PALAEOLITHIC MAP ENGRAVED FOR STAGING WATER FLOWS IN A PARIS BASIN SHELTER

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MÉDARD THIRY AND ANTHONY MILNES

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Summary. *The Ségognole 3 shelter lies within a quartzitic sandstone megaclast in a lag deposit in the Paris Basin. It displays a female sexual configuration associated with a horse engraving, stylistically attributed to the Upper Palaeolithic. Recent studies have demonstrated that modifications to the natural features of the shelter had been undertaken to cause water to flow through what is seen as the vulva. New investigations reported here describe additional modifications to natural features in the shelter to direct rainwater infiltration to a network of channels engraved onto the shelter floor to form a functioning representation of watercourses. The carved motifs and their relationship with natural features in the sandstone of the shelter can be compared with major geomorphological features in the surrounding landscape. The engraved floor is not quite a map but more like a model in miniature of the surrounding landscape, potentially a world-first 3D-model of a Palaeolithic territory.*

INTRODUCTION

A cave complex in the Fontainebleau sandstones extends to the south of Paris and includes more than 10,000 shelters, of which over 2000 have engravings. The engravings are fundamentally non-figurative, rectilinear and geometric (Tassé 1982; Cantin *et al*. 2022); they are thought to have been engraved at the end of the Mesolithic period (Guéret and Bénard 2017). Within these shelters, only three with figurative representations of Late Palaeolithic style are currently known: an incomplete animal painted on a split plate (Leroi-Gourhan 1976) from a shelter destroyed by quarrying at Boutigny-sur-Essonne (Essonne); the engraving of two horses connected to the hydrological combination with a female sexual figuration in the La Ségognole 3 shelter (Bénard 2010; Thiry *et al*. 2020) in Noisy-sur-Ecole (Seine-et-Marne); and carved aurochs in the La Saboterie 1 shelter (Bénard and Valois 2014) located in Buno-Bonnevaux (Essonne). This Palaeolithic rock art is invaluable as only a few examples are known above 46°N latitude (Aubry and Luis 2012). Two upright quartzitic sandstone megaclasts erected by humans occur close to two of these Late Palaeolithic shelters. This conjunction is not likely to be fortuitous but rather linked to a cultural process. We have suggested that the megaliths date from the Late Palaeolithic and may be ‘engineered landmarks’ erected to mark places that had special cultural significance for Late Palaeolithic hunter-gatherer people (Thiry and Milnes 2024a).

The shelter Ségognole 3 in Noisy-sur-École (Seine-et-Marne, France) detailed here has a fine engraving of a horse about thirty centimetres long accompanied by a second eroded engraving which now shows only the foreparts of a horse. The proportions of the complete horse and its stylistic relationship with several horses in the Lascaux cave led to a chrono-cultural attribution, placing it to somewhere between the Solutrean and the ancient Magdalenian (Bénard 2010). The horses are symmetrically arranged on either side of three slots that distinctly evoke a pelvic triangle. The slots of the pelvic triangle have been engraved and the natural fractures shaped to resemble groin folds, and the framing of the thighs and hips. However, the most remarkable anthropogenic interventions were intended to modify the hydrology of the shelter to drain water into a slot representing the vulva (Thiry *et al*. 2020). A natural basin at the rear of the carved panel had been deepened by percussion to open fractures and direct infiltrating water towards the top of the pelvic triangle so as to form an outflow through the vulva. These works changed the pelvic triangle in the Ségognole 3 shelter into a complex and functional installation including moistening and flow cycles. The Palaeolithic people could potentially have operated the 'vulvar outflow' on demand and without weather constraints. It is likely that this setup had symbolic and ritual purposes and formed, together with the parietal arrangement, an integral part of a complex and dynamic installation linked to a female sexual configuration. These anthropogenic modifications were firstly identified through detailed meso-geomorphological observations which distinguished them from natural morphologies.

As well as the abovementioned specific hydrological arrangements, we identified several anthropogenic modifications on the floor of the shelter that modified the hydrology of the floor independently of the effects of staging of the female sexual representation. Here, we focus on these additional hydrographical features and compare the pattern of water flows on the floor of the shelter with the local hydrographical network. Together, these natural and worked morphologies comprise a picture map combining landscape elements in plan and relief.

