07-09 JAN 2024
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مؤتمر التراث الأثري لتقنيات الري وإدارة المياه في العالم الإسلامي

THE ARCHAEOLOGY OF IRRIGATION TECHNOLOGY & WATER MANAGEMENT IN THE ISLAMIC WORLD CONFERENCE

BAHRAIN NATIONAL MUSEUM

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THE ARCHAEOLOGY OF IRRIGATION TECHNOLOGY & WATER MANAGEMENT IN THE ISLAMIC WORLD CONFERENCE

Co-organized by the Bahrain Authority for Culture and Antiquities and Professor Timothy Insoll - Institute of Arab and Islamic Studies at the University of Exeter, UK

This conference will explore the various structures used in water management, from subterranean tunnels to reservoirs and canals. It aims to understand how ancient societies managed water resources, informing modern practices and our understanding of human-environment relationships.

The conference will address the origins, diffusion, and independent development of these structures, with a global focus on regions like the Middle East, North Africa, Asia, Sub-Saharan Africa, and former European territories. It will also explore the potential of past human ingenuity in developing hydraulic infrastructure, offering solutions for present and future challenges like environmental and climate change.

Distinguished speakers will address the conference›s themes, and audience participation is encouraged through both in-person and online attendance. Pre-registration is required and free of charge.

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07 JANUARY

SUNDAY

9:00 - 9:45 am	Registration
10:00 - 11:00 am	Opening Ceremony
11:00 - 11:15 am	Coffee break
11:15 - 11:55 am	**Professor Timothy Insoll (presenter), Dr. Rachel MacLean, and Dr. Salman Almahari** The Archaeology of Irrigation Systems and Water Management in Bahrain
11:55 am - 12:35 pm	**Professor Saad Al-Rashid** Ancient Water Installations in the City of Al Rabadhah on the Hajj Route from Kufa to Mecca
12:35 - 12:50 pm	Coffee break
12:50 - 1:30 pm	**Dr Friedrich Weigel (presenter), Dr. Patrick Keilholz, Dr Ulrike Siegel, Katharina Kuntz** Water Management at Qurh/ al-Mabiyat (Saudi Arabia): First results of a new research project
1:30 - 2:10 pm	**Dr. Ajab Al-Otaibi** Ancient Irrigation Systems in the Al Aflaj Province, Kingdom of Saudi Arabia
2:10 - 3:10 pm	Lunch break
3:10 - 3:50 pm	**Dr. Nasser Al-Jahwari** Irrigation System during the Late Islamic Period in Al-Batinah South, Sultanate of Oman
3:50 - 4:30 pm	**Professor Michael Harrower** Water Histories of Yemen and Oman: A Comparative Perspective

08 JANUARY

MONDAY

9:00 - 9:15 am
Opening Note by Dr. Salman Almahari,

Director of Antiquities and Museums, Bahrain Authority for Culture and Antiquities

9:15 - 9:55 am
Dr. Jaafar Jotheri

Tigris, the Ineffective River for Irrigation during the Islamic Period

9:55 - 10:35 am
Professor Bernhard Lucke

Oasis Construction on Landscape Scale: how ancient runoff irrigation in the southern Levant created agricultural land by harvesting dust and water

10:35 - 10:50 am
Coffee break

10:50 - 11:30 am
Dr. Marïette Verhoeven

Istanbul's Water Supply: History and Heritage

11:30 am -12:10 pm
Dr. Simone Mantellini

Beyond the Silk Roads Trade: Irrigated Agriculture in the Middle Zeravshan Valley, Samarkand Oasis (Uzbekistan)

12:10 - 12:25 pm
Coffee Break

12:25 - 12:55 pm
Dr. Tjahjono Prasodjo

Archaeological and Textual Records of Ancient Irrigation in Java, Indonesia from 4th to 16th Century

12:55 - 1:35 pm
Dr. Monika Baumanova

The Archaeology of Water Management on the Swahili Coast of East Africa

1:35 - 2:45 pm
Lunch break

2:45 - 6:00 pm
Site visit to Saar Archaeological Site, Barbar Temple, and Qal'at al-Bahrain

09 JANUARY

TUESDAY

9:00 - 9:15 am	**Opening Note by Taha Ansari,** Vice President (Africa) of the ICOMOS International Scientific Committee on Water and Heritage
9:15 - 9:55 am	**Prof. Mohamed Soliman** Interpretational Correlation between the Hydrological Infrastructure and Water Architecture in Islamic Alexandria within a Contemporary Urban Context
9:55 - 10:35 am	**Dr. Louise Rayne** Mapping Desertification in the Middle East and Northern Africa
10:35 - 10:50 am	Coffee Break
10:50 - 11:30 am	**Prof. José Mª Martín Civantos** Building Landscapes with Water in al-Andalus. Historical Irrigation Systems as Cultural Heritage and Sustainability Examples
11:30 am - 12:10 pm	**Dr. Angelo Castrorao Barba** Water Management and Irrigation Systems in Islamic Sicily and its Legacy
12:10 - 12:25 pm	Coffee break
12:25 - 1:00 pm	Conference Closing & Recommendations
1:00 - 2:00 pm	Visit to Bahrain National Museum
2:00 - 3:00 pm	Lunch break
3:00 - 6:00 pm	Site visit to Madinat Hamad Qanat, Dilmun Burial Mounds, and the A'ali Royal Mounds

