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CHINA-PORTUGAL BELT AND ROAD JOINT LABORATORY
ON CULTURAL HERITAGE CONSERVATION SCIENCE

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中国 - 葡萄牙文化遗产保护科学“一带一路”联合实验室
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前沿研究 Research Fronts

关于建筑遗产重建问题的再思考

Changing Attitudes towards Architectural Heritage Reconstruction

资料来源：
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陈曦 , 施沁怡 . 中国建筑遗产重建的思考：以苏州为例 . 亚洲建筑与建筑工程杂志 .（网络首发日期：2025 年 4 月 28 日）.
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UNESCO. Why rebuild? . UNESCO World Heritage Centre. 2025.
Xi Chen & Qinyi Shi. Reflections on the reconstruction of architectural heritage in China: a case study of Suzhou. Journal of Asian Architecture and Building Engineering. (Published online: 28 Apr 2025).

我们为什么要重建？

法国凡尔赛国立高等建筑学院研究员弗兰卡·马尔塞维西（Franca Malservisi）指出，围绕建筑遗产保护的争论往往忽略了一个根本问题：社会为什么要保护建筑？她认为，每一次遗产认定都是人们在面对导致建筑衰败的强大外力时做出的回应。重建一座纪念性建筑，在本质上是一个积极向上的举措，它既展现了对未来的信心，也致力于治愈过往战争或自然灾害带来的创伤。例如，2019 年巴黎圣母院火灾后的修缮以及波斯尼亚莫斯塔尔古桥的战后重建，都超越了建筑本身，成为社会情感修复的重要载体。

重建的本质：新与旧的共生

马尔塞维西强调，重建工作费时费力，且因工匠技术、审美观和世界观的代际更迭，现代的“重建”往往会系统性地采用不同于原有建筑的解决方案。例如，法国阿拉斯市政厅在重建时采用了钢筋混凝土结构。这意味着最终建成的是一座新建筑，它一方面呼应着早已消亡的古迹，同时又绽放出独特的生命力。因此，重建不是孤立的工作，它涉及政治、战略、社会等多重因素，必须考虑到建筑与城市景观以及当下社区需求的融合。

中国语境下的理论演变：从西方原则到本土化思考

Why Rebuild?

Franca Malservisi, a researcher at the École Nationale Supérieure d'Architecture de Versailles, points out that debates surrounding architectural heritage conservation often overlook a fundamental question: Why does society protect buildings? She argues that every heritage designation is a response made by people facing powerful external forces that cause architectural decay. Reconstructing a monumental building is essentially a positive initiative; it demonstrates confidence in the future and serves to heal the trauma caused by past wars or natural disasters. For instance, the repair of Notre Dame de Paris after the 2019 fire and the post-war reconstruction of the Old Bridge in Mostar transcend the architecture itself, acting as important vessels for social emotional healing.

The Nature of Reconstruction: Symbiosis of New and Old

Malservisi emphasizes that reconstruction is time-consuming and labor-intensive. Due to generational shifts in craftsmanship, aesthetics, and worldviews, modern "reconstruction" often systematically adopts solutions different from the original building. For example, the Town Hall of Arras in France was reconstructed using a reinforced concrete structure. This means that the final result is a new building that echoes the vanished monument while simultaneously blossoming with a unique vitality. Therefore, reconstruction is not an isolated task; it involves multiple factors including politics,

在这一国际理论背景下，陈曦与施沁怡的研究以苏州为例，梳理了中国遗产保护理念的演变。研究指出，长期以来，国际遗产保护领域以西方的《威尼斯宪章》为基础，通常将遗产视为化石般的标本，反对重建。直到 1994 年《奈良真实性文件》发布，引入了文化人类学中的“文化相对主义”概念，这一局面才发生改变。这一转变促使中国学界重新审视“真实性”理论，开始探索符合东方木构建筑特质的保护路径：即不执着于物质材料的真实性，而是通过周期性的修缮与重建来延续建筑的生命。

1.1990 年代：西方影响期

1990 年代，随着国际交流的增加，国际遗产保护理念逐渐被中国遗产保护界接受。然而，根深蒂固的“修旧如旧”和“恢复原状”观念仍在产生影响。这一时期，受 1994 年《奈良真实性文件》的触发，全球范围内展开了关于真实性的讨论。这场话语也引发了中国国内关于以《威尼斯宪章》为首的西方主导的国际保护原则是否真正适用于中国文化语境的激烈辩论。这场辩论的焦点集中在杭州胡雪岩故居的重建上。

清华大学郭黛姮教授代表反对观点，主张保护遗址，认为彻底毁灭的建筑无法完全复原，所有修复都应清晰可辨；而项目负责人高志华和建筑考古学家杨鸿勋则提出了全面的重建计划，他们认为《威尼斯宪章》忽视了东西方古建筑的差异，中国应在考虑自身独特背景的情况下开辟自己的文化遗产保护道路。胡雪岩故居的重建项目引发了关于重建和真实性的深远讨论。

案例：五峰园。同期，苏州对其多座古典园林进行了修复，五峰园便是其一。该园建于约 1550 年，因战乱和工厂占用而荒废。1998 年，苏州政府决定依据历史文献重建五峰园，旨在恢复其原有风貌。通过苏州勘察院提供的历史地形图分析表明，重建后的五峰园其周边边界、建筑和景观格局与重建前的地形图描绘高度一致。五峰园与胡雪岩故居一样，证明了它们的重建不仅是为了恢复物质遗产，更是为了重申

strategy, and society, and must consider the integration of the building with the urban landscape and current community needs.

Theoretical Evolution in the Chinese Context: From Western Standards to Cultural Relativism

Against this international theoretical background, the research by Xi Chen and Qinyi Shi traces the evolution of Chinese heritage conservation concepts using Suzhou as a case study. The study points out that for a long time, the international heritage conservation field was based on the Western *Venice Charter*, often viewing heritage as fossilized specimens and rejecting reconstruction. This situation did not change until the release of the the *Nara Document on Authenticity* in 1994, which introduced the concept of "cultural relativism" from cultural anthropology. This shift prompted the Chinese academic community to re-evaluate the theory of "authenticity" and explore conservation paths suited to the characteristics of Eastern wooden architecture—that is, not fixating on material authenticity, but perpetuating the life of the architecture through periodic repair and reconstruction.

1. The 1990s: The Period of Western Influence

In the 1990s, with the increase in international exchanges, international heritage conservation concepts gradually gained acceptance in China, yet the deeply rooted notions of "repairing old as old" and "restoring to the original state" persisted. Triggered by the *Nara Document on Authenticity*, a global discussion on authenticity was initiated. A heated debate emerged on whether Western-dominated principles like the *Venice Charter* were applicable to the Chinese context. The focal point was the reconstruction of the residence of Hu Xueyan in Hangzhou.

Professor Guo Daiheng advocated for the preservation of the site's ruins, asserting that destroyed buildings could not be fully reconstructed. This opposed the comprehensive reconstruction plan by Gao Zhihua and Yang Hongxun, who argued that international documents overlooked the differences between Eastern and Western ancient architecture and that China should forge its own path.

Case: Wufeng Garden. Built around

文化身份并代表地方历史。

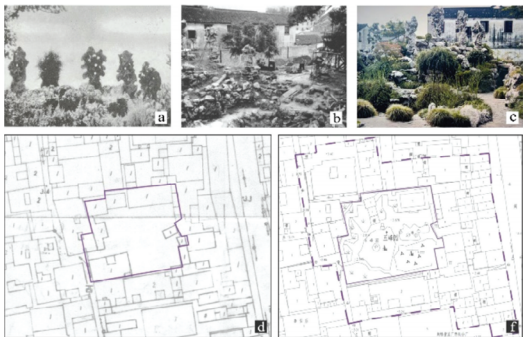

图 1：五峰园：历史照片 (a)；重建前照片 (b)；重建后照片 (c)；重建前总体平面图 (d)；重建后总体平面图 (f)
Figure 1. Wufeng Garden: historical photo (a); photo before reconstruction (b); photo after reconstruction (c); general plan before reconstruction (d); general plan after reconstruction (f)

2. 2000 年代：城市化发展期

2002 年修订的《文物保护法》引入了关于重建的条款，将拒绝重建的做法提升到了法律层面。值得注意的是，该法规承认在“特殊情况”下可以在原址进行重建，但并未明确界定这些“特殊情况”的标准，将其留给行政当局裁量。2004 年发布的《中国文物古迹保护准则》将重建归类为“极特殊”、“特批”的工程。然而，2005 年的《曲阜宣言》则强调了中国木构古建筑的独特性，提倡遵循原材料、原结构、原工艺的复原以确保科学和艺术价值。这反映了在外部思想影响下的现代化进程中，中国遗产发展的非线性轨迹。

在快速城市化背景下，遗产作为构建集体历史记忆和提升城市形象的重要媒介，被视为一种宝贵的城市资产（Urban Asset）。城市管理者认为遗产能够像土地和基础设施一样产生有形的经济效益。因此，尽管有严格的审批程序，但在政治动机、经济发展等因素驱动下，大规模重建项目依然层出不穷。

案例：阊门重建。2001 年，苏州政府决定重建阊门，将其定位为城市发展的关键要素。虽然项目通过探地雷达（GPR）等无损技术对遗址现状进行了调查，但在重建后的现有状况来看，阊门仅仅在外部延续了历史风貌，而完全放弃了传统的建筑结构和材料。例如，城门被设计为两层钢筋混凝土结构，并用彩绘混凝

1550, it was severely damaged by war and factory encroachment. In 1998, the Suzhou government decided to reconstruct it based on historical documentation. Analysis of historical topographic maps indicates that the boundaries, buildings, and landscape patterns after reconstruction closely align with historical depictions. Like Hu Xueyan's Former Residence, Wufeng Garden exemplifies that reconstruction serves not only to restore material heritage but also to reaffirm cultural identity and represent local history.