SETTING

Although Late Palaeolithic engraved shelters are rare in the region, there are numerous Late Palaeolithic open-air sites that have been long studied (Fig. 1). Foremost are Pincevent (Leroi-Gourhan and Brézillon 1966), Étioles (Olive 2005; Caron-Laviolette *et al*. 2018), and several others located on the Seine and Loing rivers (Bridault *et al*. 1994; Valentin *et al*. 1999; Bignon 2007). These open-air sites are large camps with hunting and residential functions where hunter-gatherer groups aggregated (Bodu *et al*. 2011). The camp sites are located at the mouths of the valleys which slope down from the Beauce plateau and in locations where the valley-sides of the Seine are less steep, and probably correspond to fords on herd migration routes. They are located within 35–45 km of the three shelters that contain Palaeolithic style figurative representations, and which were clearly accessible for exploration and exploitation by Palaeolithic hunter-gatherer groups.

The landscapes of the southern Paris area are framed by a thick layer of loose sand, the Sables de Fontainebleau (of Oligocene age) which forms a regional escarpment between the Brie plateau (lower limestone plateau) and the Beauce plateau (upper limestone plateau), as shown schematically in Fig. 2A. The sand formation is about 50 m thick and contains 0.5 to 4 m thick quartzitic sandstone slabs. At the edges of outcrops, quartzitic sandstone slabs become fractured

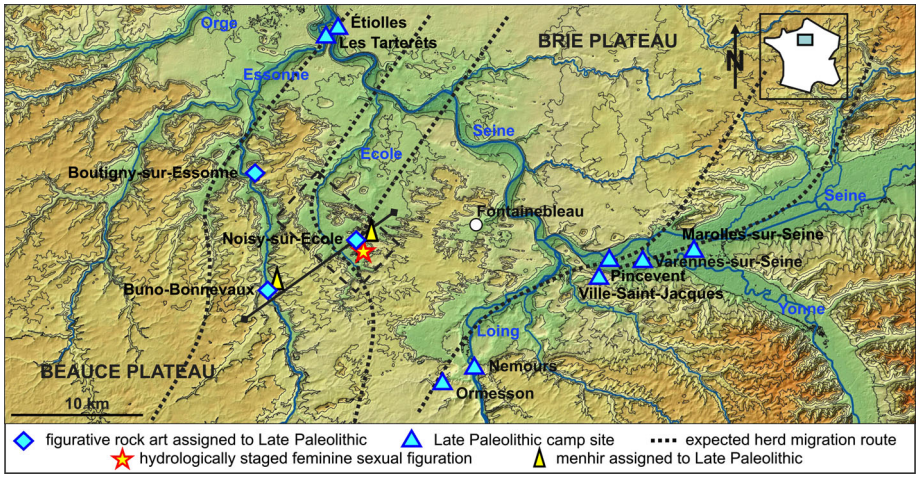

FIGURE 1

Landscape context of the Late Palaeolithic sites in the southern Paris area. The line shows position of the section in Fig. 2 and the dashed rectangle is the outline of the Ecole river map in Fig. 12B. Map DAO by Michel Rey. Modified from Thiry and Milnes (2024a).

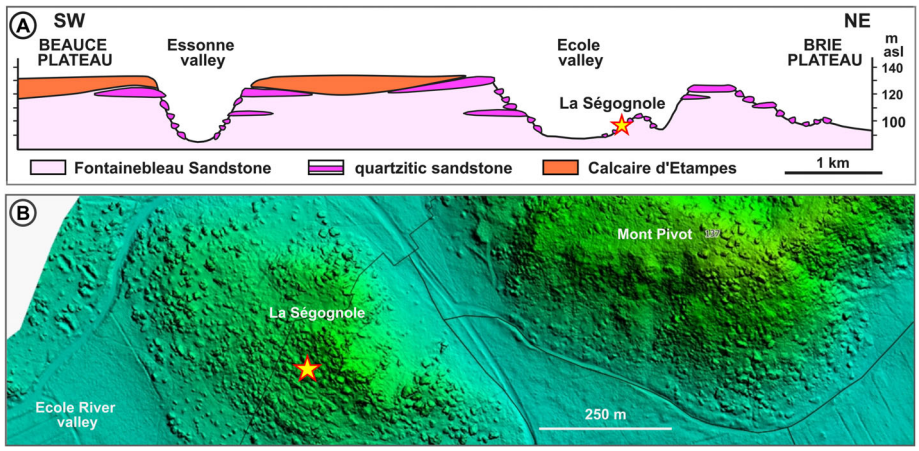

FIGURE 2

Setting of the La Ségognole 3 shelter. A) Geomorphological section through the Fontainebleau sandstone landscapes where the engraved shelters occur (vertical scale much increased for readability). See location in Fig. 1; B) LIDAR map showing the main characteristics of the landforms composed of steep hillocks crowned by quartzite pans and surrounded by rock lags. Picture, DRAC Ile-de-France/SRA, treatment ONF, 2017. Modified from Thiry and Milnes (2024a).

and break free, moving downslope as the scarps retreat to form a rocky chaos that covers the sand slopes (Fig. 2B). Metre-sized cavities housed in quartzitic sandstone blocks of several metres length host the engraved walls of the shelters.