The Archaeology of Irrigation Systems and Water Management in Bahrain

07 JANUARY
11:15 - 11:55 am

Recent excavation of a spring and associated qanat system at Hamad Town in central Awal has provided significant insight into irrigation technology in indicating how the qanat tunnels and maintenance shafts were constructed. It has also highlighted how the archaeology of water management has been neglected in Bahrain in comparison to, for example, international trade, ceramics, or fortifications. The scattered existing archaeological research on water management and irrigation that has been completed - in Bilad al-Qadim, Barbar, and Qala'at al-Bahrain - will be summarised and reviewed and suggestions made as to how these, and other relevant sites could be revitalised, interpreted, and presented to the public. This, it will be argued, is of increasing importance within the global climate emergency, when both water scarcity and flooding are emerging as major factors affecting human populations, and the archaeology of water management indicates how carefully our ancestors conserved and managed this precious resource.

PROFESSOR TIMOTHY INSOLL (PRESENTER)
Institute of Arab and Islamic Studies, University of Exeter, UK
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Professor Timothy Insoll FBA is Al-Qasimi Professor of African and Islamic Archaeology at the Institute of Arab and Islamic Studies, University of Exeter, where he is also founding director of the Centre for Islamic Archaeology. Educated at the Universities of Sheffield and Cambridge, he has completed archaeological field projects in Eritrea, Ethiopia, Ghana, India, Mali, Saudi Arabia, and for many years in Bahrain where he is Honorary Archaeological Advisor to the Crown Prince and Prime Minister of Bahrain, HRH Sh. Salman bin Hamad Al-Khalifa. He has published extensively, including 11 monographs (one translated into Turkish and two into Persian), and 13 edited volumes and special issues of journals. He is a Fellow of the British Academy and of the Society of Antiquaries and Royal Asiatic Society.

DR. SALMAN ALMAHARI
Director of Antiquities and Museums,
Bahrain Authority for Culture and Antiquities,
Manama, Kingdom of Bahrain
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Dr. Salman Almahari is a highly skilled archaeologist with over 22 years of extensive experience in the field. Currently serving as the Director of Antiquities and Museums in Bahrain, he has played a pivotal role in preserving and promoting the rich cultural heritage of the region. Dr. Almahari has actively participated in numerous excavation projects within Bahrain and has contributed significantly to the field through his extensive research and publication of various articles and lectures.

DR. RACHEL MACLEAN
Department of Archaeology,
University of Exeter, UK
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Dr Rachel MacLean is an Honorary Research Fellow in the Faculty of Humanities and Social Sciences, University of Exeter. She is a graduate of Queens University Belfast and the University of Cambridge, and has worked on field projects throughout Africa and in Bahrain. She has been the co-director of the Early Islamic Bahrain Project for a number of years, and is the co-author of the Archaeological Guide to Bahrain.

Ancient Water Installations in the City of Al Rabadhah on the Hajj Route from Kufa to Mecca

07 JANUARY
11:55 am - 12:35 pm

The search for water and techniques for preserving it has been an integral part of the successive cultural renaissance of the Arabian Peninsula. From digging wells and constructing dams on valley straits and flood paths to establishing pools and water canals. The southern and northern Arab kingdoms were famous for their great experience in water installation techniques and management. Their ruins remain to this day bearing witness to unique experiences and knowledge of groundwater and benefiting from rainwater and flood flows which extended throughout the Islamic era in their archaeological and architectural evidence. This paper examines water facilities on the Hajj and trade routes in the Arabian Peninsula, which linked the Two Holy Mosques to other Islamic cities. The focus will be on the Hajj route from Kufa to Mecca and Medina, looking at water installations in Al Rabadhah, established on the Hajj route east of Medina. Al Rabadhah is an early Islamic site in the Arabian Peninsula, which was inhabited by historically significant individuals for three centuries, until an attack by the Carmathians in 917 CE led to its abandonment. Archaeological excavations in the city revealed a unique pattern of water conservation within residential buildings.

PROFESSOR SAAD AL-RASHID

Professor in Islamic Archaeology, King Saud University.
Former Deputy Minister for Antiquities, Saudi Arabia.
Head of the Board of Trustees of the Archaeological Association, Saudi Arabia

Professor Saad Abdulaziz Al-Rashid is the Advisor to the Head of the Saudi Commission for Tourism and National Heritage and Emeritus Professor for Islamic Archaeology at the King Saud University. He is the former Deputy Minister for Antiquities and Museum Affairs at the Ministry of Education, Saudi Arabia. He is the Head of the Board of Trustees of the Archaeological Association. He was also Chairman of the Department of Archaeology and Museology as well as the Chairman of the Department of Library and Information Science at the King Saud University. Moreover, he held a position as Vice Dean of the College of Arts and Dean of Library Affairs. Professor Saad received his Ph.D. in Islamic Archaeology from the University of Leeds, UK. Throughout his career he has supervised several archaeological excavations in Saudi Arabia. As one of the leading scholars in Islamic archaeology in the Arabian Peninsula, he has published numerous articles and books.

