

THE HERITAGE ISSUE

A Quarterly Newsletter by APTi South Asia

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A Historic Preservation Podcast



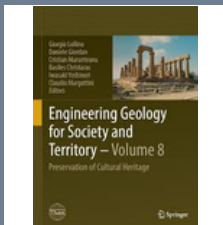
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PRESERVATION ENGINEERING



When we talk about the built heritage, the significance of a structure extends far beyond its architectural beauty or aesthetic appeal. It reflects the social, cultural, and historical values of its time.

This edition of the APT South Asia Chapter's publication, The Heritage Issue, themed "Preservation Engineering," delves into how engineering plays a crucial role in unveiling this deeper understanding. It allows us to look beyond the surface—to examine the hidden stresses, accumulated damages, material decay, and the overall structure of a building. Preservation engineering gives us the tools to document and analyse these distresses with precision, enabling us to make informed, evidence-based decisions. Through structural assessments, material analysis, and innovative intervention techniques, engineers contribute to the sustainable longevity of heritage structures—ensuring they remain safe, resilient, and meaningful for future generations.

Dig in to learn more!



South Asia

The Association for Preservation Technology International
L'Association internationale pour la préservation et ses techniques



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@APTi South Asia Chapter

www.aptsouthasia.com

From the Editorial Team

This edition of **The Heritage Issue** dives into the theme of '**Preservation Engineering**' focusing on understanding the value of engineering and engineering principles in the field of preservation. With this theme, articles on this news letter highlights the role of preservation engineering in integrating new technology With tradition systems to stabilize historic structures while maintaining their aesthetics and integrity.

The section of *Institutionalizing Heritage* highlights the restoration approach adopted by Savani Heritage for the Rajabai Clock Tower and Library Building. The project, which received the prestigious UNESCO Asia-Pacific Award for Cultural Heritage Conservation, showcases a structured and methodical approach to conservation — grounded in a deep understanding of historical construction techniques. It also emphasizes the critical role of non-destructive testing (NDT) in assessing the building's condition, enabling informed and sensitive interventions.

Adding another layer of insight is a podcast featuring Dr. Arun Menon, offering an engaging discussion on the role of structural engineering in heritage conservation. Dr. Menon emphasizes the critical importance of interdisciplinary collaboration — highlighting how engineers, architects, conservators, material scientists etc. must work together to develop holistic conservation strategies. He reflects on how meaningful preservation is achieved not through isolated efforts, but through the integration of different disciplines.

A noteworthy contribution in the section '*Starting Young to Care for the Old*' explores the emerging field of non-destructive testing (NDT) in historic conservation in India and its potential applications by Tejal Shoratiya. The article demonstrates how these tools enable engineers to assess the condition of heritage structures without inflicting damage. By facilitating minimally invasive and context-sensitive interventions, these technologies support restoration strategies that preserve the authenticity and integrity of historic structures.

Lastly, the review of book 'Engineering Geology for Society and Territory – Volume 8 - Preservation of Cultural Heritage' reviewed by Prof. Michael Tomlan talks about engineering geology. The book is a helpful collections of essays for emerging professionals who become involved in any conservation project below or above ground.

- Khushi Shah

"Execution Chronicles of the UNESCO Asia Pacific Award Project: The Rajabai Clock Tower and Library Building "

Jagrut Savani | Lakshmi R | Nishigandha Karpe
Images by Savani Heritage Conservation Pvt. Ltd