DETAILS OF THE SHELTER

General layout

The quartzitic sandstone block that houses the Ségognole 3 shelter is roughly rectangular, about 7.5 m x 6.0 m wide and 2.5 m in height. The shelter extends across the sandstone block from side to side, is open at the two ends and consists of an upper and a lower gallery that slopes from south-east to north-west (Fig. 3A). Towards the north-west, the upper gallery is roughly level, whereas the lower gallery dips into the sandstone (Fig. 3B). Further north-west, the two galleries diverge and become separated by a dividing wall about 30 cm thick (Fig. 3-Pw). At the north-west facade the two galleries form two distinct openings with a vertical offset of about 100 cm.

The presence of depressions in the sandstone on the floor of the galleries is a characteristic of the Ségognole 3 shelter (Fig. 3A). Roughly circular hollows, 50 to 70 cm in diameter and with regular smooth bottoms are called ‘basins’ (B); smaller irregular depressions, without specific smooth bottoms and rimmed by a sandstone bulge are named ‘sinks’ (S) that overflow through grooves (G); ‘sump’ (Su) is the name of a closed depression at which the lower gallery slope ends (Fig. 4). Elliptical sandstone bulges (b) that are 20 to 50 cm in diameter and 5 to 10 cm high are another characteristic of the shelter (Fig. 3A). These protuberances correspond to sites of more intense silicification at the time of formation of the sandstone (Thiry and Milnes 2024b). The sandstone megaclast hosting the shelter is crossed by an interconnected network of metre-long fractures that formed in response to extension stress regimes during twisting as it slid downslope.

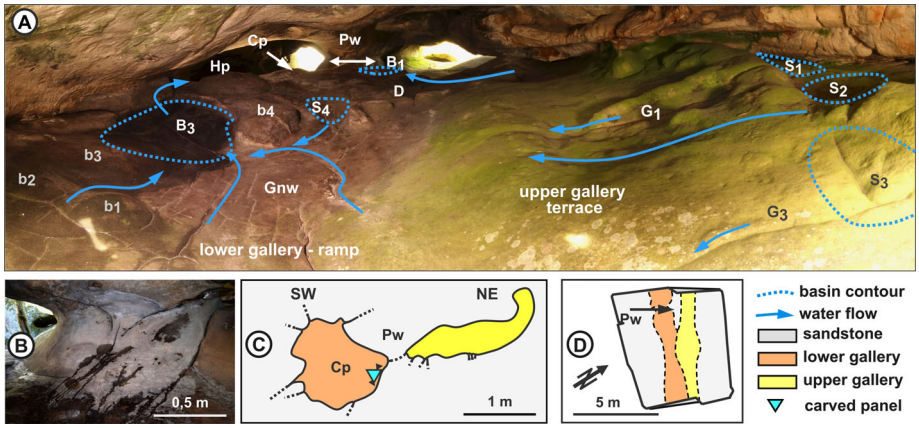

FIGURE 3

Ségognole 3 shelter. A) View from the south-east entrance downslope towards north-west entrances. The gallery is divided into two parts separated by a narrow wall Pw accompanied by narrowing of the upper gallery with basin B1 in its floor. The lower gallery has sandstone bulges b1 to b4 which emerge from the floor where there is a groove network Gnw that directs water flow to the basin B3, crosses a sandstone hump Hp, drops approximately 80 cm and forms the chamber where the carved panel Cp is located. The upper gallery (upgradient) contains three sinks S1 to S3 that overflow through grooves G1 and G3 towards the lower gallery ramp groove network Gnw that flows to basin B3. A series of sandstone bulges make a divide D between basin B1 and basin B3 watersheds. ‘Wide-angle’ photo by Pascal Crapet; B) Engraved female sexual figuration with vulvar outflow after 3 days water infiltration from basin B1 at the rear of the panel; C) Vertical section through the engraved panel. Note the height offset between the two galleries and the meagre sandstone wall (about 30 cm wide) separating them; D) Plan view of the two galleries.

