EDICULA Educational Digital Innovative CUltural heritage related Learning Activities

THE EDICULA IMMERSIVE EVENT 19 December 2022 || 10:30 – 14:30

National Technical University of Athens, Patission Campus, Averof Building, Kaftatzoglou Ceremony Hall

EDICULA INNOVATIVE INTERDISCIPLINARY SYNTHETIC METHODOLOGY WITH REFERENCE TO THE HOLY AEDICULE OF THE HOLY SEPULCHRE REHABILITATION PROJECT IN JERUSALEM



NATIONAL TECHNICAL UNIVERSITY OF ATHENS Chief Scientific Supervisor Professor Emeritus Antonia Moropoulou

NTUA Interdisciplinary Team Prof. E. Korres, Prof. A. Georgopoulos, Prof. A. Moropoulou, Prof. C. Spyrakos, Assist. Prof. Ch. Mouzakis, Deputy Construction Site Manager

EDICULA

Educational Digital Innovative Cultural heritage related Learning Activities

Project Code: 2020-1-EL01-KA203-079108





NATIONAL TECHNICAL UNIVERSITY OF ATHENS [GREECE]

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Co-funded by the Erasmus+ Programme of the European Union







NATIONAL TECHNICAL UNIVERSITY OF ATHENS EDICULA NTUA TEAM

EDICULA

Educational Digital Innovative Cultural heritage related Learning Activities Project Code: 2020-1-EL01-KA203-079108

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Researchers: Ioannis Rallis

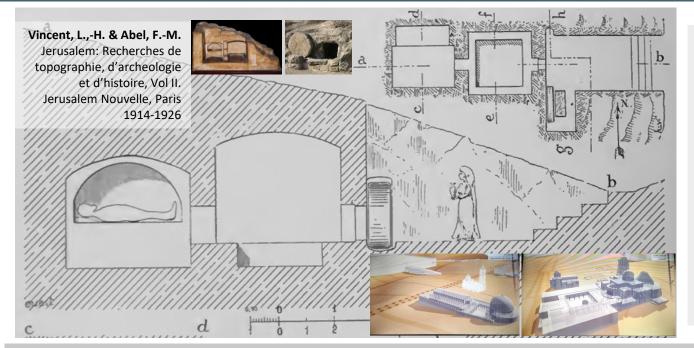
Co-funded by the Erasmus+ Programme of the European Union





The experience from the Holy Aedicule rehabilitation project aims to demonstrate the array of issues related to CH protection and preservation and to trigger a dynamic, openminded, and multi-disciplinary discussion regarding the main thematic areas that will be addressed in the EDICULA project, fusing experience from all partners

Historical aspects related to the Aedicule of the Holy Sepulchre



1st PHASE

- Period of Constantine the Great and construction of Constantinian institutions (326-614 AD)
- The destruction of the Holy Shrines by the Persians (614 AD). The reconstruction of the Church of Resurrection by Patriarch Modestos
- The destruction of the Holy Shrines by Caliph Hakem bi-Amr-Illah on 1009 AD The reconstruction of the Church of Resurrection of the Byzantine Emperor Constantine IX Monomachos (1042 - 1048).

2nd PHASE

- 11th c. Byzantine period
- First Crusaders period (1099 1187)

3rd PHASE

The restoration intervention of the Crusaders in the late Romanesque style, gives a new character to the previous intervention of Monomachos, integrating all Holy Shrines below a single building

From the Constantinian, to the Byzantine, to the Crusaders to the Renaissance, to the Komnenos period which we restored



The Holy Aedicule (326 AD)

© Theo Mitropoulos

(614AD) after its partial destruction by the Persians

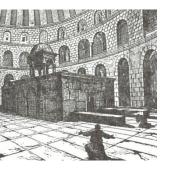
© Theo Mitropoulos 8th c. AD. The rehabilitation of the core of the Aedicule by

Patriarch Modestos

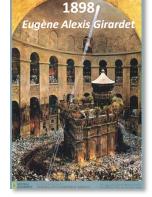


© Theo Mitropoulos

(11th c. AD). The rehabilitation in the shape of "pulpit" by Monomachos 1045 AD



Crusaders' phase 12th c. AD De Brun 16th c. AD

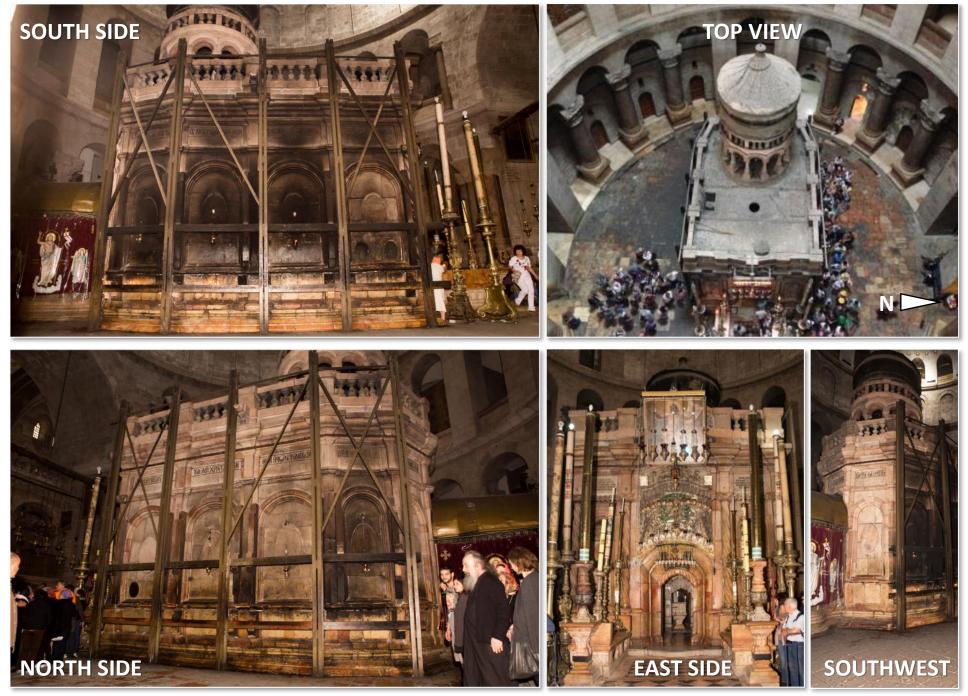


The 2016 state of the reconstructed Aedicule by architect Komnenos in 1810 (after the fire of 1808) and the addition of the iron frame from the British rulers, 1947



Dr. Th. Mitropoulos, Greek Orthodox Patriarchate of Jerusalem

The Holy Aedicule prior to the rehabilitation interventions (2015-2016)



Historic initiative of the Greek-Orthodox Patriarch of Jerusalem to invite the NTUA

The project was initiated, became possible and is executed under the governance of His Beatitude, the Greek-Orthodox Patriarch of Jerusalem, Theophilos III.

His Beatitude, the Greek-Orthodox Patriarch of Jerusalem, Theophilos III invited Professor Antonia Moropoulou (March 2015) and signed a programme agreement with the National Technical University of Athens in order to conduct a study regarding *"Materials & Conservation, Reinforcement and Rehabilitation Interventions in the Holy Edicule of the Holy Sepulchre"* with the consensus of all three Christian Communities **NATIONAL TECHNICAL UNIVERSITY OF ATHENS** Interdisciplinary Research Group for the Monuments Protection

Materials & Conservation, Reinforcement and Rehabilitation Interventions in the Holy Edicule of the Holy Sepulchre

> Final Report Presentation, 27 January 2016, Consulate General of Greece in Jerusalem 19 February 2016, Greek-Orthodox Patriarchate of Jerusalem 8 March 2016, Zappeion Hall, Athens

Scientific Coordinator: Prof. A. Moropoulou

Interdisciplinary Research Group NTUA:

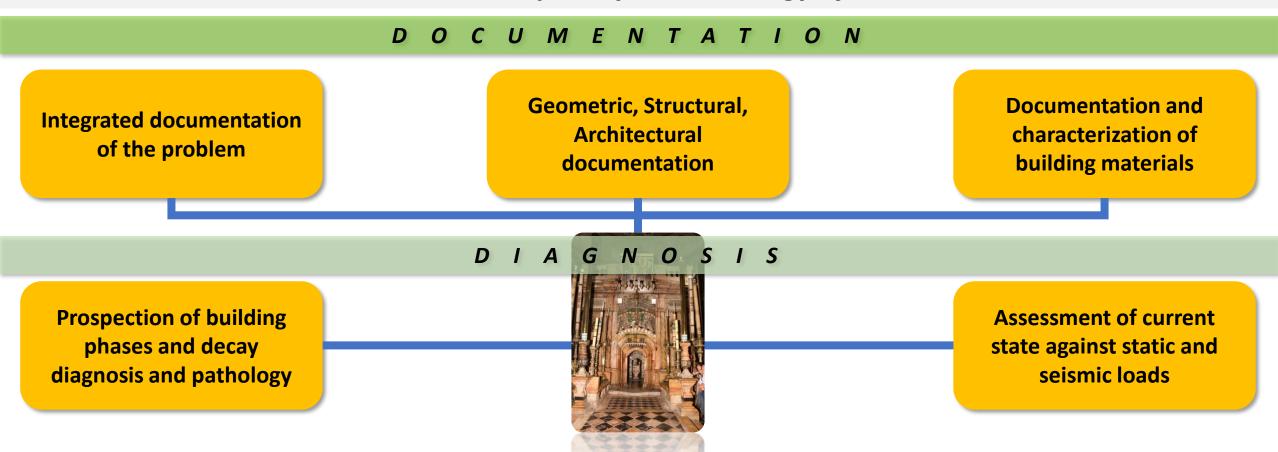
Prof. E. Korres, School of Architecture Engineering NTUA, Former Director of the Interdisciplinary Postgraduate Programme "*Protection of Monuments*" **Prof. A. Georgopoulos**, School of Rural and Surveying Engineering NTUA, Laboratory of Photogrammetry

Prof. A. Moropoulou, Director of Studies in the NTUA Interdisciplinary Postgraduate Programme Direction *«Conservation Of Building Materials»*, School of Chemical Engineering NTUA,

Laboratory of Materials Science and Engineering

Prof. C. Spyrakos, School of Civil Engineering NTUA, Laboratory for Earthquake Engineering

Aim and interdisciplinary methodology of Research

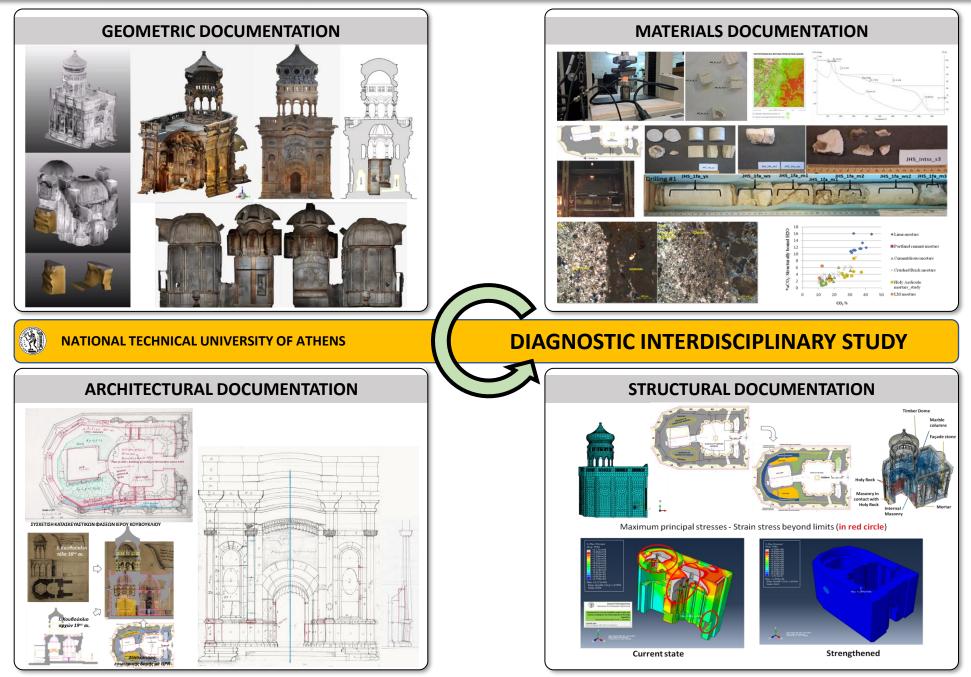


PROPOSAL

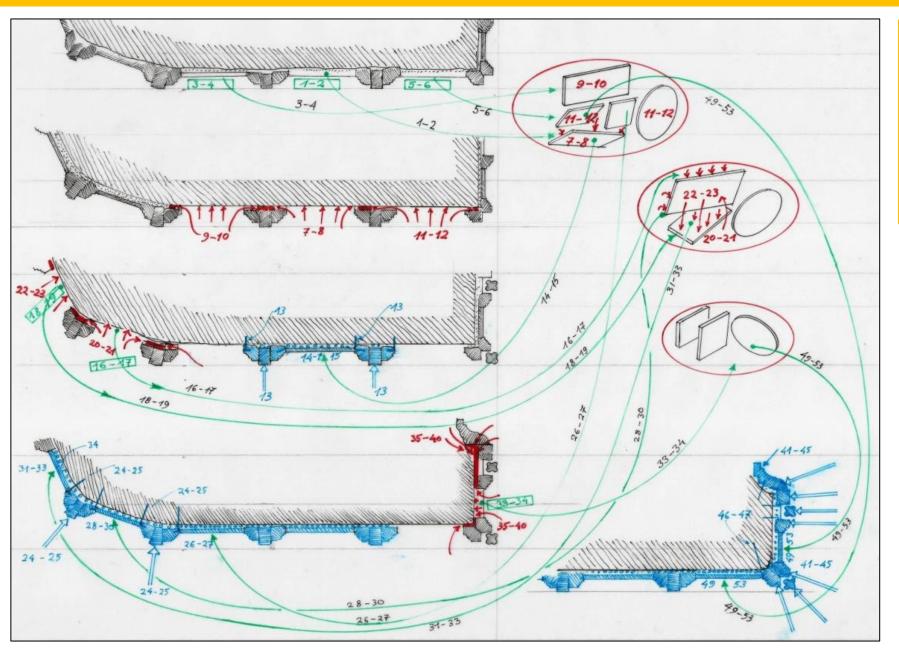
Principles, ethics, requirements and instructions for conservation reinforcement and rehabilitation materials and interventions Continual update of the three religious communities of the Holy Church of the Resurrection in Jerusalem and organization of scientific and institutional debate for decision making regarding the most appropriate solution.

INTERRELATED GEOMETRIC, ARCHITECTURAL, MATERIALS AND STRUCTURAL DOCUMENTATION

How architectural, historical and materials characterization geometrical documentation and structural assessment act as knowledge based digital infrastructure to support the design of the rehabilitation



PROPOSAL FOR REHABILITATION



Minimum invasive Maximum compatibility & performance with historical materials and structures

Diagram of the work's progress (design by Prof. Em. Korres)

HISTORIC AGREEMENT BETWEEN THE THREE CHRISTIAN COMMUNITIES, WHO FULFILLED THEIR HISTORIC RESPONSIBILITY ENTRUSTED TO THEM BY THE STATUS QUO

The Common Agreement of the **Status Quo** provides the Greek Orthodox Patriarch of Jerusalem with the authority, in constant collaboration with the Leaders of the Christian Communities, the historic Guardians of the Holy Sepulchre, consisting of the Greek-Orthodox Patriarch of Jerusalem, Theophilos III, the Custos of the Holy Land, Pierbattista Pizzaballa (until 05.2016, today the Latin Patriarch of Jerusalem) and Francesco Patton (from 06.2016), as well as the Armenian Patriarch in Jerusalem, Archbishop Nourhan Manougian, to coordinate all scientific, technical and administrative aspects of the project.