2. The 2000s: The Period of Urbanization Development

The 2002 revision of the *Law on Protection of Cultural Relics* elevated the denial of reconstruction to a legal realm, acknowledging it only under "special circumstances" without explicit definitions. *The 2004 Principles for the Conservation of Heritage Sites in China* categorized reconstruction as an "extremely special" project. However, the *2005 Declaration of Qufu* emphasized the uniqueness of China's ancient wooden structures, advocating for restoration following the original materials, structure, and techniques to preserve their scientific and artistic value. This reflects the nonlinear trajectory of China's heritage development amid modernization influenced by external ideas.

During rapid urbanization, heritage was considered a valuable urban asset capable of generating tangible economic benefits. Consequently, reconstruction emerged as a favored strategy among urban managers.

Case: Reconstruction of Chang Gate. In 2001, the government decided to reconstruct Chang Gate as a pivotal element in development. While non-destructive techniques like GPR were used to survey the ruins, the reconstruction merely continues the historical style externally while abandoning traditional structures. The gate represents a two-story reinforced concrete structure, with painted concrete columns imitating wood. This approach enhances strength but undermines structural integrity, reflecting that despite legal restrictions, reconstruction became an expected choice leveraging urban development.

3. The 2010s: World Heritage Site Impact and The Influence of Heritage Tourism

土柱模仿木柱。这种做法虽然增强了建筑强度，却最终破坏了其结构真实性。这表明，尽管有明确的法律限制，但在城市发展的契机下，重建成为了城市管理者的预期选择。

3. 2010 年代：世界遗产与旅游影响期

这一时期，“世界遗产效应”与商业推广紧密结合，遗产的实用性被进一步放大。世界遗产地成为旅游和外国投资的热点。由于对重建合法性缺乏明确共识，许多项目在世界遗产品牌效应的推动下应运而生。

案例：张氏义庄与可园

张氏义庄：为了给贝聿铭设计的苏州博物馆新馆(位于世界遗产拙政园旁的忠王府区域)腾出空间，苏州政府决定将原址上的保护建筑张氏义庄整体搬迁至附近的潘儒巷进行重建。虽然这一搬迁工程成功抢救了濒危遗产并保留了近 90% 的原有结构，但关于这种异地重建的合理性和必要性仍存在质疑。为了在异地充分重现原貌，必须对构件进行编号和记录；特别是对于彩画，应基于截面显微镜和 X 射线荧光光谱（XRF）等分析，清洗表面污渍以显露原有图案，而非重新绘制。

可园：同期，可园也启动了修复和重建工作。对于历史记载中有但现场已无存的建筑（如坐春舫、石桥），采用了复原性重建。值得注意的是，由于过去 50 年间可园周边道路不断翻修抬高，导致园内地势低洼。因此，在重建过程中，地面被整体抬高了 30 厘米，并实施了排水系统和雨污分流系统。这两处建筑的重建虽然抢救了遗产，但也不可避免地受到了世界遗产效应、旅游热度和经济发展等外部因素的影响,这些因素往往掩盖了遗产本身的内在价值。

4. 2020 年代：灾后与战后遗产关注期

近年来，随着全球范围内冲突与自然灾害的频发，遗产重建被赋予了新的意义。根据现有理论，当遗产受到自然灾害或战争破坏影响时，重建被视为一种可接受的保护方法。在此类情况下，重建超越了有形遗产，象征着危机后地区当地居民社会经济状况和文化身份的再

图 2：阊门：重建前照片（a）；重建后照片（b）；遗址及现状位置图（c）；使用探地雷达（d）；钢筋混凝土结构的柱子（f）；重建后的立面（g）

Figure 2. Chang Gate: photo before reconstruction (a); photo after reconstruction (b); location map of ruins and current status (c);using ground penetrating radar (d); columns of reinforced concrete structure (f); elevation after reconstruction (g)

During this period, the "World Heritage Effect" played a significant role in stimulating economic growth, and heritage was expected to be more "useful." World Heritage have become hot spots for tourism and foreign investment. Numerous reconstruction projects emerged driven by the promotion of the World Heritage brand.

Case: Residence of Zhang & Ke Garden.

Residence of Zhang: To accommodate the new Suzhou Museum designed by I.M. Pei, the government relocated the residence to Pan Ru Lane. Although this project rescued the heritage and preserved nearly 90% of the original structures, questions arise regarding the rationale. Technical preservation required elemental analysis (like cross-section microscopy and XRF) for colored paintings to reveal original designs rather than repainting.

Ke Garden: Restorative reconstruction was utilized for missing structures like the Zuochun Pavilion. Notably, due to road renovations raising the surrounding pavement, the garden's ground level was elevated by 30 cm during reconstruction, and a drainage system was implemented. These projects raise questions about necessity but are inevitably influenced by external factors like tourism, which often overshadow the intrinsic value of the heritage itself.

生。例如四川都江堰伏龙观在震后的抢救性重建，旨在重建当地居民的社会生活和信心。

案例：垂虹桥。与伏龙观不同，苏州垂虹桥作为宋代古桥遗址（1048 年建），其重建面临巨大的伦理与环境挑战。历史上，该桥是文人墨客汇聚之地，具有极高的文化象征意义。然而，由于周边环境变迁和城市扩张，古松江的水位和水量已大幅减少，恢复原有的“长桥卧波”景观及与水的关系已无可能。目前的讨论倾向于不再进行物理重建，吴江博物馆馆长崔瑛建议利用现代数字媒体技术(如光影投射)再现其历史辉煌。这反映了在不可逆的环境变化面前，遗产保护正从单一的物质重建转向对历史信息与文化价值的数字化传承，以及寻求尊重历史同时回应现代需求的解决方案。

讨论与结论

综合弗兰卡的理论与苏州的实践，我们发现遗产保护的核心正在从关注“物的本体”向关注“人的情感与社会价值”转移。未来的遗产保护将更加注重跨学科协作，引入不同领域的专家，共同探讨如何在尊重历史信息与满足当代社会需求之间找到动态平衡。正如苏州案例所展示的，重建不再是简单的复原，而是对文化精神与价值观的深刻反思与延续。

（项一鉴、陈曦编译）

4. The 2020s: The Recent Emphasis on Post-Disaster and Post-War Heritage

Recently, heritage reconstruction is increasingly seen as regeneration for post-crisis regions, aiming to rebuild the socio-economic conditions and cultural identity of local residents, as seen in the post-earthquake reconstruction of Fulong Temple.

Case: Chuihong Bridge. Unlike Fulong Temple, the potential reconstruction of Chuihong Bridge (collapsed ruins from 1048) faces controversy. Due to irreversible environmental changes—specifically the significantly diminished volume and water level of the Song River—restoring the bridge's original relationship with the water is impossible. Reconstructing it raises concerns about authenticity. Current discussions, including a multidisciplinary approach, favor using modern digital media technology to recreate historical splendor rather than physical rebuilding. This debate involves finding solutions that honor history while addressing modern needs and effectively conveying cultural value.

Discussion and Conclusion

Combining Malservisi's theory with Suzhou's practice, we find that the core of heritage conservation is shifting from focusing on the "ontology of the object" to focusing on "human emotion and social values". Future heritage conservation will place greater emphasis on interdisciplinary collaboration, bringing together experts from different fields to jointly explore how to find a dynamic balance between respecting historical information and meeting contemporary social needs. As demonstrated by the Suzhou cases, reconstruction is no longer simple retrofitting, but a profound reflection and continuation of cultural spirit and values.

(Translated and edited by Yijian Xiang and Xi Chen)

实践案例 Case Study

在巴黎圣母院数字孪生框架内构建灾后建筑遗产重建的流程

Faceting the Post-Disaster Built Heritage Reconstruction Process Within the Digital Twin Framework for Notre-Dame de Paris

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1. 引言

2019 年 4 月 15 日，巴黎圣母院遭遇大火，尖塔倒塌并砸毁了中殿的最后两个跨度，拱顶上方的大部分木质屋顶也化为乌有。火灾次日，大教堂的重建工作与针对巴黎圣母院的科学研究便被分开组织：当务之急是既要在现场收集新数据，又要确保重建和修复工作能在最短时间内完成。如今，超过 170 名学者参与到了巴黎圣母院的科学研究中，他们被分为石材、金属、木材、彩色玻璃、土木工程、声学、雕塑与装饰、人类学以及数字数据等多个工作组。这代表了对该纪念碑进行研究的一次前所未有的科学努力。灾难发生后，首要任务是采取加固和脚手架搭建等安全措施以稳定建筑物，随后是在进行设计规划之前清理遗骸、清洁和去污活动。历史古迹研究实验室（LRMH）的科学家和国家考古学家在对材料遗存进行分类、初步盘点以及制定紧急记录协议以记录石材遗存方面发挥了主导作用，随后石材工作组也加入了这项工作。本文旨在通过强调在建筑遗产修复框架内数字孪生驱动方法的潜力和局限性，记录数字数据工作组与石材工作组之间的一项合作实验结果，该实验旨在解决将中殿拱顶倒塌部分重建至灾前状态的问题。

巴黎圣母院横向拱重建问题的独特之处在于，横向拱的大部分拱石（Voussoir）元件都保存下来可供研究。令人惊讶的是，它们中的

1. Introduction

April 15th, 2019: Notre-Dame Cathedral in Paris was burning, the spire collapsed on the last two spans of the nave and most of the timber roof was gone above the vaulted ceilings. The day after the Notre-Dame fire, the rebuilding work of the cathedral was organized separately from the scientific research on Notre-Dame: at stake was the gathering of new data in the field while allowing the work of rebuilding and restoration to be done in the shortest time frame. More than 170 scholars are involved today in the scientific research on Notre-Dame divided by working groups focused on Stone, Metal, Timber, Stained Glass, Civil Engineering, Acoustics, Sculpture and Ornamentation, Anthropology, and Digital Data. It represents an unprecedented scientific effort to study the monument. Post catastrophe, the first priority was given to the safety measures of strengthening and scaffolding works for the stabilization of the monument, followed by the removal of remains, cleaning and depolluting activities before addressing design planning. The scientists of the Historical Monuments Research Laboratory (LRMH) and state archaeologists played a leading role in the sorting of material remains for the initial inventorying and emergency documentation protocols to document the stone remains, followed afterwards by the Stone working group. By highlighting the potential and the limits of a digital twin driven approach within the framework of the architectural heritage restoration, this paper documents

