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Beyond skills: reflections on the tacit knowledge-brain-cognition nexus on heritage conservators

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Abstract

The conventional perception of heritage conservators' knowledge has primarily focused on their explicit knowledge rooted between science and humanities. However, this perspective on their knowledge is imprecise and often overlooks other intangible dimensions, particularly their accumulated practical (hands-on) tacit knowledge, which extends beyond the traditional view and is often reduced to a mere skill. This comment/perspective article challenges this traditional view and aims to explore the significance of this ineffable knowledge and the possible implications of repetitive practical sensorimotor motions on the conservator's brain, embodied cognition, intuition, and decision-making. This new vision aims to reflect on how we understand the scope of knowledge of worldwide heritage conservators and to open new doors for research and interdisciplinary collaborations.

Keywords Heritage conservators, Tacit knowledge, Neuroplasticity, Embodied cognition, Decision-making, Knowledge acquisition

Introduction

Cultural heritage conservators play a crucial role in our society by preserving our historic legacy in a good state of conservation and safeguarding its historic attributes for future generations. They work in museums, heritage institutions, historic sites, and private conservation studios worldwide. Their daily actions involve activities such as examining objects or performing conservation interventions such as cleaning, stabilizing fragile materials, repairing structural damage, or applying surface treatments to stop decay or improve conservation conditions [1]. To conduct successful visual examinations and hands-on interventions, conservators require comprehensive knowledge of humanities, enabling them to understand manufacturing techniques and historical/cultural contexts, and sciences, allowing them to comprehend materials composition, deterioration mechanisms, and reactions that may occur during conservation treatments [2]. These academic competencies are typically acquired through university education [3], educational practice, and further professional development. However, despite acquiring academic knowledge in both humanities and science, to perform successful interventions, conservators also need to have another type of knowledge that is not easily taught or even expressed with words, but fundamental for the success of most interventions, which is commonly described in philosophical research as "tacit knowledge" [4]. The significance of tacit knowledge is, in general terms, still not fully comprehended in our everyday activities, and its contribution remains undefined in numerous professional practice fields worldwide [5]. The term "tacit knowledge" was initially

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defined by the chemical engineer and philosopher Michael Polanyi (1891–1976) as the type of knowledge, which is difficult to express with words, or to describe in mathematical terms, but fundamental to the successful development of any practical action [4]. The current clearest examples illustrating the significance of tacit knowledge focus on trying to explain with words how to ride a bicycle, throw a ball in baseball or play a musical instrument [6]. In all these cases, successful outcomes depend on the practitioner's acquisition of both explicit knowledge (learned through documented information and facts) and tacit knowledge (accumulated through practical experience and understood sensorimotor information, often gained through observation and deep concentration). The existence of this ineffable tacit knowledge in conservation has already been identified by several academics in the past while reflecting on conservation interventions [7–18]. For example, Jonathan Ashley-Smith expressed that conservators possess a unique intuitive understanding of materials and their behavior, which significantly influences decision-making and treatment processes [7]. Similarly, Salvador Muñoz-Viñas emphasized that conservators possess a distinct type of knowledge, know-how, skill, or intuition that, while not scientific, is essential to the practice of conservation [8]. Other studies in this line, conducted by Carol Grisson and Elena Charola at the Smithsonian's Museum Conservation Institute in the United States, concluded that visual/tactile evaluation presents, in several cases, higher levels of accuracy compared to instrumental techniques for measuring roughness and assessing the effectiveness of conservation treatments [12]. Other publications in heritage conservation also highlight the need to translate traditional intangible knowledge embedded in practice into explicit knowledge to preserve it for future generations [13, 14]. Moreover, beyond its direct impact on conservation practical hands-on interventions, tacit knowledge, proved useful when navigating other complex ethical dilemmas [15], assessing other conservation activities including decision-making [16, 17], or developing effective management strategies [18]. These are a few examples that emphasize the conservator's capacity to utilize a dimension of knowledge beyond the merely explicit knowledge, and their activities often rely on an intuitive perspective that cannot be easily expressed with words [8]. However, despite the previous identification of this type of knowledge in the heritage conservation field, both its importance and the true extent of its impact on conservators' daily interventions are far from being fully understood, and surprisingly, to date, there has been no single research study aimed at understanding or decoding some parts of this intangible tacit knowledge.