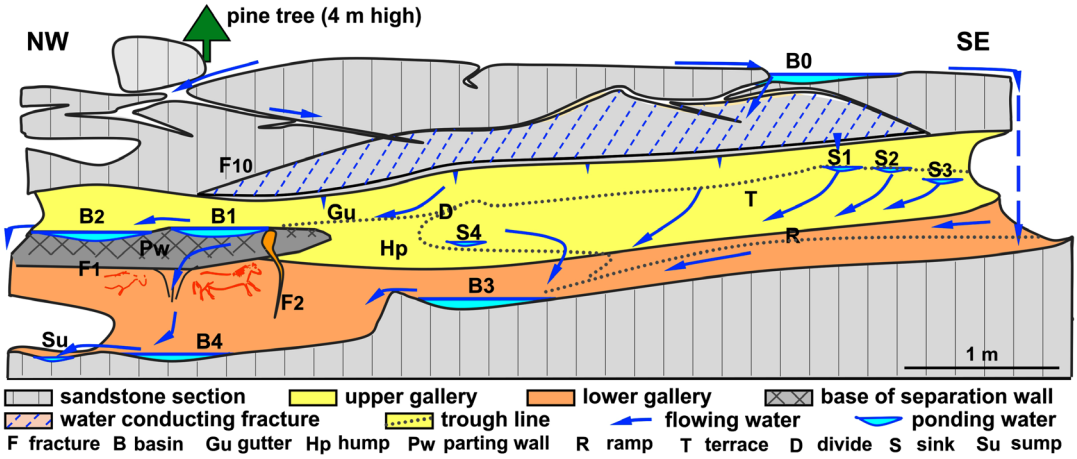

FIGURE 4

Diagram showing in detail the morphological features of the shelter and associated hydrological flows. The upper gallery receives water infiltrated through fractures under basin B0 in the south-east and under a boulder placed on the megaclast in the north-west, which mainly feeds the vulvar flow via basin B1. The lower gallery is mainly fed by the discharge from basin B0 on ramp R at its south-east opening, and after successive stages ends in the sump Su at its north-west opening.

FIGURE 5

Seepage water (dark colours) from fractures in the northern wall of the upper gallery: view from the chamber of the carved panel. North-west and south-east are openings into the shelter; F10 is the main fracture in the vault; Hp is the sandstone hump between upper and lower galleries.

Hydrology

Water is a significant component of the La Ségognole 3 shelter. Influxes of water during rain periods are evidenced by seepages through fractures: the water then runs across the floors of the galleries and is retained in depressions in the sandstone. A major fracture F10 in the vault of the upper gallery and less extensive fractures on its north wall control most of the water infiltrating into the shelter (Figs. 4 and 5). As well, water cascades directly from the top of the sandstone megaclast at the south-east opening and onto the ramp that forms the floor of the lower gallery (Fig. 4).

Above the shelter on top of the sandstone megaclast is a relatively large basin B0, more than 1 m long, through which most of the water that enters the shelter flows: it acts as a kind of water tower (Fig. 4). Basin B1 in the upper gallery feeds the vulvar flow of the female sexual figuration (Thiry *et al*. 2020) and spills over into B2 which overflows out of the shelter. In addition, the upper gallery contains three sinks (S1, S2 and S3) towards its south-east opening that overflow onto the ramp in the lower gallery, and sink S4 more centrally sited amidst sandstone bulges. Basin B3 of the lower gallery is located at the end of a long ramp at the point where the gallery drops into the engraved panel chamber. It is mainly fed by water overflowing from basin B0 and, occasionally, by overflow from sinks S1, S2 and S3 in the upper gallery. Water spills from basin B3 into basin B4, located 80 cm below at the foot of the engraved panel and which overflows towards the north-west exit, where it seeps into a porous depression Su in soft sandstone that acts as a sump. The superposed arrangement of the galleries is the key part of the hydrology of the shelter (Fig. 4). There are two main independent flow paths separated by a series of bulges which form a divide D: one leads to basin B1 in the upper gallery that overhangs and feeds the female sexual configuration; the other flows along the ramp in the lower gallery to feed basin B3 and ends in basin B4 in front of and below the sexual figuration.