大多数在火灾或坠落过程中并未被毁坏。因此，如果把重建比作拼图游戏，在这种情况下，只有极少数的拼图块丢失了。在总共 79 个掉落的拱石元件中，有 76 个从废墟中被识别出来，并且截至本文发表时，已有 71 个经过了分析。构建一个真实可信的灾前状态假设是文化遗产重建项目的主要目标，因为真实性是“关于价值的基本要素”。哥特式建筑时代的一个主要特征是六分拱顶，其中横向尖拱是实现覆盖层机械稳定性和轻盈性的主要推动因素。巴黎圣母院的拱顶见证了一个技术里程碑，因为它们达到了很高的高度，在墙壁上引入了大窗户，并使中殿充满了光线。遵循《伦敦宪章》和《塞维利亚宪章原则》等国际建议文件，我们的重建研究可以定义为“虚拟复原”或“虚拟重建”。但这些定义并未涵盖我们研究问题的全部。巴黎圣母院的重建问题并不属于典型的虚拟重建研究案例，通常后者记录的是建筑资产的衰败状态，且重建假设仅部分覆盖物理对象。在这里，虚拟重建与物理纪念碑的修复项目交织在一起，因为它记录了纪念碑本身及其组件的详细资料。这种特殊的运作背景促使我们考虑使用数字孪生这一替代方法来探索重建问题，并在数字资产与物理资产及其交互之间建立这些必要的联系。

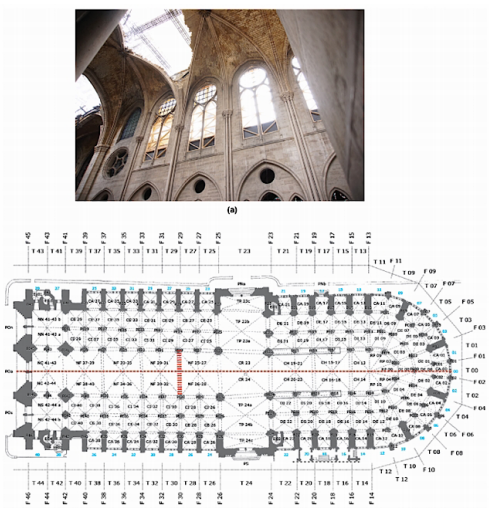

图 1：(a) 巴黎圣母院中殿和耳堂倒塌的拱顶；(b) 倒塌的中殿拱顶在平面图上的位置
Figure 1. (a) Collapsed vaults in the nave and the transept of Notre-Dame; (b) Situation of the collapsed nave vault on the floor plan

the results of a collaborative experiment between the Digital Data and Stone working groups to address the reconstruction of a collapsed part of the nave vaulted ceiling to the pre-disaster state.

The uniqueness of the reconstruction question of the Notre-Dame transverse arch lies in the particular case where most of the voussoir elements of the transverse arch are available for study. Surprisingly enough, most of them were not destroyed during the fire or their fall. Hence, if the reconstruction can be compared to a jigsaw puzzle, in this case, only few puzzle pieces are missing. From the total of 79 fallen voussoir elements, 76 are identified from the remains, and 71 have been analyzed at the time of this paper's publication. The formulation of a faithful pre-disaster state hypothesis is the main objective in cultural heritage reconstruction projects, as authenticity is “the essential qualifying factor concerning values”. A primary characteristic of the Gothic building-style era is the sexpartite vaulted ceiling with the transverse pointed arches as main enablers of mechanical stability and lightness for the covering. Notre-Dame's vaulted ceiling bears witness to a technical milestone due to the height they reach, introducing large windows in the walls and filling the nave with light. Following international recommendation documents like the *London Charter* and the *Principles of the Seville Charter*, our reconstruction study can then be defined as a virtual anastylosis or a virtual reconstruction. But these definitions do not cover the totality of our research question. The reconstruction question in Notre-Dame does not fall within the typical case of virtual reconstruction study, where the built asset is usually documented in its decayed condition and the reconstruction hypothesis partially overlaps with the physical object. Here the virtual reconstruction intertwines with the restoration project of the physical monument, as it is documented (surveys, photos collections etc.) of the monument itself and its components. This peculiar operational context brings us to consider the alternative method of digital twin to explore the question of reconstruction and build these mandatory connections between the digital and physical assets and their interactions.

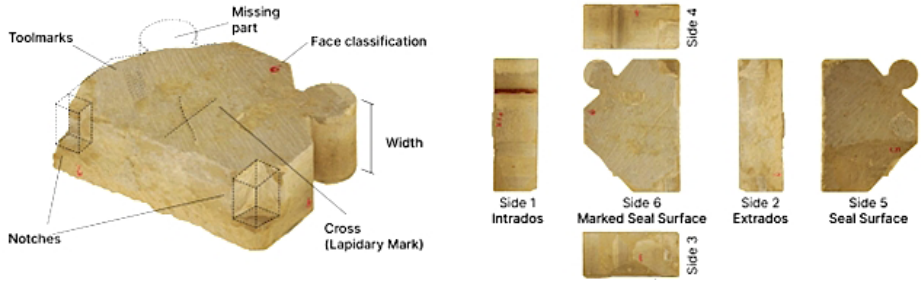

图 2：倒塌拱门的组件：拱石，标准化的预制建筑构件
Figure 2. The components of the collapsed arch: the voussoirs, standardized and manufactured building elements

2. 方法

数字孪生用于复杂系统建模，在物理资产与其孪生的数字资产之间建立针对特定过程的定制反馈，并设计它们之间的链接。它最初为航空航天工业设计，随后自然扩展到制造业，进而扩展到建筑业。尽管应用背景不同，但以下数字孪生的定义非常适合遗产纪念碑：“一组虚拟信息结构，模仿单个或独特物理资产的结构、背景和行为，在其整个生命周期中根据来自其物理孪生体的数据进行动态更新，并最终为实现价值的决策提供信息”。文化遗产建筑的生命周期在设计和建造阶段大致相当于完整的建筑施工生命周期，但也存在一些主要差异。第二个主要差异在于强调永久基础上的监测和维护，正如文化遗产国际政策所述，目的是“维护其真实性和完整性”。其推论是，这些文化遗产资产理论上不存在“生命终结”，而是会被持续维护和监测。我们提倡一种迭代建模方法，将重建问题作为设计阶段的一部分。该策略是一种机会主义策略：通过在各个阶段迭代堆叠链接来加强连接。为了减轻流程的复杂性和混乱性，微服务架构是一种基于分而治之策略的赋能范式，允许堆叠特定的无状态和自主流程。

2. Methods

Digital twin is employed for complex system modeling with a tailored feedback between physical and its twinned digital asset, specific to a process, and the links engineered between them. Originally designed for the aerospace industry, it finds a natural extension to manufacturing, and then to construction. Despite the difference in the context of application, the following definition of digital twin suits well to heritage monuments: “a set of virtual information constructs that mimics the structure, context and behaviour of an individual or unique physical asset, that is dynamically updated with data from its physical twin throughout its life-cycle, and that ultimately informs decisions that realize value”. The cultural heritage building life cycle is roughly equivalent to the full building construction life cycle for design and construction phases, but there are some major differences. The second main difference is the stress put on monitoring and maintaining on a permanent basis, as stated by cultural heritage international policies “to maintain their authenticity and integrity”. The corollary is the theoretical absence of end-of-life for these cultural heritage assets that are then continuously maintained and monitored. We advocate for an iterative modeling method, rooting the reconstruction question as a part of the

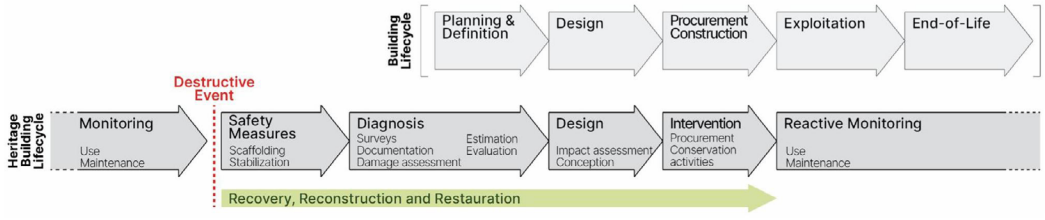

图 3：建筑生命周期与作为连续文化遗产建筑生命周期的巴黎圣母院修复项目
Figure 3. Building life cycle and Notre-Dame restoration project as continuous cultural heritage building life cycle

知识连续性、数据建模与管理。科学信息的数据管理策略要求意识到数据的来源和异构性。语义网技术栈提供了被认定为赋能数字孪生知识图谱应用的技术基础。我们使用 CIDOC CRM，这是一种适用于文化遗产记录的标准核心本体。模式制作是一种自下而上的建模方法，以数据和事件为中心，在其周围编织一个有凝聚力的信息簇，并与图中现有的簇保持松散的链接。为了断言知识图谱的一致性，每个模式都配有一个验证图，其中包含 SHACL 规则，以便在第三方服务中进行处理。通过这种方式，在项目各个阶段集成数字孪生的新功能变得更加容易，由于微服务的自主性，任务可以在参与者之间更清晰地分配。

