

SMACH KNOW-HOW EXCHANGE PROGRAM on
SUSTAINABLE MANAGEMENT OF CULTURAL HERITAGE IN RESPONSE TO CLIMATE CHANGE
(October 2021 - February 2022)

Week October 25

Friday October 29

Introduction of the Program, faculty and participants

Week November 1

Friday November 5, 1-3 pm

Core Module: Introduction to Climate Change and Cultural Heritage Sustainable Management

(Cristina Sabbioni, Institute of Atmospheric Sciences and Climate (ISAC), National Research Council (CNR), Bologna, Italy)

The lecture will address the results achieved on the impact of climate change on cultural heritage opening the perspectives of future research direction. The development of risk evaluation for cultural heritage management and the use of advance technologies, including satellite data, for assessing the impact of climate with its change will also be presented. It will be finally discussed the challenge to provide actions through an effective collaboration among researchers, cultural heritage managers and policy makers.

Week 8 November

Friday November 12, 1-3 pm

Core Module: How to communicate and engage the publics (Ilda Mannino and Alessandra Fornetti, Venice International University)

The session explores the role of communication and engagement of the public for the sustainable management of cultural heritage, the challenges that professionals in the sector face when communicating to the public and provides some practical tips on how to communicate effectively. The participants will be also involved in an hands-on session to practice the proposed strategies.

Week November 15

Friday November 19, 1-3 pm

Core Module: UNESCO Policy for promoting Sustainable Management of Cultural Heritage in response to Climate Change (Milika Nikolic)

Week November 22

Tuesday November 23, 1-4 pm

Elective module: Wooden Heritage and Climate Change (Miha Humar, University of Ljubljana)

Wood is one of the oldest materials in human history. Thus it is not surprising that the considerable amount of cultural heritage is partially or entirely made of wood. Predominately the wooden cultural heritage exposed to outdoor conditions is exposed to various biotic and abiotic factors. Among the biotic factors, fungi and insects play a predominant role. In most of Europe, fungi are more threatening than insects. The intensity of fungal decay depends mainly on wood species, temperature and precipitation events. To estimate the planned service life of wood and to determine the maintenance intervals of wooden object, it is necessary to assess how wood behaves in a given environment. There are a variety of models that have been developed to assess the loading of wood. The approach most commonly used in practice is that developed by Theodore Scheffer. Scheffer proposed a climate index (Scheffer climate index) based on the number of rainy days and monthly average temperatures. The results of the analysis of climatic conditions show that the Scheffer climate index is higher than it was decades ago at most of the analysed sites in Slovenia. Similar trends are observed elsewhere in Europe as well. Due to the climate changes, it can be expected that the importance of the insects, predominately termites, will increase as well. They will spread into the regions where they were not traditionally present. In the end, a few case studies will be presented.

Week November 29

Wednesday December 1, 2-4 pm

Elective module: Climate Change and Collections (Matija Strlic, University of Ljubljana and University College London)

Week 6 December

Monday December 06, 1-4 pm

Conservation Mortars for the Protection of Cultural Heritage and Natural Environment (Emilija Nikolić, Institute of Archaeology, Belgrade, Serbia)

The Institute of Archaeology is a part of the national team currently working on the nomination dossier for the property named Frontiers of the Roman Empire – The Danube Limes in Serbia with an aim to include it in the UNESCO World Heritage List. At the same time, it participates in the research project financed by the Science Fund of the Republic of Serbia named Mortar Design for Conservation – Danube Roman Frontier 2000 Years after (MoDeCo2000). The project deals with the characterisation of the historic mortars from the monuments of the Danube limes and raw materials used for their production, giving recommendations for the design of compatible conservation mortars. While this approach fully respects the principle of compatibility during the conservation treatments, it also helps avoid the use of cement – the material that stands in the foundations of modern development, but which manufacturing is one of the main producers of carbon dioxide.

In this lecture, the methodology of the project researching historic mortars for conservation will be shown. It includes desk research of literature; field research with a sampling of original mortars and raw materials; laboratory research of mortars using different techniques; scientific interpretation of the results; design and laboratory testing of conservation mortars; and finally, in situ application of mortars with monitoring. One of the monuments being researched is monumental Trajan's Bridge, dated to the beginning of the 2nd century AD, whose remains stand

on the Serbian and Romanian sides of the river Danube, representing a challenge for research, conservation, and presentation.

Elective module: Cultural heritage conservation and restoration technologies & material analysis and characterization of stone Cultural Heritage (Laura Bruno, University of Rome Tor Vergata)

The lectures will focus on the biodeterioration of stone monuments due to the development of phototrophic biofilms, on the methods used to investigate the microorganisms responsible for colonization and on the innovative methodologies applied for the restoration of colonized surfaces. Moreover, the fundamental role of bioreceptivity of stone on the development of microbial biofilms will also be presented. A comparison between the development of phototrophic biofilms on monuments present at our latitude and those in tropical regions will be considered to infer the role of climate change on the biological colonization.

