can be best leveraged to produce and present a an immersive archaeological experience. Papers in this session that focus on particular efforts to communicate archaeological science are particularly encouraged to contribute to this session. Combined, the session hopes to attract a global community of scientists and heritage managers looking to expand, apply, or refine the application of these technologies in diverse archaeological contexts.

*Immersive Technologies and the Theories of Place, Alexander Klippel, Danielle Oprean,  
Claire Ebert, Jiawei Huang, Jan Oliver Wallgruen*

## **S40 Science and Technology (S&T) for Archaeology and Cultural Heritage in the Eastern Mediterranean**

*Athos Agapiou, Phaedon Kyriakidis, Vasiliki Lysandrou, Apostolos Sarris*

*Neue Aula, Room 9, 13.45 - 15.30, 21 March 2018*

This special session aims at promoting the establishment of an Eastern Mediterranean Centre of excellence for Archaeology and Cultural Heritage in Eastern Mediterranean that seeks to advance in a systematic way archaeological research and practice, as well as enhance sustainable growth through the preservation and valorisation of cultural heritage in the wider region. Based on the initiative of the recent successful Teaming for Excellence Phase 1 WIDESPREAD project MedSTACH (Eastern Mediterranean Science and Technology Centre of Excellence for Archaeology and Cultural Heritage), this session will showcase the need for such a regional entity that will capitalise on scientific excellence and multidisciplinary research. Apart from excellent science and technological innovation, the particular centre will provide best practices and guidelines to local and regional stakeholders, while bridging existing gaps “on the ground” that often hinder the valorisation of cultural heritage. The session will seek papers dealing with current and future prospects of projects and activities in the wider area of the Eastern Mediterranean (including the Balkans, Middle East, Anatolia, NE Africa, etc.); the objective being to illustrate the current activities and needs in the wider spectrum of technologies applied in archaeological research and cultural resources management, spanning from ground-based, aerial and satellite remote sensing, geoinformatics, spatial technologies, modelling, climatic reconstructions, protection and conservation of monuments, etc. Some key questions arising within this context include: How is sustainability of such centres achieved and maintained? Which are potential, current or future, services that are of need and can be integrated and supported by such centres? What is the potential involvement of the private/business sector and what are the links with the tourism industry? The proposed special session will provide the forum for advocating the long-term need for a regional, science and technology centre of excellence in archaeology and cultural heritage, while presenting current relevant initiatives, thus offering a unique opportunity for networking the development of new synergies.

Computer-based Cross-disciplinary Research in Historic Mediterranean Cities,  
*Nikolas Bakirtzis, Sorin Hermon, George Artopoulos, Thilo Rehren*

Predicting soil erosion based on Revised Universal Soil Loss Equation (RUSLE) using NDVI time series and high resolution DEMs: the case study of the Unesco World Heritage Site of "Nea Paphos", Cyprus, *Athos Agapiou, Vasiliki Lysadrou, Marios Tzouvaras, Branka Cuca, Stefano de Angeli, Fabiana Battistin, Maria-Christina Salvi, Nicola Masini, Alessio Di Iorio, Diofantos G. Hadjimitsis*

Towards an Integrated Methodology for the Hazard Assessment and Monitoring of the Monuments of the Town of Rethymno, Crete, *Apostolis Sarris, Chliaoutakis Angelos, Argyriou Lemonia, Argyriou Nasos, Papadopoulos G. Nikos, Cantoro Gianluca, Manataki Meropi, Papadopoulos S. Nikos, Oikonomou Dimitris, Tzigounaki Anastasia, Giapitzoglou Kostas, Kontogianni Vicky, Antonaki Valia, Karamanliki Panagiota, Zouzoula Eugenia, Alertas Nikos*

E-RIHS-Cy: The Eastern Mediterranean node of E-RIHS - The European Infrastructure on Heritage Science, *Sorin Hermon, Nikolas Bakirtzis*

MedSTACH: Eastern Mediterranean Science and Technology Centre of Excellence for Archaeology and Cultural Heritage, *Phaedon Kyriakidis, Athos Agapiou, Vasiliki Lysandrou, Nicholas Kyriakides, Vasiliki Kassianidou, George Papasavvas, Maria Dikomitou-Eliadou, Andreas Charalambous, Theodora Moutsiou, Marina Solomidou-Ieronymidou, Despo Pilides, Anthi Kaldeli, Ploutarchos Pantelides, Andrew Bevan, Marcos Martinon-Torres, Mark Altaweel, Apostolos Sarris*