随着重建专家流程的发展，数字孪生逐步在四个方法论层面上建立起来。

(1) 物理复原：我们选择通过物理复原在 1:1 的比例下测试重建假设，即测试从碎片中重新组装拱门。目的有二：借助印有从 Andrew Tallon 点云中提取的拱门布局的 15 x 10 米篷布，定位组件的原始位置，并收集考古和几何信息。这一步骤限制了早期阶段表征的中介效应。

(2) 逆向工程：由于现场限制，物理复原结果有限，因此采用了逆向工程，在没有原始图纸的情况下开发规范。我们制作了一个几何参数化模型以拟合灾前点云，从而提取尺寸设计。我们使用非线性回归拟合参数化拱门拱石的构造线，以创建插槽位置。

(3) 时空标注：我们希望识别拱石从坠落那一刻起在废墟中的路径。利用众包摄影覆盖（13,000 张图像），我们应用了一种新型的时间摄影测量标注方法。这允许将单张图像上的交互式 2D 标注传播到相应的 3D 点云和其他图像中，有助于追踪在清理行动期间移动的文物。

(4) 运筹学研究：重建是一种特殊的设计案例，其中部件是预先存在的，必须按原样归还以最大化真实性。我们调整分配问题来构建倒塌拱门问题，使用由物理复原谓词和逆向工程测量值构成的目标函数。

design phase. The strategy is an opportunistic one: strengthen the connection by stacking the links iteratively along the phases. In order to mitigate the complexity and messiness of processes, microservice architecture is an enabling paradigm based on a divide and conquer strategy allowing to stack ad hoc stateless and autonomous processes.

Knowledge continuity, data modeling and management. The data management strategy for scientific information requires awareness on both the provenance and heterogeneity of data. The semantic web stack provides a technological foundation identified as enabling digital twin knowledge graph applications. We use the CIDOC CRM, a standard core ontology applicable for cultural heritage documentation. Pattern making is a bottom-up modeling approach centered on the data and events, webbing a cohesive cluster of information around it and maintaining loose links with the existing clusters in the graph. In order to assert the consistency of the knowledge graph, each pattern is paired with a validation graph with SHACL rules to be processed within a third party service. In such a way, integration of new functionalities in the digital twin alongside project phases is eased, tasks can be allocated more clearly between the actors due to the autonomy of the microservices.

Framing the facets of the hybrid hypothesis for the reconstruction, the digital twin has progressively been built following the development of the expert processes for the reconstruction in 4 methodological facets.

(1)Physical Anastylosis: The choice was made to test the reconstruction hypothesis at the scale 1:1 with a physical anastylosis, that is a test for reassembly of the arch from its pieces. The aim is twofold: locate the original position of the components with the support of a 15 x 10 m tarpaulin printed with the arch layout extracted from Andrew Tallon's point cloud, and gather archaeological and geometrical information. This step limits the mediating effect of the representation in the early stages.

(2)Reverse Engineering: Since physical anastylosis gave limited results due to site constraints, reverse engineering was employed to develop specifications without

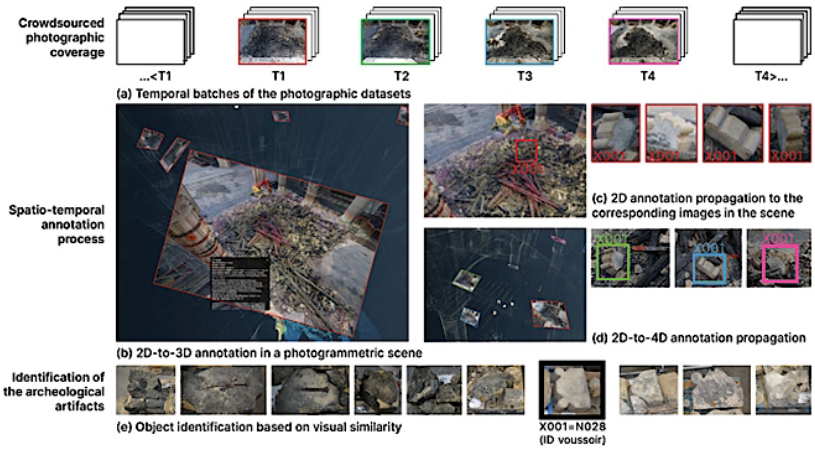

图 4：摄影测量场景中的时空追踪，恢复行动期间废墟中拱石的识别与标注
Figure 4. Spatio-temporal tracking in photogrammetric scenes, identification, and annotation of voussoirs in the remains during the recovery operations

3. 结果

3.1 从物理复原经验谓词到运筹学决策

我们将拱门重建问题表述为一个线性规划模型，这是对将拱石元件与其对应插槽位置相联系的分配问题的改编。重建问题可以表述如下：设一个倒塌的拱门由一组拱石元件组成，记为 C= {c1, ... ,cn}，其中 n 是石块数量。每个石块都应该被分配到一个位置 E = {e1, ... ,em}。第一步在于找到拱石宽度与插槽位置之间的匹配。这是物理复原的主要标准，但单独使用时表现相对较差。因此，作为一个逻辑谓词，拱石元件应尽可能接近插槽位置的宽度。第二步旨在利用时空标注提取的信息，将插槽位置与拱石坠落位置进行匹配。因此，目标函数最小化拱石宽度与插槽位置宽度之间的差值，并使用大教堂点云模型作为参考空间，最小化拱石重心与位置插槽重心之间的距离。

3.2 从物理复原谓词和数据到线性规划模型约束

若干考古谓词被整合到模型约束中。

(1) 基石：横向拱的基石（N232）只能位于顶峰插槽。

(2) 凹槽：当横向拱存在时，拱石的拱背上制作了立方体凹槽以放置木板。我们定义了规则：半凹槽必须面对另一个半凹槽，全凹槽不得面对另一个凹槽。

original drawings. A geometric parametric model was crafted to fit the pre-disaster point cloud to extract dimensional design. We fit the construction lines of the parametrized arch voussoirs using nonlinear regression to create slot locations.

(3)Spatio-temporal Annotation: We want to identify the path of the voussoirs inthe remains from the moment they fell. Using crowdsourced photographic coverage (13,000 images), we apply a novel approach of temporal photogrammetric annotation. This allows interactive 2D annotations on a single image to be propagated in the corresponding 3D point cloud and other images, helping to track artifacts that moved during cleaning operations.

(4)Operational Research: Reconstruction is a special design case where parts pre-exist and must be returned as is to maximize authenticity. We adapt the assignment problem to formulate the collapsed arch problem, using an objective function formed from physical anastylosis predicates and reverse engineering measures.

3. Results

3.1 From physical anastylosis empirical predicates to operational research decision making

We formulate the arch reconstruction problem as a linear programming model, an adaptation of the assignment problem linking voussoir elements to their corresponding slot locations. The reconstruction problem can be formulated as follows: let a collapsed arch be composed of a set of voussoir elements as C= {c1, ... ,cn} where “n” is

(3) 凹槽位置：语料库分析发现，带凹槽的拱石仅存在于拱门的上三分之一处。

(4) 石刻标记：刻在接合面上的十字符号被解释为铺设符号，指示放置方向。最终，物理复原数据的核心价值在于提供了若干已知且并排的拱石簇。正是这些簇的整合，以及线性规划模型、相应的复原评估和相关专家之间的相互作用，为制定最有力的重建假设创造条件。

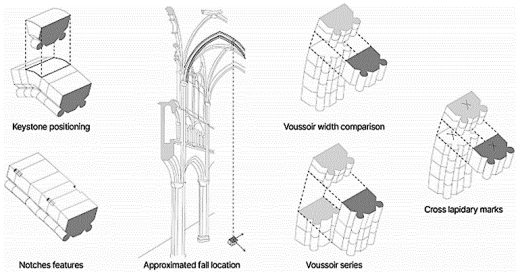

图 5：重建研究中使用的考古谓词集
Figure 5. Set of the archeological predicates used in the reconstruction study

3.3 性能评估

物理复原确定了基石和 3 个拱石的位置，将 21 个拱石组装成 5 个簇（其选定位置存在不确定性）。通过 'glecrt' 模型对物理复原方案的评估发现了 2 处凹槽约束违规。可以说，系统被显著标准特征化得越精细，对模型的信心就越大。除凹槽位置外，所有谓词都提供了约 20% 的置信度稳步提升。影响最大的是宽度和拱石坠落位置目标函数。我们在此应补充物理复原簇识别的级联效应：发现的石块簇越多，解空间就越受限制，相应的混合假设置信度就越高。具有 5 个已识别集群的混合假设为重建带来了 73.55% 的置信度。所得重建假设的 3D 可视化可在线访问。

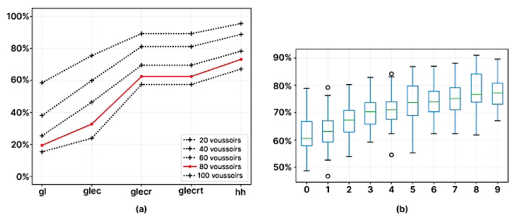

图 6：(a) 每个拱石数量的里程碑模型置信度百分比；(b) 79 个拱石的混合假设置信度百分比
Figure 6. (a) Percentage of the milestone models confidence per number of voussoirs; (b) percentage of the hybrid hypothesis confidence for 79 voussoirs

the number of stones. Each stone is supposed to be allocated to a location E = {e1, ... ,em}. The first step consists in finding a match between the widths of the voussoirs and the location slots. This is the main criterion for the physical anastylosis, which taken alone has a relatively poor performance. Therefore, as a logical predicate, a voussoir element should fit as close as possible to the slot location width. The second step aims at matching the slot locations with the voussoir fall locations with the information extracted by the spatio-temporal annotation. Hence, the objective function minimizes the delta between the voussoir width and the slot location width, and minimizes the distance between the gravity center of the voussoir and that of the location slot using the cathedral point cloud model as reference space.

