and frequency of fall events are of more importance. Future climate scenarios are yet to be downscaled, however, expected results are the increased contrast between winter and summer rainfall, and also increasing night-time temperatures (due to increased atmospheric moisture, hence greater cloud cover). This research into stone response to environmental condition will feed into the development of a new model of sandstone decay that considers increased winter wetness and the implications this has for deeper-penetrating moisture (and therefore salts) and increased algal colonisation.

Climate change and wet winters: Testing the diffusion of soluble salts in building stone under saturated conditions

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Controls on stone decay processes are rapidly changing as a result of changing climate. As such, there is a need to understand decay, not just in a dynamic world, but also in a world where the nature of the dynamics themselves are changing. Future climate change scenarios for the northwest of the United Kingdom (NW UK) typically project both increased short-term uncertainty in day-to-day weather conditions and an underlying trend towards wetter, warmer and longer winter conditions. The result of this is that natural stone used in buildings and monuments is wet for long periods of time – over a wet winter, it is possible that entire blocks become saturated. Usually the movement of salts is associated with moisture flux, but this paper investigates an alternative mechanism of salt movement – when blocks are saturated and a concentration gradient is set up, ions must move by diffusion. Because of the increasingly likely scenario of block saturation (in NW UK), this paper proposes a way of testing salt diffusion through natural building stones, modified and refined from studies testing chloride diffusion in concrete, to determine how quickly salts may diffuse through natural stone and any associated deleterious chemical effects. A concentration gradient is set up, whereby salts diffuse through a saturated sandstone sample from a 'cell' containing a 0.55 molar solution to another 'cell' containing de-ionized water. The increase in concentration in the cell containing de-ionized water can be measured at intervals using Ion Chromatography. Preliminary tests have shown that both salt and stone types are important controls for the rate of diffusion. Emphasis is placed on the need to adapt laboratory studies to more accurately reflect the environmental conditions under investigation.

Spatial distribution of salt penetration in weathered sandstone

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This research investigates the importance of the spatial distribution of salts in the weathering process of stone decay. The relationship between salt penetration and the intrinsic rock property, permeability, is examined to elucidate the ingress and egress of salt solution in masonry sandstone. The accelerated weathering trial simulates pre-loading a sandstone block with a 10% salt solution (equal parts NaCl and $MgSO_4$) during a wet winter followed by dried out in summer. Permeability data measured from horizontal slices through the block are correlated with salt data from IC analysis. Results indicate relatively high surface permeability values and salt crystallization on exposure to air. The effect of salts blocking pores and reducing permeability is evident in a reduction in permeability in the near surface