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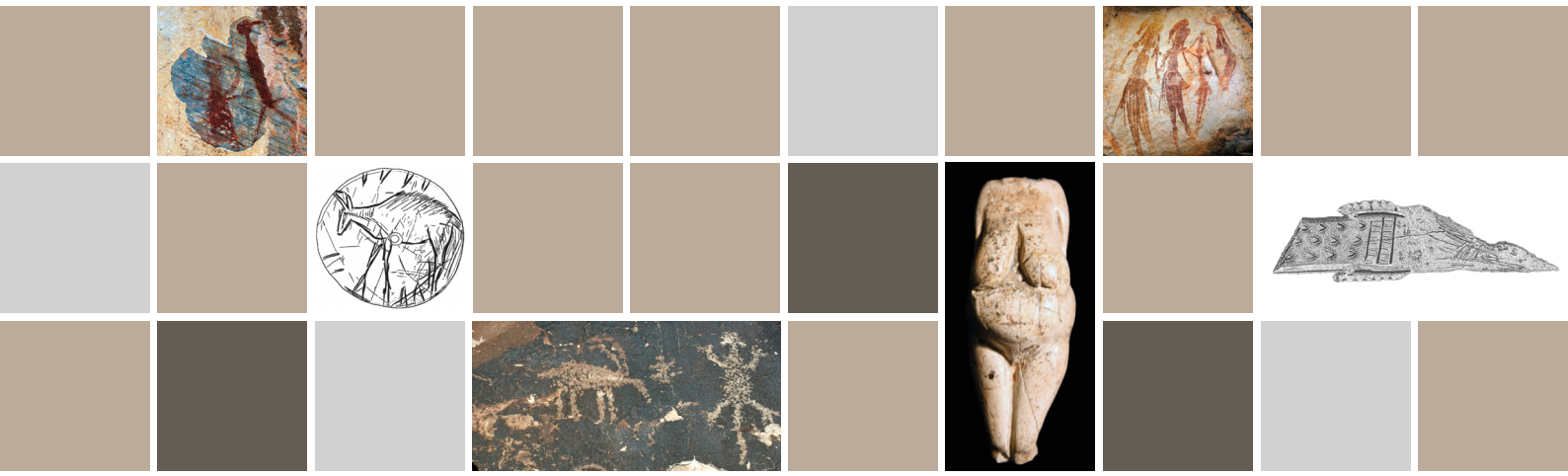

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INDEXING THE TRACES OF ANTHROPOGENIC ACTIVITIES AND MODIFICATIONS IN DEEP KARST ENVIRONMENTS

Yann-Pierre MONTELLE

Indexing the traces of anthropogenic activities in underground environments constitutes a fundamental contribution to future studies of the use of caves by Paleolithic humans. This taxonomically oriented investigation is mainly based on the forensic principle of "exchange" during the time of contact between two agents and the traces that this contact leaves. The observation, analysis and reproduction in the laboratory of the biomechanical and taphonomic processes implied in the production and preservation of these traces are also an important aspect of this research. A catalogue of structural traces and modifications must be constructed and its contents should be based on observation, recording, taxonomy and comparative analysis of the traces left by modern speleologists and analogous ones found in underground prehistoric sites; all of this together composes an empirical database that researchers can use to corroborate, question or formulate new hypotheses on the use of caves by humans during prehistory. In 1919, in his opening speech to the Academy of Sciences, Edmond Locard (1877-1966), a criminology specialist and pioneer in forensic police investigation, postulated that: "Any author of a crime forcibly leaves material

The author observed anthropogenic traces on a clay floor
in the Gallery of Crosshatching, Chauvet Cave (photo: J.-M. Geneste, 2008).

evidence of his presence at the crime scene". Today, this principle is known to forensic police investigators as the "Locard Principle of Exchange" (PEL). PEL can be resumed as follows: when there is contact, there is transfer – this transfer can be of a cosmic or microscopic dimension; whatever the nature of this transfer, it will leave its trace, a trace whose permanence depends on the taphonomic hazards to which it is subjected; its detection and interpretation are dictated by the taphonomic knowledge of the investigator. Adapted to the underground conditions of deep caves, Locard's principle of exchange becomes the fundamental axiom for a rigorous investigation "of the interferences between humans and the cave". Traces indicative of a logical action, footprints indicating a pause, or evidence of a modification made to facilitate circulation, are usually located on surfaces that have resisted water run-off, trampling and other random processes.

Some types of traces are well-known, such as prints left by feet, hands, knees or spear points; as is the transport of organic material that breaks and that we trample; the movements of bone remains that leave their negative imprints, or traces of modifications to structural elements of the cavity (broken concretions, for example). But there are other traces that we cannot yet identify because we haven't "thought" of them. They require a paleo-chronological approach. They cannot be separated from the biomechanical processes of which they are the signatures. These traces would have been subject to the taphonomic modifications associated with underground environments. It is therefore necessary to take these modifications into account when analyzing a cave floor and that which could appear to be banal would rapidly become the ichnological subject of an original behavior. The systematic progression of a speleologist would be dictated by the volume of the traces observed and, being conscious of the modifications created by his progression, he would precisely record all of the identifiable traces. This implies that the speleologist would be able to integrate both the progression techniques adapted to the requirements of the terrain and a global knowledge of the cavity (from a karstic, geological, climatological and taphonomic perspective) in order to identify and describe the nature and the typology of the observed traces and modifications.

The morphology of the cavity is a determining factor in the choice of trajectories. Whether it is vertical or horizontal, it has been observed that the path follows a topographic logic. The progression of the speleologist forms an axis of circulation punctuated by the morphological aspects of the floors and walls. The testimonies of speleologists through time can be arbitrarily taxonomized in two main categories: intentional and non-intentional contacts. We can thus distinguish three groups of traces: the first includes the traces of progression (dynamic foot and handprints, slides, falls, broken concretions); the second includes the traces of stopping (brief station, "pause", catching one's breath, contemplating difficulties, problems of orientation or lighting); the last group is that of the traces associated with modifications made to the site.

This taxonomy is a solid foundation onto which we can add other criteria such as: the morphological variations of the space crossed; the physical capacities of the individual; his or her age; previous knowledge of the topography; the technical means used to facilitate progression across a difficult terrain; the lighting; the simultaneous presence of predators, etc. This non-exhaustive and preliminary list is nonetheless sufficiently descriptive to illustrate the level of complexity in which this taxonomy operates. When analyzing a trace, empirical observations of its morphology and typology do not suffice; it must rather be integrated into a research context in which this trace is projected into an analytical system oriented toward interrogations concerning functions and motivations, for example.

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