3.2 From physical anastylosis predicates and data to LP model constraints

Several archaeological predicates were integrated into the model constraints.

(1)Keystone: The keystone of the transverse arch (N232) could only be located at the peak slot.

(2)Notches: While the transverse arch was existing, cubic notches were made on the extrados of the voussoirs to receive planks. Rules were defined: a half-notch must face another one, a full notch must not face a notch.

(3)Notch Location: Corpus analysis found that notched voussoirs were present only in the upper third of the arch.

(4)Lapidary Marks: Cross signs carved on joint faces were interpreted as laying signs indicating the direction of placement. Finally, the main proficiency issued from physical anastylosis data is to provide several clusters of voussoirs known to be side by side. It is the integration of these clusters and the interplay between the linear programming model, corresponding anastylosis assessment, and the related experts that allows the formulation of the strongest reconstruction hypothesis.

3.3 Performance evaluation

The physical anastylosis located with certainty the keystone and 3 voussoirs, assembled 21 voussoirs as 5 clusters with uncertainty on their selected location. The evaluation of the physical anastylosis

4. 讨论 : 文化遗产中的数字孪生

毋庸置疑，数字孪生已被认定为一种超越任何数字技术对应物的赋能框架。然而，目前在文化遗产领域，数字孪生应用的例子寥寥无几。文化遗产领域的一个常见陷阱在于开发创新但对其研究资产过度拟合的方法论和工具。整个数字孪生实验适用于拱门的重建问题，并且仅针对类似的问题或资产具有可重复性。因此，该数字孪生实验的重用在这方面似乎有限，但这被视为有利于流程效率的权衡。相反，由于数字孪生中各个层面的过程划分，它们本身都具有高度的可重用性。数字孪生框架的多功能性是解决部件重用和共享的方案，这与更单一的架构形成对比。整体的凝聚力归功于跨学科视角的横向衔接。观点的多样性在技术和人文层面上既是财富也是挑战：不同背景的科学利益相关者的合作对于为复杂问题创造创新解决方案是强制性的。共享和协作的先决条件（相互理解、教学意识、调解和数字工具的采用）导致在数字孪生框架中的参与者、物理资产和数字资产之间达成平衡。

5. 结论

从创伤性事件中恢复的能力对于文化遗产纪念碑的保护至关重要。本文表明，数字孪生框架在文化遗产中的应用可以解决相关的重建问题并支持反应性监测。这促成了从静态信息管理向随信息生产而变的适应性工作流的动态转变。它首先确定了一个有效的概念基础（数字孪生），以此作为迭代建模方法的基础。随后，我们详细介绍了在混合假设中对重建问题的 4 个互补观点的协调 —— 作为表征、作为层级系统、作为数据来源、作为优化问题。我们就巴黎圣母院中殿横向拱从其坠落和破碎的组件中重建，获得了一个定量的且确定了不确定性的解决方案，置信度超过 73%。通过这项研究，我们希望强调灵活的数字对象（如数字孪生）的重要性，它们较少受技术束缚，能够在协作环境中解决复杂和混乱的问题。目前，这项数字孪生应用的研究正在进行中：它将继

solution via 'glecrt' model brought 2 notches constraints violations. Arguably, the more finely the system is characterized by salient criteria, the greater is the confidence in the model. All predicates but the notch location provide a steady improvement of about 20% confidence. The most impactful are the width and voussoir fall location objective functions. We should add here the cascading effect of physical anastylosis cluster identification: the more stone clusters found, the more the solution space is restrained and the higher the corresponding hybrid hypothesis confidence. The hybrid hypothesis with 5 identified clusters brings a 73.55% confidence in the reconstruction. The 3D visualization of the resulting hypothesis of reconstruction is accessible online.

4. Discussion: digital twins in cultural heritage

It is a given that digital twins are already identified as an enabling framework beyond any digital technology counterparts. However, few examples of digital twin applications are currently available in the field of cultural heritage. The common pitfall in the cultural heritage field lies in developing innovative but overfitted methodologies and tools to the assets it studies. The digital twin experiment as a whole fits the reconstruction question of an arch and is reproducible only for similar questions or assets. Therefore, the reuse of this digital twin experiment appear limited at that aspect, but it is considered as a trade-off in favor of process efficiency. Inversely, because of the process partitioning in facets in the digital twin, all of them are highly reusable by themselves. The versatility of the digital twin framework is a solution for the reuse and the sharing of parts, in opposition to more monolithic architectures. The overall cohesion happens thanks to horizontal articulation of interdisciplinary perspectives. The multiplicity of viewpoints is both a richness and a challenge at a technical and human level: the collaboration of scientific stakeholders from different backgrounds is mandatory to create innovative solutions for complex problems. Prerequisites for sharing and collaboration—mutual understanding, pedagogical awareness, mediation and digital tool adoption—lead to strike a balance between actors, physical and digital assets in the digital twin framework.

5. Conclusion

The capacity to recover from a traumatic

续伴随大教堂的修复工作。未来的一个工作视角是数字孪生中的运行结构监测功能。未来的工作将集中在为其他研究项目发布作为可用语义砖块的知识图谱模式，自动化处理链中的时空标注和文物识别，以及从通往数字生态系统的单向链接转向双向链接。

event for a cultural heritage monument is a crucial point for its conservation. This paper showed that an application of the digital twin framework for cultural heritage can solve the related reconstruction questions and support reactive monitoring. This contributed to a dynamic shift from static information management to an adaptive workflow following the information production. It first identified a valid conceptual basis (digital twin) to base upon an iterative modeling method. Then we detailed the harmonization of 4 complementary viewpoints on the reconstruction problem—as a representation, as a hierarchical system, as data provenance, as an optimisation problem—in a hybrid hypothesis. We obtained a quantitative and uncertainty ascertained solution for the reconstruction of the transverse arch of the nave of Notre-Dame de Paris cathedral from its fallen and fragmented components with more than 73% of confidence. With this study, we want to emphasize the importance of flexible digital objects, such as digital twins, less bounded by technologies, to address complex and messy problems in a collaborative environment. At present, this research of digital twin application is ongoing: it will carry on with the restoration of the cathedral. One future perspective of work is the operating structural monitoring functionality in the digital twin. Future work will concentrate on pattern publishing for knowledge graphs as available semantic bricks for other research projects, automating the spatio-temporal annotation and identification of artifacts in a single processing chain, and moving from one-way links to the digital ecosystem to two-way links.

平台动态 Platform Dynamics

中国乡村遗产的时代活力（三） 山地深处的传承途径

The Contemporary Vitality of Rural Heritage in China (Part 3) Pathways of Heritage Transmission in the Mountainous Regions

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Note: This article was originally published in People's Daily (Overseas Edition), June 8, 2020. All illustrations in this article are based on the authentic scenes of Loushang Village

贵州的传统村落密布。全国 6819 处传统村落中，贵州省以总计 724 处中国传统村落独占鳌头。贵州省又多山，山地与丘陵面积占全省面积的 92.5%，拥有典型的喀斯特地貌。贵州省民族众多，有“文化千岛”之称，多民族文化交流与融合生生不息。自然与文化的长期交融，形成了各具特色的山地聚落。

人与自然的共同作品

贵州的山地聚落既有个性也有共性。相近的自然资源禀赋往往使得人们在实践中不约而同地选择了类似的生存策略，其核心就是如何在相互协作的基础上与自然和谐共处。

图 1：贵州楼上村
Figure 1. Loushang Village, Guizhou

Traditional villages are densely distributed throughout Guizhou Province. Among China's 6,819 traditional villages, Guizhou ranks first with a total of 724 nationally recognized traditional villages. The province is predominantly mountainous, with hills and mountains covering 92.5% of its total area, characterized by typical karst landscapes. Guizhou is home to diverse ethnic groups, earning it the reputation of a "cultural archipelago," where multi-ethnic cultural exchange and integration are persistently evolving. The long-standing integration of nature and culture has given rise to distinctive mountainous settlements.

A collaborative work of humanity and nature

The mountain settlements in Guizhou possess both distinctive identities and shared characteristics. Similar natural resource endowments often lead people to instinctively adopt analogous survival strategies in practice. At their core lies the pursuit of harmonious coexistence with nature, built upon a foundation of mutual collaboration.

Located in Guorong Township, Shiqian County, Tongren City, Guizhou Province, Loushang Village stands apart from the typical Dong or Miao settlements. It is instead a classic example of a Han Chinese immigrant

位于贵州省铜仁市石阡县国荣乡的楼上村，不同于侗寨苗村，而是一个典型的汉族移民村寨。明弘治六年（1493 年），一支源自江西的汉族周氏在“江西填湖广”“湖广填四川”的历史移民潮中辗转入黔，最终定居于贵州思南府寨纪（楼上村古称）。

楼上村选址于山坡之上，与廖贤河保持着安全的距离。其间的山水草木，不仅给予了人们最为基本的生存载体，还为人们提供了丰富而便利的物质材料。环境中的龙洞湾、天福井、野猫洞等天然泉眼，是村民最为主要的耕作与生活之源。村民将其以分导建渠的方式，依循着地势与水源高程的差异，将耕地分为稻作、旱作分片轮作，有序合理地保证了不同空间和时间下，对水和土地的有效利用。遍布于山野田间和村落之中的各类自然与人为的草木植被，则皆可为人们所转化利用。梯田中既可保护田埂又可作为生产蜡油的乌桕树、房前屋后用于制作农具和用具的阳山竹、山林里涵养水土又可用以建造房屋的杉木、松木等树材，无不与村民的生产生活发生着重要的联系。即便是远方名不见经传的高山，村民们也能够通过峰峦与云雾的关系判断气象的变化，为来日的耕种作息提供依据。

图 2：天福古井
（村民深谙循环用水之道。水池分为两级，第一级用于洗菜，第二级则用于清洗衣物、牲畜饮用。人多之时，取水需谦让有序。村民在此饮用取水、日常浣洗、乘凉闲聊，古井处是村内重要的公共活动空间）
Figure 2. Tianfu Ancient Well
(The villagers are well-versed in the practice of water recycling. The pool is divided into two levels: the first level is used for washing vegetables, while the second level is reserved for laundering clothes and providing drinking water for livestock. During busy times, fetching water requires courtesy and order. Here, villagers draw water for drinking, carry out daily washing, chat, and cool off—making the ancient well a vital public social space within the village)

village. In the sixth year of the Hongzhi era of the Ming Dynasty (1493), a Han family surnamed Zhou, originating from Jiangxi, migrated westward during the historic population movements known as "Jiangxi filling Huguang" and "Huguang filling Sichuan." After a long journey, they eventually settled in Zhaiji (the ancient name of Loushang Village), which was then part of Sin'an Prefecture in Guizhou.