METHODOLOGY

Our analysis of the anthropogenic arrangements in the Fontainebleau sandstone shelters is based on geomorphological concepts (Delannoy *et al*. 2004; Heydari 2007; Ferrier *et al*. 2017). The approach seeks to distinguish and explain, by means of objective criteria, the morphologies that make up a shelter, the morphogenetic processes that generate each of the elements (thus distinguishing natural morphologies from those related to anthropogenic action) and then to demonstrate the purpose(s) behind the anthropogenic actions. Observations are mostly made at the 1 m or even centimetric scales. In Ségognole 3, infiltrating water has induced alterations/dissolutions of the sandstone which gradually subdued natural morphologies and so it is difficult or even impossible to discern any wear-marks of tools. Thus, special attention has been paid here to the analysis of the geometries of grooves and slits to distinguish those likely to correspond to fractures induced by mechanical stresses within the rock or to provide an argument that they may be of anthropogenic origin.

Regardless of the ultimate origin of fractures or fissures in rock masses, either linked to regional tectonics in the case of the majority of fractures (Peacock *et al*. 2018) or related to relief and recent weathering as in the case of the Grès de Fontainebleau (Thiry *et al*. 2017), they cut across or abut against each other to form networks whose geometric properties are characteristically linked to the stress regime (Fig. 6A). Protected from weathering, fractures within the shelter are straight, thin, often chipped on their edges (Fig. 6B) and with ‘clean’ intersections.

Water flows and ponding in the shelter have been systematically recorded and photographed during more than 70 visits to the site in the last five years. Additionally, tests were conducted to determine the rates of water infiltration into and through some fractures and slots, to measure the capacities of basins, and to observe and monitor flows along both natural and modified sandstone structures.

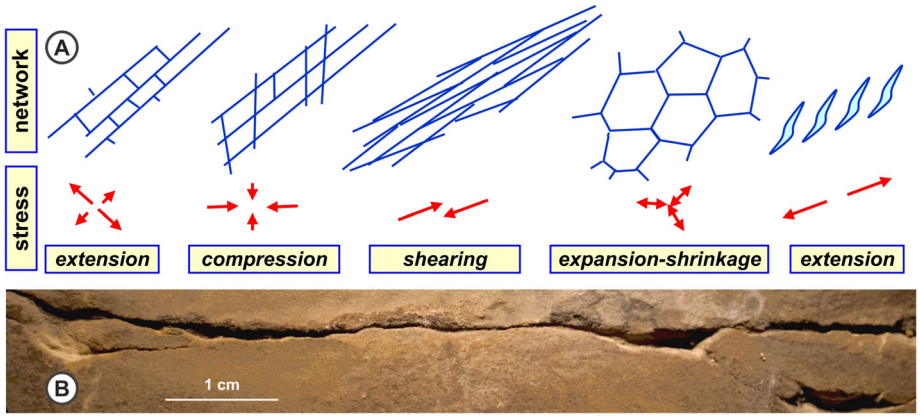

FIGURE 6
Typical fracture geometries. A) Fracture networks vs tension regimes. In the surficial domain fractures are always interconnected and the angles between them indicate the regimes and directions of stresses; B) Natural fracture with scaly and non-rounded edges. Shelter La Ségognole 3, Noisy-sur-Ecole.

RESULTS

Several sandstone structures in the shelter were generated either by removal of rock volumes or by simply engraving furrows. Anthropogenic interventions relating to the staging of the female sexual representation have been reported elsewhere (Thiry *et al.* 2020). Here we focus on the upstream water flows in the upper and lower galleries near the south-east entrance where there are several additional arrangements concerned with the hydrology of the shelter, including specific modifications to the natural basins and to the drainage into and out of the shelter.

Water retention basins

Installation of a spillway on basin B3. Basin B3 of the lower gallery is set at an incline to a sandstone hump which separates it from the chamber of the engraved panel located about 80 cm below (Fig. 4). This hump is notched by a well-marked spillway (Fig. 7A). A black patina coats the bottom and the edges of the basin, rising up to the level of the sandstone hump, and marks the original fill-level of the basin before it was lowered to the current spillway level. Here meso-geomorphological criteria were sought to ascertain whether the notch is due to progressive weathering and erosion of the sandstone hump or to anthropogenic working.