This perspective article aims to explore the dimensions of tacit knowledge embedded in heritage conservation practices and the potential implications of these repetitive observational and practical sensorimotor motions on the conservator's brains and their embodied cognition.

The conservator's knowledge: differentiation between explicit and tacit knowledge

The importance of explicit knowledge is widely recognized in society as it encompasses all the propositional facts, information, and understanding acquired through education and learning [19]. This type of knowledge can be structured, stored, and easily transferred to others, as evident in books and other forms of documentation [20]. However, the role of tacit knowledge is still an enigma, and its implications for most professional practical fields are unclear, not well understood, and have not yet been deeply investigated [5]. This is due, essentially, to the nature of this type of accumulated "practical knowledge". Since this tacit knowledge is considered everything a person (or a professional) knows how to do but does not necessarily know how to explain or articulate in words, most of this intangible knowledge cannot be easily written down or recorded to analyze, understand, transfer, or even preserve [21].

In their daily activities, professional conservators are immersed in highly demanding observation and engaged in a variety of sensorimotor activities. A detailed example of the differentiation between tacit and explicit knowledge in heritage conservators' practice can be found elsewhere [8]. Figure 1a illustrates a common conservation activity. This action emphasizes that successful conservation practice actions often require the simultaneous utilization of both forms of knowledge, and that the absence of either form can lead to suboptimal results. In the example illustrated in Fig. 1a, the conservator's tacit knowledge includes understanding the exact pressure to apply with the swab, striking a balance between removing dirt and avoiding damage to fragile historical material, knowing the different types of movements to perform with the swab at different stages during the cleaning process, and recognizing when to stop cleaning. The importance of this tacit knowledge could be evidenced when considering the potential risks associated with employing a swab on a historic Egyptian wall painting without possessing the required accumulated sensorimotor knowledge, which includes understanding the appropriate application of swab pressure and movements. Moreover, visual acuity

Explicit Knowledge			Tacit Knowledge		
Conservation Principles Ethics and Guidelines	Conservation Materials	Art and Cultural History	Visual Perception	Hand-Eye Coordination	Proportion and Spatial Awareness
Material Science	Conservation Techniques and Methods	Technical Research	Manual Dexterity and Tactile Sensitivity	Sensory Integration	Kinesthetic Knowledge and Memory

Fig. 1 Exploring the conservator's knowledge and differentiation of explicit and tacit knowledge. **a** An example of a cleaning process carried out in 2008 during the conservation of Ancient Egyptian Wall Paintings in the Old Egyptian Necropolis, Thebes, Egypt. (In the picture, Dipl. Rest. Christina Verbeek in the tomb of Neferhotep TT49. Research project financed by the Gerda Henkel Foundation, photo: Thomas Haupts) [32]. The process consisted of initial mechanical cleaning using a damp swab soaked in deionized water to remove encrusted soot, followed by a combination of mechanical and chemical cleaning to effectively eliminate the old darkened varnish [32]. (Image: Courtesy of Christina Verbeek); **b** a detailed example of the removal of adherent surface deposits using physical–chemical means (cotton swab) at the Church of Sucevića Monastery in Suceava, Romania, in September 2006. This image was released under Creative Commons Attribution-Share Alike 3.0. **c** Image showing the "before" state (**c**) and the "after" state (**d**) of the restoration of the polemic Salvator Mundi painting [33]. The painting underwent comprehensive restoration before being attributed to Leonardo da Vinci in 2011 [34] and subsequently sold in 2017 for US$ 450.3 million [35]. The conservation process has not been publicly disclosed or extensively documented. This image was released under Creative Commons Attribution-Non-Commercial 4.0 International (CC BY-NC 4.0). The table below presents the differentiation between explicit and tacit knowledge that collectively enables conservators to preserve historic objects effectively

