

Ashes to Ashes, Soot to Soot

Microchronological Study of Human Occupations at the Grotte Mandrin Site

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Soot traces, testifying of the fact that our ancestors mastered fire, are witnesses of past human activities. They can sometimes be noticed on the walls and/or vaults of cavities and also inside calcareous concretions (e.g., stalagmites). They are a particularly suitable material for very high temporal resolution archaeology.

At the Grotte Mandrin site, wall fragments discovered in the archaeological levels of the shelter were covered with thin (millimetric) blackish deposits. These traces result from combustions in the cavity during prehistoric times. The soot thus deposited on the vault was covered and preserved by a thin calcareous crust (fig. 1). Microscopic observation of these concretions shows a kind of "layer cake" in which carbonates blackened by soot and "clean" carbonates are intermingled.

Few comparable cases have been referenced. It was therefore necessary to adopt an empirical and naturalistic approach when studying these singular deposits. The blackened wall fragments were systematically collected during each excavation season since 2006. For analysis, these samples were either polished or prepared into thin sections. They were then observed under microscope in order to reveal the succession of multiple very thin soot films appearing as a single deposit to the naked eye (fig. 2). The position of each film is then recorded using photographs, thanks to DataWald software, usually used in dendrochronology (the study of tree rings). The collection of this data allows the representation of the succession of soot films in the form of "bar codes" (fig. 3). To each sample corresponds its own bar code.

Fig. 1 –

- 1– Rock shelter and crusting after human occupations
- 2– Deposition of soot on the vault during occupation
- 3– Rock shelter and crusting before human occupation
- 4– "Layer cake"; soot films inside calcareous crust after several human occupations
- 5– Limestone bedrock
- 6– Calcareous concretion
- 7– Soot
- 8– Smoke
- 9– Hearth
- 10– Micro-cracked limestone
- 11– Percolation
- 12– Water circulation in micro-cracks
- 13– Water runoff
- 14– Condensation
- 15– Stall and fall of a wall fragment
- 16– Runoff
- 17– Percolation
- 18– Condensation

Fig. 3 –

- 1– Measurements of gaps between soot films EF-1081_part1
- 2– Scale = 0.1
Resolution px/mm = 640.0
- 3– Sample: EF-1081
N = 16

Fig. 4 –

- 1– Chronicle of Occupations (E)
- 2– Overlapping of the Occupations Chronicles of Layers E and F
- 3– End of the Chronicle of Occupations (F)
- 4– Rhodanian Quina Mousterian
- 5– Neronian (transitional group Middle to Upper Paleolithic)