Case studies:

Stećci; medieval tombstones graveyards

Stećak monuments

Caričin grad

Trajan's bridge part of frontiers of Roman Empire - The Danube Limes in Serbia

Week 13 December

Wednesday 15 December, 1-4 pm

Elective module: Monitoring for bio deterioration: reporting on case studies (Giada Migliore, Chiara Alisi, ENEA and Univ. of Sarajevo)

This lecture provides an overview of the most recent and updated application of microbial and bio-based technologies for the conservation and restoration of Cultural Heritage. Sampling and characterization of microorganisms useful for the bio-cleaning of monuments and artefacts will be described. Cases on the bio-consolidation by calcinogenic bacteria and bio-mortars will be presented. The characterization of deteriogenic biofilms and their control with bio-based products as alternatives to traditional synthetic biocides will be illustrated. All the bio-technologies will be demonstrated through a gallery of case studies.

Case studies:

- Trajan's bridge part of frontiers of Roman Empire - The Danube Limes in Serbia / Stećci;
- Medieval tombstones graveyards- Bosnia

Season's holidays

Week 10 January

Tuesday January 11, 1-4 pm

Elective module: Geo-hydrological hazard and cultural resources under climate change (Crescenzo Violante, CNR)

This talk discusses geological and geophysical approaches to assess geo-hydrologic hazard affecting cultural resources under climate change. The increase of extreme rainfall under climate change affects the stability of natural slopes and has consequences on natural and cultural heritage. For this reason, the assessment of geohazard phenomena related to ground stability and alluvial events is important for evaluating exposure of tangible heritage to climatic variation. For this aim, geological data and historical records are important sources for the evaluation of flooding

episodes caused by torrential or prolonged rainfall and are useful tools for defining the quality and completeness of the information needed to outline the trends of climatic oscillations.

Thursday January 13, 1-4 pm

Elective module: Multidisciplinary approach to cultural heritage: from archaeology to new technologies applied to cultural sites (Lucia Alberti, Francesca Colosi, Carla Sfameni, CNR)

Through the analysis two case-studies based in Montenegro, the Roman town of Doclea, near Podgorica, and the archaeological site of Municipium S, at the border with Serbia, we propose an example of good practices related to a global, multidisciplinary approach to hidden and almost unknown culture heritage sites. These two sites suffer very different weather conditions – very high and low temperatures – that profoundly affected the stone monuments conditions. Proceeding from historical research, archaeological survey up to the application of new technologies of territorial analysis and conservation procedures, our final goal is the valorization of the sites for a better fruition and a real reappropriation by the local communities. Our goal is to stress the importance that a correct approach to cultural heritage can produce in term of social and economic improvements.

Case studies: Doclea and Municipium S in Montenegro

Week 17 January

Wednesday January 19, 1-4 pm

Elective module: Landscape technologies

a) Remote sensing (Pasquale Merola, CNR)

In the past, archaeologists already used air pictures to investigate archaeological areas, but in recent years the development of advanced technologies has provided an additional investigation tool, which is useful for spatial analysis and for integrating the information derived from field survey. Remote sensing in particular is an important technology for a better understanding and characterization of buried elements in different archaeological sites. It is based on the principle that over time any buried ruins, either of human or natural origin, affect soil surface characteristics creating anomalies, due to different factors, such as soil physical and chemical features, and vegetation cover status.

In particular, relevant archaeological features have been pointed out in several studies using multispectral remote sensing optical sensors (QuickBird, OverView etc., drone) or by the combined use of LIDAR and hyperspectral data to identify archaeological excavations.

b) Geophysical methods and techniques (Salvatore Piro, CNR)

Nowadays, non-destructive geophysical prospecting methods are increasingly used for the resolution of ground problems in urban and suburban areas, implying detailed physical and geometrical reconstructions of hidden ambient. The needs are both the macro and meso-scale characterization of geolithological or materic hosting contexts and the definition of targets, which most properly the demand is addressed. The probability of a successful application rapidly rises if a consistent multi-methodological approach is adopted.

The geophysical prospecting surveys are aimed to image the subsoil, at depths ranging from 1 to 10 m, in order to: 1) detect archaeological remains, 2) to map technological networks, 3) to characterize surface geology, and 4) to identify possible aquifers. To this aim, different geophysical techniques, including Electrical Resistivity Tomography (ERT), Ground Penetrating Radar (GPR) and Magnetic methods, will be used and integrated.

This activity aims at defining the most appropriate acquisition techniques, at different scales, of multidimensional modeling, of data representation and management referred to areas which may contain archaeological sites and historic buildings.

Week 24 January

Wednesday January 26, 1-4 pm

Elective module: Spectroscopic techniques for the in situ characterization of materials in archaeology (Vincenzo Palleschi, CNR)

The complexity of the problems related to the wide variety of materials used in the field of archaeology and the degradation these materials can often suffer also due to the effects of climate change, as it does not allow to select a single methodology to be used in a standard way for this kind of analysis. Optical techniques are widely diffused and extremely well established in the field of Artworks diagnostics because of their effectiveness and safety. The purpose of this talk is to introduce the basics of some of these methodologies (Multispectral Imaging, XRF, LIBS, RAMAN) together with some case studies, where these techniques are used directly in situ.