Water Management at Qurh/al-Mabiyat (Saudi Arabia): First results of a new research project

07 JANUARY
12:50 pm - 1:30pm

Located about 19 km southeast of the old city of al-Ula, on the edge of the now desiccated palm gardens, al-Mabiyat was once one of the most important and prosperous towns in NW Arabia, ancient Qurh. The city profited not only from its location on trade and pilgrimage routes, but also from the exploitation of the region›s agricultural and mineral resources (Wadi al-Qura).

An interdisciplinary research project of the German Archaeological Institute, funded by the Royal Commission for AlUla (RCU), recorded hydrological structures inside and outside the settlement in 23-2022, providing new information about water management in Qurh during the early to middle Islamic period. In this context, a text by Al-Muqaddasi (10th century AD) may point to the poor water quality that made water management even more important. In addition to intramural features such as wells / cisterns and sinkholes, two extramural birkahs were identified, possibly related to surface runoff water collection and flood control structures.

The modelling of the terrain and the simulation of precipitation events and their surface runoff allow a first understanding of the ancient situation. A critical evaluation of this model, considering the archaeological evidence, allows to design a first framework for the natural challenges and water management in ancient Qurh. Furthermore, the project aims at developing a sustainable water mitigation strategy for the long-term protection and preservation of the present archaeological site.

DR. FRIEDRICH WEIGEL (PRESENTER)
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Dr. Friedrich Weigel is a Near Eastern archaeologist and currently a research associate in the Orient Department of the German Archaeological Institute for the Qurh Conservation and Archaeological Project. He investigated pre-Islamic residential architecture at the Tayma Oasis and conducted archaeo-hydrological investigations of an agricultural irrigation system at the same site.

DR. PATRICK KEILHOLZ
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Dr. Patrick Keilholz is Professor of Hydrology and Water Management at the Technical University "Georg Ohm" in Nuremberg. His academic research focuses on paleohydrology, historical and urban hydrology, and the interaction between groundwater and surface water. He has participated in various field projects in the Middle East, and most recently in the AlUla Oasis at the sites of Qurh / al-Mabiyat and Tell Saq.

KATHARINA KUNTZ
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Katharina Kuntz MA is a conservator and currently a research associate in the Orient Department of the German Archaeological Institute for the Qurh Conservation and Archaeological Project. She has been involved in field projects in the Arabian Peninsula and Iraq, and her research interests focus on the theories and methodologies of conservation science. She is a doctoral candidate at the Free University of Berlin.

DR. ULRIKE SIEGEL
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Dr. Ulrike Siegel is a building archaeologist and currently a research associate in the Orient Department of the German Archaeological Institute for the Qurh Conservation and Archaeological Project. An expert on the Islamic urban architecture of the city of Raqqa, Syria, she has been involved in numerous DAI research, training and excavation projects, such as Resafa (Syria), Hujayrat al-Ghuzlan (Jordan) and Uruk (Iraq).

Ancient Irrigation Systems in the Al Aflaj Province, Kingdom of Saudi Arabia

07 JANUARY
1:30 - 2:10 pm

Al-Aflaj, an ancient site renowned for its abundant springs and water reserves, boasts seventeen springs, some ranking as the largest in the Arabian Peninsula. These springs gave rise to sophisticated irrigation systems, essential for sustaining life and embodying human resilience. Such systems thrived under the security of a robust, stable state, as the channels were vulnerable to sabotage. The peak of this irrigation infrastructure was observed during the Umayyad and early Abbasid eras, but it declined due to high maintenance costs, labor demands, and operational hazards. This decline might also be attributed to the Arabian Peninsula›s unstable security and lack of centralized governance. Archaeological evidence suggests the Al-Aflaj canals date back to the 1st century AD, enduring through the first three Islamic centuries, before fading in the fifth Hijri century. The canals were ingeniously designed, originating from higher ground with accessible groundwater or springs. Water was then channeled through extensive underground tunnels, interspersed with vertical wells at intervals of about 5-4 meters, a distance thoughtfully set for maintenance and cleaning purposes. The study encompasses detailed photographic records of the canals and an exhaustive examination, including geophysical surveys and Carbon-14 analysis of various organic materials, highlighting the early inhabitants' meticulous care for their life essentials.

DR. AJAB AL-OTAIBI

Director of Archaeological Research and Documentation, Heritage Commission of Saudi Arabia

Dr. Ajab Al-Otaibi holds the position of Director of Archaeological Research and Documentation at the Heritage Commission of Saudi Arabia. His distinguished career includes former roles such as General Director of Tourism and National Heritage at the Riyadh Branch and Director of the Heritage Department in Riyadh. Dr. Al-Otaibi has contributed significantly to the heritage sector in Saudi Arabia. His scholarly contributions encompass a range of articles and two notable monographs, including a comprehensive study on water installations in the Hail region. An alumnus of King Saud University, he earned his PhD there. Additionally, Dr. Al-Otaibi is an active member of multiple scientific societies and serves on the advisory committees of various Saudi universities.