COMMON AGREEMENT

Today March 22nd, the three Communities, the historic guardians and servants of the Holy Places, are fulfilling a historic responsibility that has been entrusted to us by the Status Quo, by installing the scaffolding to allow for the necessary conservation, reinforcement and repair interventions to the Holy Aedicule.

Today we mark the formal beginning of the project for the restoration of the Sacred Aedicule in the Church of the Anastasis. This project is being carried out by a team of specialists from the National Technical University of Athens under the supervision of Professor Moropoulou, whose important report has recently been completed and published. This report was submitted to the three Communities here in Jerusalem in February of this year, and the work can now begin.

We wish to acknowledge the consensus that the three Communities have reached so that this project could proceed, following up the meeting of March 19th, at the Greek Orthodox Patriarchate of Jerusalem in order to forward the "Innovative integrated diagnostic research and strategic planning for compatible, performing and sustainable materials and conservation and rehabilitation interventions of the Holy Aedicule of the Holy Sepulcher in the All-Holy Church of the Resurrection in Jerusalem," conducted by the National Technical University of Athens.

The implementation of this project will respect and will not change the rights and the claims of the three Communities.

The consensus achieved implies the following:

1. The Project will be implemented within the engineering and scientific framework of specifications as set forward by the NTUA Study.

2. The Project will be managed within the following framework:

2.1 The meeting of the Heads of the three major Communities performing as "project owners' committee" (POC) will undertake the responsibility for all strategic decision making.

2.2 Each Community should create separate accounts for contributions in order to collect the necessary funds to cover the cost of completion of the works of the conservation of the Holy Aedicule.

2.3 a. The commencement of the works will begin within a fortnight after the Easter Feast of the Eastern Churches.

2.3 b. The works, which will be completed in approximately eight months to one year, will not prevent the religious services in the Holy Sepulcher or, more specifically, in the Aedicule, nor prevent the access of pilgrims into these places.

2.4 The CTB (Common Technical Bureau of the Church of the Holy Sepulcher), staffed by three Architects by the three Communities, will be responsible for the correct execution of the project according to the scientific studies and directives realized by the National Technical University of Athens. The representative of the Common Technical Bureau of the Church of the Holy Sepulcher (Dr. Theodosios Mitropoulos), as Construction Site Manager (CSM), will be responsible for the construction site's operation within the directives set forward by the relevant authorities.

2.5 The Scientific Supervision will be performed by the interdisciplinary NTUA Study Team, headed by Professor A. Moropoulou (CSS). She has the overall responsibility for the scientific monitoring of the work and is the director of the interdisciplinary scientific monitoring laboratory which will be set up in the construction site. In collaboration with the interdisciplinary NTUA scientific team, the Project Manager (PM) and the CSM she will monitor and control the work.

2.6 The project management will implement the project charter, report on the work progress according to the schedule and budget, and coordinate the construction and the scientific supervision teams in order to complete the work successfully and on time and to manage risks on regular basis.

2.7 The (POC) project owners' Committee authorizes the Steering Committee (SC) to cope with the current problems of integrated project governance with the participation of the CSS (Chief Scientific Supervisor), the CSM (Construction Site Manager) and the PM (Project Manager). The Patriarch of Jerusalem or His Deputy is chairing the SC with the obligation to inform the project owners Committee.

For the first time in over two centuries, the Sacred Aedicule will receive urgent interventions. This restoration will secure this Holy Place for generations yet to come for all those pilgrims and people of good will who come to this church to seek spiritual renewal. During the entire project, the Holy Tomb will remain accessible to pilgrims without disruption, and for this careful planning and execution we owe the project team a huge debt of gratitude. The Holy Tomb must always be open to all.

May God bless this work and those whose responsibility it is to carry out, and may the renovation of the Holy Tomb of our Lord Jesus Christ be a beacon of hope for a hurting

NOURHAN MANOUGIAN

Armenian Patriarch of Jerusalem

f. Rebattine yebell for aly N. Mayer PIERBATTISTAPEZABALLA THEOPHILOS III Custos of the Holy Land Patriarch of Jerusalem

world.



SCIENTIFIC SUPERVISION, MONITORING AND DECISION MAKING

PROJECT FOR THE CONSERVATION, REINFORCEMENT AND REPAIR INTERVENTIONS FOR THE REHABILITATION OF THE HOLY AEDICULE OF THE HOLY SEPULCHRE IN THE ALL-HOLY CHURCH OF RESURRECTION IN JERUSALEM

> National Technical University of Athens Chief Scientific Supervisor: Prof. Antonia Moropoulou

> > A Collective Work by

NTUA Interdisciplinary Team Prof. E. Korres, Prof. A. Georgopoulos, Prof. A. Moropoulou, Prof. C. Spyrakos, Assist. Prof. Ch. Mouzakis, Deputy Construction Site Manager

An exemplary project highlighting Greek and European Innovation and Expertise in the field of Cultural Heritage protection Exploiting a multilevel integrated interdisciplinary approach

The exemplary project of the Holy Aedicule rehabilitation

Scientific coordination and supervision challenges

The coordination of an interdisciplinary team at the highest level of technical responsibility:

- Respect to the Status Quo and the three Christian communities
- The **coordination** of a complex project in a changing environment in conditions of risk and within a limited timeframe with many restrictions and prerequisites
 - ✓ Continuous pilgrimage and religious functions
 - ✓ Preserve and highlight the values of the monument
 - ✓ Limited timeframe (Easter to Easter ceremony)
- An effective decision making process throughout the project to manage and solve arising issues through scientific support

The exemplary project of the Holy Aedicule rehabilitation

Scientific coordination and supervision challenges Social, political, cultural, religious

- The integrated coordination of a complex project in the sensitive environment of the open city of Jerusalem, a city of two different people and three different religions which without their tolerance and even their support would not become feasible
- The scientific support to the integrated governance throughout all phases of the rehabilitation project
- > The scientific coordination of a diverse group comprising of:
 - ✓ The interdisciplinary NTUA team
 - The scientific team supporting the scientific support of the project, comprising of over
 50 members (architects, civil engineers, survey and rural engineers, chemical engineers, archaeologists, etc)
 - ✓ The Greek teams of Conservators and Restorers, comprising of 12 members

The project of the **rehabilitation of the Holy Aedicule** as a **pilot multispectral, multidimensional, novel approach** through **transdisciplinarity** and **cooperation**

Innovative scientific methodologies and challenging projects:

- Mark future trends in the protection of cultural heritage
- Have initiated a universal conversation within a holistic approach
- Merge capabilities and know-how from the scientific fields of architecture, civil engineering, surveying engineering, materials science and engineering, information technology and archaeology, as well as heritage professionals and stakeholders in cultural heritage

The project of the **rehabilitation of the Holy Aedicule** as a **pilot multispectral, multidimensional, novel approach** through **transdisciplinarity** and **cooperation**

The advanced digital documentation:

- Permits the data fusion of interdisciplinary innovative modelling, analytical and NDTs
- Supports the emergence of a transdisciplinary field for multispectral sustainable preservation and management of Cultural Heritage

Within this field, the communication, social awareness and participation is enhanced

To this end, **new funding tools, schemes and mechanisms** are searched out on the basis of reuse of heritage assets to generate revenue for a sustainable preservation towards circular economy.

Effective implementation methodology

• Funding Crowdsourcing **High supervision with Project implementation** continual documentation, Decision by the Technical Bureau diagnosis, pilot applications making upon under the responsibility and update of the study by the the study of the three religious **NTUA interdisciplinary** authorities **Research Group In-situ Interdisciplinary Documentation and ORGANISATION** Monitoring Laboratory – **MANAGEMENT OF Training of the Technical Staff** CONSTRUCTION SITE The continued operation of pilgrimage of the Holy Sepulchre is ensured

SCIENTIFIC SUPPORT TO INTEGRATED GOVERNANCE

INTEGRATED GOVERNANCE OF THE PROJECT

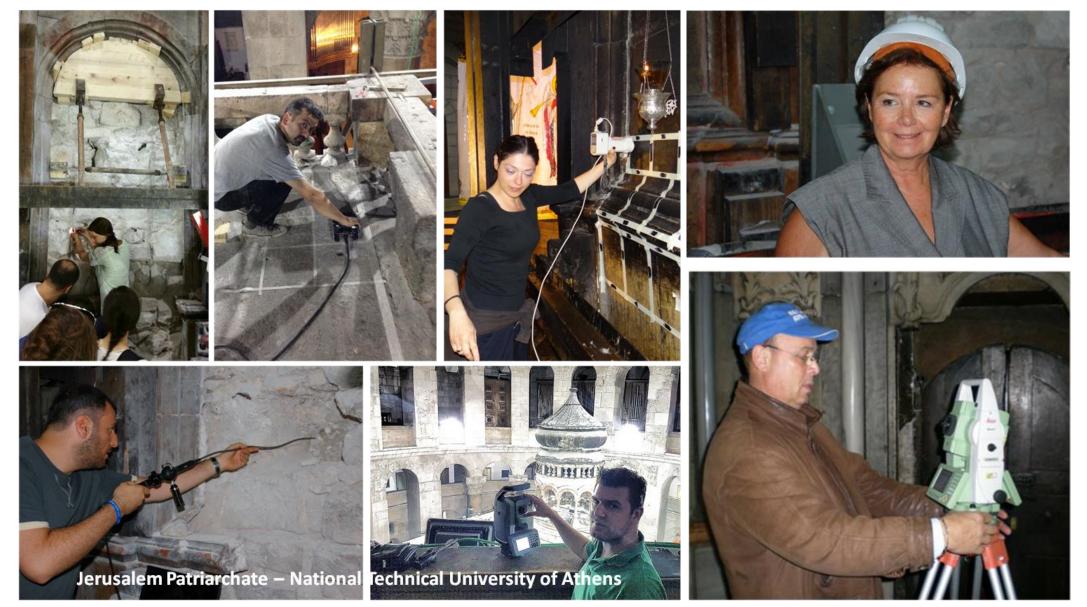
Project Owners' Committee

Interdisciplinary Documentation & Monitoring Laboratory IDML Karstentuh able Digital Microscor gital SLR camera

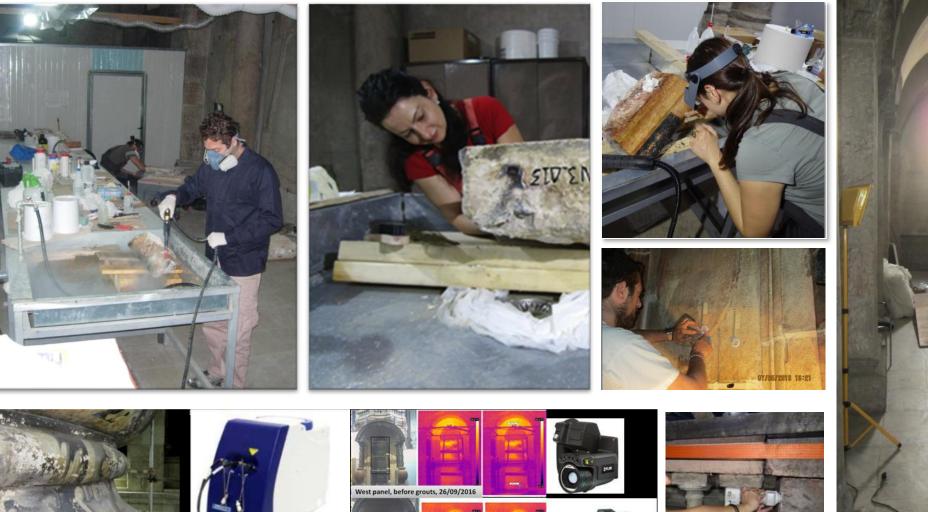
Custos of Franciscan Order Apostolic Administrator Armenian of Jerusalem Patriarch Patriarch Theophilos III Nourhan (Chairman) Manougian Francesco Patton Pierbattista Pizzaballa (until May 2016) (Since June 2016) WMF/Mica Ertegun Fund/ **Common Technical Bureau Project Steering Committee** Greek Orthodox Archdiocese of (Dr. Theodosios Mitropoulos, Osama (5-7 members) Hamdan, Carla Benelli, Irene Badalian) America (oversight) Project Site Manager ientist & Director of Patriarch Manager **Dr.** Theodosios Rehabilitation Ir. Nikos Mitropoulos Interventions (Chairman) Moropoulos Prof. Antonia Moropoulou Direct. of **Deputy Site** Asst. Deputy Director of **Director of** Geometric Manager Assist. Site Manager, Reinforcement Restoration Documentation Prof. Head of Prof. Kostantinos Prof. Emmanouil **Prof. Andreas** Charalampos Restorers Spyrakos Georgopoulos Mouzakis /asileios Zafeiris Administrative **Scientific Construction site management**

The **integrated scientific management of the project** is recognized as the only prerequisite that can successfully face the risks and uncertainties that arise during the progress of the Works.

