

On Palaeolithic coloring agents: epistemological analysis of scientific process

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What were the coloring agents used during the Palaeolithic? How to recognize, define and describe them? What kind of information may they have recorded?

In the past decade, these questions have become essential since coloring agents take a central place in current researches on modern human behaviors and emerging of figurative expressions. Typically, coloring agents are found in various archaeological/sedimentological/economical/cultural contexts: open air and rock-shelter dwellings (settlements?), graves, drawings and paintings in caves.

As a consequence, this topic needs interdisciplinary approaches. There is a crucial challenge to overcome which starts from sharing semantics adapted from geosciences, archeology and material sciences. This allows to strengthen the fundamental knowledge to build the working hypothesis and the methodology.

Notably, as for the flaked industry, the “chaîne opératoire” (processing sequence) analysis has proven to be an efficient tool. It provides i) a path to a dynamic comprehension of coloring material processing and ii) a way to include this productions within a systemic framework of Palaeolithic activities. Applied to the coloring agents, it concerns:

1- The qualification of their sensitive (visual and mechanical) properties: color tone, texture, proneness to be ground to powder.

2- The procurement strategies which require the setting up of geological references (Project *Pigmentoθήque*), and combine information concerning geological contexts, availability and sensitive properties. With a combined and reproducible documentation and characterization procedure of the raw coloring rocks, we **identify the signature** with different scales of information (petrography, mineralogy, geochemistry). This gives robust data in order to compare raw materials to coloring agents used during the Palaeolithic, even if they were transformed by heating or mixing, as well as if they were ground to powder, or strongly modified through taphonomic processes.

3- Techniques implemented to use the coloring agents are corollaries of sensitive properties, supply strategies, as well as the objectives of the production. Thus, techniques are systematically documented (powder production, hue control, grain size of the powder, mixing with other substances).

4- As a synthesis of the three previous stages of analysis, the objectives of the production are questioned with regard to sensitive, availability and cultural concerns.

At this point, by studying current scientific methods and discourses on past human activities related to coloring agent exploitation, we can focus on the possible weaknesses in the scientific procedures.