Irrigation System during the Late Islamic Period in Al-Batinah South, Sultanate of Oman

07 JANUARY
3:10 - 3:50 pm

Water is considered one of the biggest challenges faced by agricultural societies throughout the ages in the southeastern Arabian Peninsula. The scarcity of natural water sources in the region was a strong motivation for these societies to invent different and sometimes complex methods to secure and use water for irrigating their crops. This research discusses the irrigation system during the Late Islamic period in the Al-Batinah South Governorate in the Sultanate of Oman. It reviews the various techniques and mechanisms that were invented by the local inhabitants in this part of the Sultanate of Oman for the purpose of irrigating agricultural fields during the Islamic periods, referring to the stages of development of water harvesting techniques in the region from the Bronze Age to the Late Islamic period. The archaeological evidence discovered at various archaeological sites in South Al-Batinah will also be reviewed, focusing on selected archaeological sites in the state of Rustaq. Ethnographic studies conducted about the region will also be discussed. The research will review the most important irrigation techniques and methods used in the study area, such as the aflaj system and the zajra, and the relationship of these techniques to the spatial dimension of the Rustaq area as a transitional region between the coast and the interior, and their role in the lives of the communities that established and relied on them in all aspects of life, and their impact on the social, economic, administrative, and political situation of the region›s inhabitants.

DR. NASSER AL-JAHWARI
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Professor Nasser Al-Jahwari is a Professor for Archaeology at Sultan Qaboos University, Oman and is a specialist in landscape archaeology, settlement patterns, and quantification in archaeology with special interest in ethnoarchaeology and rock art. He has directed numerous archaeological projects ranging from prehistory to the Islamic period and intensively published in scientific journals. He is also a heritage expert for ICOMOS and UNESCO. Moreover, he is a member of the editorial boards of diverse international journals, an accredited scientific arbitrator for some local and international scientific organizations and Editor-in-Chief of the Journal of Oman Studies.

Water Histories of Yemen and Oman: A Comparative Perspective

07 JANUARY
3:50 - 4:30 pm

Water resources and management played an important long-term role in the trajectories of societies throughout the Islamic World. In Yemen and Oman clear similarities and pivotal differences in topography, geology, climate, culture, politics, and religious histories illustrate how adjacent countries developed a vibrant and unique range of technologies, strategies, and cultural traditions. Comparative understanding of water histories not only helps us appreciate the richness of different cultures but is also helpful in confronting water management challenges of the present and the future.

PROFESSOR MICHAEL HARROWER

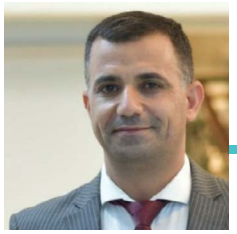
Associate Professor of Archaeology
Director of Undergraduate Studies - Archaeology,
Department of Near Eastern Studies,
Johns Hopkins University

Michael Harrower is an Associate Professor at Johns Hopkins University whose research concentrates on long-term histories of civilizations in Africa and Arabia. He has more than 25 years of experience as a field archaeologist and has directed major research projects in Yemen, Ethiopia, Oman, and Saudi Arabia. He is a specialist in Geographic Information Systems (GIS) and satellite imagery mapping, and his investigations have focused on the spatial, political, and ideological dynamics of water and most recently on ancient trade.

Tigris, The Ineffective River for Irrigation During The Islamic Period

08 JANUARY
9:15 - 9:55 am

In this paper, we focused on the floodplain area of southern Mesopotamia and reconstructed the ancient rivers and irrigation systems in this area. We used remote sensing and GIS techniques, ground-truthing, laboratory sample testing and reviewed historical texts and old maps. We traced many landscape archaeological features belonging to different periods of occupation; however, one of the project›s main findings was about the differences between the Tigris and Euphrates in terms of using them for irrigation. Compared to the Tigris, the Euphrates has highly elevated levees and less discharge, sediments, gradients, crevasse splays, and sinuosity. These differences made the Euphrates more valuable for irrigation than the Tigris because the land of marshes associated with the Euphrates was much easier to reclaim for agriculture, the irrigation canals were easier to clean, less destructive floods, and the dams and barrages were more resilient. Consequently, the Euphrates was responsible for irrigating more than two-thirds of the irrigated land, including the land associated with the western bank of the Tigris, such as Baghdad and Wasit. Moreover, this means that the Euphrates was also used for transportation more than the Tigris and, therefore, was more favourable than the Tigris in building cities and towns. We will present a new map showing the irrigation network during the Islamic period and give some more detailed examples of case studies.



