Limestone in the Built Environment: Present-Day Challenges for the Preservation of the Past

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Limestone in the Built Environment: Present-Day Challenges for the Preservation of the Past

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Preface

There is a general preconception, at least amongst lay observers, that limestones typically decay in a slow, uniform and largely predictable fashion primarily in response to surface dissolution. It is accepted that the rate of dissolution can be accelerated by, for example, an increase in rainfall acidity associated with atmospheric pollution, but the underlying assumption of uniformitarian change still persists. It can be readily demonstrated, however, that the decay of many limestones used in construction is far from uniform and predictable. Instead, in many cases decay is characterized by marked temporal and spatial variability both within individual blocks and often across complete facades. This particularly applies to granular limestones (e.g. bioclastic and oolitic limestones) that are frequently characterized by effective physical breakdown similar to that normally associated with, for example, quartz sandstones. This is commonly accomplished by mechanisms such as granular disintegration, contour scaling and multiple flaking, but in polluted environments may also be linked to the rapid formation of surface crusts composed primarily of gypsum that emphasize the central role of salts as the drivers of decay.

Spatial differentiation of decay at the level of individual blocks may initially be controlled by small-scale variability in key rock properties, most notably the degree of induration, texture and associated porosity/permeability. At the facade scale, however, localized environmental controls on processes such as surface soiling and crust formation may assume a greater significance. In temporal terms, initial gypsum crust formation can stabilize a surface, but over their lifetime, such crusts can be associated with subsurface weakening and act as a source of salts that can eventually penetrate deeply into the underlying stone. Such that, if the crust is breached in any way it is often followed by rapid erosion as pre-weathered subsurface material is lost and 'deep salts' exploited.

It is in the face of such complexity that the idea for the original workshop on granular limestones, on which this volume is based, was conceived under the combined auspices of the Stone Weathering and Atmospheric Pollution NETwork (SWAPNET), the UK Engineering and Physical Sciences Research Council (grant EP/D008603/1) and Heritage Malta. This was on the basis that not only do we need to understand the nature and causes of their decay more fully, but also that we must begin to explore how this improved understanding can be used to inform future conservation strategies. Nowhere is this understanding more urgent than on the limestone island of Malta that provided the ideal venue for the meeting.

This volume would have not been possible without help from numerous colleagues who carried out reviews. Their thorough effort highly improved the level of the papers:

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