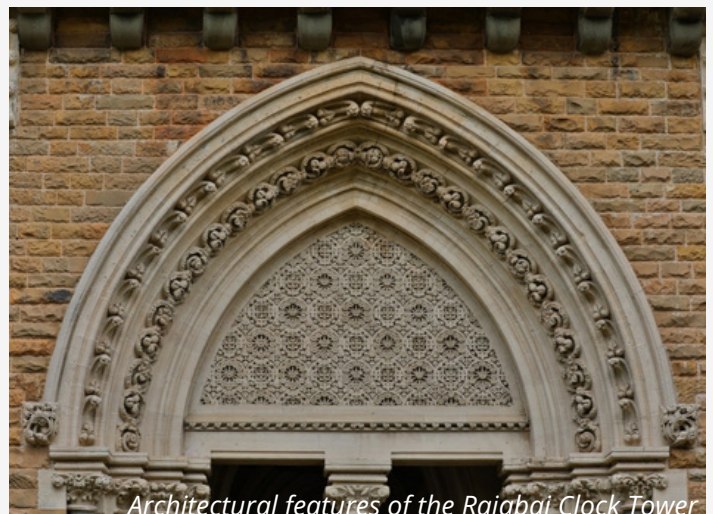


The Rajabai Clock Tower and Library Building

The Rajabai Clock Tower and University Library in Mumbai's Fort area are iconic Grade I listed heritage buildings, completed in 1878 and 1874, respectively. These structures were generously funded by *Premchand Roychand*, with the clock tower named in honour of his mother, Rajabai. Designed in the Victorian Neo-Gothic style by renowned architect *Sir George Gilbert Scott*, these buildings showcase the grandeur of 19th-century architecture of the city of Mumbai.

The clock tower, an imposing 85 meters tall, dominates the Oval Maidan skyline, standing proudly amidst a blend of architectural styles. The Rajabai Clock Tower is a landmark and a testament to Mumbai's rich colonial heritage, blending historical significance with architectural splendour. They display a stunning blend of materials, including Porbandar limestone, Red Dhrangadhra stone, and yellow basalt stone, complemented by wooden ceilings, ornate openings, lime plaster, and vibrant Minton tiles flooring.

These materials also contribute to the structural integrity and aesthetic charm of the buildings. Distinctive architectural features include intricate carvings, ornate sculptures, Venetian arches, and elegant spires with finials that punctuate the skyline. The buildings boast a spiral staircase, a majestic Gothic vault, and mesmerizing stained-glass windows that bathe the interiors in colourful light. Wooden partitions with detailed carvings and unique parapet designs speaks the layers of craftsmanship and historical depth.



Architectural features of the Rajabai Clock Tower

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The intricate details of Rajabai Clock Tower

The restoration of this iconic building was spearheaded by the Vice Chancellor of Mumbai University, with involvement of various stakeholders and consultants like Somaya and Kalappa Consultants (SNK Consultants), Tata Consultancy Services (TCS) and the Indian Heritage Society (HIS). Savani Heritage, executed the restoration process in an attempt to bring back the building's architectural grandeur and engineering brilliance. This restored landmark stands as a living testament to how a well-planned, methodical approach to conservation can not only preserve cultural heritage but also extend the life and legacy of historic structures

The restoration project was carried out in two key phases. The first phase in 2015 focused on structural and fabric restoration, along with the meticulous repair of the iconic clock. The second phase delved into the restoration of artworks, façade detailing, antique furniture, and the installation of decorative lighting and illumination systems to enhance the building's grandeur.

The approach for restoration began with an in-depth site study and proposed research to understand the materials, their current conditions, and areas of deterioration. Non-Destructive Testing (NDT) techniques to gain a comprehensive understanding of the structural integrity and underlying issues were employed which greatly facilitated the restoration process. Some of the key issues that were identified included vegetation overgrowth, insensitive past interventions, layers of cement and paint, black crust formations, cracks, biological colonization, flaked or peeled plaster, and wood deterioration — all primarily linked to long-term maintenance neglect.

Defects observed at Rajabai Clock Tower and Library Building



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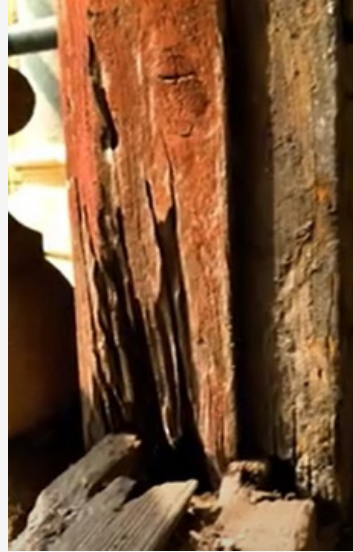
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Restoring the clock tower posed a unique challenge due to its towering height of 85 meters. The construction of robust scaffolding was crucial to ensure the safety and efficiency of artisans and labourers working at such formidable heights.

Conditions on the stones such as black crust, painting were addressed by combination of hand scraping, water jet mist cleaning, paper poulticing as per the extent of conditions found. Water jet mist cleaning process was used to clear paint, and black crust without damaging the stone. In conditions with deep extent of paint penetration, paper poultice method was used. In this process, a mask of paper pulp is laid over the stone using solution of ammonium carbonate, and recycled paper that is kept for 24 hrs or more to absorb the impurities from the surface of the stone. Once the mask was removed the surface is cleaned with light water misting without over-wetting.