Continuous scientific documentation, monitoring and assessment of all acquired data, in real scale and real time comprises the **scientific support to decision making**. Hence, the **integrated governance** of the project is achieved on the **basis of the NTUA study**, as well as the **NTUA scientific reports** throughout the implementation of the study The <u>Interdisciplinary Documentation and Monitoring Laboratory</u> has been established at two rooms of the Rotunda belonging to the Greek-Orthodox Patriarchate,, continuously functioning under the NTUA interdisciplinary team's scientific responsibility



The Conservation lab is established and functions at the Franciscan Gallery



West panel, after grouts, 14/11/2016



Optimization of planning of all stages of the rehabilitation works while addressing case-specific limitations

Strict set of requirements:

✓ Accessibility

The Holy Aedicule should continue be accessible to the Three Christian Communities for religious functions, as well as for pilgrimage

Time limitations

Timeframe of completion was strict and non-extendable (≤ 12 months)

✓ Space limitations

Space for the setup of the worksite was limited; furthermore, the worksite was required to be set up in such a manner, as to not obstruct the church's functions

Values of the monument

The values of the monument were to be respected and highlighted



 Final mortar application, pointing and finishing

 Conservation interventions on the Onion Dome, the Dome of the Chapel of the Angel, the Dome of the Burial Chamber

 Anchoring of interior marbles

• Grouting of top zone

ITERATIVE PROCESS OF THE MAIN STAGES OF REHABILITATION

0

 Removal of disintegrated and incompatible mortars from the revealed masonry

• Repointing of the masonry

Repair and partial reconstruction of part of the masonry

• Injection of grouts up to 3m

 Resetting and anchoring of exterior columns

Resetting and anchoring of stone column railing

• Reassembly of stone panels

Dismantling and removal of

the stone panels

Optimization of planning of all stages of the rehabilitation works while addressing case-specific limitations

All stages of the **works** and **logistics** of human resources, instrumentation and materials were **carefully planned and controlled**, so that necessary works could be performed in parallel at adjacent areas of the Aedicule

The actual **works were performed during the night**, when the Church was closed to the public, with the exception of the sixty hours when the Tomb of Christ was opened, during the grouting process, when the monument was inaccessible to the public



Jerusalem Patriarchate – National Technical University of Athens

The Greek teams of restorers and conservators working in full capacity in two shifts day and night









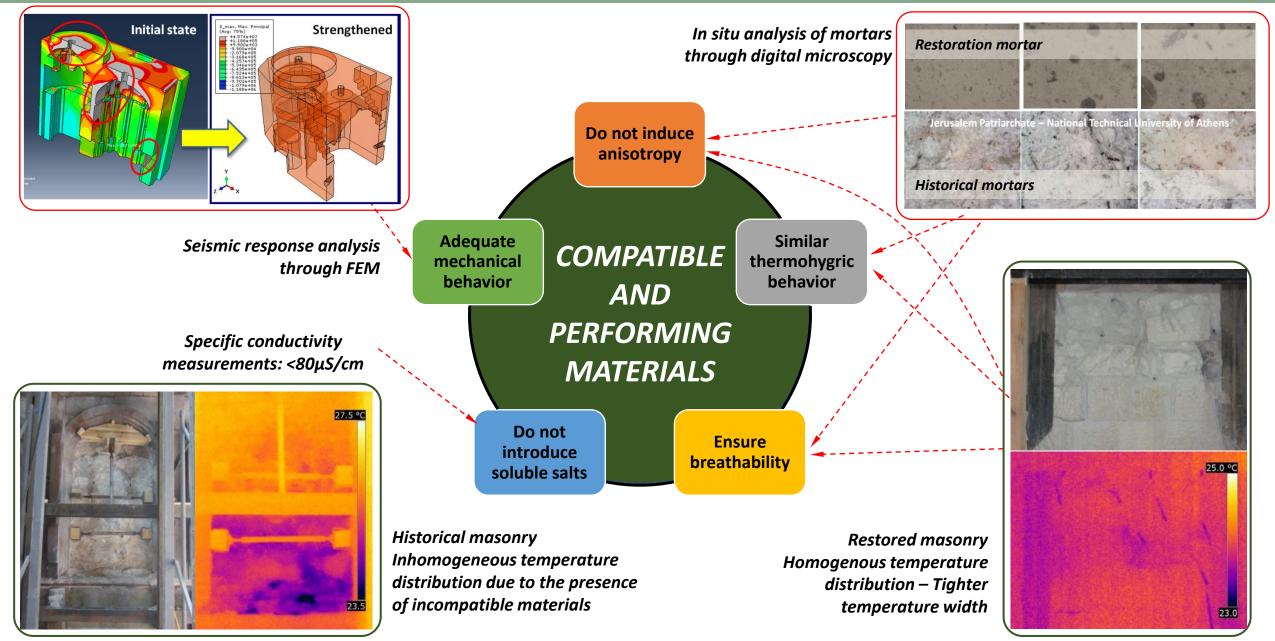




Innovative methodology to ensure the project's goals

 Ensure structural integrity, compatibility, performance of materials & interventions
 Preserve and highlight the values
 Ensure sustainability

Innovation in selecting and designing compatible and effective materials for the rehabilitation of the Holy Aedicule

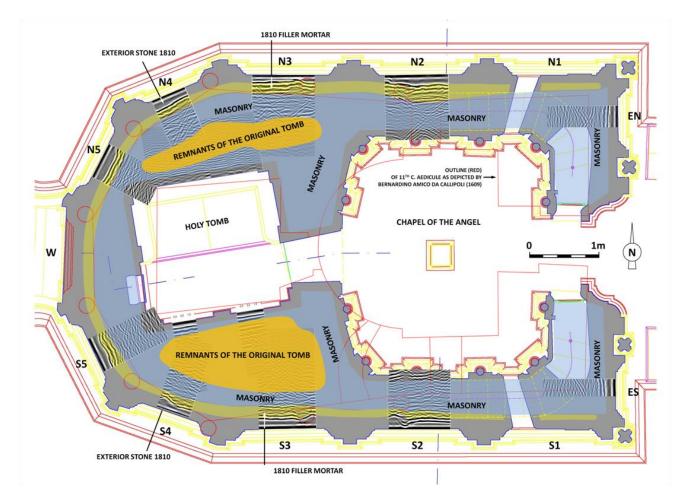




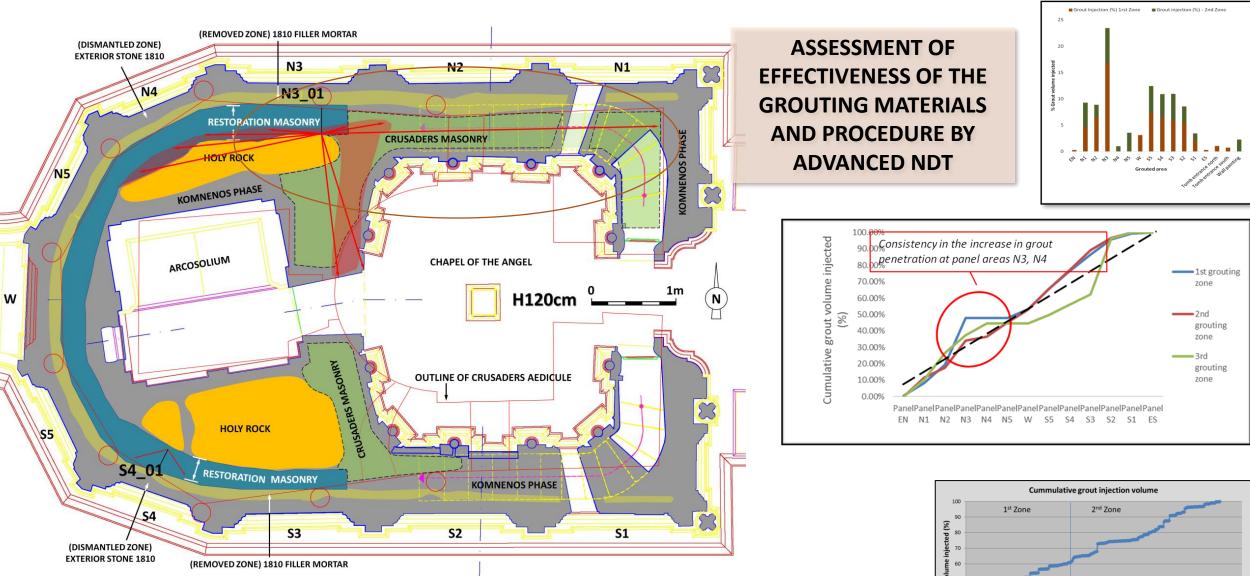


INNOVATIVE PROSPECTION OF THE NON-VISIBLE LAYERS OF THE AEDICULE AS A MAJOR TOOL FOR ITS REHABILITATION

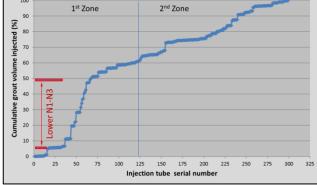
Integrated Nondestructive Prospection, Architectural and Geometric **Documentation Digitally Render the** Internal Structure of the Holy Aedicule and Reveal its **Construction Phases**



GEOMETRIC AND DIGITAL DOCUMENTATION

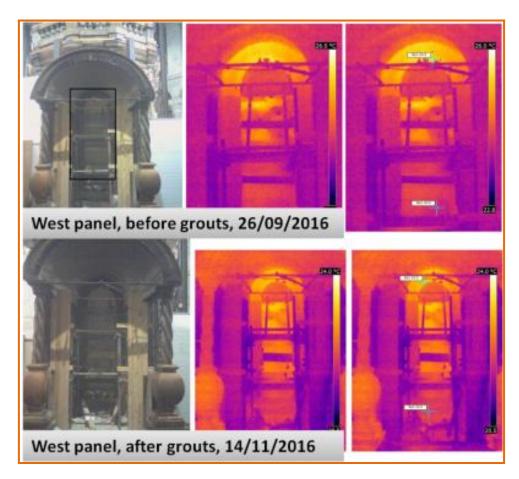


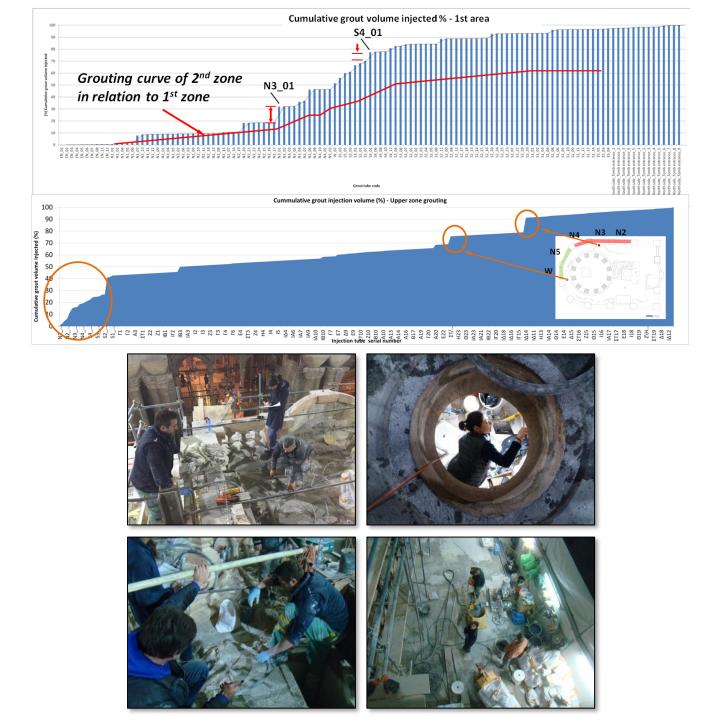
Analysis of the relative location of the exit tubes in the case of insertion tube N3_01, based on the internal structure of the Aedicule as revealed by GPR analysis, shows that *grouting was successful in homogenizing the interface between the restoration masonry and the north block of Holy Rock as well as the other construction phases*



NDTs FACILITATE DECISION MAKING

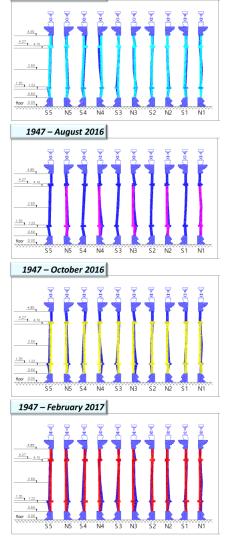
The higher areas of the panels consumed a significant volume of grout ~40%; this is in accordance with IRTh results conducted after the lower part grouting, which showed the presence of voids at the higher panel levels and indicated the necessity of the upper zone grouting





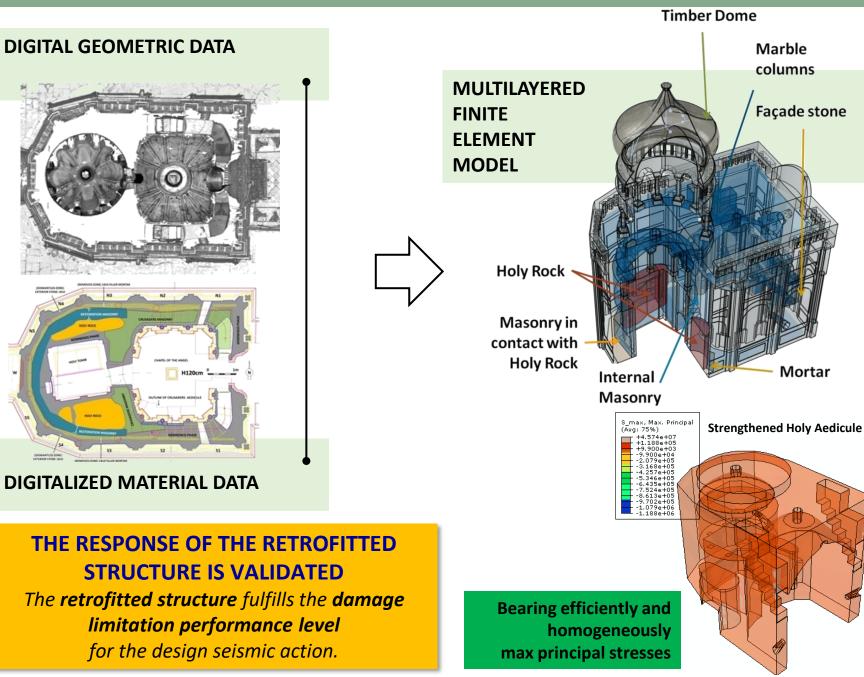
Time Evolution of the columns' Deviations from verticality

1947 – January 2016



Diminution of the deformations

INNOVATIVE METHODOLOGY TO ENSURE STRUCTURAL INTEGRITY



affecting Jerusalem

Seismic activity

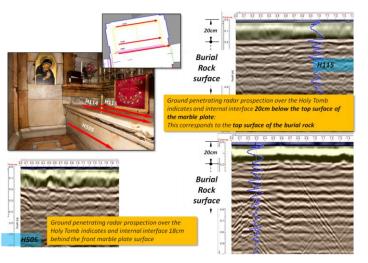
INNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGS TO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT

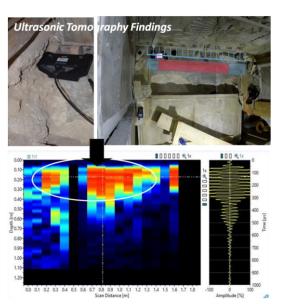
Lifting of the stone of the Tomb **3D** Reconstruction of the revealing the burial monument **Burial Surface**



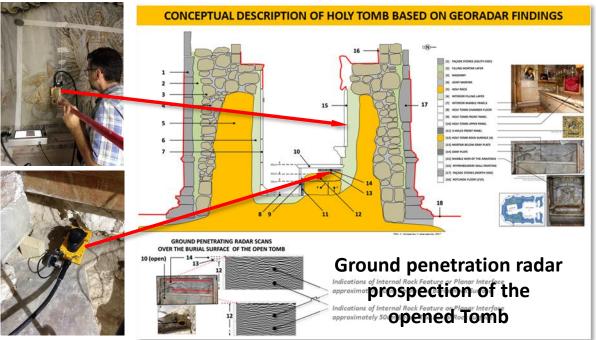
INNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGS TO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT

Georadar prospection over the closed tomb





INNOVATIVE NON-DESTRUCTIVE INSPECTION BY NTUA TO REVEAL THE BURIAL MONUMENT'S MORPHOLOGY





Digital portable microscopy over the burial surface

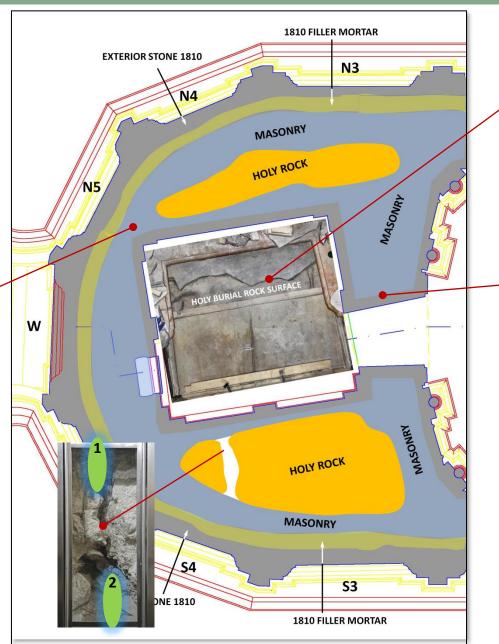


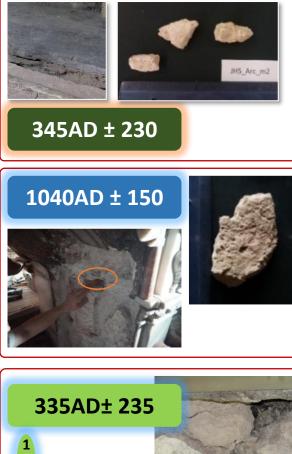
INNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGS TO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT

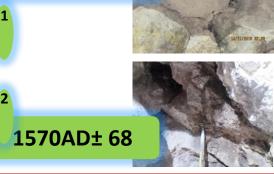
Archaeometric results stemming all historic periods from the Constantinean era to Byzantine, Crusaders, Renaissance and Komnenos restoration eras



Moropoulou, A., Zacharias, N., Delegou, E. T., Apostolopoulou, M., Palamara, E., & Kolaiti, A. (2018). OSL mortar dating to elucidate the construction history of the Tomb Chamber of the Holy Aedicule of the Holy Sepulchre in Jerusalem. *Journal of Archaeological Science: Reports, 19*, 80-91.