DR. JAAFAR JOTHERI
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Jaafar Jotheri is an Iraqi landscape archaeologist who obtained his PhD in 2016 in Geoarchaeology from Durham University, UK. He has over 18 years of experience conducting archaeological excavations and surveys in Iraq, focusing on the landscape of ancient Iraq and the ancient rivers, marshes, canals and irrigation systems. He published more than 20 articles related to this topic. He is currently an assistant professor in the Department of Archaeology, University of Al-Qadisiyah, Iraq, teaching and supervising undergraduate and postgraduate students. He cooperated and worked with several international universities and institutions in conducting archaeological and heritage projects in Iraq, such as University College London, Durham University, Newcastle University, the British Institute for the Study of Iraq (London), Sapienza University of Rome, Tokushima University, the Academic Research Institute in Iraq (USA), The American Society of Overseas Research (ASOR) and the British Academy.

Oasis Construction on Landscape Scale: how ancient runoff irrigation in the southern Levant created agricultural land by harvesting dust and water

08 JANUARY
9:55 - 10:35 am

Landscapes of desert fringes are often considered degraded, characterized by encroaching desertification and greatly diminished fertility due to poorly adapted land use since the beginnings of agriculture thousands of years ago. However, recent research has made increasingly clear that the narrative of ancient man-made desertification is largely fiction. Focusing on Petra in Jordan as example, it will be shown that numerous traces of terraces have been preserved in the surrounding mountains. These ancient land use features are an important part of the cultural heritage which is unfortunately rarely considered, although it provides important testimony to past land use practice and its environmental impact. A case study of several terrace systems found that they are on the one hand suited to control runoff and thus minimize the risk of flash floods, and on the other hand collected sufficient water for runoff-irrigated agriculture. Faeces biomarkers indicate manuring with human excrements, which suggests that the purpose of the terraces was indeed for agriculture and not only flood control. An unexpected discovery was that the parent material of terrace soils was mainly aeolian dust, which means that the terraces not only harvested runoff water, but also dust, creating fertile soils on previously barren rocks. Statistical modelling and regional comparison with similar terraces in the Negev desert indicates that such terrace soils are a specific, man-made type of soils. According to historic sources, they could provide outstanding yields during years with sufficiently strong runoff events, which could explain how large cities like Petra were supplied.

PROFESSOR BERNHARD LUCKE
Friedrich-Alexander-University (FAU)
Erlangen-Nürnberg, Institute of Geography

Bernhard Lucke graduated as environmental engineer at BTU Cottbus, focusing on soil development, land use, desertification, and historical landscape change in drylands. He was a Fulbright research scholar at Pennsylvania State University and taught at the German Jordanian University in Amman. At FAU Erlangen-Nürnberg, he compared historical landscape changes in the Middle East, Mexico, and Germany. Bernhard Lucke also served as research coordinator at KU Eichstätt-Ingolstadt, and as head of research data management at Max Rubner-Institute. Currently, he continues to teach at FAU and works as a soil scientist at the Bavarian State Agency of the Environment.

Istanbul's Water Supply: History and Heritage

08 JANUARY
10:50 - 11:30 am

My paper focuses on both the history and remains of Istanbul›s water supply system. When Emperor Constantine chose to establish the city named after him, Constantinople, on a well defendable peninsula at a crossroads of important trade routes, the choice turned out to be less fortunate from the point of view of water supply, because the city lacked fresh water. As I will show the dependence on the supply of fresh water from outside the city was and still is decisive and characteristic of water management at this location.

A system consisting of channels, bridges and tunnels that carried water through the landscape, totalling more than 400 km, was constructed in the fourth and fifth centuries. I will show how this system had to be adapted over the centuries to changing conditions, including droughts, hostile attacks, and fluctuating population numbers, and how it was revitalized and restored by the Ottoman Sultan Mehmet II after the conquest of Byzantine Constantinople in 1453. In modern Istanbul, remnants of this impressive water supply system can still be seen of which the so-called Valens Aqueduct, the 971-meter-long aqueduct bridge dating back to the fourth century, is the most important. I will argue that this monument, representing centuries of multi-layered history of urban water supply, is an ideal showcase to tackle the challenges of developing a greater awareness of the precious value of water and to restore the relationship between water and heritage.

DR. MARÏETTE VERHOEVEN

Radboud Institute for Culture and History (RICH), Radboud University, The Netherlands.

Mariëtte Verhoeven is a university lecturer and researcher at the Radboud Institute for Culture and History at Radboud University, The Netherlands. Verhoeven specializes in the field of late antique and Byzantine cultural and architectural history. Currently her research focuses on the cultural history and transformation of water heritage in Istanbul, from late antiquity to modern times. She also investigates the use of digital techniques to increase public awareness of and engagement with cultural heritage. Verhoeven regularly gives lectures to a broader audience.

Beyond the Silk Roads Trade: Irrigated Agriculture in the Middle Zeravshan Valley, Samarkand Oasis (Uzbekistan)

08 JANUARY
11:30 am - 12:10 pm

Located in the middle of the Eurasian landmass, Samarkand has always been a major socio-political entity of ancient Sogdiana. Despite its fame is closely connected to the rich trades along the Great Silk Road, historically Samarkand developed in close connection with its hinterland. However, like elsewhere in Central Asia, the arid conditions have been making life and economic activities almost impossible without an appropriate resource management.