is of paramount importance in discerning the optimal point at which to cease the cleaning process. This type of knowledge surpasses mere explicit knowledge and skill, embodying acquired and cultivated understood sensorimotor information—a fundamental element for achieving successful interventions, as recently indicated by Salvador Muñoz-Viñas [8]. This becomes really important when considering that original historic material often holds immense historical, cultural, symbolic, and economic value [22], and that conservation activities directly affect various aspects, including aesthetic characteristics, durability, cultural significance, societal appreciation, attraction for tourism, and even the economic value of the artifact (Fig. 1c, d). However, despite the significant contribution of this ineffable knowledge to their activities, it has been often overlooked and has never been thoroughly investigated, analyzed, or subjected to comprehensive research to comprehend its true implications. Furthermore, surprisingly, there have been no systematic efforts in science to transform specific aspects of intangible tacit knowledge into explicit knowledge. Such a conversion could facilitate learning from it, enable its transfer to other practitioners, integrate it into education, and, in certain cases, ensure its preservation for future generations.

But how can we investigate this type of intangible knowledge? Is it possible to do so considering our current state-of-the-art methods? Despite the lack of systematic large-scale research on the study of tacit knowledge, several initial attempts have already been made in global academic circles to gain insight into certain aspects of this ineffable knowledge embedded in diverse practical activities [23–31]. Many of these studies are being focused on translating practical knowledge into explicit knowledge, particularly in fields such as robotics [23], software development [24], the food industry [25], and business negotiations [26]. For instance, in the domain of software and robotics, researchers analyze the tacit knowledge of skilled human operators by capturing their actions and movements, aiming to facilitate the sharing of tacit knowledge with others [23, 24] and potentially convert it into codified explicit knowledge that can enhance robot autonomy [27–29]. Conversely, in the area of healthcare, tacit knowledge has been examined to understand its role in the intuition and decision-making of hospital staff, improving the response to patient needs and overall effectiveness [30], and its impact on successful program planning and implementation [31]. These efforts shed light on how we could study tacit knowledge in conservation practical settings. In this framework, I believe there is a compelling need in the heritage conservation practice field to initiate comprehensive and systematic research to explore this type of intangible knowledge given the high cultural and economic implications this work entails. Further initiatives could involve exploring the possibility and feasibility of "translating" or "converting" specific aspects of this intangible knowledge into an explicit form. Such endeavors would aim to uncover methods of articulating and documenting tacit knowledge, making it more accessible and transferable to others. By doing so, all conservation practitioners could enhance their understanding, facilitate knowledge sharing, and potentially preserve this valuable knowledge for future generations. Additionally, by uncovering hidden knowledge, new alternative approaches, ideas, methods, and solutions can arouse and inspire new research lines that may not be apparent through explicit knowledge alone. The study of the conservator's tacit knowledge could have implications not only in the domain of heritage conservation but also across diverse professional practice fields, encompassing areas such as sports, medicine, and education.

The neuroplasticity of conservators' brain: implications for their tacit knowledge and cognition

