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Original article

Science, value and material decay in the conservation of historic environments

Rachel Douglas-Jones^a, John J. Hughes^{b,*}, Siân Jones^c, Thomas Yarrow^d

^a Technologies in Practice Research Group, IT University of Copenhagen, Rued Langgaards Vej 7, 2300 Copenhagen, Denmark

^b School of Engineering and Computing, University of the West of Scotland, Paisley Campus, Scotland PA1 2BE, United Kingdom

^c School of Arts, Languages and Cultures, University of Manchester, Manchester, England M13 9PL, United Kingdom

^d Anthropology, Durham University, Dawson Building, South Road, Durham, England DH1 3LE, United Kingdom

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ABSTRACT

The historic environment undergoes cycles of material deterioration, and these processes have a powerful impact on the meanings and values associated with it. In particular, decay informs the experience of authenticity, as a tangible mark of age and 'the real'. This article examines the intersection between material transformation, scientific intervention and cultural value. Drawing on qualitative social research at three Scottish historic buildings, we show that there are a complex range of cultural values and qualities associated with material transformation. Furthermore, we highlight how the use of science-based conservation to characterise, and intervene in, processes of material transformation can affect these values and qualities. We argue that it is necessary and important to consider the cultural ramifications of such interventions alongside their material effects. This requires a case-by-case approach, because the cultural values and qualities associated with material transformation are context-specific and vary with different kinds of monuments and materials. We conclude with a series of recommendations aimed at integrating humanities and science-based approaches to transformation in the historic environment.

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1. Introduction

Stone, brick and mortar are the most widespread materials making up the historic-built environment throughout Europe, and to varying degrees in other parts of the world. In this article, we look at the vulnerabilities of such masonry materials to deterioration and decay, and the ways in which heritage science interventions intersect with the range of cultural values and qualities associated with such material transformation. The core of our argument is that the assessment of values associated with material transformation – and the scope and potential effects of scientific intervention – requires a case-by-case approach. The specific values and qualities associated with material transformation are complex, situational and contextual. Consequently, it is not possible to identify simple rules or models that can be applied universally across different heritage sites, even in cases where the same processes of material transformation are at work. Instead, qualitative social research should

be used to explore how material transformation is involved in the creation and negotiation of values at specific historic buildings and monuments. Our arguments are based on research carried out at three case study sites in Scotland, during 2013–14. This research shows that material transformation is associated with a wide range of overlapping attitudes and values amongst both heritage professionals and visiting publics. Furthermore, there is no basis for a priori distinctions between forms of decay that are positively valued and those that are considered undesirable. Our analysis reveals that values associated with material transformation are informed by complex relations between materials, decay processes, types of monument, visitor expectations, forms of expertise and demands on use. In our conclusions, we examine the implications of the research project, and provide recommendations for practitioners in navigating the changing face of value-oriented conservation.

Collaboration between the sciences and the humanities is central to the AHRC Science and Heritage research project underpinning this article (www.uws.ac.uk/mavproject/). The research team has expertise in heritage science (Hughes, PI), cultural heritage (Jones) and social anthropology (Douglas-Jones and Yarrow). Working in partnership with the National Trust for Scotland and Historic Scotland, our case studies extend the range of this interdisciplinary dialogue, incorporating heritage professionals with

* Corresponding author.

E-mail addresses: rdoj@itu.dk (R. Douglas-Jones), john.hughes@uws.ac.uk (J.J. Hughes), sian.jones@manchester.ac.uk (S. Jones), t.g.yarrow@durham.ac.uk (T. Yarrow).

backgrounds in architecture, conservation, heritage management, engineering and a range of different kinds of heritage science. A stakeholder workshop also proved a fruitful context for interdisciplinary discussion and debate. Previous ethnographic research carried out with Historic Scotland between 2010 and 2013 [1] also informs the arguments presented in this article.

In advancing interdisciplinary understandings of the values attached to material transformation in the historic environment, we pay specific attention to how these inform, and are informed by scientific interventions. We define heritage science broadly as anything involving the application of scientific methods for measuring change, analysing materials, protecting them from decay, and consolidating vulnerable components [2,3]. This encompasses a common distinction between applications of science to advancing understanding (of both material change and heritage environments), and intervening to modify, manage, or arrest material change [3]. The latter area is sometimes referred to as 'conservation science' [4] and includes both preventive conservation based on scientific understandings of agencies and processes of deterioration (sometimes referred to as 'environmental conservation'), as well as remedial conservation, which may include adding or removing materials using techniques originally developed through scientific research.