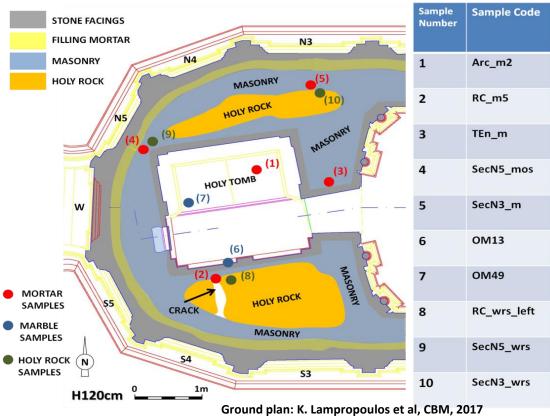






METAGENOMICS & BIOINFORMATICS: MICROBIOTA CHARACTERIZATION OF BUILDING MATERIALS OF HIGH HISTORICAL AND ARCHAEOLOGICAL SIGNIFICANCE

Correlation with building materials data, archaeometry data and historical data

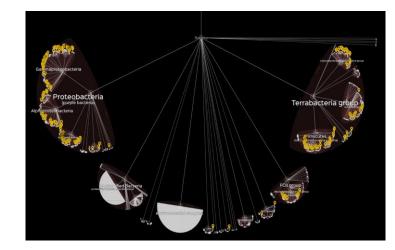


Non destructive sampling



NTUA in cooperation with DNASequence

Prof. A. Moropoulou¹, Dr E.T. Delegou¹, PhD Cand. Th. Bris¹, Dr A. Salakidis², Dr C. Karapiperis², Dr Z. Hilioti², Dr A. Chasapi², D. Valasiadis², A. Alexandridou², V. Rihani², M. Kroustalaki², Prof. C.A. Ouzounis², ¹School Chem. Eng. NTUA, ²DNASequence, SRL Hellas



Taxonomic distribution: 94.16% represented bacterial sequences

The following microorganisms present the highest relative abundance in all the samples under investigation: Pseudomonas aeruginosa, Acinetobacter johnsonii, Chroococcidiopsis thermalis PCC 7203, Loriellopsis cavernicola, Zhihengliuella somnathii, Massilia atriviolacea και Massilia aurea

- Detection of halotolerant microorganisms, because of the special microclimate of the monument, which present high rising damp
- Detection of species with the capacity of inducing CaCO₃ precipitation, thus future applications of materials bioremediation via self-healing processes, could be applied

Two approaches for data correlation via bioinformatics tools

Machine learning technique: The less abundant and yet idiosyncratic communities were ranked at the genus level, on a per sample basis.

Discrete biodiversity

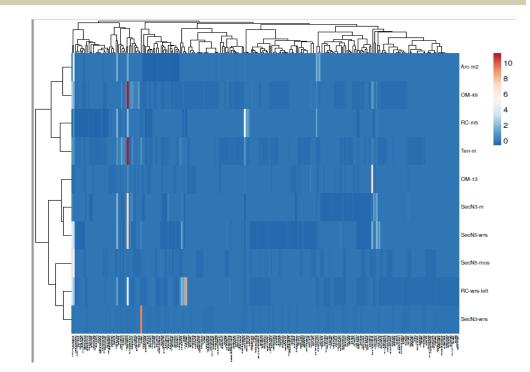
e.g. The photosynthetic genera of Chroococcidiopsis and Loriellopsis, could be evidence that in some period of the past some building materials were not embedded in the Holy Tomb and in the masonry respectively, as they were found; but they were part of Aedicula areas visible to the pilgrims and reached by the sunlight.

Criteria of data correlation:

- 1) location in the monument
- 2) construction period
- 3) composition/ production technology

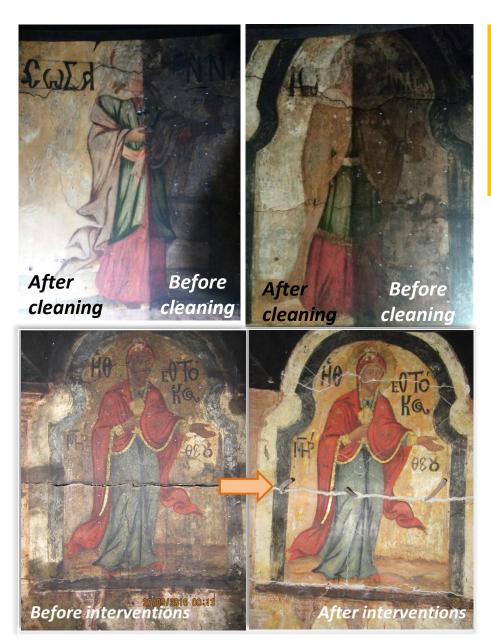
k mean clustering analysis:

Correlation analysis based on the kind and the abundance of the species identified in each sample.



Based on the cluster analysis the mortar located in-between the Holy burial bed and the low fragmented (not visible today) grey marble plate, is correlated with a Proconnesos marble fragment that was found inside the Holy Tomb and is assumed to be the decorative edge of the low fragmented grey marble plate (also of Proconnesian origin)

Thus, there is high possibility that THESE TWO BUILDING MATERIALS WERE POSITIONED AT THE HOLY TOMB DURING THE SAME CONSTRUCTION PERIOD, THAT IS THE CONSTANTINEAN ERA INNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGS TO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT



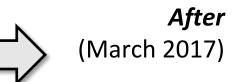
REVEALING & CONSERVATION OF THE FRESCOES: CHAMBER OF THE TOMB



REVEALING, CLEANING AND PROTECTIONINNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGSOF THE EXTERIOR FAÇADE INSCRIPTIONSTO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT



NORTHWEST FAÇADE *Before* (May 2015)





SOUTH FAÇADE Before (May 2015)

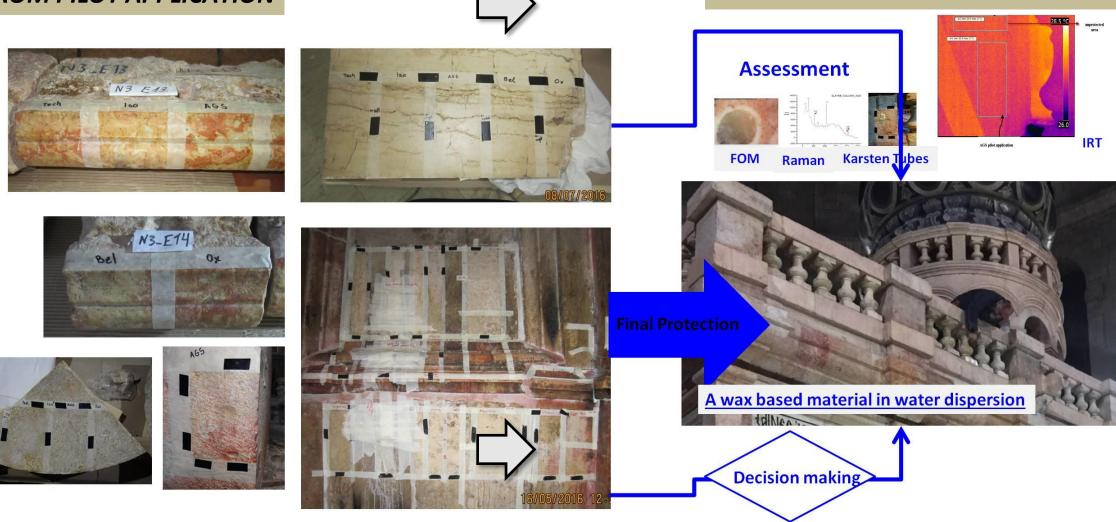


After (March 2017)



PROTECTION INTERVENTIONS

FROM PILOT APPLICATION

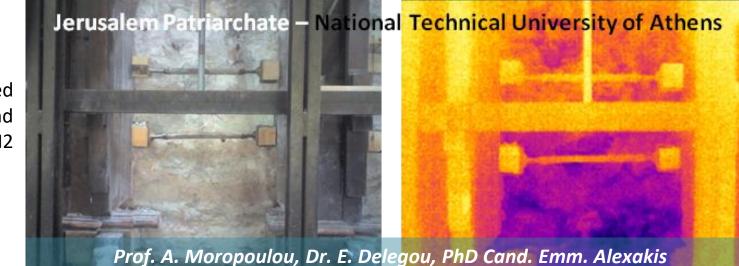


TO FINAL APPLICATION

In order to ensure sustainability, a cultural rehabilitation of the pilgrims' attitude is required. The extinguishing of the candles onto the Aedicule's exterior facades, must stop

INNOVATIVE METHODOLOGY OF RISK ASSESSMENT: SUSTAINABILITY AT RISK (INTENSE RISING DAMP FROM THE UNDERGROUND)

Immediately after the removal of the external stone slabs intense rising damp phenomena were observed



The **temperature difference** between the lower and the upper part of the masonry is suggested from the thermograph (July 2016)

The revealed masonry behind panel N2

We undertook the investigation of these issues and the study of a proposal to **reverse the connected risks** and **ensure sustainability**

Proposed interventions

- Foundation Interventions for the Underpinning, Reinforcement, Water and Humidity Control of the Holy Aedicule
- Control of the rising damp and installation of proper sewage and water drainage system
- Pavement preservation and rehabilitation



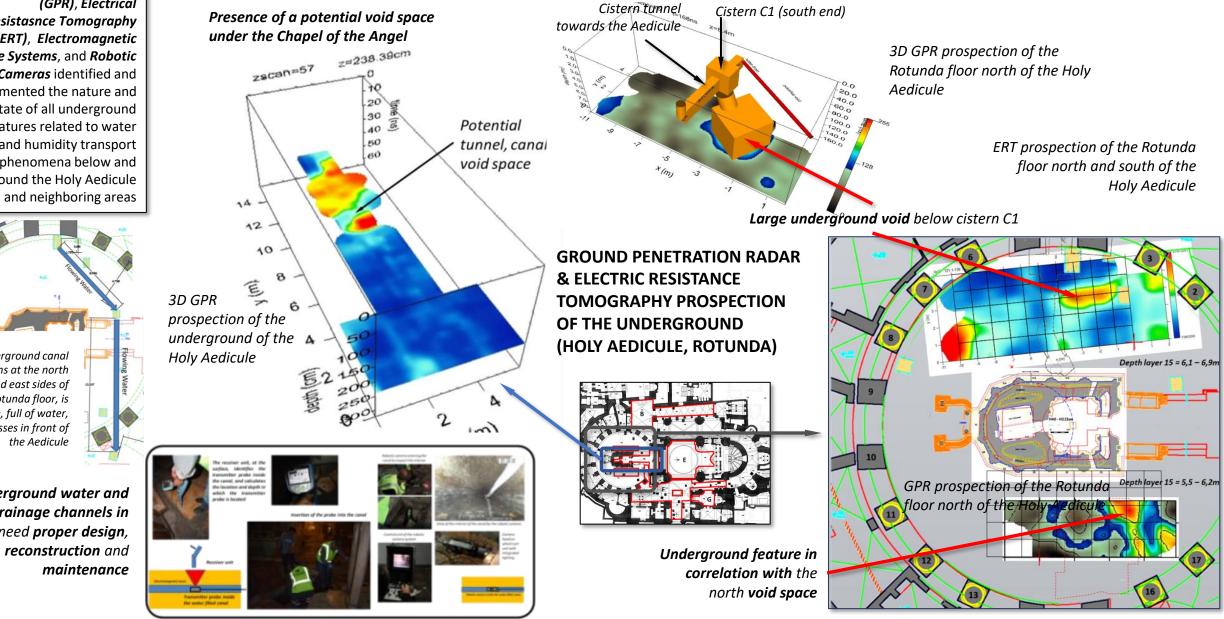
NATIONAL TECHNICAL UNIVERSITY OF ATHENS

Ground penetrating radar (GPR), Electrical Resistasnce Tomography (ERT), Electromagnetic Probe Systems, and Robotic Cameras identified and documented the nature and state of all underground features related to water and humidity transport phenomena below and around the Holy Aedicule

The underground canal that runs at the north east and east sides of the Rotunda floor, is active, full of water, and passes in front of the Aedicule

Underground water and drainage channels in need proper design, reconstruction and maintenance

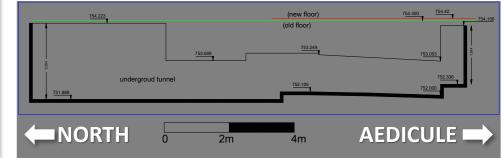
SUSTAINABILITY AT RISK: 3D DIGITAL NON-DESTRUCTIVE PROSPECTION OF UNDERGROUNDS RISKS



RISK ASSESSMENT: 3D GEOMETRIC DOCUMENTATION OF UNDERGROUND ENVIRONMENT

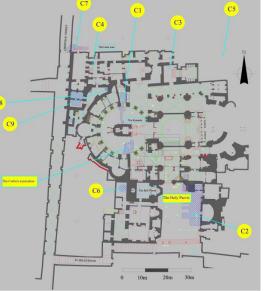
Geometric documentation determined the depth of each cistern determined its positional relation to the Holy Aedicule in order to assess its eventual impactand documented in detail the most important cisterns

C1) Geometric documentation (vertical section) of cistern C1



Corbo

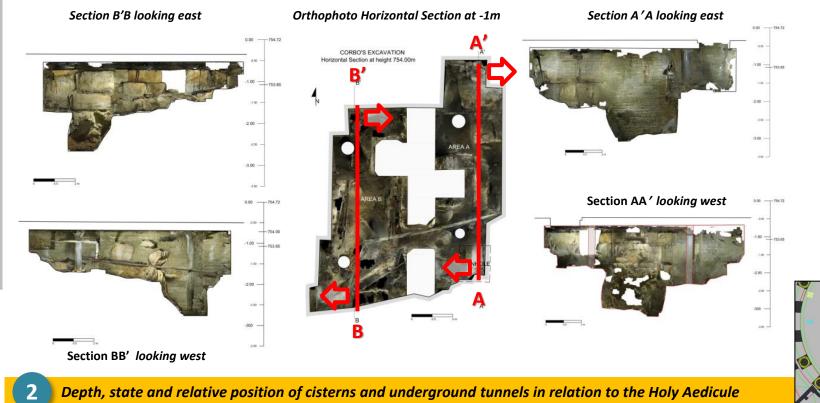
The position of the cisterns &underground tunnels on the ground plan of the Holy Sepulchre Complex.