Deteriorated stone elements were repaired using the Dutchman repair process, where missing sections were seamlessly integrated with new material, then finished with plaster and paint to match the original aesthetics. To address structural cracks, the SS pin stitching method was employed, reinforcing the stone masonry. To safeguard the stones from future deterioration, a protective water-repellent coating was applied.



Condition assessments of Rajabai Clock



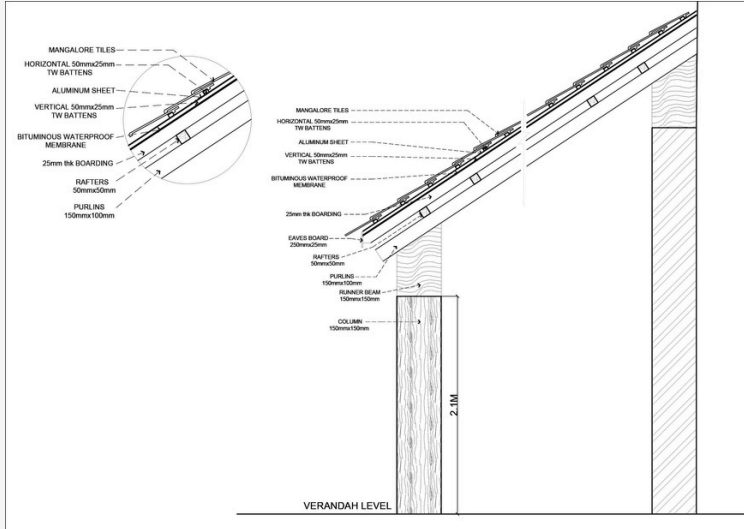
Before and after

Lime pointing was also a crucial part of the restoration process, carried out with precision to ensure both structural integrity and aesthetic continuity. The process began with the careful raking of joints to remove deteriorated material, followed by thorough surface cleaning to eliminate dust and debris. To achieve clean, crisp lines, adjacent areas were meticulously masked with tape, ensuring the joints were properly filled and perfectly aligned. Using lime enhanced the durability and breathability of the masonry, preserving the building's historic charm while ensuring long-term stability.

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A major component in the restoration was the roof of the library building which was treated with the zero punctured method. This method consists of laying a layer of bituminous waterproofing membrane, battens, aluminium sheet, horizontal battens and Mangalore tiles above it. This resulted in a water tight roof resting on the wooden vault ceiling of the building. The Burma teak of the ceiling was polished, restored and decorated back with ornate chandeliers.



Roofing details at the Rajabai Clock Tower and Library Building

The artworks being intricate and unique required a careful approach and was reproduced/repared as essential using lime plastic repair. The process involves moulding / shaping art work with the help of lime mortar and SS armature pins.

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Restoration of the Minton tiles



Restoration of furniture

Restoring the unique Minton tiles on the flooring required a thoughtful approach and was done by salvaging original Minton tiles of matching colours from old, demolished buildings. These tiles were then thoroughly cleaned, repaired and used as per requirements. For the intricate central floral motif, an accurate replica using new tiles from the Bharat brand were created ensuring consistency in colour, texture, and design.

Similarly, the rosewood and teakwood furniture underwent meticulous restoration. This process included specialized treatment to address any signs of deterioration, and careful polishing to restore their natural sheen. Each step was executed with precision to preserve the rich craftsmanship and timeless beauty of these wooden elements.

The restoration project took into consideration various elements and methods and adopted the best practices for each of the activity. It earned recognition with the UNESCO Asia Pacific Award for Honourable Mention in 2018, highlighting the success of the conservation approach and the crucial role of local craftsmanship in preserving the building's historic integrity. Savani Heritage, embraced the adaptive methods, innovative construction technologies, and the thoughtful integration of modern requirements within heritage structures.

