

Book review

The Stone Cycle and Conservation of Historic Buildings

Thematic Set, *Quarterly Journal of Engineering Geology* **46(4)**: 363–492.
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This excellent and useful set of papers on stone conservation is something of a secret, being hidden away inside a highly respected, peer-reviewed journal on engineering geology. It forms most of a special 'thematic' issue of the journal, but there is no external declaration of its subject and, indeed, the front cover boasts an entirely irrelevant colour photograph of a famous Italian landslide! Moreover, inside, the thematic set of papers on stone conservation is, somewhat inappropriately, joined by two 'research articles' on unrelated issues, one of which includes six pages of colour maps, in contrast to just two pages of colour images in the whole thematic set of papers. That said, once discovered, the secret is well worth knowing and all those involved in the conservation of stone buildings will find this a helpful resource.

The thematic set is divided into three groups of papers: a short introduction, four invited papers and eight other submitted and accepted papers. Professor Joann Cassar (University of Malta) and Dr Mike Winter (TRL, Edinburgh), together with seven other distinguished co-authors, provide a succinct but helpful introduction, in which they summarise the 'stone cycle' of use and potential reuse and identify the two main themes arising from the set of related papers. First, stone 'durability' is found to be variably defined, according to various objectives and purposes. Second, the development of stone usage has depended upon technological developments in quarrying and processing, as well as improved understanding of stone properties and characteristics, plus easier transportation.

As one might expect, the four invited papers provide a valuable foundation of information and guidance. Professor Heather Viles of Oxford University opens with a pragmatic approach to the complexity of stone durability, such that assessments are based upon resilience rather than resistance; she foresees research that will combine laboratory and field exposure testing with the monitoring of actual stone façades. Next, Dr Richard Přikryl of Charles University in Prague, who has previously edited some impressive special publications on building stone for the Geological Society, provides a good review of the durability assessment of stone, setting out available procedures and a substantial array of references; he warns of the potentially positive or negative aspects of later interventions, such as cleaning or consolidation during restoration.

The late Professor Bernard Smith of Queen's University, Belfast, together with five co-authors, continues the invited papers with a splendid example of the way in which the particular materials and environmental factors in a region can be understood and then harnessed to assist with improvement of the conservation of local historic stone structures. They describe, with

examples, an academic-industrial partnership in Northern Ireland, including the formation of a database to relate the experience of actual performance with the various stone sources, which can help with specifications for conservation. Dr Graham Lott of the British Geological Survey completes the set of invited papers with some very valuable guidance on sourcing stone for conservation in Britain, which includes the only colour images in the thematic set, whereby some typical limestone and sandstone buildings are matched with appropriate thin-section photomicrographs (photographs taken through a microscope) of the various rock/stone varieties in question. Non-geologists involved in stone conservation will find this paper particularly helpful.

Of the eight remaining papers in the thematic set, three relate to particular stone types, in Madrid (Fort *et al.*, various types), the Netherlands (Quist *et al.*, Eocene limestone) and Sicily (Calia *et al.*, calcarenites), whereas each of the other five papers addresses an issue in stone conservation.

Siedel describes a comparison of the stones and conditions that have controlled varying performance in three different cities in Saxony, Germany. Erkal *et al.* provide an interesting case study of environmental (hygrothermal) monitoring of an eleventh century chapel in England, constructed using Blue Lias stone; this paper gives helpful insight into the systematic measurement of environmental conditions that control stone decay. Zurakowska and Hughes describe a limited study into the possible effect of stone cleaning on the sandstone urban façades of west-central Scotland, addressing the belief by some that cleaning can exacerbate decay; they tentatively conclude that cleaning is not a major decay factor, with examples of severe decay being more often linked to design or maintenance deficiencies. McCabe *et al.* consider the term 'time of wetness', finding that the duration of deep internal wetting is more important than the more ephemeral wetting of exposed surfaces; accordingly, they propose and define the term 'time of deep wetness', but further research will be needed to establish how actually to use this parameter. Finally, Alves *et al.* debate the possible role of 'specific surface area' in the interpretation of salt weathering tests on travertines; this work appears quite inconclusive, but will doubtless be of interest to those researching the durability assessment of limestones.

Overall, this 'secret' set of papers is well worth discovering for those interested in the performance and conservation of natural stone in historic buildings. Each of the papers is well supported by tables, diagrams and references, and, although the use of more colour (including an apposite cover photograph) would have been an advantage, it was encouraging to note that the limited use of colour had been employed to good purpose (in the paper by Lott). The reviewer has no hesitation in commending this thematic issue of a respected journal.

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