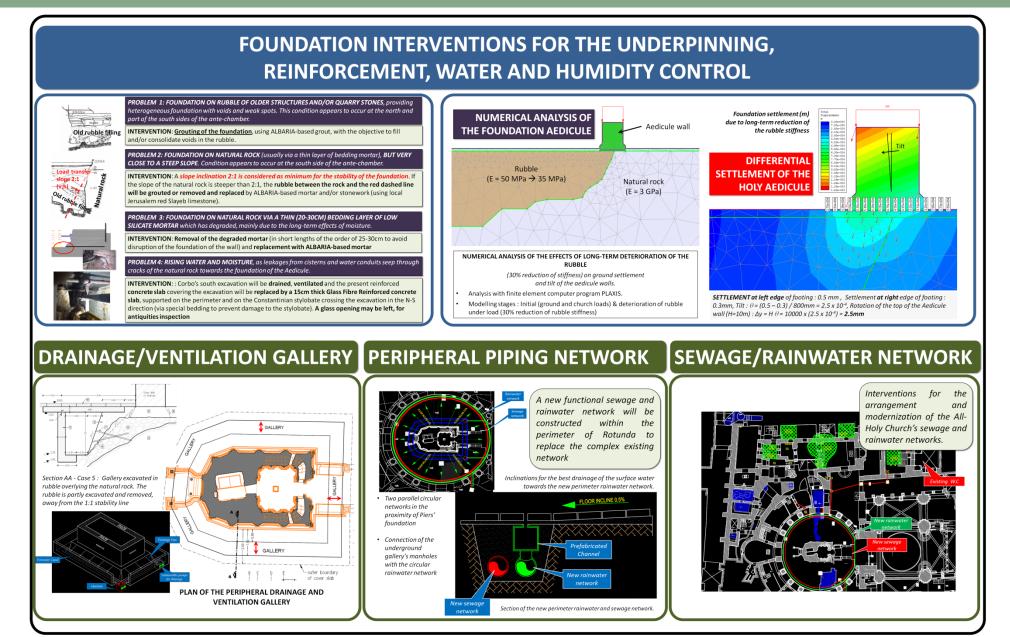
The positions of the cisterns and underground tunnels are presented on the ground plan of the Holy Sepulchre Complex

Cistern	Depth (m)	Situation	Minimum distance from the center of the Holy Aedicule (m)
C1	2.43	without water	3.40
C2	7.30	without water	32.45
C3			34.00
C4			29.85
C5	-	1.45	(*)
C6	11.40	water (0.90m)	23.07
C7	4.79	without water	38.38
C8	0.50	without water	21.38
C9	1.75	without water	18.76
Corbo's excavation	1.00 - 2.65	without water	5.31

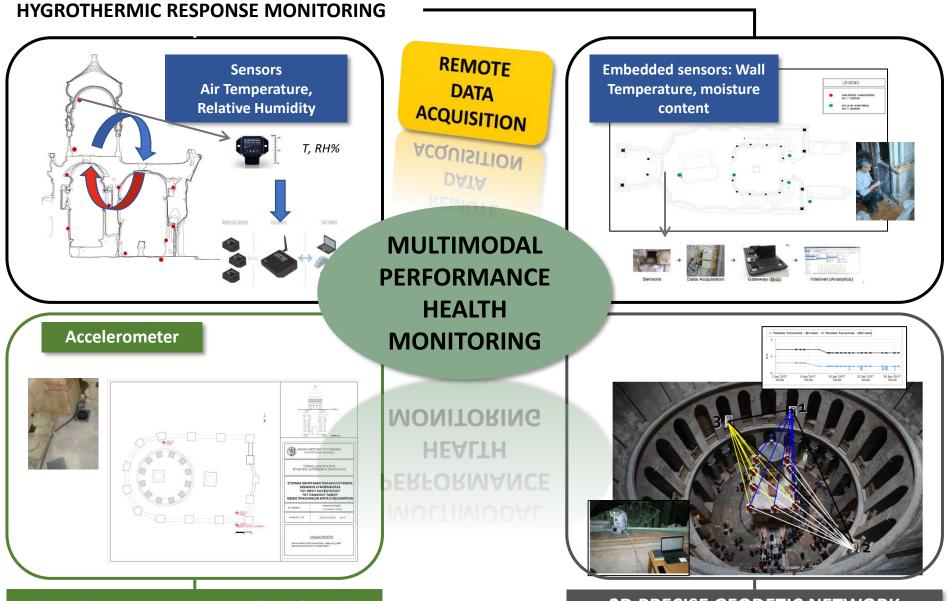
Detailed documentation of underground cisterns



INNOVATIVE METHODOLOGY TO ENSURE SUSTAINABILITY: UNDERGROUND INTERVENTIONS TO REVERSE THE RISK TO SUSTAINABILITY



INNOVATIVE METHODOLOGY TO ENSURE SUSTAINABILITY: MONITORING THE RESPONSE OF THE AEDICULE - MULTISENSORS



STRUCTURAL HEALTH MONITORING

3D PRECISE GEODETIC NETWORK

Innovations of the Holy Aedicule rehabilitation

Dynamic digital documentation as a core space of integration

This interdisciplinary project, within a holistic approach, merges capabilities and know-how from the scientific fields of architecture, civil engineering, surveying engineering, materials science and engineering, information technology, archaeometry and archaeology.

Throughout the project, innovative and high-measuring technologies were applied - with emphasis on non-destructive techniques - to fully document the Holy Aedicule, assess its state of preservation, identify the causes of the observed damages, and monitor all rehabilitation interventions

Innovations of the Holy Aedicule rehabilitation

Dynamic digital documentation as a core space of integration

The three-dimensional reconstruction of the monument provides an integrated core space, enables and optimizes:

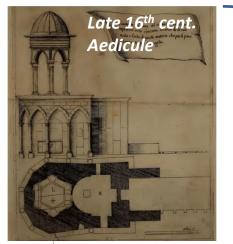
- ✓ Accurate and detailed (3D) design of rehabilitation interventions
- Estimation of required quantities of restoration materials
- Dynamic environment for the optimization and redesign processes throughout all stages of the rehabilitation project
- ✓ Assessment of the rehabilitation, with reference to the main goals

Merging of all necessary information through the 3D data is achieved, by a **fragmented approach**

This provides the basis for TRANSDISCIPLINARITY

INNOVATIVE METHODOLOGY TO REVEAL AND INTERPRET FINDINGS TO PRESERVE AND HIGHLIGHT THE VALUES OF THE MONUMENT

HISTORIC REPRESENTATION OF THE HOLY AEDICULE EVOLUTION BY DIGITAL CORRELATIONS: LATE 16th & EARLY 19th CENT. AEDICULE



Early 19th cent. Aedicule The digital correlation, (NDT prospection, and architectural, geometric and historic documentations) of the late 16th and the early 19th c. Aedicule indicates the probability of embedded parts of the earlier structure:

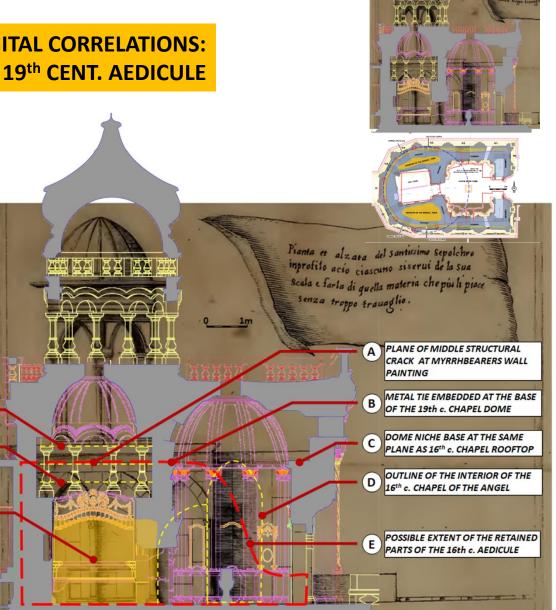
- At the western part, up to the Myrrhbearers area
- At the eastern part, up to 1.5m of the northern masonry of the Chapel of the Angel

Lampropoulos, K.C., Korres, M., Moropoulou, A. "A transdisciplinary approach to reveal the structural evolution of the Holy Aedicule in the Church of the Holy Sepulchre", in Nondestructive Evaluation and Monitoring Technologies, Documentation, Diagnosis and Preservation of Cultural Heritage, Eds. A. Osman and A. Moropoulou. Springer, SPM (2019) 107-120.[DOI: https://doi.org/10.1007/978-3-030-25763-7 8

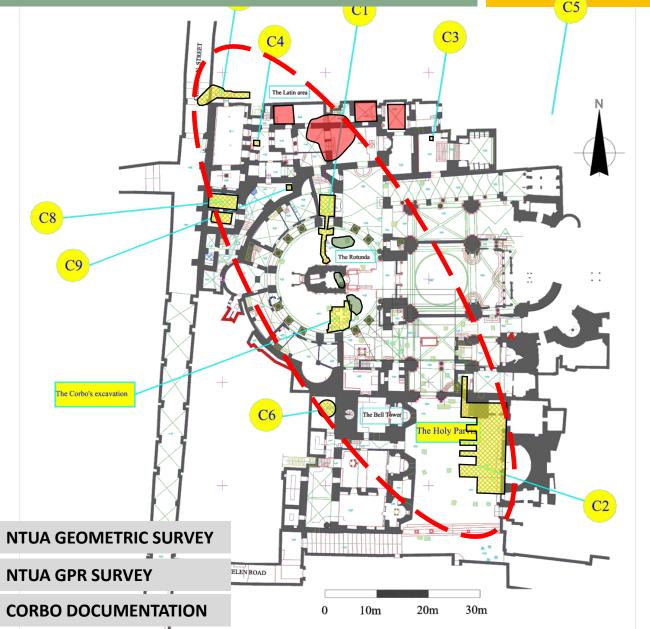
y PLANE OF UPPER STRUCTURAL CRACK AT MYRRHBEARERS WALL PAINTING PLANE OF LOWER STRUCTURAL CRACK AT MYRRHBEARERS

> REMNANTS OF ORIGINAL AEDICULE (HOLY ROCK)

WALL PAINTING



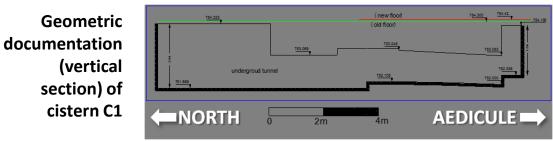
ACHIEVING THE PROJECT'S GOALS: 2. REVEALING AND PRESERVING VALUES



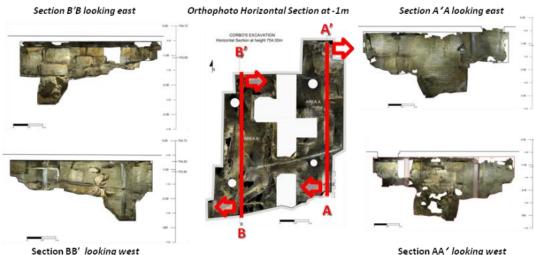
ARCHAEOLOGICAL SEMANTICS OF THE UNDERGROUND AREA OF THE CHURCH OF THE HOLY SEPULCHRE

The Holy Aedicule is located at the center and above a **cluster of underground cisterns**, and natural and manmade **underground voids** and spaces

NTUA Laboratory of Photogrammetry



Geometric documentation of Corbo's Excavation

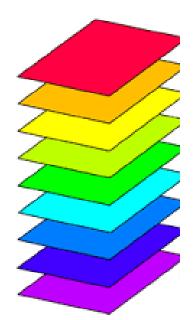


Innovative Multilayer Data Management – Platform Architecture

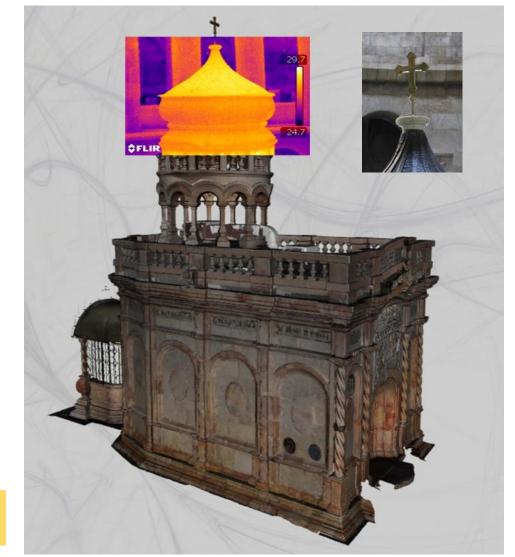
Content-Based Management through Semantic Data Integration

Multilayer Management of Information Big Data Integration

- Non destructive Testing
- Analytical Techniques
- Spatial
- Historic
- Time, etc.