Over the last two decades, advances in neuroscience have demonstrated that the human brain is highly adaptive and constantly undergoes morphological and functional changes in response to our diverse range of experiences, activities, and environment [36]. This phenomenon, known as 'neuroplasticity,' replaced the previously held notion of it being a static and non-changeable organ [37, 38]. Neuroplasticity primarily occurs in brain areas related to memory, cognition, and other functions such as sensory perception, motor skills, and language processing [39]. The first worldwide recognized study which demonstrated that our daily professional activities can change the structure and morphology of our brain revealed that expert London taxi drivers possess an enlarged hippocampus—a brain region intricately associated with human spatial memory—in contrast to regular car drivers [40]. This enlargement is a result of their high-demanding need to memorize the layout of 25,000 streets in London, which is commonly known as "*The Knowledge*" [41]. This enlarged hippocampus equips them with superior spatial memory skills compared to average adults [40, 41], which ultimately makes them more suitable for performing their professional activity [41]. Additional structural brain plasticity studies demonstrated that expert violists' brains exhibit enhanced neural connections in the right hemisphere motor cortex [42, 43]. This specific cortical region plays a crucial role in orchestrating intricate finger movements [43]. The development of these enhanced neural connections is attributed to the demanding engagement in finger sensorimotor practice [43]. These enhanced neural connections in the somatosensory cortex allow them to achieve superior finger speed, enabling them to produce, in some cases, up to 30 notes per second [42]. Further studies demonstrated that the auditory cortex of expert violinists is up to 25% larger compared to young unskilled violinists [42–44], and the size of the auditory cortex can vary depending on several factors, including experience, age of initiation, and daily practice hours [44]. Additionally, long periods of inactivity in expert violinists result in a gradual loss of sensitivity and synaptic connections, potentially leading to cortical shrinkage to normal dimensions [42–44]. Recent advancements in neuroscience also revealed structural brain changes in professional dancers [45–48], predominantly in brain regions responsible for motor control, coordination, spatial memory, and processing, such as the motor cortex, cerebellum, and hippocampus [45]. These structural brain adaptations are a direct result of their extensive accumulated expertise and demanding training in spatial and visual-motor skills [46]. Consequently, professional dancers exhibit superior motor skills, precise coordination, and refined spatial awareness compared to junior or non-professional dancers with significantly less accumulated sensorimotor expertise and brain adaptations [47]. These structural brain changes not only contribute to their performance but also lead to significant enhancements in memory, attention, body balance, psychosocial parameters, and alterations in peripheral neurotrophic factors [48]. Furthermore, other renowned studies have indicated that activities such as ball juggling, which involve complex training of visual-motor skills, can improve connectivity in brain regions responsible for coordinated movements. Noticeable changes have been observed as early as after 7 days of training [49]. Intriguingly, similar to findings in musicians, these brain changes revert back to their original size when the practice is discontinued [50].

Results of this nature, highly supported by experimental research involving human professionals, provide compelling evidence that extensive training and repetitive practice of sensorimotor skills can significantly alter the structure and morphology of the brain and enhance our proficiency in specific activities, empowering us with enhanced skills and capabilities [51].

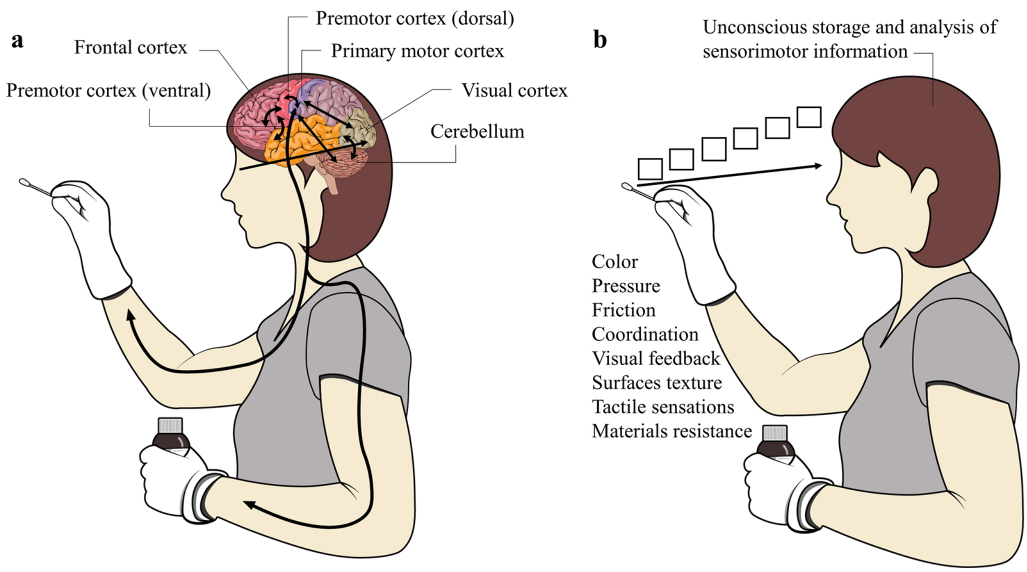

Fig. 2 **a** Schematic image illustrating the feedback and feedforward sensorimotor interactions that might occur in the brain of a conservator during a conservation activity performance. As a conservator concentrates and engages in practical conservation actions, several areas of the brain are involved in observing and controlling the fine movements required for the activity; **b** Schematic image illustrating the potentially huge amount of sensorimotor information that conservators receive and store during any of their daily practice activities