As seen from 'upstream', the morphologies of the sandstone forming the spillway are *a priori* relatively blunt and rounded as might be expected from weathering. However, the 'downstream' view shows concave morphologies and angular edges that contrast with the natural morphologies in the shelter and elsewhere (Fig. 7B). The former are the depressions formed by removal of large conchoidal flakes of sandstone by percussion. Given their size, the flakes must have been detached with a heavy hammerstone. Additionally, the irregularly curved furrows that occur on both sides of the spillway are not connected to any inherited natural fractures in the sandstone (Fig. 7C). The patterning and V-profile of these furrows suggest that they were carved by humans, perhaps for further deepening the spillway or simply to regulate the morphology of

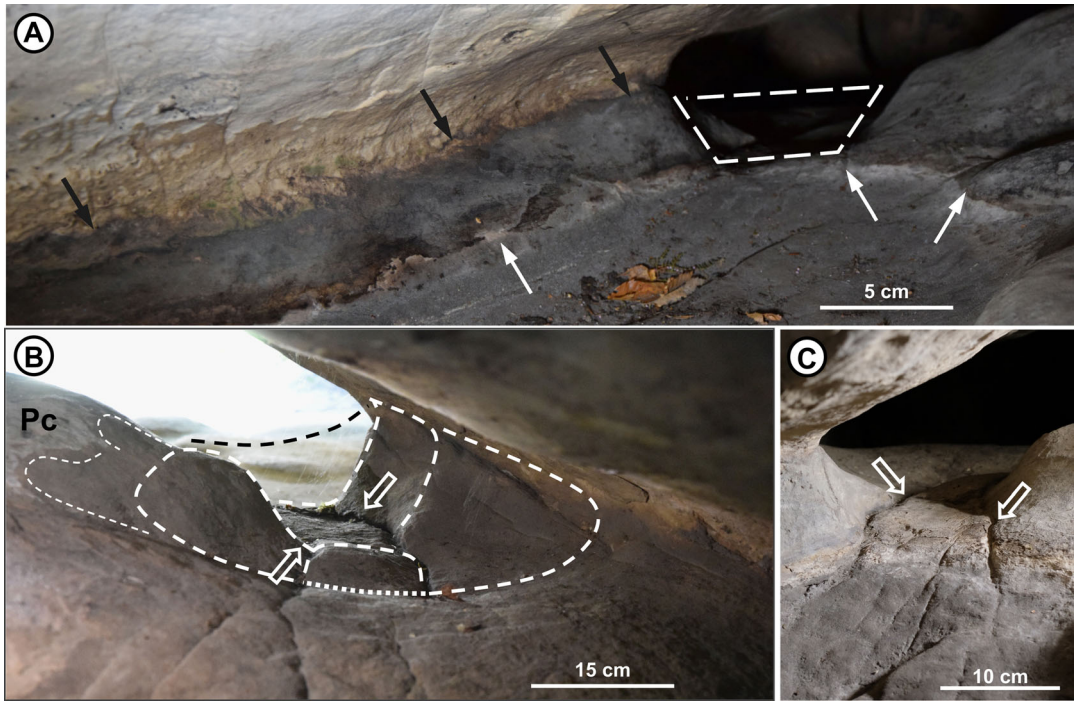

FIGURE 7
Spillway on basin B3. A) View from upstream. Material removed from the sandstone hump shown by dashes. The dark patina (black arrows) marks the initial fill level of the basin and the white deposits (white arrows) mark the maximum water level after excavation of the spillway; B) View from downstream (chamber). Conchoidal flakes of sandstone were removed by percussion (dashes) and furrows mark both sides of the incision (white hollow arrows); Pc: primary crust of the sandstone hump intersected by the workings; C) View from upstream, the curved furrows (white hollow arrows) are not the extensions of natural fractures.

its base. Working of the spillway in this fashion lowered the fill-level of the basin by about 7 cm and caused the basin to fill and spill more frequently than would have occurred if the original fill-level had been maintained.

Adjustments to top basin B0. Basin B0 (Fig. 4) is a rather large one, measuring approximately 150 x 100 cm and 10 to 20 cm deep, located on top of the Ségognole 3 sandstone megaclast. It is exposed to weathering and so does not retain sharp morphologies that might reflect the locations of conchoidal flakes removed by percussion, in contrast to basin B3 inside the shelter. We compared the morphologies of basin B0 with those typical of natural basins that have developed on the top of Fontainebleau sandstone megaclasts elsewhere (Fig. 8A). Natural basins are rounded depressions, somewhat limited in size, with concave and smooth morphologies resulting from slow weathering of the sandstone (Thiry *et al*. 2017). Using the regularity of the edges and bottoms of natural basins as a reference, we can distinguish features in basin B0 that suggest possible anthropogenic modifications.