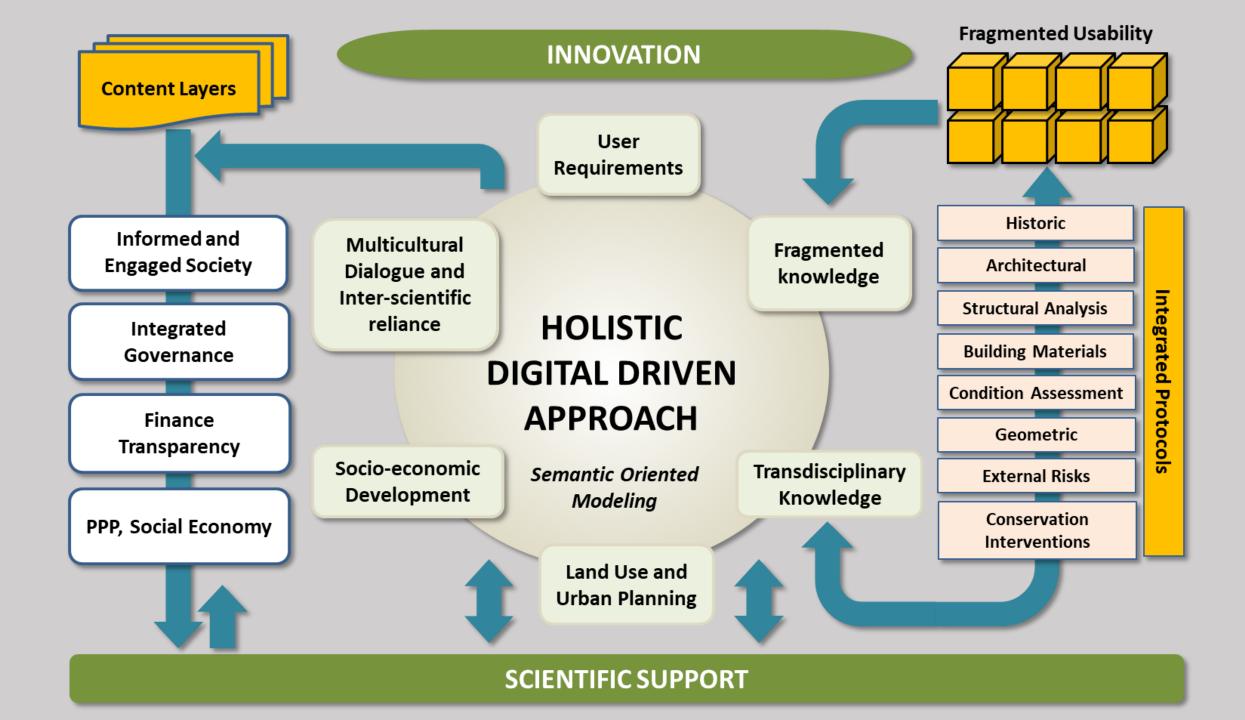


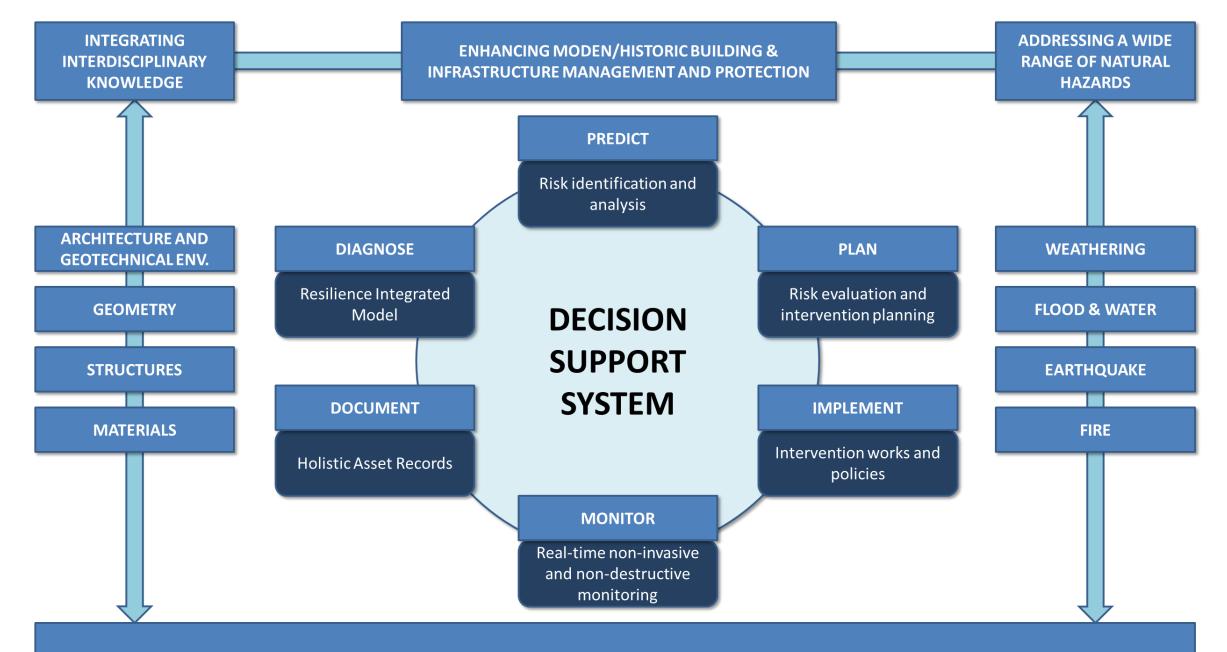
Platform as the cornerstone for data management, knowledge acquisition & information sharing

The exemplary project of the Holy Aedicule rehabilitation demonstrates the interrelated issues encountered during such a socially, scientifically and technically challenging effort. These were successfully addressed through the **dynamic utilization of Innovation, within a new holistic approach** to the effective safeguarding and management of CH assets

> Science and Engineering, at the disposal of Society, and through a joint decision support system ensures the effective safeguarding and management of Cultural Heritage







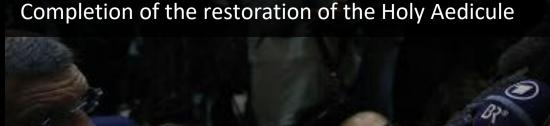
SOCIO-ECONOMIC SUSTAINABILITY AND POLICY

INNOVATION ENHANCING SOCIAL ACCESSIBILITY: BRINGING THE WORLD TO THE TOMB OF CHRIST

Communication strategy of the project

The National Geographic Society and the Media were present and disseminated to the rest of the world critical, stages of the project, in conjunction with the Steering Committee Meetings:

- July 2016 Dismantling and removal of the stone panels
- October 2016 Lifting of the stone of the Tomb
- December 2016 Resetting of columns, homogenization of structural layers and consolidation of the Holy Rock by the injection of compatible grouts
- February 2017 Removal of iron frame
- March 2017





Strategic cooperation of the National Technical University of Athens, the three Christian Communities and the National Geographic Society on the news for the opening of the Tomb of Christ and on to the Tomb of Christ Exhibition

Fredrik Hiebert, National Geographic Archaeologist-in-Residence **Kristin Romey**, staff writer covering archaeology and paleontology for National Geographic

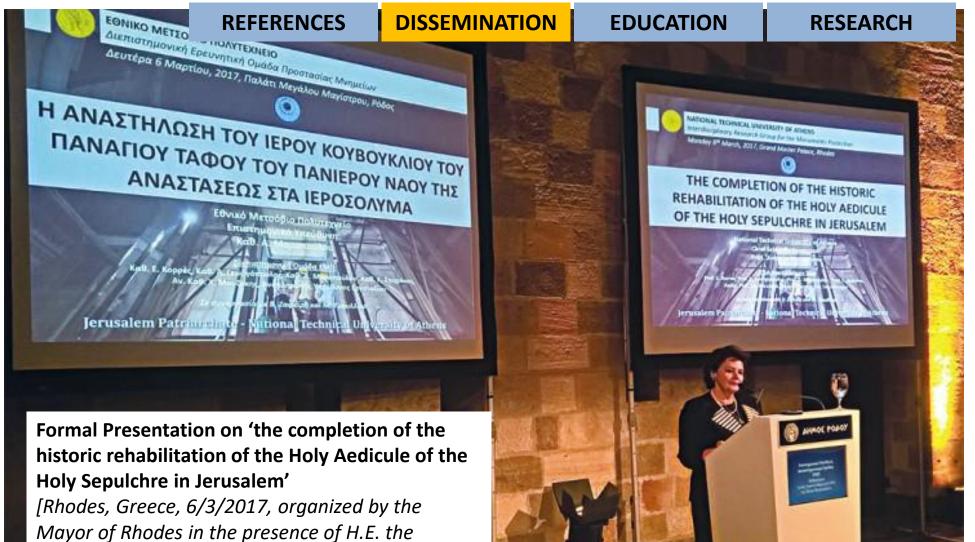
Exclusive: Christ's Burial Place Exposed for First Time in Centuries by Kristin Romey, published October 26, 2016 https://news.nationalgeographic.com/2016/10/jesus-tomb-opened-church-holy-sepulchre/

Unsealing of Christ's Reputed Tomb Turns Up New Revelations by Kristin Romey, published October 31, 2016 https://news.nationalgeographic.com/2016/10/jesus-christ-tomb-burial-church-holy-sepulchre/

When the Tomb was opened after 500 years, two billion people kneeled, in spirit, in front of the Tomb of Christ



Fredrik Hiebert, National Geographic Archaeologist-in-Residence International Conference on Digital Heritage – EUROMED [Nicosia, Cyprus, 31/10-5/11/16]: Opening of the Conference by H.B. the Greek-Orthodox Patriarch of Jerusalem & Key note lecture: "Study, implementation and monitoring: Scientific integrated governance for the rehabilitation of the Holy Aedicule of the Holy Sepulchre in Jerusalem", a collective work presented by Prof. A. Moropoulou



President of the Hellenic Republic, H.B. the patriarch of Jerusalem and the Religious Leaders of the Christian Communities at the Holy Sepulchre]: Honoured presentation by Prof. A. Moropoulou This complex project was implemented and completed with Innovation, setting future trends in the protection of monuments,

as recognized in **Brussels on 14.03.2017** by representatives of the Directorates-General for Research & Development, Education and Culture and ICT/Connect





Innovation and Cultural Heritage High-level Horizon 2020 conference of The European Year of Cultural Heritage *Tuesday 20 March 2018*

Venue: Royal Museum of Arts and History, Park Cinquantenaire, Brussels

Organized by the European Commission Directorate General for Research and Innovation, in close cooperation with Directorates General for Education and Culture and for Communications Networks, Content and Technology

The most promising innovations in the field of cultural heritage, while discussing on policy developments, success stories and future challenges



INVITED SPEECH: DIGITAL SOLUTIONS AND MULTI LAYER DATA INNOVATIONS IN THE REHABILITATION OF THE HOLY AEDICULE OF THE HOLY SEPULCHRE IN JERUSALEM

HORIZON The EU Research & Innovation Magazine

SOCIAL SCIENCES

Link:

https://horizon-magazine.eu/article/digital-innovation-canenhance-cultural-heritage-hears-conference_en.html

Digital conservation

Digital technology is not just a new tool to visualise, explore or consume cultural heritage – it can also α ssist with conservation efforts.

Professor Antonia Moropoulou of the National Technical University of Athens, Greece, spoke in detail about the restoration of the Holy Aedicule in the Church of the Holy Sepulchre in Jerusalem, Israel. She worked with digital specialists to develop a high-resolution 3D model of the Holy Aedicule, which allowed her team to devise the optimal way to restore it. The model allowed them to identify damage that had been done by previous conservation efforts, and to assess how the monument might react to seismic activity in the area, and plan its rehabilitation accordingly.



SOCIAL SCIENCES

Digital innovation can enhance cultural heritage, hears conference

21 March 2018

by Catherine Collins



The Holy Aedicule in the Church of the Holy Sepulchre in Jerusalem was restored with the help of a high-resolution 3D model. Image credit - Flickr/Jorge Láscar, licensed under CC BY 2.0

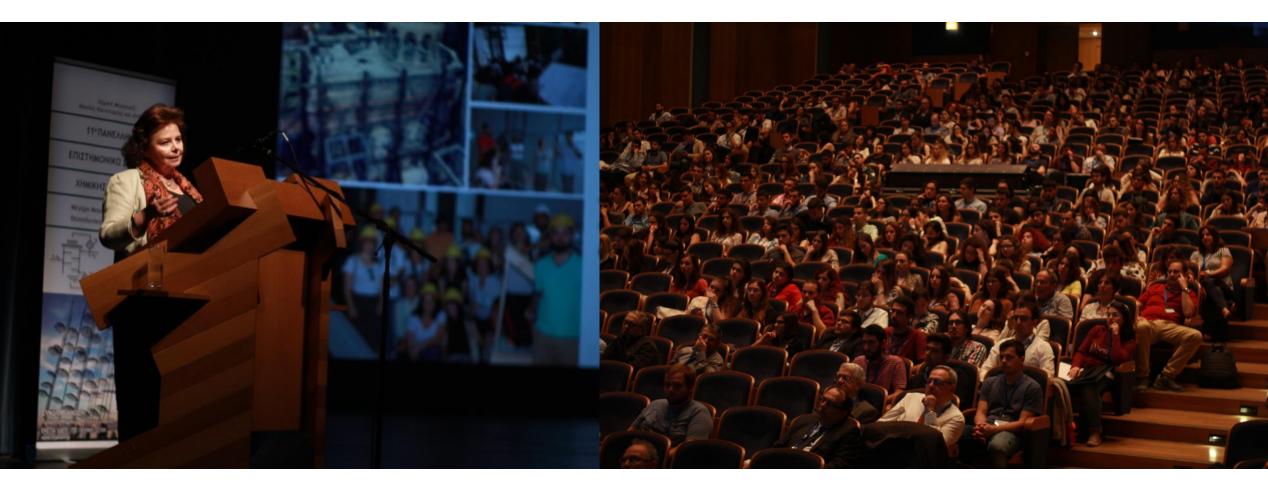
Digitalisation has a role to play in the conservation and promotion of modern-day cultural heritage but should enhance real-life experiences, rather than replace them, experts say.

The Innovation and Cultural Heritage conference, held in Brussels on 20 March 2018, brought together a diverse range of researchers from the fields of science, technology, archaeology, social sciences and humanities, where they showcased their interdisciplinary work in this arena.

The role of Chemical Engineering

in the integrated interdisciplinary governance of the project

11th Panhellenic Scientific Conference of Chemical Engineering [Thessaloniki, 25-27/5/2017]: Invited Speech "Materials and techniques for the reinforcement, restoration and conservation of the Holy Aedicule of the Holy Sepulchre in Jerusalem: The role of Chemical Engineering in the integrated interdisciplinary governance of the project"



TRANSDISCIPLINARITY:

BRIDGING ENGINEERING WITH HISTORY, ARCHAEOLOGY AND THEOLOGY

Exchange of knowledge with scholars:

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Αρχική / Blog / Η ΠΑΡΟ	OYEIAELE TOY						

10th Annual Conference, 26 October 2016, Jerusalem *"New Studies in the Archaeology of Jerusalem and its Region"*

Η ΠΑΡΟΥΣΙΑΣΙΣ ΤΟΥ ΕΡΓΟΥ ΑΠΟΚΑΤΑΣΤΑΣΕΩΣ ΤΟΥ ΙΕΡΟΥ ΚΟΥΒΟΥΚΛΙΟΥ ΕΙΣ ΤΟ ΙΔΡΥΜΑ ΥΑD ΙΖΗΑΚ BEN ZVI.

Τήν μεσημβρίαν τῆς Τετάρτης, 13ης /26ης Όκτωβρίου 2016, ἡ συντονίστρια καθηγήτρια τοῦ

έπιτελούμενον ἕργον τῆς συντηρήσεως καί ἀποκαταστάσεως τοῦ Ἱεροῦ Κουβουκλίου τοῦ

Έλληνικοῦ Μετσοβίου Πολυτεχνείου (Ε.Μ.Π.) κ. Άντωνία Μοροπούλου ἐπαρουσίασε τό ἐπιτυχῶς

Παναγίου Τάφου είς τάς διαφόρους φάσεις, πτυχάς καί προοπτικάς αύτοῦ, ὡς ἐμφαίνεται εἰς τό

Κωνσταντίνης κ. Άριστάρχου, προσκεκλημένην είς τήν πρώτην ήμέρα τῶν ἐργασιῶν τῆς Tenth Annual New Studies in the Archaeology of Jerusalem and its Environs Conference, λαμβανούσης χώραν είς τήν Δυτικήν Ιερουσαλήμ είς τό Ίδρυμα Yad Izhak Ben Zvi. Ἡ παρουσίασις αὕτη μέ τίτλον 'Sustainable Rehabilitation of the Holy Sepulchre. An Interdisciplinary Scientific Study and Monitoring, a Scientific intergrated Governance of the Project, ἀναρτηθήσεται προσεχῶς είς

video, εύλογία καί παρουσία τῆς Α.Θ.Μ. τοῦ Πατρός ἡμῶν καί Πατριάρχου Ἱεροσολύμων κ.κ. Θεοφίλου, συνοδευομένου ὑπό τοῦ Γέροντος Ἀρχιγραμματέως Σεβασμιωτάτου Ἀρχιεπισκόπου

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βίντεο.

Έκ τῆς Άρχιγραμματείας.

