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Archaeometry of Rock Art Pigments. Mineralogical characterization and production techniques in the schematic art of the Western Iberian Peninsula.

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My research was carried out within the project Rupscience: Analysis of Operative Chains, Archaeometry and Rock Paintings chronology. This approach uses materials and technology primarily from Portugal and Spain (PTDC/HIS-ARQ/101299/2008. FCT).

This research aims to establish, firstly, the chemical-mineralogical characterization of south-western schematic art paintings of the Iberian Peninsula and, secondly, to raise questions about the preparation, production and conservation of prehistoric pigments. These pigments were analysed using archaeometric technics that allowed the quantification of each mineralogical component, particularly, the application of Raman spectroscopy, the x-rays microfluorescence (EDXRF), electron scanning spectroscopy (SEM), stereomicroscopes and optical microscopy. Within rock art studies, these scientific approaches are considered relatively new and will provide some answers to many of the fundamental questions on why rock art was commissioned.

The rock shelters paintings date from early Neolithic to Bronze Age, are similar in style and form part of a much wider schematic rock art tradition within Western Europe. In Iberian Peninsula, we selected the shelters Pego da Rainha, Lapa dos Coelhos, Lapedo 1, Ribeiro das Casas and Segura in Central Portugal, whilst in Extremadura in Spain La Calderita and Friso del Terror.

The analysis has yielded critical results fundamental to our understanding of which methods and techniques were used (e.g., mixture of substances, grinding, possible burnt processes) in the production of the paintings, and allowed the characterization of their main components. We know the main ingredients, but it is not easy to discover the "recipes"- proportions and possible binders used (possibly due to the lack of preservation of the organic components).

The results indicated that the raw materials used in reddish pigments in the Western Iberian Peninsula were essentially comprised of iron oxides and hydroxides. In other analysed contexts (shelters in Africa and Brazil), red pigments were directly associated with iron oxides (principally hematite), along with other materials that produced different colour pigments (white: beeswax, calcite and clays; black: charcoal). Furthermore, results showed that pure untreated hematite or goethite was applied to south-western art panels, and no organic matter was identified. Based on laboratory work, were also identified some of the preparation techniques, such as crushing, and probable thermal heating; this latter technique could probably be applied due to the purpose of the inclusion of other substances (binders), although these have not been identified in the samples analysed.

It is not clear why different iron oxides and techniques were used to prepare the red pigments, although it could be linked to the ritual process involving mineral identification, extraction (quarrying), preparation, application and use. Therefore, a number of identified stages in producing the painted image required forethought, imagination and the intimate knowledge of the natural constituents that created the pigments.

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