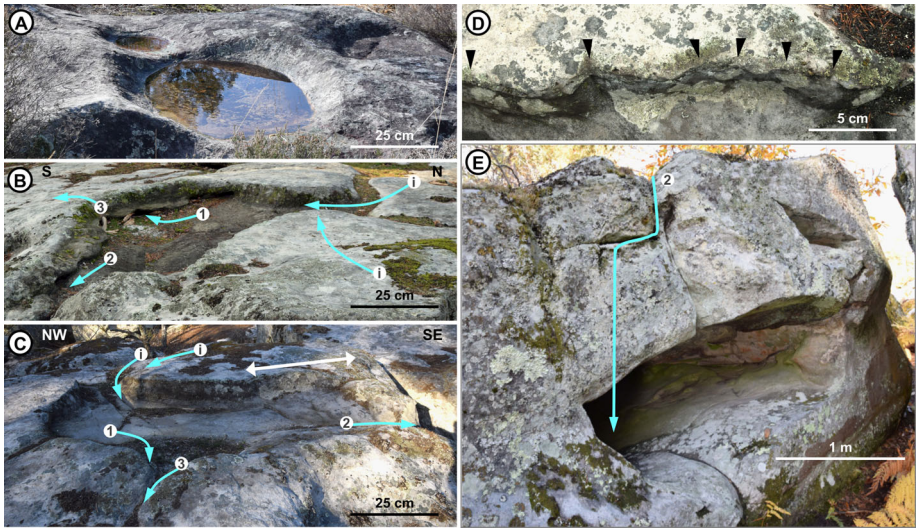

FIGURE 8

Basin morphologies and water pathways. A) Typical smooth shape of a natural basin on top of Fontainebleau sandstone megaclasts; Rocher de la Reine, Fontainebleau; B) and C) View towards west and north-east respectively of basin B0. The irregular contours, steep walls and flat bottom of the basin are quite different from those of natural basins. (i) Inflows from rain on the sandstone surface; (1) lower outflow level through a flat recess; (2) intermediate outflow level towards south-east opening; D) Detail of the north-east edge (double white arrow on C) showing V-notches reminiscent of percussion marks (arrows) that recut edges of the natural silica crust covering the surface – view from above; (E) south-east opening with trace of the intermediate outflow level (2) which falls inside the shelter directly onto the lower gallery ramp. Note outflow (2) deviates from a main fracture rill to a relatively unaltered groove before falling into the shelter.

At first sight, the angular contour and linear segments of basin B0 are somewhat bizarre (Figs. 8B and C). In natural basins, all the morphologies, both depressed and protruding, are rounded and smoothed and their bottoms are regularly concave. The profile of basin B0 is clearly different, with a mostly flat bottom and an angular junction with the walls. The lower outflow level through a flat recess at the bottom of the basin is a specific morphology (1 in Fig. 8B) that tallies with a thin, original uncemented sand layer there. Moreover, the bottleneck at the north-west extent of basin B0, through which it fills, has been chopped and deepened to connect it with the wide slits that occur here. The northern edge of the basin is essentially linear and cuts into the weathering silica crust that forms the surface of the sandstone megaclast (Fig. 8D). The breaking away of the crust indicates that this border has been carved out. A succession of clearly altered V-notches in the ledge towards the south-east show percussion marks (Fig. 8D). Furthermore, the outflow in the south-east (2 in Figs. 8B and C) has a clearly delineated channel that appears to have been created. At the exit of the spillway (2 in Fig. 8E), the water does not follow the vertical slot, which is on its direct pathway, but takes a detour by flowing along a horizontal groove before cascading into the south-east opening of the lower gallery. This detour causes the water to fall onto the ramp of the lower gallery and to drain towards basin B3. This deviated route is a further indicator of significant modifications to basin B0 to control its drainage. Our morphological analyses show that basin B0 has been extensively modified to enlarge and deepen it and thus increase its water-holding capacity.

Drainage network on floors in the shelter

The upstream parts of the galleries are remarkable for the many features in the sandstone floor that relate to the flow of water. These include gutters, open slits and more discrete grooves with frequent interconnections that are scarcely related to natural fissures. They are clearly located in accordance with the various sloping surfaces on the floors and walls in the shelter.