Friday January 28, 1 pm

Core module: Policy, Legal Actions and Cultural Rights for Cultural Heritage Protection in Response to Climate Change (Lily Martinet)

Week 31 January

Wednesday, February 02, 1-4 pm

Elective module: Application of archaeometric techniques for the analysis and conservation of Balkan artworks (Slavica Vucković, University of Montenegro and Stefano Legnaioli, Simona Raneri, CNR)

Through the analysis of the case studies of the 20th century concrete monuments in Montenegro, part of the project “Monuments of the II World War in Montenegro”, we intend to explore the more recent application of archaeometric techniques for their analyses and conservation.

Archaeological mortars are often composed of highly inhomogeneous materials and detailed analysis in most cases can be quite difficult. In this talk, a Laser-Induced Breakdown Spectroscopy (LIBS) equipment with microscopic-scale spatial resolution will be presented to create images of element distribution. Thanks to the combined use of an unsupervised clustering algorithm and the calibration-free procedure, it is possible to obtain a good discrimination between material of different composition, allowing a quick classification for further mineral-petrographic investigations. The collected information provides useful insights for evaluating consolidation and restoration practices to address the natural hazard. The method has been successfully applied to real archeological samples of mortars and construction material such as those used in the foundations of the Smederevo fortress (Republic of Serbia) and the historical site of Doclea (Montenegro).

Case studies: Monuments of the II World War in Montenegro; Doclea in Montenegro

Week 7 February

Wednesday, February 09, 1-4 pm

Elective module: Enhancement and fruition strategies for cultural heritage sites (Bruna Di Palma, CNR)

The theme focuses on the identification of innovative methodologies for the knowledge, enhancement, transformation and management of architectural, urban and landscape heritage. The aim is to transmit strategies and skills ranging from the ability to read and recognise its values, to the ability to understand its palimpsest, also in the light of past transformations, to the ability to intervene on historical architecture, urban aggregates and the man-made landscape with the intention of extending its life **and** allowing it to be passed on to the future. The themes to be explored are: a) experimentation of methodologies of knowledge and intervention on the cultural heritage in relation to its context, working on the specificities of the architectural project; b) improvement of the use of the man-made heritage; c) practices of reading the historical, architectural and landscape heritage as a first step for thoughtful transformations aimed at improving the conditions of use, accessibility and safety.

Case study: Doclea in Montenegro

Week 14 February

Wednesday, February 16, 1-4 pm

Elective module: Web lectures hands-on to show users how instruments of the ISIS@MACH ITALIA (IMI) Research Infrastructure may operate for the analysis of Cultural Heritage artefacts (Senesi R, Andreani C, UniTOV)

Hands-on web lectures will be dedicated to students-technicians-non experts from Balkan countries through the IMI online platform to show how both the IMI instruments **ESEM-EDS** and **ILLUMINA** and the neutron beamlines **TOSCA** and **VESUVIO** at the ISIS Spallation neutron and muon source (UK) operate for:

- a) the analysis of Cultural Heritage artefacts (examples from samples of Egyptian Sandals and analysis of ancient biological samples of humans, other animals and plants, in order to study their paleogenome and microbiota)
- b) data acquisition and use of results

A dedicated virtual room will be made available by the end of January 2022 for users interested to register to attend the web lectures.

Week 21 February

Wednesday, February 23, 1.00-5.00 pm

Elective module: How to prepare a Climate Action Plan: a framework for planning mitigation and adaptation policies (Cristiana Scarpa, City of Venice)

The lecture will explore different methods for approaching the preparation of a climate action plan for making the case for climate action, including

- dealing with an illustration of common guidelines, methodologies and approaches, in particular the C40 2020 deadline Programme and the Covenant of Mayors approach.
- MITIGATION: describing data, stakeholders, methods to prepare a GHG inventory; defining target and scenario and data set;
- ADAPTATION: risk analysis and measures;
- case study: VENICE CAP and VENICE SECAP

Elective module: The management of UNESCO World Heritage sites: from theory into practice.
Case study: World Heritage Site "Venice and its Lagoon" (Katia Basili, City of Venice)

The lecture will be divided into two parts: the first part will deal with an illustration of UNESCO guidelines, methodologies and approaches for the management of UNESCO World Heritage Sites following the evolution of the international debate on preservation and development of cultural heritage.

The second part will focus on the understanding of how the UNESCO standards can be applied concretely at local level, requiring the setting up of a complex system of responsibilities and obligations with consequences for the authorities in charge of protection and management and stakeholders. The work carried out and now in progress for the updating of the site management plan for "Venice and its Lagoon" will be discussed as a case study.

Hands-on session