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# Conservation of the Lions Court at the Alhambra of Granada

## Conservation de la Cour des Lions à l'Alhambra de Grenade

## Erhaltung des Löwenhofs in der Alhambra von Granada

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### 1. INTRODUCTION

Decay studies on marble artifacts, relative to different architectonic structures of the Arab Palaces in Alhambra, show that the severe deterioration processes have been primed by static displacements. It is evident in the Court of the Lions [1], in which the environmental thermohygrometric influences have an important, [2] and [3], but secondary part on the decay evolution. Weathering processes weaken, above all, the marble artifacts already affected by micro-cracking conditions [1].

### 2. MARBLE STRUCTURES

#### 2.1 Material

The Macael marble, widely used in the monumental complex of the Alhambra, is an anisotropic material both in texture and physical-mechanical properties, as the relative petrofabric analyses and investigations of the directionality of certain physical and mechanical parameters ( $V_p$ ,  $E$ ,  $\sigma_c$  and  $\sigma_t$ ) have verified.

This anisotropic behaviour and its relative magnitude have been preliminarily determined in laboratory on correlated quarry and monument marble specimens (from working scraps of the "fuente de los Leones" unexposed copy, and from damaged original artifacts, removed during ancient restorations).

#### 2.2 Colonnades in "Patio de los Leones"

On-site valuations of the physical-mechanical behaviour and decay evolution on marble artifacts (under external influences and loading stresses) have been based on the following non-destructive investigations: i) Textural orientations of the single structural elements, related with their specific geometrical conformation, working and laying. Generally the foliation plane, mechanical weakness plane, lies

horizontally for base, capital and architrave elements, while it is in vertical placement for the shafts. ii) Ultrasonic pulse velocity measurements, to value the relative decrements due to incipient or moderate and severe decay.

The whole of the Macael marble artifacts, in different structures of the Arab Palaces, show a satisfactory conservation stage, with some exceptions: e.g., colonnades in "Patio de los Leones" (figure 1).

Selective decay evolution, relatively to columnar structures in the Court of the Lions has been verified

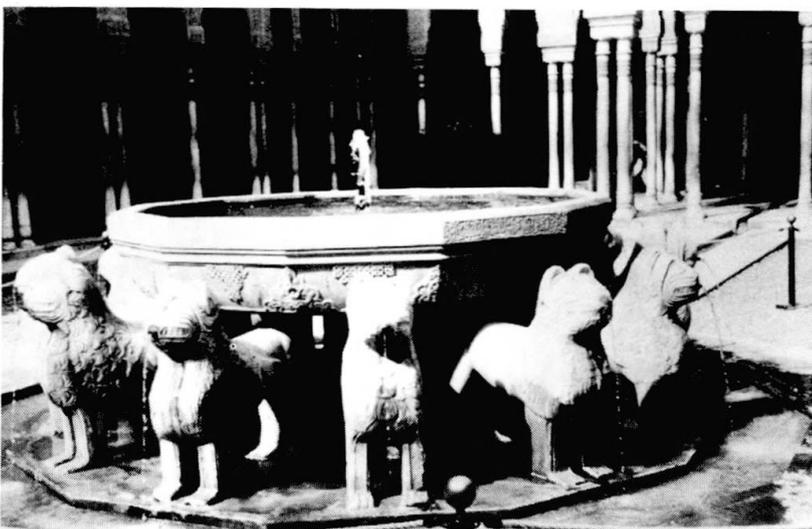


Fig. 1 "Patio de los Leones", Alhambra.