This contribution presents the results of the last two decades of the Uzbek-Italian Archaeological Project in Samarkand. The activities conducted both at regional and local scale allowed to reconstruct the settlement dynamics and the landscape transformations of this territory in a diachronic perspective. An approach combining remote sensing techniques with geo-archaeological field surveys unveiled a masterplan that ensured a rational exploitation of the territory: urban spaces around the city; areas for irrigated agriculture in the plain; pasture lands and burial areas in the foothill. Thousands of settlements depended on a complex irrigation system based on the Dargom and other canals fed by the Zeravshan river since the pre-Islamic period. However, an ongoing investigation suggests a significant transformation in the settlement pattern and irrigation network following the Arab conquest of the region at the beginning of the 8th century.

DR. SIMONE MANTELLINI

University of Bologna, Department of History and Cultures, Ravenna Campus
Position: Assistant Professor

Dr Simone Mantellini is currently Assistant Professor in Indian and Central Asian Archaeology and Art History at the University of Bologna, Department of History and Cultures. He is Director of the Italian Archaeological Expedition in Samarkand, Uzbekistan, and Field Director of the Italian Historical-Archaeological Mission in Sindh, Pakistan. His research interests mostly focus on Central Asia with a specific attention to man-environment interactions, cultural landscapes and water management. In the Samarkand Oasis, he dedicated his Ph.D. to the study of the ancient irrigation systems by combining remote sensing and historical maps with geo-archaeological fieldwork.

Archaeological and Textual Records of Ancient Irrigation in Java, Indonesia from 4th to 16th Century

08 JANUARY
12:25 - 12:55 pm

The classical period of the island of Java (16-4 AD), a period prior to the Islamic period on Java, produced historical and archaeological findings related to ancient irrigation on the island of Java. The main data sources are archaeological finds and epigraphic records. However, these findings have so far not been able to fully reveal the ancient irrigation system in Java. The problem lies in the small quantity of intact irrigation structure remains and the lack of adequate research related to ancient Javanese irrigation. This presentation aims to explore data sources available on the ancient Javanese irrigation and their potentials in uncovering ancient irrigation systems and management in Java in the past. The presentation will begin with the presentation of archaeological data: remains of irrigation structures, ancient irrigation artifacts, and temple reliefs that depict agricultural and irrigation activities. The epigraphic records come from Old Javanese inscriptions issued by ancient Javanese kingdoms. These inscriptions record the construction of dams and water canals as well as the officials who took care of the irrigation sector in Ancient Java. Information about these water officials contributes to reconstructing irrigation management at that time. Textual evidence records that ancient irrigation management in ancient kingdoms was mostly carried out at the local level or subordinate areas.

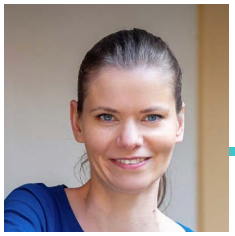
DR. TJAHJONO PRASODJO
Department of Archaeology,
Universitas Gadjah Mada, Indonesia.

Tjahjono Prasodjo was born in Yogyakarta, Indonesia. Currently teaching archaeology at the Department of Archaeology, Faculty of Cultural Sciences, Universitas Gadjah Mada. He graduated from the Universitas Gadjah Mada, Indonesia, with a bachelor›s degree in archaeology. Received a Fulbright scholarship for his master›s program in archeology at the University of New Mexico, USA. He obtained his doctoral degree at Leiden University with a dissertation entitled «The Confluence of Water and Power: Water Management in the Brantas River Basin from the Tenth to the Sixteenth Century CE». Specializing in Old Javanese epigraphy, ancient Indonesian history, and public archaeology.

The Archaeology of Water Management on The Swahili Coast of East Africa

08 JANUARY
12:55 - 1:35 pm

Across the world, water management has been an essential part of urban life. From an archaeological perspective, which casts its eye over the long term, the East African coast represents one of many regions where Islamic societies thrived in a relatively arid environment for at least a thousand years. Swahili towns of East Africa clustered close to the oceanfront, which provided ready access to maritime resources and trade networks of the Indian Ocean. Urban freshwater management has long been less readily understood, apart from the recording of stone wells that were ascribed with paramount importance for sustainability of Swahili settlements, and their salinization interpreted as potentially the greatest environmental threat to the existence of these towns. Current research of the preserved built environment shows that the placement of towns directly on the oceanfront did not compromise their access to freshwater, but rather was a part of local strategy, which many aspects are still applied on the Swahili coast today. Wells were only one type of many features related to the management of water, which also included a system of small reservoirs, cisterns and short canals for freshwater storage and distribution. As water was available in private and public buildings for purposes ranging from cleansing to drinking, cooking and aesthetics, the placement of features associated with water had social implications. Interdisciplinary archaeological research on the Swahili coast shows that both environmental and social aspects of water management complemented one another in the past, as they do today.