The Rajabai Clock Tower and Library Building



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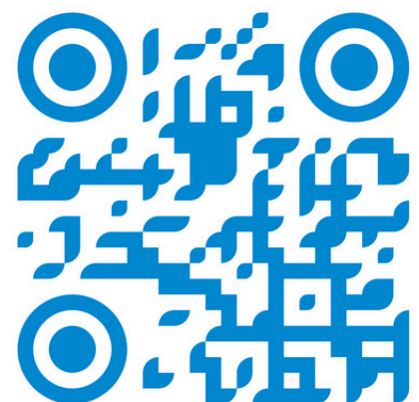
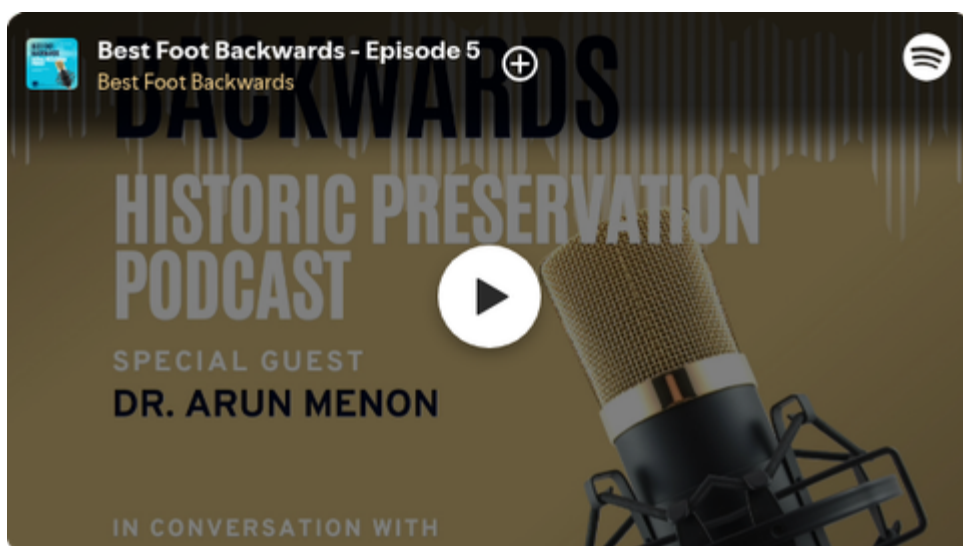
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In this insightful episode of **Best Foot Backwards**, we sit down with renowned preservation engineer **Dr. Arun Menon** to explore the rich and layered world of heritage conservation in India and South Asia. Dr. Menon shares his journey in the field of preservation engineering, reflecting on how structural engineering intersects with history, culture, and community values.

We dive deep into the interdisciplinary nature of heritage conservation, discussing how fields like architecture and engineering, archaeology and material science come together to protect and preserve our built heritage.



[Best Foot Backwards Podcast | https://gqr.sh/nA4v](https://gqr.sh/nA4v)

Special Feature – Starting Young to care for the Old

Nondestructive Testing (NDT) in India: A Tool for Historic Preservation

By Ar. Tejal Shrotriya (Cornell '23)

India's vast architectural heritage—from ancient temples and fortifications to colonial and post-independence buildings—demands sensitive conservation strategies. Nondestructive Testing (NDT) has emerged as an indispensable technique for heritage preservation, allowing professionals to evaluate structural integrity without causing harm. In her thesis at Cornell University, titled 'Non-destructive Testing of Historic Reinforced Concrete Structures', Tejal explored the application of nondestructive testing (NDT) techniques to assess the condition of historic concrete buildings. The research aimed to evaluate the effectiveness of various NDT methods in identifying structural issues and determining the overall health of these heritage structures. This article presents an overview of NDT techniques currently employed in India, insights from field applications, and recommendations for the future.



Hammer testing procedure, Source: Tejal Shrotriya

In India, the use of NDT for historic preservation has seen a gradual rise due to the large number of heritage structures made of various materials such as stone, wood, and concrete. The country boasts ancient temples, palaces, and colonial-era buildings, many of which are in dire need of repair due to environmental exposure, age, and urbanization. NDT provides a non-invasive means to assess the condition of these buildings, helping to maintain their historical value while planning for their future.

Why NDT?

Unlike invasive techniques such as core extraction, NDT enables the assessment of subsurface flaws, material degradation, and structural weaknesses while preserving the original fabric of the structure. This is critical in India, where many historic buildings are fragile and rich in cultural significance.

Various NDT Techniques and their Applications

Ultrasonic Pulse Velocity (UPV):

UPV assesses the quality of concrete by measuring the velocity of sound waves. It's effective in detecting internal voids and inconsistencies in early 20th-century concrete structures. For example, UPV has been used in Chandigarh to evaluate internal deterioration without damaging reinforced concrete, especially where defects are not visually obvious.

