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A Geomorphologically Driven Conditional Assessment for the Study of Urban Stone Decay

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Much of humanity's legacy is within the built environment and therefore in the stones that have been used for its construction. This means that targeted building conservation strategies are vital when considering the maintenance of this heritage. Conditional assessments play a major part in these efforts by classifying blocks based upon their visual state of decay. However, as these tools were developed with the purpose of informing decision making by professionals in the construction and conservation industries, limitations exist when considering them as part of studies with a geomorphological focus.
Links between the decay of stonework and spatially variable control factors, such as material properties, micro-climatic conditions and pollutant distribution, have been well documented in past studies, with observations of decay on wall sections supporting this concept. For example, the distribution of weathering features can indicate that certain blocks are more susceptible than others to decay. Additionally, adjoining blocks can exhibit similar processes, suggestive of interaction between the blocks, indicating a linkage between individual block scale decay and processes acting at a wider wall scale. These observations have led to comparisons between the weathering of rock outcrops and building façades, with mortar joints playing the role of fractures or bedding.
This comparison has highlighted the necessity to not simply consider decay in terms of architecture or engineering, but also in terms of the geomorphological processes taking place. The patterns of decay created at a wall scale, whilst being visually chaotic, can provide clues to the controlling factors acting upon this system, if they are subjected to informed scrutiny. Despite such discussions, the focus of surveys towards remediation have created limitations when applying the results of these surveys towards the understanding of processes acting between blocks at a wall scale. This work aims to take into consideration these limitations by undertaking two conditional assessments, using differing techniques, of wall sections at Fitzroy Presbyterian Church in Belfast. These assessments will be undertaken using a classification system focusing upon percentage of surface alteration. Initially, an assessment was carried out focussing on classifying each block individually. This was then followed by observations in a regular grid of 10x10cm squares across the wall sections.
Results suggest that decay features develop beyond the extents of a single stone when situated within a larger built structure, with mortar and blocks providing both interconnectivity and barriers that influence the spread of decay. The results suggest the presence of three wall scale processes; urban microclimatic influencing capillary rise of ground water, architectural features creating a barrier and the passage of moisture through deteriorating mortar. Probe permeametry, GPR and 3D modelling of the wall sections were used to provide support for these findings. For the conservationist, application of a gridded observation approach is time consuming and of little use when deciding upon the remediation of individual blocks. However, in geomorphologically focused studies it facilitates a greater understanding of processes that extend beyond a single block, particularly when considering sites where the development of decay appears to be spatially complex.