## S41 Immersive Techniques in Archaeological Practice and Publication

*Jeffrey Emanuel*

*Neue Aula, Room 14, 8.15 - 12.15, 22 March 2018*

This session focuses on the thoughtful integration of digital methods into the processes of gathering, recording, interrogating, and publishing archaeological data. Digital publications, geospatial datasets, and three-dimensional presentation are examples of interactive approaches to what has been called “digital archaeology.” This interactivity can be taken a step further, as approaches like Augmented, Virtual, and Mixed Reality (AR, VR, and MR) allow for the fostering of immersive experiences around the reconstruction, visualization, and presentation of archaeological data. This session highlights all aspects of digital innovation in the survey, excavation, interrogation, and publication process, with particular emphasis on 3D modeling and printing, data interoperability, and VR, AR, and MR. It is intended both to serve as a follow-up to the CAA 2017 session on 3D modeling, AR/VR, and immersion (chaired by the session proposer), and to foster further discussion about the uses of interactive and immersive technologies both in the field, and in the presentation and analysis of objects and datasets. The format of this session will be a combination of interactive presentation and discussion, with a specific emphasis on demonstrations of 3D reconstruction, Virtual/Augmented and Mixed Reality experiences, online presentation, and other interactive and immersive approaches to excavation, recording, and dissemination. Our goal is to cultivate a needed community of practice and shared knowledge around these techniques and approaches, while working together to support the highest quality of digital methods and processes in archaeological practice.

Visualizing the past: Developing tools to facilitate accurate and immersive experiences in archaeology, *Grace Sommers, Rebecca Napolitano, Hannah Smagh, Sophia Feist, Branko Glisic*

Seeing Past Worlds: night skies in the Bronze Age, *Gail Higginbottom, Vincent Mom*

Developing an optimized methodology to create a portable virtual reality tour in a small archaeological site: La Peña del Castro (Spain), *Mario Alaguero, David Checa, Andrés Bustillo*

Virtual reality immersive serious game to enhance learning. The case of Peña del castro, *David Checa, Mario Alaguero, Andres Bustillo*

Exploration of methods for interacting with archaeological 3D-data in multi-scale virtual environments using virtual reality, *Thomas Bremer, Susanne Brandhorst, Kay Kohlmeyer, Sebastian Plesch, Arie Kai-Browne, Lenja Kaufmann, Bilge Hürmüzülü Kortholt*

## COFFEE BREAK

The effect of Augmented Reality and 3D printing in the comprehension of two historical bridges in Burgos (Spain), *Lydia Ramon Perez, Andres Bustillo Iglesias*

Virtual Reconstruction of the Maya Site of Vista Alegre: Multi-use Digital Assets in Context, *Jessica Marie Moss*

A Visit to the Pnyx: Virtual Reality as a Tool for Archaeological Research, *Erika Holter, Una Schäfer*

The Harvard Yard Archaeology Project: From Analog History to Digital Presentation, *Thomas Bremer, Susanne Brandhorst, Jeff Emanuel, Luke Hollis, Brandon Bentley, Alexis Hartford*

Studies in Digital Heritage: A New, Open Access, Peer-Reviewed Journal, *Bernard Frischer*

## ~~S42 Archeology Heritage Information Modeling. Models construction for documentation and analysis~~

~~Michele Calvano, Tommaso Empler, Carlo Inglese, Alfonso Ippolito, Luca J. Senatore~~

~~Neue Aula, Room 1, 13.45 - 17.45, 22 March 2018~~

This paper session will explore the use of digital technologies as a means of “creative disruption”, in the construction of new meaning and archaeological knowledge. Archaeologist creatively engage in the archaeological record in their daily practice, but it is the “creative innovation”, that experiential, raw, impactful application of creative thought, tools and techniques, which empowers and enriches archaeological meaning-making, that needs further exploration. Transcending beyond the mere fetitization of digital applications to visualize archaeological data, the proximal goal is to explore and discuss the exemplary applications of creative innovation to disrupt and communicate new ways of archaeological knowledge translation and mobilization through the novel use of archaeological theory, method and practice by creative digital means. Whether it is the application of robotics and drones, the auralization of excavations, the virtual (re)imagination of known and unknown archaeological data or the statistical networking of digital data through closed and open digital networks, this session will aim to engage in near-term and future-proofing discussions to enable theoretical and methodological considerations alongside the practical in-field and post-excavation application of digital techniques through creative means.