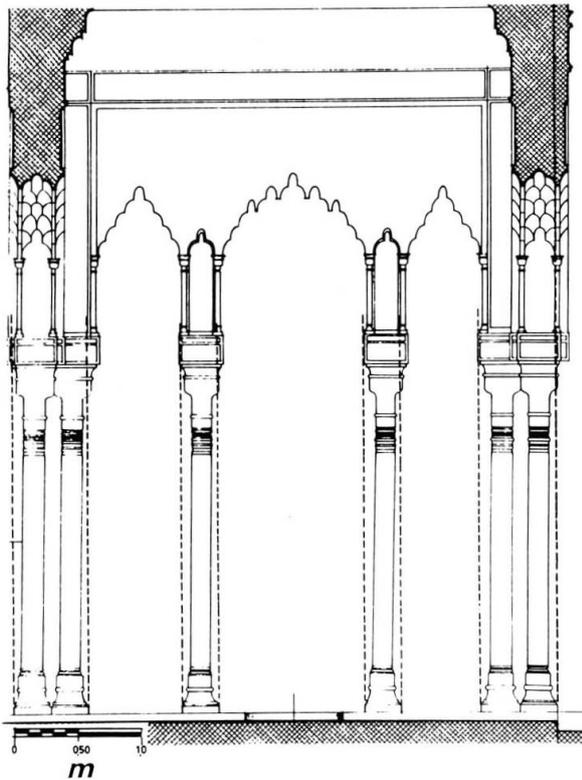


Fig. 2 Static situation, drawn in 1976, for "Templete de los Mocarabes", Court of the Lions.

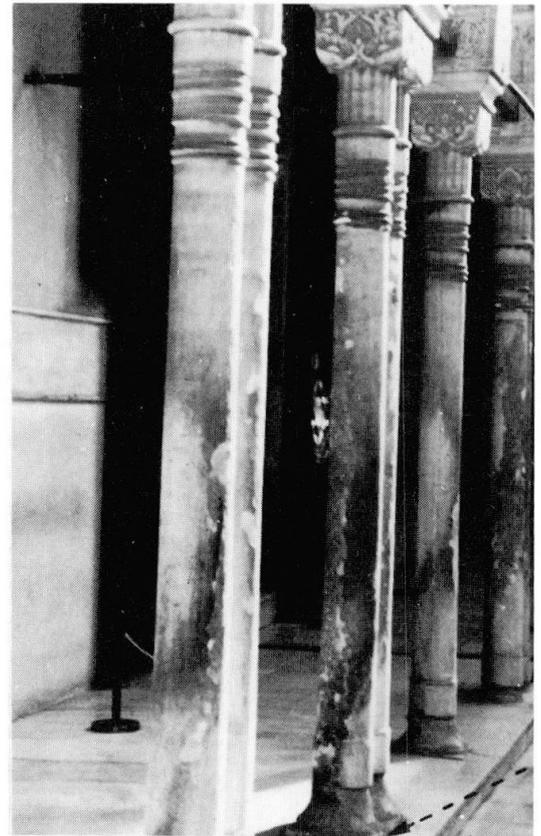


Fig. 3 Progressive reduction in height of bases, and damaged shafts according to mechanical weakness plane.

by direct correlations between the increases of the apparent decay degree and total anisotropy index, measured in marble artifacts. Moreover, this evolution has been related to: a) rotation of the foliation plane, consistent with the shaft placement, influencing the durability of the artifacts under the same exposure conditions; and b) evident displacements of the original static conditions (figure 2), and new signs of differential settlement and plumb-line diversifications in severe damaged shafts, recognized particularly in the "Galeria de Dos Hermanas" colonnade (figure 3).

### 3. CONCLUSIVE REMARKS

A convenient control on stability conditions of the colonnades appears useful to found the adequate maintenance interventions, before carrying out replacements of damaged marble artifacts and/or protective treatments.

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### REFERENCES

1. ZEZZA U. and E. SEBASTIAN PARDO, El marmol de Macael (Almeria) en los Monumentos Historicos de Granada (Espana). I Congreso Internacional Rehabilitacion del Patrimonio Arquitectonico y Edificacion, Canarias, Nueva Grafica Press, Vol. 1, pp. 153-160, June 1992.
2. BELLO M.A., L. MARTIN and A. MARTIN, Decay and Treatment of Macael White Marble. Studies in Conservation, Vol. 37, pp. 193-200, 1992.
3. GALAN E., M.A. GUERRERO, M.A. VASQUEZ and F. ZEZZA, Progressive Deterioration of Marble columns by thermal changes in relation to their State of Superficial Decay. Proceedings 7th International Congress on Deterioration and Conservation of Stone, Lisbon, Vol. 2, pp. 905-913, June 1992.