26/10/2016 Κοινοποίηση f y 8*

Κατηγορίες

- Ανακοινωθέντα
- Ανακοινώσεις Ιστοχώρου
- Αρθρογραφία
- Δραστηριότητες Πατριάρχου
- Γράμματα Μηνύματα
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- Λειτουργική ζωή
- Όμιλίαι Διάφοροι
- Συνοδικαί ἀποφάσεις

Άναζήτηση

Εῦρεση	Q
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https://jerusalem-patriarchate.info

TRANSDISCIPLINARITY: BRIDGING ENGINEERING WITH HISTORY, ARCHAEOLOGY AND THEOLOGY

Exchange of knowledge with scholars:



TRANSDISCIPLINARITY:

BRIDGING ENGINEERING WITH HISTORY, ARCHAEOLOGY AND THEOLOGY

Oxford, October 2017

5th aniversary of the Mica and Ahmet Ertegun Graduate Scolarship Program in the Humanities

SALVAGUARDARE per IMMAGINARE



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ulos Prof. A. Mo ssist, Prof. Ch. Mouzakis, Deputy Co

CI EDIP NTUA Dr. E.T. Delegou, PhD Co

Στο Πανεπιστήμιο της Οξφόρδης 24/10/17

Biblioteca Ambrosiana Piazza Pio XI, Milano Venerdì 5 e sabato 6 maggio 2017



GIORNATE DI ARCHEOLOGIA E STORIA DEL VICINO E MEDIO ORIENTE

VENERDÌ 5 MAGGIO | MATTINA

Ore 10.30-12.30 | Lectio Magistralis | I restauri della tomba di Cristo PROFESSORESSA ANTONIA MOROPOULOU, Università tecnica nazionale di Atene

LECTIO MAGISTRALIS, Biblioteca Ambrosiana, Milano, Maggio 2017, **GIORNATE DI ARCHEOLOGIA E STORIA DEL VICINO E MEDIO ORIENTE**

TRANSDISCIPLINARITY:

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Institut für Christkatholische Theologie, März 2018, Hauptgebäude, Universität Bern

Festival Biblico: Un modo nuovo per incontrare la Bibbia, May 2018, Vicenza





World ► Europe US Americas Asia Australia Middle East Africa Inequality Cities Global development



Jesus's tomb in Jerusalem exposed during conservation work

Shelf where Jesus's body is thought to have been taken after crucifixion is exposed in \$4m restoration of Church of the Holy Sepulchre

CORREIO BRAZILIENSE Ciência e Saúde

Cientistas descobrem gruta no Santo Sepulcro, onde Jesus foi sepultado

Os estudiosos serão capazes de ver a superfície da rocha original sobre a qual, de acordo com a tradição, o corpo de Cristo foi depositado



Pedra de mármore que cobre a sepultura vista da entrada da edícula

PARIS MATCH - 23/03/2017 - N* 3540

PARIS MATCH - 23/03/2017 - N* 3540

LE SAINT-SEPULCRE REVELE AUX YEUX DU MONDE

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LES COMMUNALITÉS CHRÉTIENNES DE TERRE SAINTE SE SONT ENFIN ACCORDÉES SUR LA RESTAURATION DU TOMBEAU DU CHRIST, PARIS MATCH Y ASSISTAIT FINA & COMPANY AND CH

SHAARETZ Thursday, May 10, 2018. Iyyar 25, 5778 Time in Israel: 10:27 PM

Iron Cage Around Holy Sepulchre's Tomb of Jesus Removed After 70 Years

A massive renovation enabled the supporting gird, built by the British, to be dismantled.

Crypt Believed to Be Jesus' Tomb Opened for First Time in Centuries



Workers removing a marble top last week from the tomb said to be of Jesus Christ, in the Church of Holy Sepulcher in Jerusalem. Dusan Vranic/National Geographic, via Associated Press

By Peter Baker



Nov. 3, 2016

JERUSALEM — The only mystical power visible was the burning light from seven tapered candles. And yet for ages, the tomb that sits at the center of history has captured the imaginations of millions around the world.



RESEARCH & INNOVATION

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SOCIAL SCIENCES

Digital innovation can enhance cultural heritage, hears conference

21 March 2018

by Catherine Collins

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The Holy Aedicule in the Church of the Holy Sepulchre in Jerusalem was restored with the help of a high-resolution 3D model. Image credit - Flickr/Jorge Láscar, licensed under CC BY 2.0



News > Science

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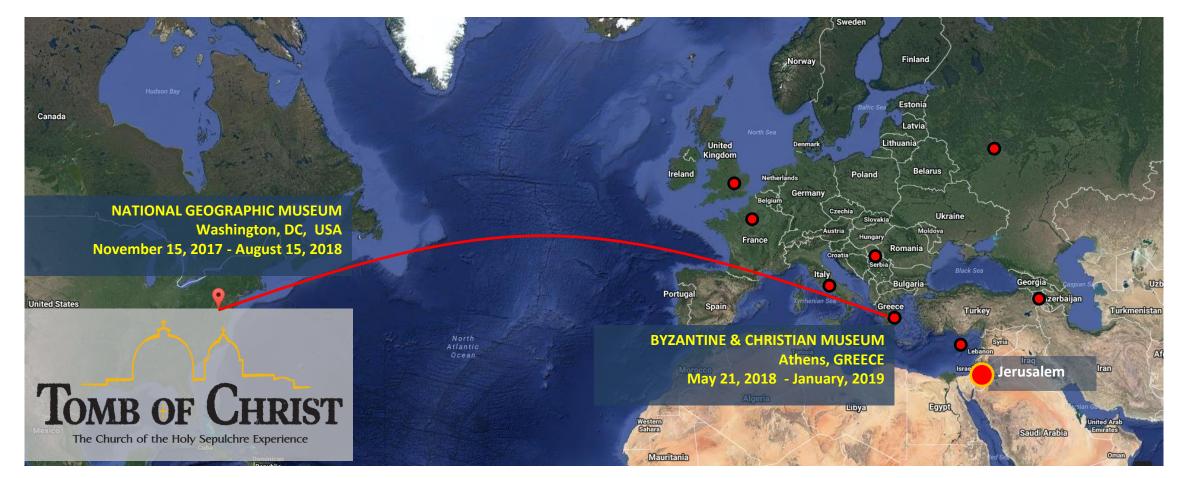
Tomb believed to have held Jesus Christ much older than previously thought, researchers discover

Church of the Holy Sepulchre in Jerusalem widely accepted as site of Christ's burial

Lydia Smith | Wednesday 29 November 2017 08:50 GMT | 💭 233 comments

DIGITAL EXPERIENCE EXHIBITION

The digital solutions and multi layer data innovations in the rehabilitation of the Holy Aedicule are presented in emblematic museums all over Europe and the World towards creating a modern, open and pluralistic society building on Europe's cultural diversity, creativity and respect of creators' rights and its values, in particular democracy, religions & values diversifications, freedom of expression and tolerance











Ο ΠΑΝΑΓΙΟΣ ΤΑΦΟΣ - ΤΟ ΜΝΗΜΕΙΟ ΚΑΙ ΤΟ ΕΡΓΟ -

ΨΗΦΙΑΚΗ ΕΚΘΕΣΗ ΠΡΟΗΓΜΕΝΗΣ ΤΕΧΝΟΛΟΓΙΑΣ

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In the Virtual Multimodal Museum -VIMM Coordination meeting, Thematic Area 1, Berlin, 12.04.2018 at the Ethnologisches Museum, Berlin, the methodology of the exhibition, its products and its values were discussed It was recognized that the appropriate and focused application of augmented technology - as employed – is capable of stimulating emotions to the exhibition visitors, in contrast to typical digital exhibitions of purely "cold" representations

This exhibition is an exemplary case amongst digital exhibitions as the visitors can "travel" in spirit, with the aid of virtual reality.

Other museums around the world have expressed their interest in hosting the exhibition

The kind of experience these exhibitions offer provides an opportunity for those who do not have or cannot visit Jerusalem and the Church of the Holy Sepulchre to obtain an experience of the Holy Sepulchre and its values and to recognize its importance and collaborations of the Restoration Project





XVIII EDIZIONE 2019 TRE TARGHE D'ARGENTO E CINQUE MEDAGLE DEL PRESIDENTE DELLA REPUBBLICA ITALIANA MEDAGLIA DEL PRESIDENTE DELLA CAMERA DEI DEPUTATI

Under the generation of the Republic, Chember of Deputies, Prevident of the Cohinet, Ministry of Foreign Affairs, Ministry of Deputies, Previdency of the Cohinet, Ministry of Defence, Cyprus Olimpic Committee, CON.1, 1, 5, 5, 25, 37 – Institute of Justiceal, Economical and Social International Heritage, Ministry of Defence, Cyprus Olimpic Committee, CON.1, 1, 5, 5, 25, 37 – Institute of Anthonic Culture "St. Michael Archangel", Studies, Uomo e Società International Association of Friedulpia Juanog Nationa, Control Culture "St. Michael Archangel", Association of Friedulpia Juanog Nations

Rome, 2nd May 2019

Mr. Antonia Moropoulo

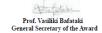
Dear Mrs. Moropoulou,

We are delighted to inform you that the Jury of the XVIII Edition of the "Giuseppe Sciacca" International Award, chaired by His Eminence, the Most Reverend Cardinal Raymond Leo Burke, has nominated you for the Prize for Science.

The solemn prize-giving ceremony, in the presence of the ecclesiastical, civil and military authorities, and with the participation of the national and international press and television networks, will lake place in the Great Hall of the Pontifical Urbaniana University - Vatican City, on Statukay, November 9^6 , 2019, at 5:30 p.m.

Looking forward to knowing whether you are going to accept the prize by participating to the above mentioned solemn prize-giving ceremony, we kindly ask you to receive our best regards.

Sincerely yours



Prof. Dott. Don Bruno Lin President of the Award

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The President of the Technical Chamber of Greece Assembly Presidium, Tonia Moropoulou,

was awarded the prestigious and highly honorary Giuseppe Sciacca International Award

The awards are guided by cultural, scientific and social volunteering and she will be awarded for her overall work in the field of Science

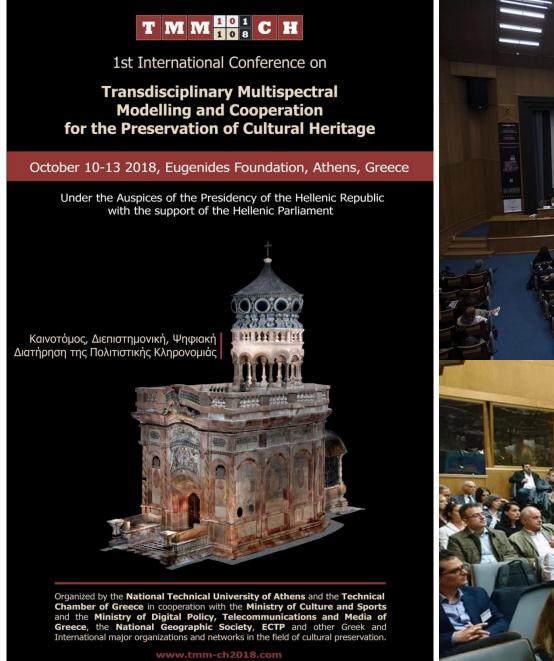
Indicatively, it is noted that other Greeks who have been honored include Konstantinos Daskalakis, Eleni Antoniadoy, Auxentios Kagos, and other.

The solemn prize-giving ceremony took place in the Great Hall of the *Pontifical Urbaniana University* – Vatican City, on November 9th, 2019.

As commented by Prof. A. Moropoulou,

«This award belongs to Greece, the Greek Scientific Community, the Greek Engineers and the National Technical University of Athens and mainly to the interdisciplinary team that completed the emblematic restoration project of the Holy Aedicule of the Holy Sepulcher» **"Giuseppe Sciacca" International Award** 9th November 2019, Vatican City













2nd International Conference TMM-CH Transdisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage Recapturing the World in Crisis through Culture

13-15 December 2021 Eugenides Foundation Athens, Greece

Open Access Panels - Videos

https://www.tmm-ch.com/

The Conference is organized under the patronage of H.E. the President of the Hellenic Republic, Ms Katerina Sakellaropoulou, by the National Technical University of Athens in cooperation with the Technical Chamber of Greece and the organization AHEPA Hellas. Distinguished scientists and representatives of the National Geographic Society, the Cultural Heritage Finance Alliance, the International Council of Monuments and Sites ICOMOS, the Organization of World Heritage Cities OWHC, the European Society for Engineering Education SEFI, the European Construction Technology Platform ECTP, the International Federation of Surveyors FIG, the International Committee CIPA Heritage Documentation, the World Monuments Fund and other major International and European Organizations, Associations, networks Universities and Research Centers, participate in the International Steering and Scientific Committees.







https://www.tmm-ch.com/



3rd International Conference TMM-CH

Transdisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage

Recapturing the World in Conflict through Culture promoting mutual understanding and Peace

20-23 March 2023 Eugenides Foundation Athens, Greece

IMPORTANT DATES First announcement and Call for Participation July 5th, 2022 Extended Abstract Submission Deadline 30 October 30th, 2022 Notification of Acceptance/Rejection November 3rd, 2022 Full paper submission deadline 13 January 13th, 2022 Notification of author's acceptance February 3rd, 2023 Announcement of preliminary program February 3rd, 2023 Completion of early bird registration 20 February 20th, 2023 Revised paper submission 20 Further revisions may be requested to comply with specific publication requirements February 20th, 2023 Announcement of the final program February 23th, 2023 **Conference dates** March 20th-23rd, 2023 Publications of papers 2023 Post Conference, end 2023

PUBLICATIONS RELATED TO THE REHABILITATION OF THE HOLY AEDICULE

- Journal of Construction and Building Materials: "Ground penetrating radar prospection of the construction phases of the Holy Aedicula of the Church of the Holy Sepulchre, in correlation with architectural analysis", K. Lampropoulos, A. Moropoulou, E. Korres, vol 155 (2017) 307-322
- Springer-Nature Book on Mixed Reality and Gamification for Cultural Heritage Chapter: "Five Dimentional (5D) Modeling of the Holy Aedicule of the Church of the Holy Sepulchre through an innovative and interdisciplinary approach", A. Moropoulou, A. Georgopoulos, M. Korres, A. Bakolas, K. Labropoulos, P. Agrafiotis, E.T. Delegou, †P. Moundoulas, M. Apostolopoulou, E. Lambrou, G. Pantazis, L. Kotoula, A. Papadaki, E. Alexakis (2017) 247-270
- Journal of the American Society of Civil Engineers: «Faithful Rehabilitation. History, culture, religion, and engineering all intertwined in a recent project in Jerusalem to rehabilitate and strengthen the site believed to be the tomb of Jesus of Nazareth. Modern methods, including 3-D laser scanning, Non Destructive Techniques and ground-penetrating radar, combined with careful documentation and design, revealed the secrets of how to help preserve and sustain the ancient site for future generations » A. Moropoulou, E. Korres, A. Georgopoulos, C. Spyrakos, Ch. Mouzakis, E. Lambrou, G. Pantazis, M. Kavvadas, P. Marinos, N. Moropoulos, V. Zafeiris, K. Lampropoulos, M. Apostolopoulou, Ch. Maniatakis, M. Agapakis, J. Agapakis, A. Fragkiadoulakis. [November 2017]

