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The relevance of scientific investigation for the preservation of monuments and historic buildings made of stone– a state of the art report

Günther Fleischer (1), Johann Nimmrichter (2), Andreas Rohatsch (3)

(1) ofi– Institut für Bauschadensforschung, Austria (guenther.fleischer@ofi.co.at), (2) Austrian Federal Office for the Care and Protection of Monuments, Department for Conservation, (arsenal@bda.at) (3) Institute of Engineering Geology, Vienna University of Technology, Austria (andreas.rohatsch@tuwien.ac.at)

The deterioration of sculptures, monuments and buildings of natural stone material by different chemical, physical and biological influences is a serious problem in Austria. The climatic situation with changes of temperature with differences up to 60˚ C and the humidity are the main reasons for the textural disintegration of stone. The determination of the lithological composition and the state of weathering are important fundamentals to define the aims of cleaning, conservation and restoration of monuments. The use of almost non-destructive investigation methods is one of the most important suppositions. Therefore, mapping of the lithological composition and the condition of weathering in combination with ultrasonic measurements, drill resistance and water absorption after Karsten are favoured investigation techniques. Thin sections of small samples and microprobes for REM-analysis allow mineralogical and paleontological characterisation, as well as structural and textural conditions. Furthermore the correlation between the results from a monument and samples from the respective quarry, which enable destructive investigations in the laboratory, such as frost-thaw-cycles, hygric dilatation, and water adsorption and dry out tests, as well as tension and compressive strength examinations etc., is of large importance. The evaluation of the results of all these investigations leads to a sensitive and balanced conservation, because each type of stone has individual physical and chemical properties and needs individual conservation methods and agents.

Parallel to the analyses in the lab, several large-scaled stone objects of different stone

types were exposed on the area of the former monastery of Mauerbach (Department of Conservation of buildings from the Federal Office for the Care of Monuments in Lower Austria) beneath a weather station of the government of Vienna. The purpose of this exposition is to learn a little more about the progress of weathering processes by studying the increase of roughness, fabric disintegration and microbiological activity. In 2005 several objects, consolidated with common stone-strengthening products (Etylsilicate, PMMA, etc.) will also be exposed.

The authors have been cooperating for many years in several research projects in order to accumulate a reliable database for the most common Austrian stones used in historic monuments and buildings. The aim of the research is to create a database with all relevant data which professional restorers and stonemasons find easy to use . In some cases, these projects were funded by the FFF and the Hochschuljubiläumsstiftung der Stadt Wien.

Apart from these important research efforts, there are also different conservation-and restoration projects. In these projects important additional measures like protective roofs and so-called sacrificial layers (e.g. lime washes) are taken in order to protect the monuments.

An interdisciplinary team (geologists, chemists, conservation scientists, restorers, architects and art historians) controls the quality of the work during the conservation process on the most important projects.

Examples for good conservation results in Vienna during the last four years are the Natural History Museum, the Art History Museum, the State Opera, the Burgtheater, Parliament, the gothic Minoriten Church and the Romanesque Church of St. Michael.

This report will show as an example of the work of the interdisciplinary team the project of the Natural History Museum in Vienna.

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