

## The Ançã limestones, Coimbra, Portugal

Mário Quinta-Ferreira (1), Lúcia Gil Catarino (1), and José Delgado Rodrigues (2)

(1) Geosciences Center, Dep. Earth Sciences, University of Coimbra, Portugal (mqf@dct.uc.pt; lidiagil@dct.uc.pt), (2) Laboratório Nacional de Engenharia Civil (ret.), 1700-066 Lisbon, Portugal (delgado@lnc.pt)

Ançã is located in the Lusitanian Basin (western Meso-Cenozoic sedimentary basin), in the municipality of Cantanhede, close to Coimbra, Portugal. This constitutes the northernmost Dogger (Bajocian) limestone sequence in Portugal.

The use of the Ançã limestones is documented since the Roman occupation of the Iberian Peninsula. It was used for the construction of houses, palaces, churches, fine sculptures, carving, paving and for the production of lime. These limestones vary from white and very soft varieties, with very high porosity used for sculpture and carving to white and hard varieties used for masonry and as aggregates and to white to bluish with low porosity and high strength varieties, mainly used for paving.

The softer and whiter variety is worldwide known as Ançã Stone (Pedra de Ançã) exhibiting a porosity of 26-29 %. It became famous after being largely used by Coimbra most famous Renaissance sculptors like João de Ruão and Nicolau de Chanterenne. The Pedra de Ançã was used mainly in the region of Coimbra, but also in several other places in Portugal, in Santiago de Compostela, Spain, and Brazil. Some examples of heritage in Coimbra using the Pedra de Ançã are the renaissance portal of the Saint Cross Church, the tombs of the first two Portuguese kings located in this church, the altar of the Saint Cross Church or of the Old Cathedral, or in sculptures at the University of Coimbra. It is quite prone to deteriorate when exposed to atmospheric agents and to soluble salts, mainly due to its high porosity. Deteriorated surfaces needing treatment constitute difficult conservation problems, especially when consolidation and protection treatments are required.

The less porous varieties of the Ançã limestones (< 20 % porosity) were mainly used for masonry, paving and production of lime. The royal Palace of Buçaco is a remarkable masonry building constructed at the end of the XIX century with the less porous varieties of the Ançã limestones.

Most of the traditional quarries are abandoned and those still in activity are mainly used to produce crushed aggregates, limestone blocks for paving produced in a quite artisanal way, and more rarely for sculpture.

The identification and characterization of the variability of the Ançã limestones, as well as the inventory of the existing quarries and outcrops are necessary to preserve this unique resource, important for the preservation and rehabilitation of several monuments and artwork, in Coimbra, classified as UNESCO World Heritage, where Ançã limestones, including the Pedra de Ançã, were extensively used.