I hypothesize that conservators, who are daily engaged in high-demanding sensorimotor activities, that in most cases require high levels of concentration, may also experience several changes in the brain (Fig. 2a) and that this could be closely linked to their above-mentioned accumulated tacit knowledge which ultimately could make them more suitable for performing some of their professional activities. For example, intensive vision-motor activities could lead to changes in cortical regions in the brain [52], which are the areas responsible for motor control and sensory processing. These changes may occur in response to the conservators' rigorous training, undergoing potential alterations in their size, density, or organization [52]. The highly focused and prolonged training in several sensorimotor activities could also induce specific structural changes in brain regions associated with sensorimotor functions, such as the primary motor cortex and the cerebellum, as in the case of professional dancers [45]. In addition, those repetitive sensorimotor activities could also promote stronger connectivity between different brain regions involved in motor planning, coordination, and sensory integration (Fig. 2). Enhanced connectivity could enable more efficient communication and coordination within the neural networks responsible for motor skills, potentially making conservators more efficient in performing specific sensorimotor tasks [53], and developing a heightened ability to interpret and respond to sensory cues, allowing for more precise and refined motor control in their conservation activities. It is important to note that any of those potential changes in conservators' brains may also depend on factors such as the nature of their training, individual differences, initiation time, practice duration, and intensity. This is crucial for conservators, as continuous practice is essential for shaping professional expertise, as emphasized by the E.C.C.O. [54] These potential changes in the conservator's brain can have significant implications for their cognition and daily performance, including: (i) improved motor skills, enhancing hand–eye coordination and dexterity for precise execution of delicate tasks; (ii) enhanced sensory processing, particularly visual perception for accurate recognition of textures, colors, and tactile sensitivity in assessing object conditions; (iii) improved spatial awareness, facilitating precise perception and understanding of small restorations within their overall context; (iv) enhanced cognitive processing, enabling faster and unconscious decision-making in actions such as applying appropriate pressure with a swab (Fig. 1a); and (v) the development of kinesthetic memory patterns, involving processing and storing sensory motions, to ensure consistent and accurate performance in repetitive conservation tasks. These brain adaptations based on their accumulated learning, which could be measured by Functional MRI (fMRI) studies or longitudinal studies, can ultimately make conservators more suitable for performing their professional conservation tasks with enhanced precision, efficiency, and expertise, and be strongly related to the accumulated tacit knowledge, their embodied cognition, intuition, decision-making, and their future cognition.

Conservator's embodied cognition and implications for unconscious decision-making and intuition

Embodied cognition is a currently popular scientific theory or cognitive approach that suggests our cognitive processes are closely linked with our body, our daily sensory and motor experiences, and how we perceive and act in the world [55]. This theory emphasizes that all bodily sensory and motor systems, beyond physical changes in the brain, play a crucial role in shaping our understanding, thinking, reasoning, judgment, decision-making, and intuition [56]. Initial concepts of the embodied cognition theory can be found in Noam Chomsky's early theories of language acquisition [57], as well as in other theories on attention [58], problem-solving [59], memory [60], and perception [61]. In all those initial studies, they suggested mental processes are not, or not only, computational processes emphasizing the significance of environment in our cognitive abilities. Embodied cognition has been investigated across various domains involving humans and diverse environmental scenarios. The literature clearly confirms that repetitive actions affect our embodied cognition [62–64] and that when we observe someone performing an action, our brains also simulate making that action, acquiring similar motor skills, and contributing to our embodied cognition [65]. However, studies in this light also demonstrate that embodied cognition can also be influenced by simple thoughts and ideas. The clearest example illustrating embodied cognition is the use of metaphorical language. Studies have shown that encountering metaphorical language that relies on physical experiences (e.g., "stand" [66]) also activates our sensory and motor systems. This suggests that ideas or thoughts can influence our minds and might contribute to our embodied cognition. Along the same line, recent investigations of embodied cognition suggest that regular contemplative activities, such as meditation [67], which do not involve physical activity, may also induce changes in the brain, including increased gray matter volume. These activities also impact our embodied cognition in areas associated with body awareness, emotion regulation, and attention. Similar studies on other contemplative activities, such as Yoga [68], which emphasizes bodily sensations, breath control, and mindful awareness, have also shown that it promotes the integration of sensory and motor processes, leading to a stronger mind–body connection and a more embodied experience of cognition, ultimately even influencing the grey matter of our brain [55]. These examples provide evidence for the interconnectedness of the mind and body in cognition and support the idea that mental or physical experiences and interactions with the world around us shape our embodied cognitive processes, including perception, memory, and problem-solving.