*The Theatre of the Roman Casinum city, Arturo Gallozzi, Rodolfo Maria Strollo, Michela Cigola*

*Reality, legend and augmented reality: Bridges on the Tiber in Rome, Adriana Caldarone*

*Parametric digital modeling as a virtual construction site for Roman bridges, Maria Laura Rossi*

*The archaeological stratifications of the Abbey of Montecassino, Michela Cigola, Arturo Gallozzi, Leonardo Paris*

## COFFEE BREAK

Lighting setups for archaeological finds, *Lorena Greco, Cristian Farinella*

Methodological approach in archaeological fieldwork: tangible and intangible heritage,  
*Alfonso Ippolito, Carlo Bianchini, Carlo Inglese, Martina Attenni, Marika Griffo*

Achaeology Heritage Information Modeling: a procedure proposal, *Tommaso Empler*

## General Papers

*Matthias Lang, Paul Reilly*

*Neue Aula, Room 14, 10.30 - 18.00, 20 March 2018*

Using the third dimension for calculation of ancient matter fluxes in tell sites- examples from sites in Bosnia-Herzegovina, Turkey and Germany, *Stefan Dreibrodt, Sarah Martini, Robert Hofmann*

Digital Archaeology at a Dinosaur Dig: the recording and integration of Palaeontological and Geological data using Digital Archaeological techniques, *Luca Brunke, Roeland Emaus, Pim Kaskes, Dylan Bastiaans, Anne S. Schulp*

Virtual Gross Sobroste, *Marta Bura, Janusz Janowski, Karolina Zięba, Piotr Wężyk*

Challenges in the analysis of archaeological 'Big Data', *Chris Green*

## LUNCH BREAK

Re-interpreting archaeological sites in 3D, *Joshua James Emmitt*

The Thin Lines of Narrow Chronological Contexts: Interpreting Spaces through Digital Recording and Photogrammetry, *Denitsa Nenova, John Wallrodt*

Connecting the Dots: Digital Techniques in the Reconstruction of the Govan Stones, *Megan Nichole Kasten*

Illuminating Bubbles: Using Photographic Filters to Identify Manufacture and Trade in Iron Age and Early Medieval Scottish Beads, *Heather R. Christie*

Immersive Experiences and Archaeology Workbenches with Digital Heritage Data, *Jiawei Huang, Jan Oliver Wallgrün, Claire Ebert, Jiayan Zhao, Jaime Awe, Alexander Klippel*

## COFFEE BREAK

Roman building terracotta - computer classification of stamps, *Tomáš Janek*

Multi-element analysis with XRF on features of the Nok Culture (Central Nigeria),  
*Annika Schmidt*

„Structure from Motion in archaeology“ - development and first experiences with an  
interactive teaching movie, *Julius Bussilliat, Undine Lieberwirth*

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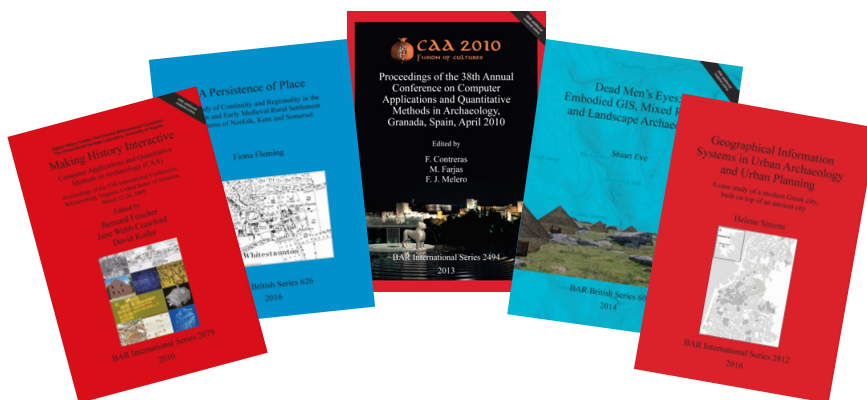
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## Postersession

*Volker Hochschild, Matthias Lang, Paul Reilly*

*Neue Aula, First Floor, 15:30 - 16:45, 20 March 2018*

Artifact GeoMorph Toolbox 3D: A software for 3D geometric morphometric shape analysis and result exploration for archaeological artifacts, *Gadi Herzlinger*

Hovering Sherds - The Use of 3-D Scanning in Pottery Vessel Reconstruction and Illustration, *Alexander Dittus, Tanja Krefß*

Exploring the maritime colonisation of Australasia through computational methods, *E. Kiki Kuijjer, R. Helen Farr, Robert Marsh, Ivan D. Haigh*