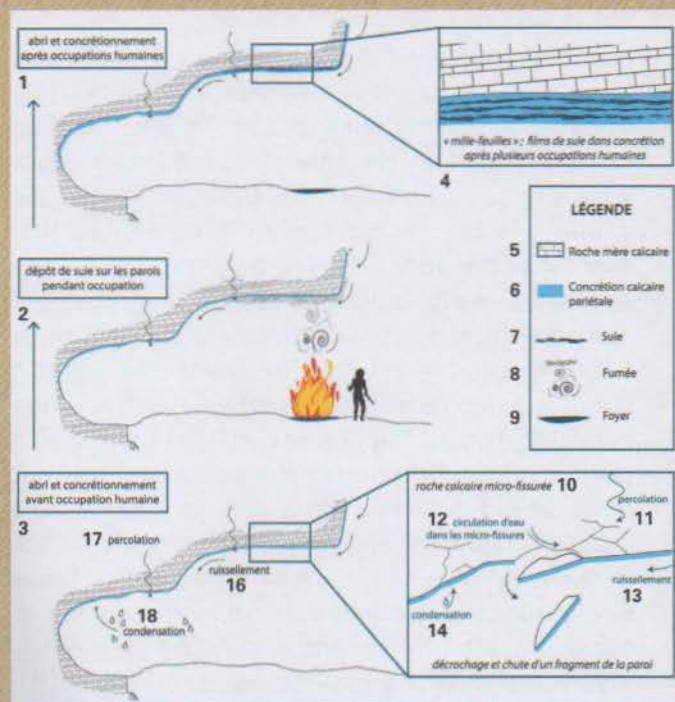


Fig. 1



Fig. 2

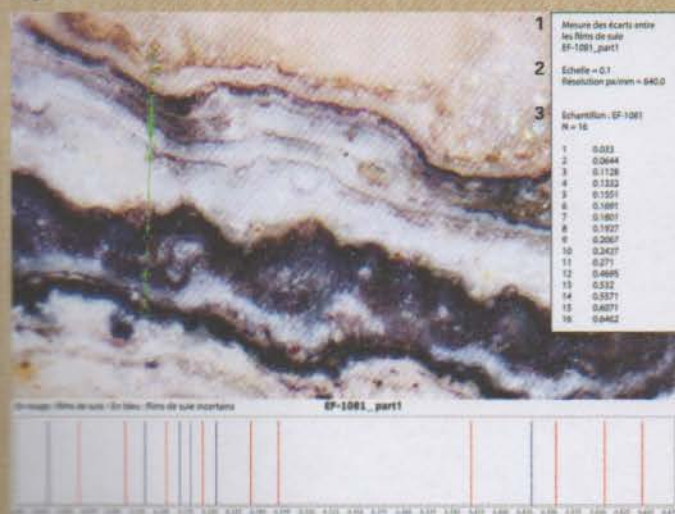


Fig. 3

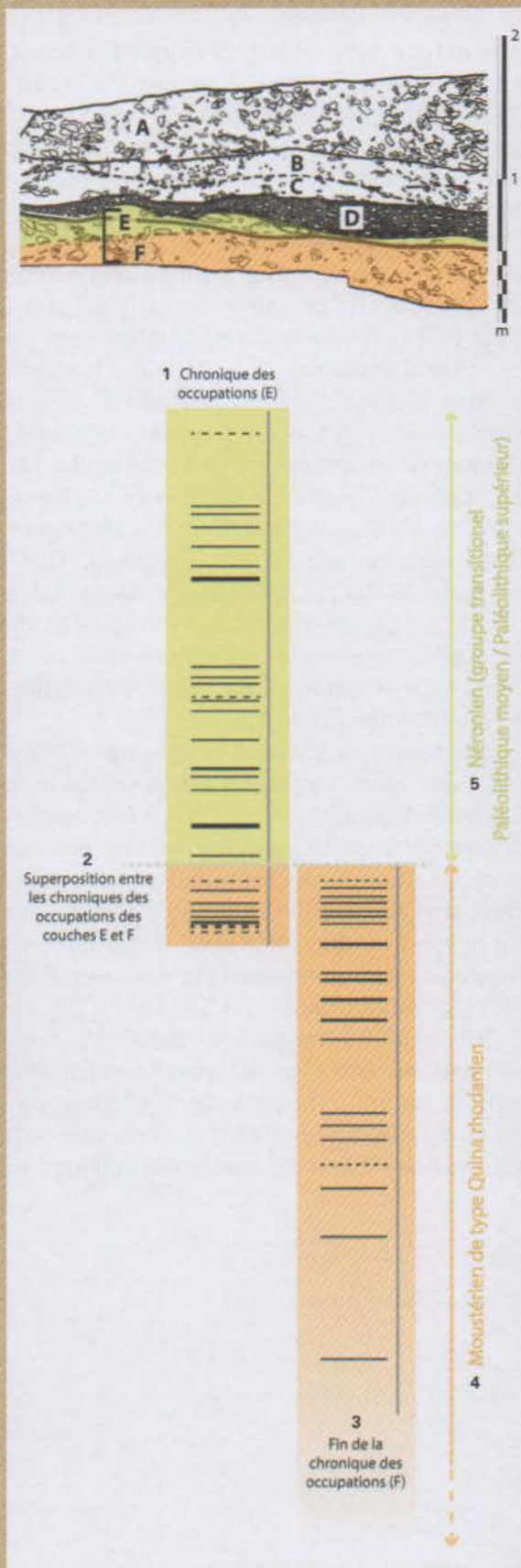


Fig. 4

Multiple samples, with their unique bar codes, are then correlated in order to rebuild the entire soot film sequence for each archaeological unit. This graphical representation traces the chronicle of human occupations in the shelter (each soot deposit on the photograph = 1 line on the barcode = 1 at least occupation: two occupations too close together will only leave a single black deposit). The occupations can then be counted and their rhythm of succession can be studied.

At the Grotte Mandrin, occupations from archaeological levels F (underlying) and E (overlying) were traced from the wall fragments covered with blackened concretions collected in the filling. Occupations of layer E are attributed to the Neronian: a Middle to Upper Paleolithic transitional group dated from around 50,000 years ago. The lithic industries of the Neronian show a very high technicality (see pp. 154–155) and, in the state of knowledge, seem to share no technical features with the Quina-type Mousterian that preceded it (attributed to Neanderthals, layer F).

Due to the progressive collapsing of the walls and vault, some fragments that have fallen in the E archaeological layer may have recorded occupations corresponding to the human installations in layer F. The reverse is impossible since the wall fragments found in layer F had already fallen on the ground before the arrival of the next group. They can no longer record the new soot deposits left by occupations of layer E.

This explains the partial overlap between the occupations chronicles of layers F and E presented here (fig. 4). Note that the same space separates the two soot films marking the first two occupations of layer E and the two films marking the last

occupation of layer F and the first occupation of layer E. The time lapse between the last occupations of the Mousterian group (F) and the first occupations of the Neronian group (E) is therefore very short. Its duration can be estimated to be within one human generation. This implies that two culturally very different human groups have succeeded each other quickly enough that the archaeological succession does not correspond to a simple succession but to the replacement of one cultural group by another in a given territory. Two conclusions may thus be drawn: that there was a clear change of rhythm in the succession of soot films between those attributed to layer F and those of layer E, which suggests that the dynamics of territory occupation were different for these two groups; the Neronian group, who returned to the Grotte Mandrin at least eighteen times, definitively replaced the previous group. The micro-chronological data is in agreement with the purely archaeological features, which do not document any intermingling between these two cultural groups: no element from the technologies highlighted in layer F is recorded in the Neronian assemblage (E) and vice versa.

The soot deposits fossilized in calcareous concretions allowed here a microchronological study of human occupations in the Grotte Mandrin. This resolution and precision of the method used here has made possible the demonstration of rapid succession (a few seasons or years) of one cultural group in the Grotte Mandrin territory by another. This method also opens up perspectives for documenting human mobility (degree, frequency, rhythms) due to its high temporal resolution, approaching that of ethnographic recordings.

The Third Man

THE PREHISTORY
OF THE ALTAI

Musée National de Préhistoire – Les Eyzies-de-Tayac

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