2. Research context

Masonry materials are vulnerable to deterioration and decay under the influence of a variety of physical and chemical agencies. 'Weathering' encapsulates a range of processes driven by moisture movement, driving rain, freeze-thaw cycles, salt crystallisation and chemical attack from pollutants [5,6]. Biofilms can have a significant impact on historic masonry, including staining, moisture movement and physical stresses [7]. Climatic variability also brings about change to physical environmental conditions, for instance increased rainfall exacerbates water ingress and increased biological growth [8,9].

In conservation contexts, responses to these forms of material degradation often result in steps to measure, record, protect, and/or repair historic buildings and monuments. There is a long and continuing tradition of regular repair and maintenance using traditional craft techniques and materials. However, the development of heritage science during the twentieth century has led to the introduction of new techniques for measuring change, analysing materials, protecting them from decay and consolidating vulnerable components [2,3,10]. For instance, petrographic analysis is used for characterisation and the determination of provenance. Biocides have been developed for the management of biofilms. More recently, the potential of self-cleaning surface treatments and water repellents is being explored [11]. Nanotechnological consolidants even promise the possibility of consolidation and restoration through the creation of new fabric [12]. As a result of these techniques, the nature of historic buildings and monuments, and their dynamic relations with their physical environments, is altered to some degree, whether directly or indirectly. For instance, rates of weathering can be modified and signs of wear and age removed. Historic fabric can also be removed and new material introduced. But what of the impact of such science-based interventions on how heritage sites are experienced and valued?

Heritage conservation and management is a complex process involving not only physical fabric, but also cultural, aesthetic, spiritual, social and economic values [13–15]. Indeed, a recent report from the Getty Conservation Institute asserts that "the ultimate aim of conservation is not to conserve material *for its own sake* but, rather, to maintain (and shape) the values embodied by that heritage" ([16]: 7, our emphasis). Furthermore, understandings of authenticity and significance in conservation philosophy

have undergone radical change over the last three decades, with increasing emphasis on the intangible aspects of heritage places [17,18]. Nevertheless, the materials making up historic buildings and monuments, and the transformations they undergo over time, are integral to the values produced in relation to them. Stone is valued for its aesthetic properties, being characterised by an outstanding range of colours, textures, and state of finish, whilst its bulk lends itself to elaborate moulding and carving. Its durability is valued, but equally weathering and wear often contribute to perceived 'character'. In the European conservation movement, such material transformation has been seen as important testimony to the passage of time and the authenticity of a monument. The value of transformation in this sense was epitomised by the Romantic ideal of the mediaeval ruin created at the hand of nature [19], and formalised by Alois Riegl [20] in the concept of 'age value' wherein visible decay and disintegration of material fabric embodied the passage of time, the age of the material affected, and was immediately and aesthetically accessible. Decay and disintegration are also central to the concept of patina and its associated aesthetic qualities of harmony and beauty ([21]: 435–437; [19]: 148–182; [22]). Patina therefore has come to refer not only to physical changes – dents, chips, oxidisation – but also qualitative experiences of these changes within an aesthetic register. Mortars, renders and plasters, whilst often less durable than stone itself, and intentionally subject to greater renewal over time, can also enhance or detract from assessments of age value and authenticity.

Despite long-standing recognition of the values surrounding ageing, decay, patina and ruination, there has been relatively little research in this specific area [21,23,24]. Conservation approaches increasingly emphasise the need to conserve the values embodied in heritage, as much as historic material itself [16]. This requires greater attention to the way in which these values enter into conservation decision-making. Conservators are often acutely aware of the value of patina, although Clifford [25] has nevertheless called for more investigation into its cultural significance. In contrast, the nature of experimental investigation means that heritage scientists often extract materials, properties and processes from their physical and social context. While there are wide-ranging and detailed studies of the impact of scientific techniques on the material fabric itself, there has been little investigation into their impact on cultural meanings and values. Indeed, it could be argued that much applied research has been driven by specific scientific frameworks, with limited consideration of possible impacts on issues of authenticity and historic value. As Cassar ([26]: 9) emphasises, we need to understand how values are affected by material change. Yet, we also need to ask how science-based approaches for measuring, analysing and modifying material transformation impact on the values of heritage? Furthermore, how do the values associated with material transformation, and the wider cultural significance of heritage, impact on the use of heritage science? To answer these questions, it is necessary to draw on humanities-based methodologies.

3. Methods

Qualitative social research methods are increasingly used in heritage management to provide evidence for value-based conservation and significance assessment [1,17,27,28]. These methods, including semi-structured interviews and participant observation, are particularly suited for examining the complex meanings and values that surround historic buildings and monuments [29]. However, they are rarely employed to understand the values and qualities specifically associated with the scientific management of material transformation. In our research, we used participant observation and interviewing to gain insight into the values associated with material transformation and the use of heritage science at

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