DR. MONIKA BAUMANOVA

Department of Middle Eastern Studies and Centre for African Studies, University of West Bohemia in Pilsen
Czech Republic

Monika Baumanova is an Assistant Professor of Archaeology and African Studies at the University of West Bohemia. Her research has centred on the built environment and organisation of space in Islamic contexts, specialising mainly on the Swahili coast of East Africa, and having developed research projects at universities in Switzerland, Sweden, Germany, the UK and the Czech Republic. Her interests include urban systems and city-state cultures, sensory perception, and the life environment in urban contexts. With her research, she employs inter-regional comparative approaches and aims to expand the interdisciplinary frontiers of archaeology.

Opening note

09 JANUARY
9:00 - 9:15 am

Representative of the ICOMOS International Scientific Committee on Water and Heritage.

TAHA ANSARI

Vice President (Africa) of the ICOMOS International Scientific Committee on Water and Heritage

Taha Ansari is the Regional Director of the National Agency of Hydraulics Resources, Adrar, since 2001. He is the Vice President (Africa) of the ICOMOS International Scientific Committee on Water and Heritage. He is also a Fellow of the Members of Adrar Province committee for agricultural development and investment of agriculture and a member of the Sahara Hydrographic Watershed Committee. Moreover, Mr. Ansari is a member of the International Association of Hydrogeologists since May 2008. He received his state engineering diploma in water resources from the University of Tlemcen, Algeria and his graduation diploma specialized in management from Adrar University, Algeria. He has published extensively about the Foggaras and initiated a digitalization project of water heritage-related data in the Southwest Region.

Interpretational Correlation between the Hydrological Infrastructure and Water Architecture in Islamic Alexandria within a Contemporary Urban Context

09 JANUARY
9:15 - 9:55 am

Since the dawn of the Islamic period (21 AH/ 641 CE), Muslim rulers spent efforts to overcome the isolation of Alexandria from the Nile. Accordingly, the Greco-Roman hydrological infrastructure of Alexandria was preserved essentially, by maintaining the Canal of Alexandria "Kẖālīẖ Amīr al-Muḫmnīn" and associated subterranean channels to feed the urban area. On the other hand, Alexandrian elites developed watering projects correspondingly, to provide water for passersby and animals for free as a good deed, which is inspired by Islamic belief. Consequently, Sabil was the adopted architectural pattern to demonstrate this charitable function, associated with a cistern beneath to reserve water annually.

Medieval water utilities were no longer functional due to urban modernization in Alexandria, leading to the establishment of the Water Company in the 1860s and urban development. As a result, the splendid medieval water utilities had turned gradually to heritage, although it was still serving in a full capacity. In addition, Sabil misplaced its origins in the contemporary urbanism of the city, which fortunately still possesses glimpses of the authentic urban fabric.

Chronology, surviving water heritage assets, and the live memory of the surrounding community are capable of outlining the water heritage values of medieval Alexandria. Hence, aligning such significant information using frontier spatial means would visualize and reshape the water heritage of Islamic Alexandria for scholars and the community.

PROF MOHAMED SOLIMAN
Ritsumeikan University-Japan and MoTA-Egypt

Mohamed Soliman; Ph.D. in Islamic Archaeological Architecture (MoTA) and Visiting Researcher at Ritsumeikan University in Japan. Soliman accomplished his Ph.D. at Helwan University on the topic of water systems in medieval Alexandria, while he obtained an MA from Alexandria University with a thesis on the adaptive reuse of historical palaces. Professionally, Soliman seized several positions at MoTA. In addition, he was appointed at several scientific institutions to conduct applied research. His research focuses on the sustainability of cultural heritage based on an interdisciplinary approach and advanced technology, considering community needs. Now, Soliman conducts his research at (ARC) and (DMUCH) Ritsumeikan University, in collaboration with a vast global network

Mapping desertification in the Middle East and North Africa

09 JANUARY
9:55 - 10:35 am

There is a gap between modern water policy and knowledge of traditional and past irrigation which can be addressed by an interdisciplinary perspective combining archaeology and remote sensing. This paper discusses how remote sensing can be used to record ancient water management systems and monitor land degradation.

Traces of traditional irrigation systems including canals and qanats were digitised using satellite images and validation in the field. An open-source machine-learning procedure was developed to map desertification. We used Google Earth Engine to apply this to a large data stack of over 200 Sentinel-2 and Sentinel-1 images and their derived products. The technique tasselled cap was applied to the Sentinel-2 data to divide it into brightest, greenest and wettest components. Training data was produced and a Random Forest algorithm applied to the combined data stack. We compared this data to the location of traditional and ancient water management features digitised using high-resolution imagery. For selected sites, this has been validated in the field.

Areas of abandoned traditional fields were correctly identified by the algorithm, some of which date back to the medieval period. When combined with archaeological field data, our algorithm allowed us to detect both areas of fields which were recently desertified, and those which were abandoned prior to the oldest satellite imagery available (1960s-80s). This suggests that the extent and locations of cultivation may have been different in the past. How past societies adapted to challenges which led to desertification could have implications for modern sustainability in the face of climate change.