Ground-Penetrating Radar (GPR):

GPR uses radar pulses to map subsurface anomalies in both built and buried heritage contexts. Its application in the Brihadeeswarar Temple, Thanjavur, enabled the non-invasive evaluation of foundation stability, revealing underlying issues crucial for long-term preservation planning.

Wood and Timber Testing:

In Kerala and similar regions, ultrasonic testing and moisture meters are employed to monitor decay in traditional wooden structures. These techniques help in detecting early signs of damage, particularly where wood is exposed to high humidity.

Infrared Thermography (IRT):

IRT detects surface temperature variations to identify hidden defects like moisture accumulation. While IRT was reportedly used at Jaisalmer Fort to track water ingress, moisture meters might have played a supporting role. Nonetheless, the technology remains vital in diagnosing problems in masonry and stone structures.

Laser Scanning (LS):

LS creates high-resolution 3D models for documentation and analysis. At Humayun's Tomb in Delhi, AKDN used LS to assess and remove inappropriate cementitious repairs. Rather than being a preparatory tool, the digital documentation directly informed the conservation strategy.

Half-cell potential test

The half-cell potential test is a non-destructive electrochemical method used to assess the likelihood of corrosion in reinforced concrete structures. It helps in identifying areas where steel reinforcement might be actively corroding, without needing to damage the structure.

Insights from Research

In her research, she analyzed the efficacy of various non-destructive testing (NDT) methods and by examining case studies from buildings such as the Herbert F. Johnson Museum of Art, she demonstrated how methods like ultrasonic pulse velocity testing and rebound hammer tests can be strategically employed to identify areas of concern without resorting to invasive or damaging techniques. Additionally, the use of contour maps, infrared thermography, and half-cell potential tests allowed for a more nuanced understanding of subsurface conditions and the likelihood of steel reinforcement corrosion. Together, these techniques formed a comprehensive diagnostic toolkit that not only enhanced the decision-making process for conservation efforts but also holds significant potential for application in the Indian context, where balancing heritage preservation with practical restoration strategies is critical.

Challenges and Future Scope

The implementation of NDT in India faces several hurdles—limited access to advanced equipment in rural areas, lack of trained personnel, and skepticism among stakeholders who favor traditional practices. Cost and data interpretation add to the complexity. However, with increasing awareness and international collaborations, India can develop standardized protocols and training frameworks to enhance NDT adoption.

Conclusion

The future of NDT in India looks promising as the country continues to recognize the importance of preserving its vast architectural heritage. As awareness grows, there is a strong potential for increased investment in both technology and training, allowing for more widespread use of NDT in historic preservation projects across the country.

Furthermore, collaborations between Indian institutions and international conservation bodies could help bridge the gap in expertise and technology. By learning from global best practices and incorporating them into local preservation efforts, India can ensure that its historic structures are preserved for future generations.

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Book Discussion – Engineering Geology for Society and Territory– Volume 8: Preservation of Cultural Heritage

Text by Dr. Michael Tomlan

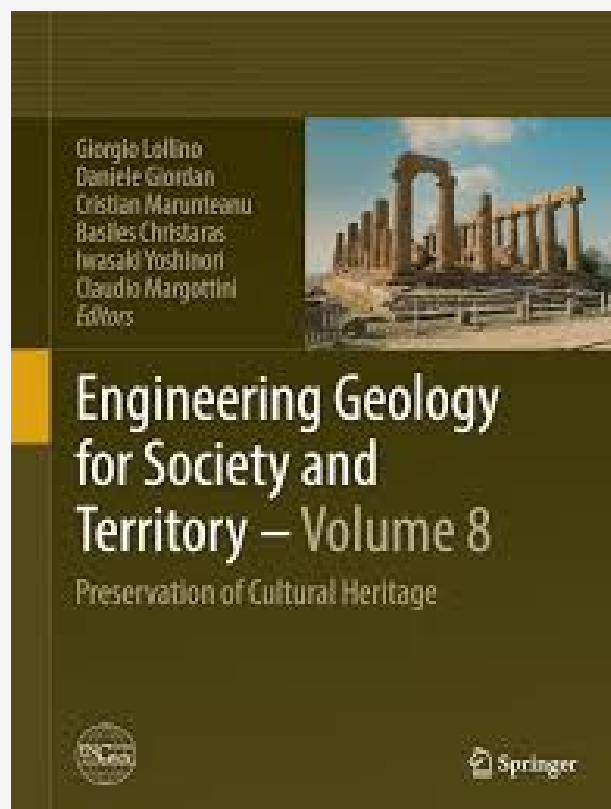
Giorgio Lollino, Daniele Giordan, Cristian Marunteanu, Basiles Christaras, Iwasaki Yoshinori, and Claudio Margottini, Editors