Nestled on a hillside at a safe distance from the Liaoxian River, Loushang Village is embraced by a landscape where mountains, waters, plants, and trees provide not only the fundamental foundation for survival but also abundant and accessible material resources. Natural springs in the environment, such as Longdongwan, Tianfujing, and Yemaodong, serve as the primary sources of water for the villagers' farming and daily life. By channeling the water through constructed canals according to terrain and elevation differences, the villagers divided their farmland into sections for paddy and dryland crops, practicing rotational cropping. This systematic approach ensured efficient use of water and land across varying spaces and times. The diverse natural and cultivated vegetation scattered across the fields, mountains, and village are all utilized by the locals. For instance, the Chinese tallow trees in the terraced fields stabilize the ridges while producing wax oil; the Yangshan bamboo around the houses is used for making farming tools and utensils; and fir and pine trees in the forests conserve soil and water while providing timber for construction—all closely intertwined with the villagers' livelihoods. Even the distant, unnamed high mountains offer practical wisdom: by observing the interplay between peaks and clouds, the villagers can predict weather changes, guiding their farming and daily routines.

If the natural spatial and geographical environment endowed Loushang Village with the foundation for survival, then its people nurtured the unique character of this land. Traditional Han clan culture took root here—the ethos of "farming and studying to sustain the family," the enduring incense at the Zitong Temple and the Zhou Clan Ancestral Hall, and the architectural layout of courtyard-style residences. Over more than 500 years, these material and cultural elements have interacted, accumulated, and layered upon one another through the passage of time, shaping a work of harmonious integration

如果说自然的空间地理环境赠予了楼上生存的基础，那么“一方人”也孕育了一方的风土。汉族传统宗族文化在这片土地里落地生根，耕读传家的思想观念、香火不断的梓潼宫与周氏宗祠、三合院的民居建筑形式和布局，500 多年来，各种物质和文化要素在时间的长河里相互作用、积累、叠加，形成了人与自然和谐共融的作品。生活起居的建筑巷道、赖以生计的耕地梯田、作为生产生活重要资源补充的河泽山林，共同构成了楼上村绝佳的村落文化景观。

发展到今天，楼上村已经成为了一个包含 8 个自然寨的行政村，其中汇集楼上村古建筑群的仁家寨被称为楼上古寨，也凭借此，楼上村先后于 2008 年成为中国历史文化名村，2012 年入选第一批《中国传统村落名录》，2013 年，“楼上村古建筑群”被公布为第七批全国重点文物保护单位。

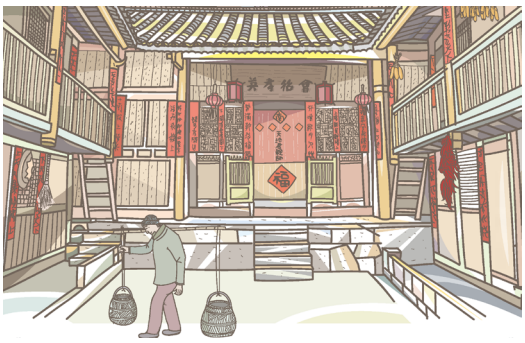

图 3：周永萼宅及窗花艺术
（宅院为三合院式，由正房和东西厢房组成，正房为清代保护建筑。建筑正房明间的前檐装有三关六扇门形制，窗花精美，窗棂镶嵌雕刻有虫鱼鸟兽、花卉神鹿等图像。窗花艺术代表着楼上村民对于美的追求）
Figure 3. Zhou Yong'e Residence and Its Paper-Cut Window Art
(The residence is designed in a traditional courtyard style, consisting of a main hall and east-west wing rooms. The main hall, a preserved structure from the Qing Dynasty, features a three-bay, six-panel door system on the front eaves of its central bay. The exquisitely crafted window lattices are adorned with carvings of insects, fish, birds, animals, flowers, and divine deer. This intricate paper-cut window art reflects the villagers' pursuit of beauty in Loushang Village)

文化景观是如何存留的？

楼上村村落文化景观的形成体现了人类尊重自然、顺应自然和巧妙利用自然的生态文明特征，这无疑构成了楼上村乡村遗产所具有的重要价值。那么这种价值如何顺利传承的？

between humanity and nature. The architectural lanes of daily life, the terraced fields that sustain livelihoods, and the rivers, wetlands, forests, and mountains that supplement vital resources for production and living together form the exceptional cultural landscape of Loushang Village.

Today, Loushang Village has developed into an administrative village comprising eight natural village hamlets. Its core area, known as Loushang Ancient Village, encompasses the cluster of ancient buildings in Renjia Hamlet. Thanks to this recognition, Loushang Village was designated as a National Historical and Cultural Village in 2008, included in the first batch of the "List of Chinese Traditional Villages" in 2012, and in 2013, the "Ancient Building Complex of Loushang Village" was announced as a National Key Cultural Relics Protection Unit in the seventh round of such designations.

How are cultural landscapes preserved?

The formation of the cultural landscape of Loushang Village reflects the ecological civilization characteristics of respecting nature, adapting to nature, and skillfully utilizing nature, which undoubtedly constitutes a significant value of its rural heritage. How, then, is such value effectively passed down?

The first pathway is the living transmission formed through the spontaneous practices of the villagers. In the context of Loushang Village, this form of living heritage remains vibrant. For example, to prevent disputes over water usage among farmlands in the past, the ancestors of Loushang established a "water rotation system", which continues to be practiced today. As the villagers explain, "Water rotation means taking turns to channel water, ensuring no time is wasted." Each household's allotted time for water diversion was determined by the size of their fields. In the era before clocks, people used burning incense sticks to time water intake at field inlets, mutually supervising to maintain order. The same principle applies to daily water usage. At Tianfu Well in Loushang Village, the spring outlet is divided into two levels: the first for drinking, washing vegetables, and other culinary

图 4：古巷道
（楼上村依山而建，青石板巷道凹凸斑驳，这里是往复田间的必经之地，也是亲朋邻里交往的重要连接。一处处或大或小的巷道，将整个村子串联成为一个整体）
Figure 4. Ancient Alley
(Built along the mountainside, Loushang Village features bluestone-paved alleys that are worn and uneven. These paths serve as essential routes to and from the fields, as well as vital connections for neighbors and friends visiting each other. A network of alleyways, both large and small, threads the entire village into a cohesive whole)

图 5：周正益宅
（正房为明代马桑古屋。院落入口处圈养家猪，院中时有家鸡活动）
Figure 5. Zhou Zhengyi Residence
(The main house is an ancient building framed with Chinese coriaria wood, dating back to the Ming Dynasty. Domestic pigs are penned at the courtyard entrance, and domestic chickens wander about the yard now and then)

第一个途径：村民自发形成的活态传承。就目前楼上村的情况来看，这种活态传承仍然具有一定生命力。比如过去为了避免各家农田的用水纷争，楼上先民建立起了“轮水制度”，相沿至今。村民们说：“所谓轮水，就是轮流放水，不耽误时间。”各家各户根据田地的大小划定引水的时间，在过去没有时钟的时代，人们在田地的引水口以烧香计时，互相监督，有序进行。包括生活用水也是如此，楼上村的天福井泉眼，出水口被划分为两级，第一级以饮水、洗菜等餐食之用，第二级以洗涤衣服等洁污之用。这是村民们约定俗成的规矩，体现着乡村朴实而独特的智慧与准则，于今仍在发挥作用，无需外界干预。

第二个途径：规划有管控作用。过往的村落保护规划往往比较强调对建筑本体的保护，而忽略了建筑和聚落发育成长的生态环境。在编制《全国重点文物保护单位楼上村古建筑群保护规划》时，编制团队通过探析村落的地理载体、生物圈层、人文圈层等几个物质层级与生产生活的关系和作用，确立了人与自然和谐共处的核心遗产价值，以此作为规划编制的依据。这就使得保护范围不再局限于国保名单上的几处重要建筑，而囊括了建筑空间、田园山水与自然环境。并且在建控地带中单独划出禁建区，包括楼上村周边以梯田、水渠、树林为

purposes, and the second for cleaning clothes and similar tasks involving dirt. These are customary rules established by the villagers, embodying the simple yet profound local wisdom and principles of rural life. They remain effective today and function without external intervention.

