THE FIRST 55 IUGS HERITAGE STONES

International Union of Geological Sciences

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Metamorphic rocks are produced when a rock is subjected to heat and or pressure and undergoes transformation. The nature and type of the resultant metamorphic rock depends on the composition of the original rock, or protolith, and the degree of heat and pressure applied.

This alteration can be generated at a large regional scale through tectonic collision or locally where a hot igneous rock comes into contact with an adjacent older country rock.

The greater the change, the higher the metamorphic grade. Limestone gets transformed into marble, mudrocks into slates or schists, and granites, at a high grade, into gneiss.

BERNARDOS PHYLLITE

Spain

El escorial

Phyllite roofs from the Spanish Baroque

A legacy quarrying since the late 16th century

Victor Cardenes

The extraction of Bernardos Phyllite dates back to the late 16th century, initiated by the directive of King Philip II. His mandate aimed at locating slate deposits in the vicinity of Madrid to supply the necessary material for the development and construction of new imperial structures.

For centuries, the Bernardos Phyllite was synonymous with nobility and excellence, with an important representation on the Spanish Stone and Architectural Heritage.

Today, these quarries continue to yield phyllite, serving the needs of both contemporary architectural projects and restoration endeavors. Notably, Bernardos Phyllite faces no significant heritage concerns, with its only challenge being the competition posed by foreign rocks of lesser quality.

Bernardos Phyllite (20 x 30 cm)

Petrography

Bernardos Phyllite displays the characteristic texture for a fine-grained phyllite. There is a strong structural control due to the intense and penetrative slaty cleavage.
Texture is porphyro-lepidoblastic, with grains of quartz and chlorite deformed by the slaty cleavage, developing cinematic structures such as pressure shadows.
The matrix is composed mainly by mica. Accessory minerals are biotite, rutile and some iron sulphides and carbonates. Texture and mineral composition is that typical for roofing slates.

Petrography

Phyllite

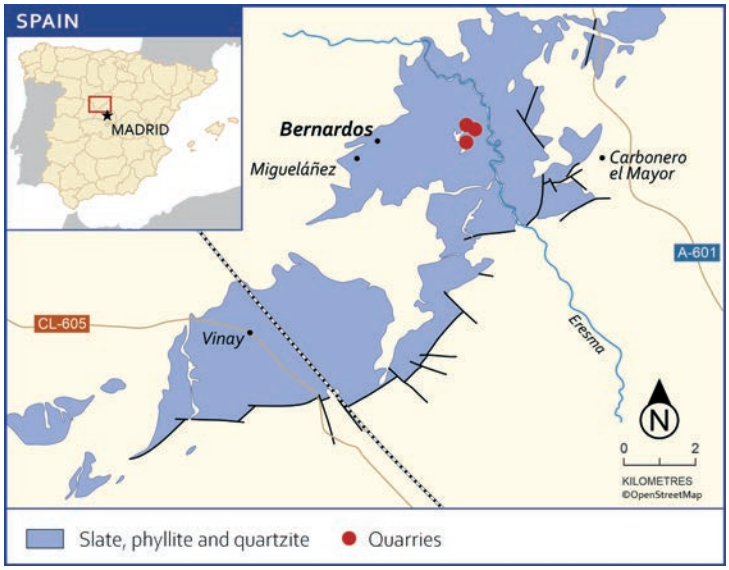
Geological setting

Precambrian- Lower Cambrian;
Massif of Santa María La Real, (Iberian Massif)

Occurrence

Bernados, Province of Segovia, Spain

Location and geology



The Massif of Santa María La Real, (Iberian Massif) is an outcrop of Precambrian - Lower Cambrian materials, affected by the Hercynian Orogeny and surrounded by the Tertiary basin of eastern Spain. This structure is the result of the compression stresses that occurred during the Alpine Orogeny. From a petrological standpoint, there are two units: the Ollo de Sapo Gneiss and the Schist-Greywacke Complex.

The Schist-Greywacke Complex (SGC) is a series of pelitic and carbonate sediments of different grain sizes affected by metamorphism.

Productive outcrops are located in the upper part of this unit, where the phyllitic levels reach up to 30 metres thickness and the slaty cleavage (S1) is penetrative and homogeneous enough to allow the split of the rock in thin, regular and flat tiles.

Quarries

Nowadays, only a few quarries are still working in the area. The most important are the historical quarries of Engorduro and El Castillo, operated by the company Naturpiedra, employing between 40 to 50 workers out of the company's total of 150.

Engorduro is one of the oldest mining explotations in Segovia, with an estimated surface of 90 hectares, and proven reserves of roofing slates for, at least, 2 milion metric tons. In turn, El Castillo has a surface of 10 hectares, with proven reserves of 500.000 metric tons.

The factory has incorporated the lastest advances in natural stone processing, so in addition to roofing slates other materials are manufactured, such as ashlars, tiles, blocks and chips. In addition, there is a special line for producing historical formats, which are used in restorations.

Quarry, Bernardos

Architectural and cultural impact

Spain has been, since the 60s of the last century, the world's leading producer of slate for roofs. The starting point of this industry dates back to the opening of the Bernardos quarries.
At that time, expert craftsmen from France and Belgium moved to Segovia to work and teach the locals the art of artisanal slate production.
Some of them married and remained in Bernardos, founding lasting dynasties of slate makers. Today there are still descendants of these slate masters living in Bernardos.
Therefore, Spanish slate architecture is influenced by the Franco-Belgian School, unlike the German School, which uses different formats and installation systems.
The first building in Castile that had a slate roof „in the Flemish way" was the Casa del Bosque de Valsaín, completed in 1562. Later, the Palacio del Pardo, current residence of foreign leaders when visiting Spain, the Alcázar of Toledo, and the Monastery of El Escorial.
From the architectural point of view, new construction techniques for roof frames, necessary for the stratification of slates, were incorporated into Spanish architecture.
During the following centuries, the phyllite industry became one of the main economic drivers of the region, along with agriculture and livestock.
At the beginning of the 20th century, production experienced a decline, due to the Spanish Civil War and changing architectural trends.
However, towards the 60s of the last century this industry was revitalized by the new operation of abandoned quarries and a new interest in vernacular architecture.
Today, this activity once again leads the development of this region of Spain.

Historical photo, Bernardos

Main reference

Cárdenes, V., Rubio, aA. & Ruiz de Argandoña, V. G. (2019): Roofing slate from Bernardos, Spain: a potential candidate for global heritage stone.- Episodes Vol. 44, 1, 3-9.

" An IUGS Heritage Stone is an IUGS designated natural stone that has been used in significant architecture and monuments, recognized as integral aspects of human culture."

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