This book is the eighth in a series intended to explore the challenges of engineering geology. The discussion recognizes several countries; tangible and intangible heritage, including India. It will be helpful for emerging professionals who become involved in any conservation project below or above ground. The papers were presented at the 12th Annual Meeting of the International Association for Engineering Geology and the Environment, after which the Chairman, Giorgio Lollino, a retired engineer and senior researcher at the Research Institute for Geohydrological Protection of the Italian National Research Council, and his co-editors created a book of nine parts.

Each essay is relatively short, no more than three or four pages, with helpful color illustrations, making it ideal for classroom use. For those unfamiliar with the term engineering geology, it includes the definition of geomorphology, structure, stratigraphy, lithology, and groundwater conditions of the geological formations; the characterization of mineralogical, physical-geomechanical, chemical, and hydraulic properties of earth materials in construction; resource recovery and environmental

change; assessing mechanical and hydrological behavior of soil and rock masses, determining of the stability analysis of engineering works, and improving and maintaining the conditions and of the properties of the terrain.

With 102 papers included, this review only suggests the broad areas and some case studies. For example, the first Part contains nine essays, some by as many as nine co-authors, while another has only one author. Part two is larger, with twelve essays. It includes the “Underground Tunneling to Match Social Development and Preservation of Historical and Cultural Heritage: Bangalore Metro Line UG-1.” Explaining underground tunneling and the necessity of monitoring archaeological and above-ground historic resources is helpful in many other contexts. Part three, with five essays, deals with rock paintings, the stability of wine cellars, the mechanical and seismic behavior of vernacular stone buildings, seismic vulnerability in Central Asia, and limestone weathering and deterioration.



Part four is entitled “Engineering Geology Problems and Preservation of Chinese Caves and Earthen Architecture Site,” returning to the Mogao Grottos and the associated earthquake data, and the problems of conservation of the cliff face.

Part five is one of the most extensive, with sixteen essays. “Geoheritage, Geosites, Geoparks” includes essays on managing the natural and cultural landscape. Italian case studies dealing with bridges, abandoned mines, rock houses, and stone quarries predominate. Part six is only slightly smaller, with fifteen essays, entitled “Monitoring and Modelling Applications for the Diagnosis of Actual Conditions”. Rapid geotechnical studies using non-destructive techniques are ever more helpful in examining the problems of designated cultural properties. Here, while Italian case studies predominate, others in Angola, Korea, Turkey, Peru, and China are included.

Part seven is dedicated to “Preservation of Cultural Heritage from Natural Hazards,” a topic of continuing interest worldwide. It examines landslides, earthquakes, subsurface aqueous flows, noise and vibration studies, rock mass movements, rock fall hazards, and landslides. Oddly, no flood mitigation surfaced.

Part eight is another small collection of five papers. These deal with “The Role of Historical Archives in the Assessment, Management and Valorization of Cultural Landscapes.” Italian case studies detailing the local social responses in meeting risks are linked to documenting the changing landscape.

The last Part is the most extensive, with twenty-two papers titled “Weathering and Preservation of Building Stones and Other Materials.” The connections between engineering geology and materials science become clear with a discussion of monastic glass production, travertine” sensitivity to freeze-thaw cycles, inappropriate stone repair, de-icing salt degradation, gypsum decay, marble disintegration, bird-dropping biodegradation, and the advantages of fluorescent microscopy.

In conclusion, engineering geology conserves cultural resources in dozens of ways. It is a multifaceted science that requires investigating the history of the environment and understanding the activities of people, past, present, and future. This work is a worthy source to be added to the reading list of any interested professional.

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Member News

The president of APT South Asia Chapter - Ms Khushi Shah recently received two awards at the Indian Responsible Tourism Summit & Awards 2025, hosted by Outlook in association with Gujarat Tourism.

