## Contents

Preface vii  

**SIEGESMUND, S., WEISS, T. & VOLLBRECHT, A.** Natural stone, weathering phenomena, conservation strategies and case studies: introduction 1  

### Weathering of natural building stones

**ONDRAŠINA, J., KIRCHNER, D. & SIEGESMUND, S.** Freeze–thaw cycles and their influence on marble deterioration: a long-term experiment 9  

**THOMACHOT, C. & JEANNETTE, D.** Evolution of the petrophysical properties of two types of Alsatian sandstone subjected to simulated freeze–thaw conditions 19  

**CASSAR, J.** Deterioration of the Globigerina Limestone of the Maltese Islands 33  

### Weathering processes

**DOEHNE, E.** Salt weathering: a selective review 51  

**ZEISIG, A., SIEGESMUND, S. & WEISS, T.** Thermal expansion and its control on the durability of marbles 65  

**MALAGA-STARZEC, K., LINDQVIST, J. E. & SCHOUENBORG, B.** Experimental study on the variation in porosity of marble as a function of temperature 81  

**WEISS, T., SIEGESMUND, S. & FULLER, E. R.** Thermal stresses and microcracking in calcite and dolomite marbles via finite element modelling 89  

### Fabric dependence of physical properties

**WEBER, J. & LEPPER, J.** Depositional environment and diagenesis as controlling factors for petro-physical properties and weathering resistance of siliciclastic dimension stones: integrative case study on the ‘Wesersandstein’ (northern Germany, Middle Buntsandstein) 103  

**STROHMÉYER, D. & SIEGESMUND, S.** Anisotropic technical properties of building stones and their development due to fabric changes 115  

**SIEGESMUND, S., VOLLBRECHT, A. & HULKA, C.** The anisotropy of itacolumite flexibility 137  

**WEISS, T., RASOLOFOSAAON, P. N. J. & SIEGESMUND, S.** Ultrasonic wave velocities as a diagnostic tool for the quality assessment of marble 149  

**MIDDENDORF, B.** Physico-mechanical and microstructural characteristics of historic and restoration mortars based on gypsum: current knowledge and perspective 165  

### Biodeterioration

**POHL, W. & SCHNEIDER, J.** Impact of endolithic biofilms on carbonate rock surfaces 177  

**SCHIAVON, N.** Biodeterioration of calcareous and granite building stones in urban environments 195  

**HOPPERT, M., BERKER, R., FLIES, C., KÄMPER, M., POHL, W., SCHNEIDER, J. & STRÖBEL, S.** Biofilms and their extracellular environment on geomaterial: methods for investigation down to nanometer scale 207
Quality assessment and conservation of stones

FITZNER, B., HEINRICH, K. & LA BOUCHARDIERE, D. Limestone weathering on historical monuments in Cairo, Egypt 217

ALVAREZ DE BUERGO, M. & FORT GONZÁLEZ, R. Characterizing the construction materials of a historic building and evaluating possible preservation treatments for restoration purposes 241

RUEDRICH, J., WEISS, T. & SIEGESMUND, S. Thermal behaviour of weathered and consolidated marbles 255

MATIAS, J. M. S. & ALVES, C. A. S. The influence of petrographic, architectural and environmental factors in decay patterns and durability of granite stones in Braga monuments (NW Portugal) 273

MICHALSKI, S., GÖTZE, J., SIEDEL, H., MAGNUS, M. & HEIMANN, R. B. Investigations into provenance and properties of ancient building sandstones of the Zittau/Görlitz region (Upper Lusatia, Eastern Saxony, Germany) 283

KOCHE, A. & SIEGESMUND, S. Bowing of marble panels: on-site damage analysis from the Oeconomicum Building at Göttingen (Germany) 299

SAHLIN, T., STIGH, J. & SCHOUENBORG, B. Bending strength properties of untreated and impregnated igneous, sedimentary and metamorphic dimension stones of different thickness 315

Environmental conditions

LEFÉVRE, R. A. & AUSET, P. Atmospheric pollution and building materials: stone and glass 329


TÖRÖK, Á. Oolitic limestone in a polluted atmospheric environment in Budapest: weathering phenomena and alterations in physical properties 363

FASSINA, V., FAVARO, M. & NACCARI, A. Principal decay patterns on Venetian monuments 381

CHAROLA, A. E. & WARE, R. Acid deposition and the deterioration of stone: a brief review of a broad topic 393

VILES, H. A. Implications of future climate change for stone deterioration 407

KLEMM, W. & SIEDEL, H. Evaluation of the origin of sulphate compounds in building stone by sulphur isotope ratio 419

SCHAFER, M. & STIEGER, M. A rapid method for the determination of cation exchange capacities of sandstones: preliminary data 431

Index 441