In the case of heritage conservators, one of the central motivations for considering embodied cognition resides in the fact that movement has been found a fundamental characteristic of embodied cognition [69]. In this light, I believe conservator's embodied cognition is also shaped by their daily repetitive sensorimotor tasks such as using swabs or brushes, which extends beyond the domain of neuropsychological structural changes and holds additional implications for their cognition, intuition, and decision-making processes. Through their daily sensorimotor activities, conservators receive (Fig. 2b) and accumulate a wealth of sensorial and motor intangible information in their brains, encompassing details such as textures, colours, or the adequate pressures applied while using the swab, which is unconsciously stored and analysed by the brain. This stored information becomes intricately linked to their future cognition, decision-making, and intuition and cognition and can be strictly linked to the mentioned tacit knowledge or accumulated practice knowledge. This accumulated sensorimotor information will be clearly linked, consciously and unconsciously, to their cognition in further uses of swabs or other conservation activities and most importantly, during their decision-making process and intuition, since this would be shaped based on unconscious intangible understood information. This unconscious storage of sensorimotor information could be processed and facilitated by the cerebellum, and other brain regions involved in motor control and coordination. This conservators' intuition[1] during practical activities, built upon this stored information, guides actions, allowing them to make sound unconscious decisions, difficult to express with words in some cases, but based on a deep understanding of the materials and objects they work with, as suggested by Ashley-Smith [7]. However, distinguishing intuition from other cognitive processes involved in decision-making in a conservation practice can be challenging due to its subjective nature. Thus, in conservation practice, professionals could constantly rely on a combination of factual knowledge (mostly explicit), technical skills (combined explicit and tacit), and accumulated practical experience or knowledge (mostly tacit). Intuition probably emerges as a result of this combination, allowing conservators to make quick

[1] Intuition: In this text, 'Intuition' is defined as the ability to understand or know something immediately, based on feelings rather than conscious reasoning.

and effective decisions based on a "gut feeling" or a deep understanding of the situation at hand. Intuition normally operates in the domain of subconscious processing [70], drawing upon tacit knowledge and accumulated practice knowledge. To identify intuition in conservation practice, it would be crucial to engage in reflective practice and self-awareness. This would involve critically analyzing the conservator's decision-making processes, recognizing patterns of behaviors and thoughts. By actively reflecting on their activities, conservators can gain insight into the role of intuition in decision-making and refine their ability to differentiate it from other types of cognitive processes, and, in some cases, train their responses and decisions, to ultimately obtain better performance. It is important to note that while intuition plays a valuable role in conservation practice, it should be complemented by explicit knowledge and evidence-based reasoning.