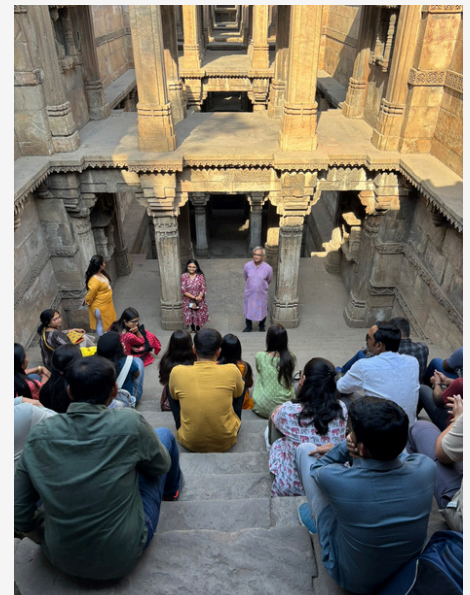
- Silver award in the national category of 'Sustainability Champions – Grassroot Heroes'
- 'One to Look Out For' award in the Gujarat Chapter category of 'Sustainable Leadership – Heritage Conservation' for her firm Khushtar Heritage Collective



Krishnachandran, a member of APT South Asia Chapter had received the David Fischetti Award 2024 for his article on "Madras Terrace Construction: Seismic Upgrade of a Historic Composite Floor Slab System"

The David Fischetti Award is presented by the Preservation Engineering Technical Committee (PETC) of the Association for Preservation Technology International for an outstanding article that advances the field of conservation engineering.

On March 23, 2025, as a part of the celebration of World Water Day, an event aimed to raise awareness about water conservation, the significance of traditional water management systems, and sustainable lifestyle practices to combat climate change was hosted in Ahmedabad. The APT-SAC's previous podcast on water heritage was discussed for engaging the youth on the importance of the topic.



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Call for Opportunities

3RD INTERNATIONAL CONFERENCE ON HERITAGE AND CULTURE - "HERITAGE AND CULTURE AS THE BASIS OF HUMAN DEVELOPMENT"

📍 ROME, ITALY

📅 October 25–26, 2025

For more information. visit:

<https://www.heritagesociety.in/events/global-heritage-conclave-2025-bharataya-matha-paramapara>



CALL FOR PAPERS 2025 - ARCHEOMATICA - CULTURAL HERITAGE TECHNOLOGIES

📅 September 15, 2025

For more information visit:

<https://www.archeomatica.it/>

CIPA 2025 SYMPOSIUM: "HERITAGE CONSERVATION FROM BITS: FROM DIGITAL DOCUMENTATION TO DATA-DRIVEN HERITAGE CONSERVATION"

📅 Deadline: August 31 – September 4, 2025

For more information visit:

<https://cipa2025seoul.org/>





- **Heritage Catalyst Program**

Remote

^{July 17} Deadline - 10th May 2025

Khushtar Heritage Collective and HeritageForAll invites a cohort of 20 for an intensive and collaborative initiative designed for emerging professionals and researchers in the fields of cultural heritage, conservation, and museum studies.

For more details: <https://www.khushtarheritagecollective.com/>

- **20th Session of the Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage**

New Delhi, India

^{July 17} December 8-13, 2025

For more details:

https://ich.unesco.org/en/news/india-to-host-the-20th-session-of-the-committee-in-2025-13542?utm_source=chatgpt.com

- **CONFERENCE: MULTIDISCIPLINARY RESEARCH ON CULTURAL HERITAGE (MARCH 2025)**

Republic of Croatia

^{July 17} September 24 - 26, 2025

For more information: <https://www.icar-us.eu/>

CONSERVATION OF ARCHITECTURAL HERITAGE (CAH) - 9TH EDITION

^{July 17} Deadline: August 31 – September 4, 2025

For more information visit:

<https://www.ierek.com/events/>



- **Submit an article for consideration for the David Fischetti Award**

The David Fischetti Award is presented by APT's [Preservation Engineering Technical Committee](#) (PETC) for an outstanding article that advances the field of conservation engineering.

^{July 17} Deadline: 30 May 2025

Register Here: <https://www.apti.org/david-fischetti-award>

- **Anveshana 2025: Tradition, Transformation and Transcendence**

Triveni Auditorium, New Delhi, India

^{July 17} May 8-9, 2025

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This issue is edited by Khushi Shah