R for Digital Heritage: web scraping, text mining and data analysis in digital engagement studies and education of future heritages practitioners, *Marta Krzyzanska, Chiara Bonacchi*

Photogrammetry in tight spaces - using photogrammetry where totalstations cannot go, *Erik Kjellman*

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

Medieval rotunda from Cieszyn, Poland, *Marta Bura, Janusz Janowski, Zofia Jagosz-Zarzycka*

Quantitative Processing of Archaeological Finds in 3D with GigaMesh, *Paul Bayer, Hubert Mara*

Un-#VEiLing the potential of Social Media: Open Archaeology for Public Engagement, *Carla Ardis, Riccardo Giovanelli, Anna Bernardoni, Arianna Traviglia*

Geophysical Prospection at the South Hill of Olynthos, Greece, *Gregory S. Tucker, David Stone, Apostolos Sarris, Nikos Papadopoulos, Jamieson Donati, Timothy J. Horsley*

R-CHAEOLGY: using machine learning algorithms in R in favour of object-oriented supervised classification in LiDAR data, *Agnes Schneider*

Magnetic susceptibility measurements for integrated quantitative interpretation of magnetic measurements, *Natalie Pickartz, Stefan Dreibrodt, Wolfgang Rabbel*

The Swedish fire cracked stone heaps through a Landscape analysis,  
*Amanda Saga Jeppsson*

Stories from the Crypt - Australian Colonial Cemeteries according to GPR,  
*Till Frieder Sonnemann*

Ship Shapes: Digitising 17th and 18th century Dutch ship models,  
*John Kennington McCarthy*

Re-visualising Kom W: From 2D to 3D, *Joshua James Emmitt*

The Emerging Genre of Museum Film, *Fan Zhang*

Cultural Heritage preservation through Open Data and GIS: A methodological proposal  
for North-eastern Iberian Peninsula, *Joan Canela Gràcia, Núria Otero Herraiz*

Lost and found - A marble fragment from Olympia, *András Patay-Horváth*

The Use of Databases in Archaeological Excavation Teams and By Archaeology Scholars in  
Turkey, *Tuğçe Köseoğlu*

The trade routes of the Mycenaean Messenia, *Vasiliki Tsoumari*

Impact and Legacy of Post-1492 Swidden Farming in Neotropical Interfluvial  
Environments, *Phil Riris*

A GIS Approach to Archaeological Settlement Patterns and Predictive Modeling in  
Chihuahua, Mexico, *Haylie Anne Ferguson*

Lost and found - A marble fragment from Olympia, *András Patay-Horváth*

Making stratigraphic interpretation reproducible - utilizing image analysis for  
archaeological fieldwork, *Vincent Haburaj, Jan Krause, Björn Waske, Brigitta Schütt*

Archaeology and social networking sites: a systematic literature review and conceptual  
analysis of topics, questions and approaches, *Costis Dallas, Ingrida Kelpšienė*

Low-cost semi-automatic image-based measurement and spatial analysis of ceramics,  
*Michaela Prišáková, Petr Dresler, Vojtěch Nosek*

# IMPRINT

## **Prof. Dr. Volker Hochschild**

Geographisches Institut  
Universität Tübingen  
Rümelinstraße 19-23  
72070 Tübingen

## **Dr. Matthias Lang**

eScience-Center  
Universität Tübingen  
Wilhemstr. 32  
72074 Tübingen

## **GESTALTUNG & LAYOUT:**

Larissa Kurz

## **DRUCK:**

Universitätsdruckerei Tübingen

**Monday**

07.30 - 17.00 --- Registration

08.15 - 12.15 &

13.45 - 17.45 --- Workshops

18.00 - 21.00 --- Icebreaker Party at the Alte Aula of the University

**Tuesday**

07.30 - 17.00 --- Registration

09.00 - 10.00 --- Welcome Adresses & Keynote

10.30 - 12.15 --- Sessions

15.30 - 16.45 --- Postersession

16.45 - 18.00 --- Sessions

18.30 - 21.00 --- Reception at the Schloss Hohentübingen

**Wednesday**

07.30 - 17.00 --- Registration

08.15 - 12.15 &

13.45 - 17.00 --- Sessions

17.10 - 19.00 --- Annual General Meeting (AGM)

19.00 - 23.30 --- Schwäbisches Bierfest

**Thursday**

07.30 - 17.00 --- Registration

08.15 - 12.15 &

13.45 - 17.45 --- Sessions

**Friday**

Excursions



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