The second pathway is regulation through planning. Traditional village conservation plans often overemphasize the protection of architectural structures while neglecting the ecological environment in which these buildings and settlements evolved. During the drafting of the Conservation Plan for the Ancient Architectural Complex of Loushang Village, a National Key Cultural Relics Protection Unit, the planning team analyzed the relationships and roles between the village’s geographical setting, biosphere, cultural layers, and daily life and production. This process led to the identification of harmonious coexistence between humans and nature as the core heritage value, which became the foundation for the plan. As a result, the scope of protection was expanded beyond the few key buildings listed as national-level cultural relics to include architectural spaces, pastoral landscapes, and the natural environment. Moreover, a "no-construction zone" was designated within the controlled construction area, covering cultural landscapes that embody productive functions—such as terraced fields, irrigation channels, and woodlands

代表的体现生产功能的文化景观。此外，还将周边自然山水划入环境协调区。活态传承面临着土壤流失的困境，保护规划在确认遗产核心价值的基础上,承担的是一个底线管控的作用，所谓“留得青山在，不怕没柴烧”。

第三个途径：长期的在地记录。在贵州的山地聚落中，自然界的水、土、木、石等种种元素被应用、置入于生产生活的方方面面，在村落内部形成了一套丰富的乡土知识体系和乡村生活哲学。全面、深入地理解和认识是传承和保护乡村遗产的重要基础，这离不开长期的在地观察与记录的工作。距离楼上村东南方 300 公里外的另一处山地聚落地扪，是一座典型的侗族村寨。2005 年，地扪侗族人文生态博物馆在贵州省黎平县地扪村正式开馆，成为国内首家民营生态博物馆。地扪生态博物馆自建馆以来，长期对村落内部传统文化进行搜集和记录，目前搜集的资料已经有约 500T，以视频、照片为主。最早从拍摄、录制当地建筑、习俗和村民生产生活开始，后来通过与高校合作的方式，拓宽了资料收集的视野。近几年又重新以家庭档案和社区档案的形式对村落的发展进行记录，回归村民现实生活。村民和外来者不管是有实际的生活需要或是研究需要，都可以进行回顾和查阅。这种长期记录本身就是一种遗产传承行为，在未来或许以乡村书院的形式进行知识转化和传播，将发挥更重要的作用。

本文绘图：李信慧（中国台湾）

around Loushang Village. The surrounding natural scenery was also included in an environmental coordination zone. While the living transmission of heritage faces challenges such as soil erosion, the conservation plan, grounded in the recognition of core heritage values, serves a fundamental regulatory role—ensuring that "as long as the green mountains remain, there will always be firewood to burn."

The third pathway is long-term on-site documentation. In the mountainous settlements of Guizhou, natural elements such as water, soil, wood, and stone are applied and integrated into every aspect of daily life and production, forming a rich system of local knowledge and a philosophy of rural living within the village. Comprehensive and in-depth understanding serves as a crucial foundation for the transmission and preservation of rural heritage, which relies heavily on sustained on-site observation and documentation.Located approximately 300 kilometers southeast of Loushang Village, the mountain settlement of Dimmen is a typical Dong ethnic village. In 2005, the Dimmen Dong Human Ecological Museum was officially established in Dimmen Village, Liping County, Guizhou Province, becoming China’s first privately operated ecological museum. Since its founding, the Dimmen Ecological Museum has been consistently collecting and documenting traditional village culture, amassing around 500 terabytes of materials—primarily videos and photographs. Initially focused on recording local architecture, customs, and villagers' daily lives and production activities, the museum later expanded the scope of its documentation through collaborations with universities. In recent years, it has shifted its approach to documenting village development through family archives and community archives, reconnecting with the lived realities of the villagers. Both villagers and outsiders can review and access these materials for practical daily needs or research purposes. This long-term documentation is itself an act of heritage transmission. In the future, it may take on even greater significance through knowledge transformation and dissemination, potentially in the form of a rural academy.

Illustrations by Xinhui Li (Taiwan, China)

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ICOMOS 理论与哲学科学委员会 2025 年列日会议
The ICOMOS TheoPhilos 2025 Conference in Liège

资料来源 Source:
https://www.icomos.org/evenement/icomos-theophilos-2025-conference/

近日，国际古迹遗址理事会（ICOMOS）理论与哲学科学委员会（TheoPhilos）2025 年度会议在比利时列日大学建筑学院（Faculty of Architecture, University of Liège）隆重举行。本次会议由 ICOMOS 理论与哲学科学委员会、列日大学艺术、考古与遗产研究室（Art, Archaeology and Heritage Research Unit）及 ICOMOS 比利时委员会联合主办。

会议背景基于威尼斯宪章六十年后的反思。本次会议恰逢《威尼斯宪章》（Venice Charter）颁布六十周年后的关键历史节点，会议主题定为“ICOMOS 在遗产理论与哲学演变中的角色：成就、问题与挑战”。作为国际遗产保护领域的基石文件，《威尼斯宪章》确立了以物质真实性为核心的保护原则，并在很长一段时间内主导了全球遗产保护的话语体系。然而，随着全球化进程的深入和文化多样性意识的觉醒，这一曾经被奉为圭臬的“欧洲中心主义”范式正面临前所未有的审视与挑战。

在为期两天的会议中，来自世界各地的遗产理论家、建筑师及学者齐聚列日大学的丰克兵营（Fonck Barracks），围绕五个主要学术单元展开了激烈的思想交锋。议题涵盖 ICOMOS 的历史成就、真实性概念的当代阐释、以及非西方语境下的遗产保护理论等。

会议的核心宗旨在于重新审视 ICOMOS 作为国际遗产教义”制定者的历史地位，并探讨如何在保持遗产保护科学性的同时，包容不同文化背景下对“历史”、“记忆”和“真实性”的多元理解。

Recently, the 2025 Annual Conference of the International Council on Monuments and Sites (ICOMOS) International Scientific Committee on Theory and Philosophy of Conservation and Restoration (TheoPhilos) was grandly held at the Faculty of Architecture, University of Liège, Belgium. The conference was jointly organized by the ICOMOS TheoPhilos Committee, the Art, Archaeology and Heritage Research Unit of the University of Liège, and the ICOMOS Belgium Committee.

Conference Background was based on Reflections Sixty Years After the Venice Charter. This conference coincided with a critical historical juncture following the 60th anniversary of the Venice Charter. The theme was set as "The Role of ICOMOS in the Evolution of Heritage Theory and Philosophy: Achievements, Problems, Challenges". As a cornerstone document in the field of international heritage conservation, the Venice Charter established conservation principles centered on material authenticity and dominated the global heritage conservation discourse for a long time. However, with the deepening of globalization and the awakening of awareness of cultural diversity, this "Eurocentric" paradigm, once regarded as the gold standard, is facing unprecedented scrutiny and challenges.

During the two-day conference, heritage theorists, architects, and scholars from around the world gathered at the historic Fonck Barracks in Liège for intense intellectual exchanges across five main academic sessions. Topics covered the historical achievements of ICOMOS, contemporary interpretations of the concept of authenticity, and heritage conservation theories in non-Western contexts.

The core purpose of the conference was

图 1：陈曦副教授的演讲
Figure 1. Prof. Chen's speech

在第四学术单元“真实性问题”（Session 4: The Issue of Authenticity）中，来自中国苏州大学建筑学院的陈曦副教授聚焦于中国建筑遗产“重建”的理论突破，发表了题为《中国建筑遗产重建的理论反思 —— 以苏州为例》的重要演讲。该报告基于扎实的实地调研与深厚的理论功底，向国际学界展示了中国学者在遗产保护基础理论领域的最新思考。

在会议闭幕式的圆桌论坛上，由 Giora Solar 主持，来自盖蒂保护研究所（Getty Conservation Institute）、ICCROM 以及英国历史建筑委员会（Historic England）的代表们展开了激烈的辩论。专家们一致认为，未来的遗产理论必须走出“象牙塔”，不再仅仅关注过去的纪念碑，而应更多地回应气候正义、去殖民化以及数字化时代带来的新挑战。

这次 ICOMOS 会议不仅是对过去六十年遗产保护理论的一次深情回眸，更是一次面向未来的思想动员。以陈曦副教授为代表的中国学者在国际舞台上的发声，标志着中国遗产保护理论正在从“引进吸收”走向“对话贡献”。通过对本土实践的理论升华，中国经验正在丰富世界遗产保护的哲学库，推动构建一个更加包容、多元且具有韧性的全球遗产保护理论体系。

to re-examine the historical status of ICOMOS as a formulator of international heritage "doctrines" and to explore how to maintain the scientific nature of heritage conservation while accommodating diverse understandings of "history," "memory," and "authenticity" from different cultural backgrounds.

In the fourth academic session, "The Issue of Authenticity", Prof. Xi Chen from the School of Architecture, Soochow University, China, focuing on theoretical breakthroughs in the "Reconstruction" of Architectural Heritage in China, delivered a keynote presentation titled "Reflections on the Reconstruction of Architectural Heritage in China: a Case Study of Suzhou". Based on solid field research and profound theoretical foundations, this report presented the latest reflections of Chinese scholars in the field of fundamental heritage conservation theory to the international academic community.

At the roundtable forum during the closing ceremony, hosted by Giora Solar, representatives from the Getty Conservation Institute, ICCROM, and Historic England engaged in a heated debate. Experts agreed that future heritage theory must step out of the "ivory tower" and no longer focus solely on monuments of the past, but should respond more to new challenges brought about by climate justice, decolonization, and the digital age.

The ICOMOS TheoPhilos 2025 Liège Conference was not only an affectionate retrospective of heritage conservation theory over the past sixty years but also an intellectual mobilization facing the future. The voices of Chinese scholars, represented by Prof. Xi Chen, on the international stage mark a shift in Chinese heritage conservation theory from "introduction and absorption" to "dialogue and contribution." By theoretically sublimating local practices, the Chinese experience is enriching the philosophical reservoir of world heritage conservation and promoting the construction of a more inclusive, diverse, and resilient global heritage conservation theoretical system.