DR LOUISE RAYNE
Newcastle University Academic Track Fellow
School of History, Classics and Archaeology

Dr Louise Rayne is a specialist in remote sensing, GIS (Geographic Information Systems), water management and sustainability in the past. She studied both Archaeology and Geography for her PhD at Durham University. Her current research is focused on understanding the resilience of oases in North Africa and the Middle East, building up evidence to support a long-term perspective of water management history including using satellite imagery to map canal systems. She has also recently worked on using spaceborne data for monitoring risks and threats to cultural heritage. She is co-convenor of RSPSoc (Remote sensing and Photogrammetry Society) Archaeology group and member of the Women in Geospatial network.

Building Landscapes with Water in al-Andalus. Historical Irrigation Systems as Cultural Heritage and Sustainability Examples

09 JANUARY
10:50 - 11:30 am

Water management systems and irrigated agriculture are one of the most characteristic elements of the Andalusi period. Its construction and expansion have given rise to an extensive historiographic literature. Its study led to the emergence of Hydraulic Archeology as a specific discipline. However, there are still many things we do not know about them, the water governance systems and the social significance of irrigation in al-Andalus. Many of these systems are still in use today, mainly in the eastern part of the Iberian Peninsula. Its conservation is due to historical factors, but also to its enormous sustainability and resilience for at least a thousand years of existence. However, today they are at serious risk of disappearing not only due to the agrarian crisis and the depopulation of the rural world, but above all due to the processes of intensification and industrialization of agriculture. This transformation involves the destruction of the cultural landscapes created by these socio-ecosystems and generates strong negative impacts due to the overexploitation of resources. From the MEMOLab, Biocultural Archeology Laboratory of the University of Granada, we have been investigating these irrigation systems for years from a comprehensive and transdisciplinary perspective and we work with the communities that manage them for their conservation, restoration and improvement.

PROF JOSÉ Mª MARTÍN CIVANTOS
Associate professor. MEMOLab, Biocultural Archaeology Laboratory.
University of Granada

Professor José Mª Martín Civantos is an Associate Professor on Medieval History and Archaeology at the University of Granada, Spain. He is specialized in Islamic Archaeology and Landscape Archaeology and the Responsible for the MEMOLab, Biocultural Archaeology Laboratory. His interest in the historical relationships between humans and nature and the use of natural resources has led him to work mainly on historical and traditional irrigation systems still in use as examples of sustainability, resilience, and governance. This effort has resulted not only in academic research, but in the protection, restoration and reuse of tangible and intangible heritage as strategy for local sustainability and socioeconomic development.

Water Management and Irrigation Systems in Islamic Sicily and its Legacy

09 JANUARY
11:30 am - 12:10 pm

This paper aims to present and discuss the archaeological evidence related to water utilization and management in the suburban areas and hinterland of Islamic Sicily, with a particular focus on the region surrounding the capital city of Madīnat ḥiqilliya/Balarm (Palermo). The transformative changes that occurred during the Islamic period had a profound impact on irrigation systems, leading to the introduction and widespread cultivation of innovative irrigated crops. These advancements in water usage were made possible through various technological innovations, especially in hydraulic infrastructure. In Palermo›s suburban areas, comprehensive surveys have been conducted to detect and classify hydraulic infrastructure and drainage tunnel sites into four distinct categories: 1) qanāts; 2) blind qanāts; 3) connected wells; 4) emerging drainage galleries. While pinpointing their exact dating presents some challenges, some of these structures exhibit characteristics typically associated with the Medieval period and it is evident that the utilization of water during the Norman era (12th century) was significantly influenced by Islamic culture. This influence is observable not only in the architecture of power, as exemplified by the Favara/Maredolce palace but also in agricultural structures like water mills, as evidenced in the territory of Qurliyūn (Corleone). Finally, the long-lasting Islamic legacy of irrigation systems is a characteristic element of the traditional agricultural landscapes of the Sicilian hinterland.

DR ANGELO CASTRORAO BARBA
Institute of Archaeology and Ethnology/Centre for Late Antique and Early Medieval Studies, Polish Academy of Sciences

Angelo Castrorao Barba is Postdoctoral Researcher (2024-2022) at the Institute of Archaeology and Ethnology/Centre for Late Antique and Early Medieval Studies of the Polish Academy of Sciences with the MSCA COFUND PASIFIC project «IS_LANDAS. Islamicate landscapes in Southern Andalusia and Western Sicily: patterns of change in settlements and rural communities between Late Antiquity and the Islamic age". He is a specialist in rural settlement patterns and landscape archaeology in Late Antique, Byzantine and Islamic Mediterranean, with particular experience in fieldworks in Sicily and Andalusia. He was post-doc/research fellowships at University of Palermo, Royal Netherlands Institute in Rome, University of Tübingen, University of Hamburg, and School of Arabic Studies-CSIC. Recently, he was PI of the project "The suburbium of Balarm (Palermo, Sicily) during the Islamic period (AD 1072/1071 -831): new archaeological perspectives" funded by The Barakat Trust (2022-2021).

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