PUBLICATIONS RELATED TO THE REHABILITATION OF THE HOLY AEDICULE

- Journal of Archaeological Science: Reports: « OSL mortar dating to elucidate the construction history of the Tomb Chamber of the Holy Aedicule of the Holy Sepulchre in Jerusalem", A. Moropoulou, N. Zacharias, E.T. Delegou, M. Apostolopoulou, E. Palamara, A. Kolaiti, vol 19 (2018) 80-91
- Journal of Sociology and Antrhopology: "Interdisciplinary planning and scientific support to rehabilitate and preserve the values of the Holy Aedicule of the Holy sepulchre in interrelation with social accessibility", A. Moropoulou, C.M. Farkakidi, K. Lampropoulos, M. Apostolopoulou, vol 6(6) (2018) 534-546
- Journal of Construction and Building Materials: "Study of the historical mortars of the Holy Aedicule as a basis for the design, application and assessment of repair mortars: A multispectral approach applied on the Holy Aedicule", Apostolopoulou, M., Delegou, E.T., Alexakis Emm., Kalofonou, M., Lampropoulos, K.C., Aggelakopoulou, E., Bakolas A., Moropoulou, A., vol 181 (2018) 618-637
- Journal of Construction and Building Materials: "NDT as a Monitoring tool of the works progress and assessment of materials and rehabilitation interventions at the Holy Aedicule of the Holy Sepulchre", Alexakis, Emm. Delegou, E.T., Lampropoulos, K.C., Apostolopoulou, M., Ntoutsi, I., Moropoulou, A., vol 189 (2018) 512-526

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- International Journal of Architectural Heritage: "Novel, Sustainable Preservation of Modern and Historic Buildings and Infrastructure. The paradigm of the Holy Aedicule's Rehabilitation», A. Moropoulou, K. Lampropoulos, M. Apostolopoulou, E. Tsilimantou, 15:6 (2021) 864-884
- Heritage: "The Grouting Process as an Innovative Tool for the Assessment of the State of Preservation and Internal Features of the Holy Aedicule of the Holy Sepulchre", K.C. Lampropoulos, M. Apostolopoulou, E. Tsilimantou, A. Moropoulou, 5 (2022) 61–87
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PERSPECTIVES

The Holy Aedicule has been rehabilitated and ensured

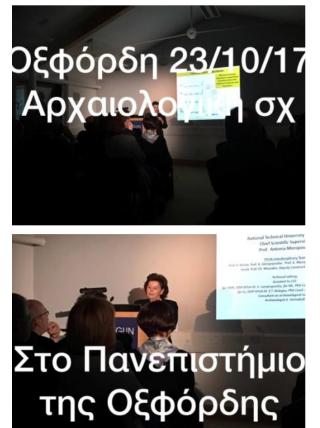
Research continues

- Concerning historical materials in relation to technology, provenance, archaeometry, etc
- The development of all data on the platform in 5 dimensions with layers of scientific information
- → Representation of the historical phases of the monument according to the data

Sustainability has to be ensured

- Monitoring
- Underground works

Dissemination



24/1

Jerusalem Patriarchate - National Technical University of Athens

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REFERENCES



EDUCATION

RESEARCH

The Hardword of the television of televisi

The Holy Sepulchre, a world centre of religious, scientific, cultural interest, a centre of pilgrimage, a centre of Education, Research and Innovation



CEREMONY MARKING THE COMPLETION OF THE HOLY AEDICULE REHABILITATION PROJECT

MARCH 22nd 2017

THE TOMB OF CHRIST: A MONUMENT WHICH UNITES CHRISTIANITY, THE CONFLAGRATED MIDDLE EAST, THE ECUMENE, WITH CONTEMPORARY GREECE AT THE CENTER









ITS HISTORY IS UNDER THE STUDY OF THE SCHOLARS OF THE WORLD

THE HOLY AEDICULE TODAY: ITS JOURNEY INTO LIGHT

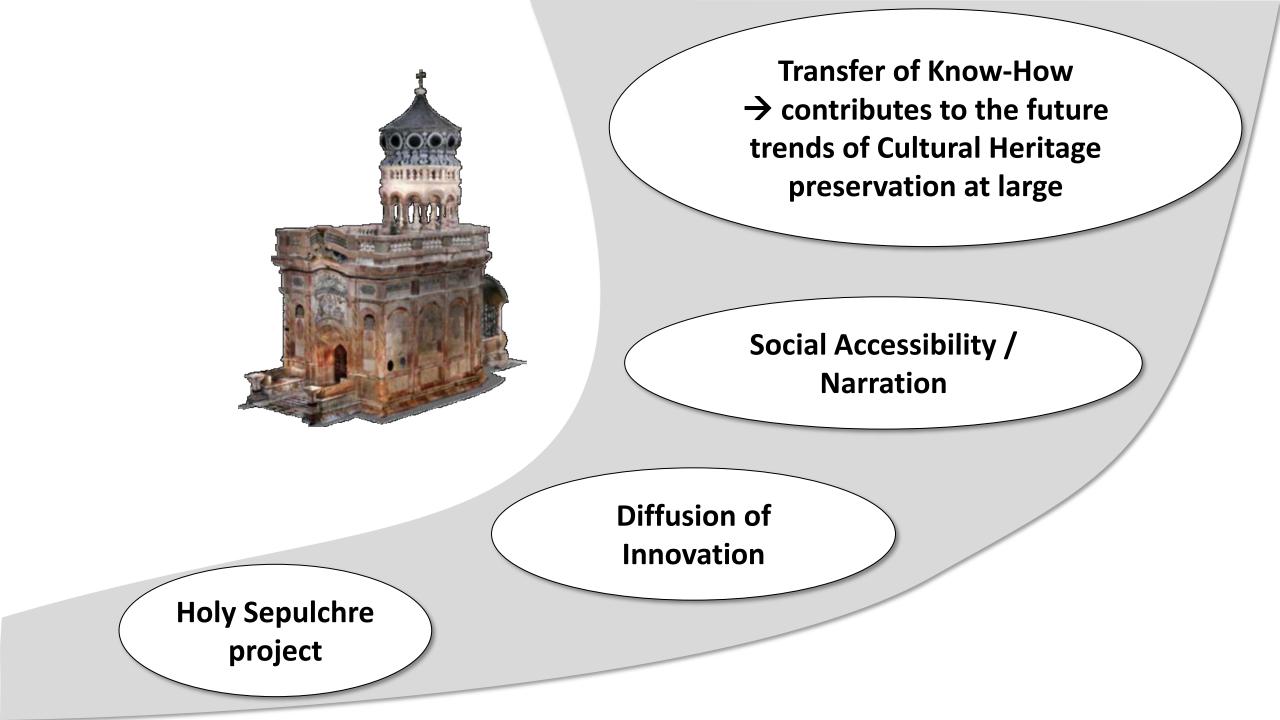
THE TOMB OF CHRIST IS AN ALIVE MONUMENT THAT TALKS TO ALL HUMANITY

INNOVATION ONLY AMPLIFIES ITS VOICE

Photo/Gali Tibbon 🔘

3D Representation of the Holy Aedicule Model Before and After Rehabilitation

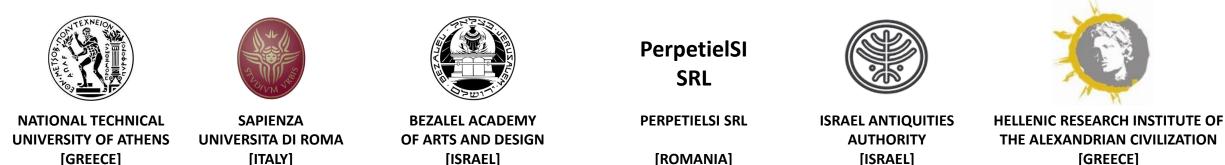




EDICULA

Educational Digital Innovative Cultural heritage related Learning Activities

Project Code: 2020-1-EL01-KA203-079108



EDICULA Innovative Interdisciplinary Synthetic Methodology with reference to the Holy Aedicule rehabilitation project

Co-funded by the Erasmus+ Programme of the European Union







EDICULA



Educational Digital Innovative Cultural heritage related Learning Activities Project Code: 2020-1-EL01-KA203-079108



Co-funded by the

Erasmus+ Programme

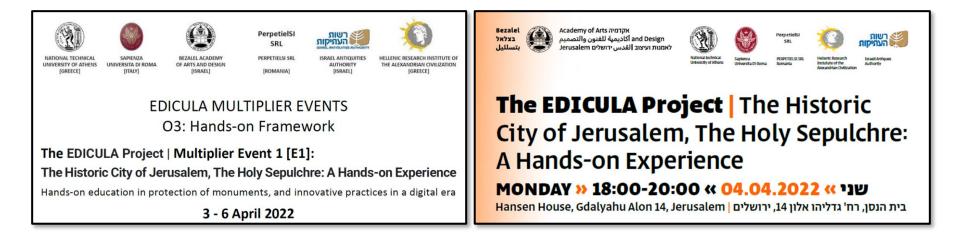
of the European Union

Educational activities for the transfer of the knowhow that we developed in the project, with the <u>National Technical University of Athens</u> – NTUA as the coordinator of the European **Erasmus + Program EDICULA** and participating institutions: <u>University of Sapienza in Rome</u> (Italy), the <u>Bezalel Academy of Arts and Design</u>, Jerusalem (Israel), <u>Israel Antiquities Authority</u> – IAA (Israel), the <u>Hellenic Research Institute of the Alexandrian Civilization</u>-HRIAC (Greece), so as to continue offering and exchanging knowhow and experiences augmenting the continuation of the works in the Church of the Holy Sepulchre, on this occasion with the responsibility of the Italians, as well as to other World Cultural Heritage rehabilitation and protection projects.

In the current world state of dramatic crisis for Peace, let this Unity in the Light of the Holy Sepulchre, shine the Resurrection of Humanity The NTUA interdisciplinary Team with the <u>Greek-Orthodox Patriarch of Jerusalem</u>, in the framework of the European program Erasmus+ EDICULA for the **knowhow transfer from the Holy Aedicule rehabilitation project**, internationally with the <u>University La Sapienza of R</u>ome, <u>Bezalel Academy of Arts – Jerusalem</u>, the <u>Israeli Antiquity Authorities</u>, the Hellenic Research Institute of Alexandrian Civilization (<u>HRIAC</u>) and <u>PerpetielSI</u>.

Multiplier event in Jerusalem 03-06.04.2022

- Transferring the knowhow developed by NTUA through the Rehabilitation of the Holy Aedicule of the Holy Sepulchre in Jerusalem universities of the Consortium to the "Sapienza University of Rome" and the "Bezalel Academy of Arts and Design"
- In the Holy Sepulchre with the permission of the Custodians of the Holy Sepulchre
- In historic monument of the Historic City of Jerusalem in cooperation with the Israeli Antiquity Authorities





















EDICULA

Educational Digital Innovative CUltural heritage related Learning Activities

THE EDICULA IMMERSIVE EVENT 19 December 2022 || 10:30-14:30

National Technical University of Athens, Patission Campus, Averof Building, Kaftatzoglou Ceremony Hall

LIVESTREAMING https://www.youtube.com/watch?v=lbecgt3Hsys

EDICULA is an innovative educational approach that <u>fuses</u> the interdisciplinary collaboration among the sectors of applied sciences in the protection of monuments with humanities disciplines using extended reality (XR) technologies and hands on experience, to develop an <u>educational framework to advance</u> <u>scientific transdisciplinary synthesis</u>

http://edicula.eu/



The EDICULA Immersive Event is <u>complimentary</u> to the **EDICULA Hands-on experience (in Jerusalem and Alexandria)** and the **EDICULA digital games**, while expanding the EDICULA framework into other **grand challenges** in cultural heritage and **bridging the gap between XR community and cultural heritage end-users**.

It includes:

• The current presentation of the <u>EDICULA innovative interdisciplinary synthetic</u> <u>methodology with reference to the Holy Aedicule rehabilitation project</u>





11:15-12:30 || The Alexandria Immersive Experience

11:15-11:45 || The Alexandria Immersive Experience

The excavation works at the Shallalat Gardens in Alexandria. Meeting the innovations of the Holy Aedicule rehabilitation within EDICULA: New perspectives in excavation strategies

Dr. Kalliopi Papakosta, Hellenic Research Institute of the Alexandrian Civilization

11:45-12:30 || The Alexandria Immersive Experience

Assoc. Prof. Anastasios Doulamis || Bridging the gap between XR community and CH end-users

Margarita Skamantzari – Ioannis Georgoulas || Digital Games of the Holy Sepulchre

Prof. Andreas Georgopoulos – Dr. Sevasti Tapinaki || 3Dimensional geometric documentation in Alexandria: A challenge for EDICULA

Dr. Ekaterini Delegou || Hands-on methodology in Alexandria using Non Destructive Techniques

The presentation of the excavation at the Shallalat Gardens in Alexandria immersive experience through:

- the presentation of the excavation works and the new perspectives that they can advance in excavation strategies through the EDICULA innovative approach,
- the interdisciplinary immersive approach through the 3Dimensional geometric documentation and the hands-on methodology using NDTs, combined with the EDICULA digital games as means to better comprehend real-time, real-scale grand challenges like an excavation.



11:15-11:45 || The Alexandria Immersive Experience

The presentation of the excavation at the Shallalat Gardens in Alexandria immersive experience projects to the future:

- i. The presentation of the excavation works implies the need for further exploration and merging of the various categories of data through the 3Dimensional geometric documentation and the handson on-site methodology using Non-Destructive Techniques
- ii. During the "Alexandria hands-on workshop" in June 2022 the production of 3Dimentional and Non-Destructive in situ educational material took place under the scientific responsibility of the NTUA EDICULA Team, leaded by Prof. A. Moropoulou and will be presented later today by Prof. Andreas Georgopoulos and Dr. Aikaterini Delegou.



The immersive experience in the Shallalat excavation in Alexandria, acts as an exemplary test case.

In this direction, the EDICULA transdiciplinary know-how developed at the rehabilitation of the Holy Sepulchre expands the EDICULA framework into other grand challenges in Cultural Heritage.

The new perspectives initiated in excavation strategies through the EDICULA innovative approach will permit a better understanding of the historic layers under discovery and will promote the reconstruction of History and of historical sites in real-scale through the centuries.



12:30-13:30 || EDICULA methodology transfer for the rehabilitation and restoration of Monuments

The case of the Varnakova Monastery in Fokis: The rehabilitation of the Katholikon

Athanasia Psalti || The archaeological approach and supervision

Timoleon Kouimtzoglou || Architectural survey and documentation

Julia Vobiri - Georgios Andriotakis || Architectural approach

Assoc. Prof. Haris Mouzakis || Structural integrity and earthquake protection aspects

Dr. Maria Apostolopoulou || Interdisciplinary methodology

EDICULA methodology transfer for the rehabilitation and restoration of Monuments

The case of the Varnakova Monastery in Fokis: The rehabilitation of the Katholikon

The presentation of the case of the **Varnakova Monastery in Fokis rehabilitation** of the Katholikon, where the transdisciplinary EDICULA methodology is also being transferred taking into consideration the challenges of big scale and emblematic monuments rehabilitation.

EDICULA

Educational Digital Innovative CUltural heritage related Learning Activities

THE EDICULA IMMERSIVE EVENT 19 December 2022 II **10:30-14:30** National Technical University of Athens, Patission Campus, Averof Building, Kaftatzoglou Ceremony Hall

13:30-14:30 || Panel Discussion

Moderators || Dr. Kalliopi Papakosta – Prof. Antonia Moropoulou – Dr. Amalia Androulidaki

Conclusive discussion by the speakers and invited stakeholders and EDICULA Erasmus+ partners