澳门举办文化遗产保护与修复研讨会

Symposium on Cultural Heritage Conservation and Restoration Held in Macao

资料来源 Source：
https://www.culture.gov.mo/gb/news/detail/24375

图 2：研讨会现场
Figure 2. The scene of the seminar

1 月 25 日，“澳门故宫文化遗产保护传承中心”在澳门艺术博物馆举办“文化遗产保护与修复研讨会”，邀请多位参与大三巴牌坊及铜像修复的专家分享文物保护的前沿理念、技术与实践案例。活动汇聚多位参与大三巴牌坊及铜像修复的专家，通过分享内地与国际文物保护的前沿理念、技术与实践案例，共同就大三巴牌坊及铜像修复进行交流及探讨，以提升公众对文物修复的了解，促进交流合作与互学互鉴，为澳门文化遗产保护注入新思维与活力。

文化局局长梁惠敏致辞时表示，传承中心以昔日圣保禄学院遗址——大三巴牌坊为首个修复对象，通过守护这座见证数百年中西文化交流的标志性遗产，促进古今中外修复技术的交流，赋予文明传承崭新的时代意义。未来，传承中心将根据各修复项目的需求，组建跨国专家团队开展合作，以文化遗产为纽带、修复实践为桥梁，善用澳门中西荟萃的文化资源，推动国际人文交流。

本次研讨会以大三巴牌坊修复为契机，汇聚中外专家智慧，正是文化交流互鉴的生动实践。她强调，保护文物就是延续城市记忆，澳门将继续借助“一基地”优势，透过文物修复与国际合作，向世界讲好澳门故事、中国故事，展现中西文化共融的独特魅力。

研讨会上，故宫博物院文保标准部主任曲

On January 25, the Palace Museum Cultural Heritage Conservation and Inheritance Centre in Macao hosted the Symposium on Cultural Heritage Conservation and Restoration at the Macao Museum of Art. It brought together experts involved in the restoration of the Ruins of St. Paul's and its bronze statues, who shared cutting-edge concepts, technologies and practical cases of cultural heritage conservation from the Chinese mainland and across the globe. The experts exchanged insights on the restoration of the Ruins of St. Paul's and its bronze statues, aiming to raise public awareness of cultural relic restoration, boost exchanges, cooperation and mutual learning, and inject new ideas and vitality into Macao's cultural heritage conservation efforts.

In her speech, Leong Wai Man, Director of the Macao Cultural Affairs Bureau, stated that the Centre has selected the Ruins of St. Paul's – the former site of the College of St. Paul's – as its first restoration project. Safeguarding this iconic heritage, a witness to centuries of Sino-Western cultural exchanges, facilitates the sharing of restoration techniques across eras and borders, and endows the inheritance of civilizations with a new contemporary significance. Going forward, the Centre will form transnational expert teams for targeted cooperation based on the needs of various restoration projects. It will leverage Macao's distinctive Sino-Western cultural resources to advance international cultural and people-to-people exchanges, with cultural heritage as the bond and restoration practice as the bridge.

The symposium, which pools the wisdom of Chinese and foreign experts around the restoration of the Ruins of St. Paul's, is a vivid practice of cultural exchanges and mutual learning. She emphasized that conserving cultural relics is preserving urban memory; Macao will continue to draw on its strengths as a cultural exchange base, telling the stories of Macao and China to the world through cultural heritage restoration and international cooperation, and showcasing

亮以“故宫博物院青铜器保护修复与科学研究”分享故宫在青铜器保护与跨学科研究方面的前沿经验，并结合三星堆遗址等案例，介绍现代技术与传统工艺结合的青铜器保护修复成果。希腊文物保护专家 Amalia Siatou 分享希腊文化遗产的保护经验，探讨大型遗址与铜、石混合材质文物的保护策略，为大三巴牌坊及铜像修复工作提供借鉴与参考。澳洲金属文物保护专家 Ian Miles 与澳门大学研究助理教授叶健雄，则透过大三巴牌坊铜像等本地案例，向公众介绍澳门文物修复的技术内涵与工作实况。

研讨会亦邀请文化遗产委员会、澳门建筑师协会、工程师学会及多间高校等代表出席，并吸引众多业界人士及公众到场参与。现场交流气氛踊跃，有效促进了保护修复领域专业知识与技术经验的共享与传播。

the unique charm of integrated Sino-Western cultures.

At the symposium, Qu Liang, Director of the Cultural Relics Conservation Standards Department of the Palace Museum, delivered a speech titled Exploration and Practice of Bronze Ware Conservation, Restoration and Scientific Research at the Palace Museum. He shared the museum’s cutting-edge experience in bronze ware conservation and interdisciplinary research, and introduced the achievements of integrating modern technologies with traditional craftsmanship in bronze ware restoration, citing cases such as the Sanxingdui Ruins. Amalia Siatou, a Greek expert in cultural heritage conservation, shared Greece’s conservation experience and explored protection strategies for large-scale heritage sites and copper-stone composite relics, providing valuable references for the restoration of the Ruins of St. Paul’s and its bronze statues. Ian Miles, an Australian expert in metal cultural heritage conservation, and Ye Jianxiong, Research Assistant Professor of the University of Macau, explained the technical essence and on-site practices of Macao’s cultural heritage restoration to the public with local cases including the bronze statues at the Ruins of St. Paul’s.

The symposium also invited representatives from the Cultural Heritage Committee, Macao Architects Association, Macao Institution of Engineers and several local universities, and attracted a large number of industry professionals and members of the public. The lively on-site exchanges effectively promoted the sharing and dissemination of professional knowledge and technical experience in cultural heritage conservation and restoration.

Ctrl+S Culture：数字世界中的人工智能与文化遗产

Ctrl+S Culture: AI and Heritage in a Digital World

资料来源 Source：
https://www.iccrom.org/news/ctrls-culture-ai-and-heritage-digital-world-%E2%80%93-conference-wrap

图 3：活动海报
Figure 3. The poster of the event

文化遗产并非一成不变，它始终在社会、文化、政治与经济的多重进程交织中，被不断重塑、重新诠释、引发探讨并延续传承。人们探寻与文化遗产的联结，既是为了确认自身身份、主张所属权益、获取发展资源，更是为了在充满未知的当下找准前行方向，同时勾勒未来的多种可能。如今，人工智能正深度介入人类观察、记录与解读世界的方式，一个核心命题也随之浮现：人工智能究竟能在文化遗产的记录、梳理、保护与传承中扮演何种角色，又如何做到不侵蚀其赖以立足的人文内核？

这一极具探讨价值的问题，成为国际文化财产保护与修复研究中心（ICCROM）「Ctrl+S Culture：数字世界中的人工智能与文化遗产」国际会议的核心议题，并在不同学科、地域与专业领域引发广泛共鸣。

本次会议共吸引 145 个国家的 2398 名代表参与，参会者分别来自博物馆、图书馆、档案

Cultural heritage is not static. It is continuously shaped, reimagined, contested, and sustained through social, cultural, political, and economic processes. People engage with heritage to affirm identity, claim ownership, access resources, and exercise agencies in navigating an uncertain present while shaping possible futures. As artificial intelligence increasingly mediates how we see, record, and interpret the world, a critical question arises: What role can AI play in documenting, describing, safeguarding, and sustaining cultural heritage – without eroding the human values at its core?

This compelling question anchored ICCROM's Ctrl+S Culture: AI and Heritage in a Digital World conference and resonated across disciplines, regions, and professional roles.

2,398 participants from 145 countries joined the conversation, representing museums, libraries, and archives, research institutions and universities, government bodies, cultural and creative industries, and community-based heritage organizations.

Across three days of keynotes, panels, workshops, and hands-on sessions, the conference created a shared space where practice met research, policy engaged with field experience, and creativity informed critical debate. The scale and diversity in the room – paired with a shared sense of urgency and hope – set a powerful and inspiring tone for reflecting on safeguarding heritage in a rapidly evolving digital world.

Day One opened with a forward-looking focus on how artificial intelligence is transforming cultural heritage. Day Two continued this momentum by examining what it means to decode heritage through artificial intelligence. The day included advances in documentation systems, ontology development, intangible heritage reconstruction, archaeological pattern identification, and policy frameworks supportingethical and validated AI use. Day Three continued this line of inquiry,

馆，高校及科研机构，政府相关部门，文化创意产业领域，以及扎根社区的遗产保护组织。

会议为期三天，通过主旨报告、专题研讨、工作坊及实操环节，搭建了共享交流平台，实现实践与科研相互结合、政策与实地经验深度对话、创意为批判性讨论注入活力。与会人员规模多元、背景丰富，怀揣共同的使命感与期许，为在快速变革的数字时代反思遗产保护工作，奠定了深刻且富有启发性的基调。

会议首日以前瞻性视角，聚焦人工智能如何重塑文化遗产保护格局。次日会议延续这一探讨热度，深入剖析借助人工智能「解码」文化遗产的深层内涵。议程内容涵盖文献建档系统的最新突破、本体论构建、非物质文化遗产数字化复原、考古学模式识别，以及支撑人工智能伦理化、可验证化应用的政策框架搭建。三日，会议进一步探寻人工智能如何成为文化创新的催化剂。演讲嘉宾们展示了各类新兴技术如何催生创新的叙事形式、还原濒临消逝或碎片化的文化记忆，同时拓宽大众参与创意创作与策展实践的渠道。

会议论文集定于 2026 年春季正式出版，届时将对本次会议呈现的各类主题、理念与创新实践展开进一步阐释。会议表明，文化遗产的未来，在于技术创新与人文专业素养的携手共进，更离不开全球各界对负责任、包容性数字转型的共同践行与坚守。

examining how artificial intelligence can act as a catalyst for new forms of cultural creativity. Speakers illustrated how emerging techniques can generate innovative narrative structures, recover fragile or fragmented cultural memories, and broaden access to creative and curatorial practices.

The conference proceedings, to be published in the spring of 2026, will further explore the themes, ideas, and innovations presented. Ultimately, Ctrl+S Culture demonstrated that the future of cultural heritage lies in a partnership between technological ingenuity and human expertise, supported by a global commitment to responsible and inclusive digital transformation.

历史建筑与遗产保护研究所
Research Institute for Historical Architecture and Heritage Conservation