Conclusions and general reflections

Tacit knowledge is commonly judged inferior to explicit knowledge in many professional settings [4, 71], and very often its implications and the true extent of their knowledge remain unexplored. This disparity in recognition and understanding can lead to undervaluing the rich insights and expertise that tacit knowledge brings to various fields. When we think about conservators' knowledge, we often only consider their explicit knowledge, which refers to their understanding of science and humanities concepts, and regard the remaining aspects as "skills".[2] However, I believe this viewpoint is imprecise and we should recognize this as a type of understood "knowledge", especially the accumulated understood sensorial and motor information. I believe tacit knowledge plays a vital role when analyzing objects, implementing hands-on tasks, dealing with complex tasks, problem-solving, and expert judgment. The embodied nature of tacit knowledge allows professionals to draw on a wealth of experiential information, finely tuned sensory perceptions, and intuitive understanding, leading to more nuanced and contextually appropriate decision-making. Therefore, instead of dismissing tacit knowledge as inferior, it is essential to recognize its unique value and leverage it alongside explicit knowledge to foster a comprehensive and holistic approach to professional expertise. By embracing both forms of knowledge, professional conservators can enhance their capacity for effective problem-solving, innovation, and successful outcomes in many specific fields.

I believe there is a need to initiate systematic large-scale research to understand this type of knowledge and comprehend its true implications. Specifically, it is surprising that no previous research has been conducted to convert specific aspects of this tacit knowledge into explicit knowledge. Such a conversion could greatly facilitate learning from it, enable its transfer to other practitioners, integrate it into education, and, in certain cases, ensure its preservation for future generations. Additionally, this type of research can also contribute to improving global decision-making and intuition when performing activities. However, due to the complexity and nature of this type of accumulated practical knowledge, future preliminary research landscapes necessitate the embracement of interdisciplinary collaborations that consider multiple points of view. These collaborations should encompass various fields, such as heritage conservation, software engineering, cognitive sciences, psychology, or neuroscience, among others. By integrating insights and expertise from multiple angles, a true extent and more comprehensive understanding of tacit knowledge can be probably obtained, leading to enriched methodologies, innovative approaches, and holistic perspectives in the study of this ineffable knowledge. Such interdisciplinary collaborations will enable the exploration of novel groundbreaking research lines, fostering breakthroughs in capturing, analyzing, and utilizing tacit knowledge to enhance various activities, improve performance, training, and advance professional practices in general terms.

In 1986 and 1988, Paolo (1921–1998) and Laura Mora (1923–2015) (Fig. 3)—former Chief Conservators at the prestigious *Istituto Centrale del Restauro* (ICR) in Italy, both highly recognized conservators and consultants to several remarkable conservation projects during the twentieth century across more than 20 countries—, retired after ~40 years of experience in conservation practice, especially in mural paintings conservation (Fig. 3b). When they retired, most of the explicit knowledge they had accumulated was published in a comprehensive book entitled "Conservation of Wall Paintings" [72]. However, upon their retirement, all their extensive practical tacit knowledge, accumulated over the span of 40 years also disappeared, and since this knowledge remained unrecorded and unstudied, we were unable to be preserved or passed on to subsequent generations of worldwide conservators beyond the ones who have worked alongside them. While our current capabilities to fully record and capture all forms of tacit

[2] In the context of this paper, 'skills' refer to the ability to perform a task effectively and proficiently, typically acquired through training, practice, and experience.

Fig. 3 **a** from left to right, Giorgio Torraca, Dr. and Mrs. Plenderleith, Zaki Iskander, Laura and Paolo Mora and Gaël de Guichen in front of the Temple of Nefertari in Abu Simbel, Egypt. 1970. © ICCROM; **b** from left to right, Laura and Paolo Mora and Luigi De Cesaris. Conservation actions at Nefertari, Egypt. 1970. © ICCROM

knowledge remain limited, I believe it is crucial that we embark on the first steps to envision new ways to study forms to capture[3] this type of knowledge to prevent the loss of these invaluable insights. This is for the benefit of conservation practice, the education and development of future generations of conservators, but primarily, for the preservation of an important part of knowledge, ultimately benefiting humankind and our cultural heritage on a global scale.

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Availability of data and materials
I do not analyze or generate any datasets, because this work proceeds within a theoretical approach.

Declarations

Ethics approval and consent to participate
Not applicable.

Competing interests
The author declares no competing interests.

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[3] Tacit knowledge may resist complete articulation, the term 'capture' here refers to the process of making it accessible and transferable, rather than fully encapsulating it in explicit forms such as words or images.

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Publisher's Note

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