At the south-east façade of the shelter, the two galleries merge, with the upper one overlooking the lower (Figs 3A and 4). The northern edge of the upper gallery near the south-east opening is marked by a series of irregular-shaped sinks: S1 is a small, elongated sink rimmed by a sandstone bulge, S2 a large irregular one with a flared spillover depression, and a third, S3, is less well-marked sink closer to the opening (Fig. 9A). S1 and S3 are connected respectively to grooves G1 and G3 that cross the upper terrace. S1 is connected to groove G1 by a channel through the adjoining bulge in the sandstone which was clearly dug out and widened as indicated by depressions marking the sites of flakes removed by percussion (Fig. 9B). Downstream, groove G1 does not continue directly across a second sandstone seam but circumvents it via a flared and rounded gutter G1a (Fig. 9A). S2 is not connected to any groove but it nevertheless shows, despite the alteration which has rounded its morphologies, a flared spillway which clearly cuts through its sandstone rim due to removal of sandstone flakes by percussion (Fig. 9C). S3 is connected by groove G3 to a point of convergence of four grooves (Fig. 9A). This convergence does not correspond to a pattern

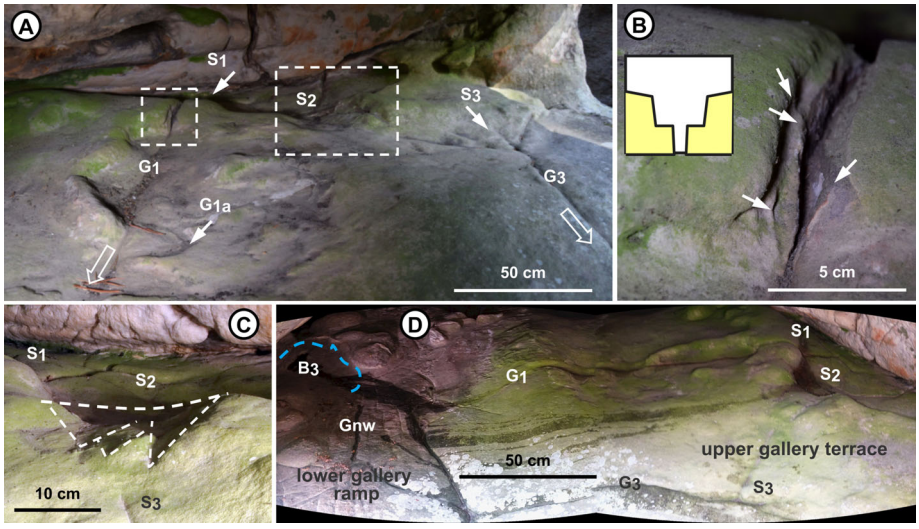

FIGURE 9

Water catchment arrangements on the upper gallery terrace. A) Sinks S1 and S3 against the north wall are connected to grooves G1 and G3 respectively; sink S2 has only a flared spillover. Groove G1 cuts across a sandstone bulge; a second bulge is circumvented by a rounded gutter G1a. Groove G3 connects upstream to a splay of four grooves in sink S3. Hollow arrows point downgradient. Dotted square shows the frame of next photo; B) Detail of the opening of groove G1 through the sandstone bulge rimming sink S1. Concavities (arrows) mark the sites of sandstone flakes removed by percussion. The insert is a profile section showing the presence of a distinct shoulder; C) Details of the spillway of sink S2 showing the traces of sandstone flakes removed by percussion (dashes); D) View of the galleries from the south-east entrance showing flow paths marked by water supplied to sinks S1-S3. Overflows from sinks S1 and S3 are channelled by grooves G1 and G3; overflow from sink S2 is dispersed along a flared depression. All flows end up in different paths in basin B3 via groove network Gnw.

of natural fractures but to channels dug deliberately to direct water flows. The three modifications have been made to promote water flows to basin B3 via the ramp of the lower gallery. A water supply experiment conducted during dry weather (to increase contrasts) shows the differentiation of flows along the upper terrace and their convergence towards basin B3 downstream of the groove network in the lower gallery ramp (Fig. 9D).

The ramp in the lower gallery is striking for its network of grooves and their peculiar morphologies. Some harder sandstone bulges are circumscribed by grooves (Fig. 10A). These could potentially be fractures due to contraction/dilation of the bulges and yet only sandstone bulges close to sculptured features (two here on the ramp and another close to the female sexual figuration) are thereby circumscribed. All others, including one at the edge of basin B3 and those scattered across the terrace of the upper gallery (Figs. 3A and 10B), are not surrounded by a groove. Where grooves converge there are, almost systematically, found rounded junctions and counter-curves (Figs. 10C and D): such features do not conform with the straight intersections characteristic of natural fracture networks (Fig. 6A). Most grooves tend to be sinuous (Fig. 10E) which is also not a feature of natural

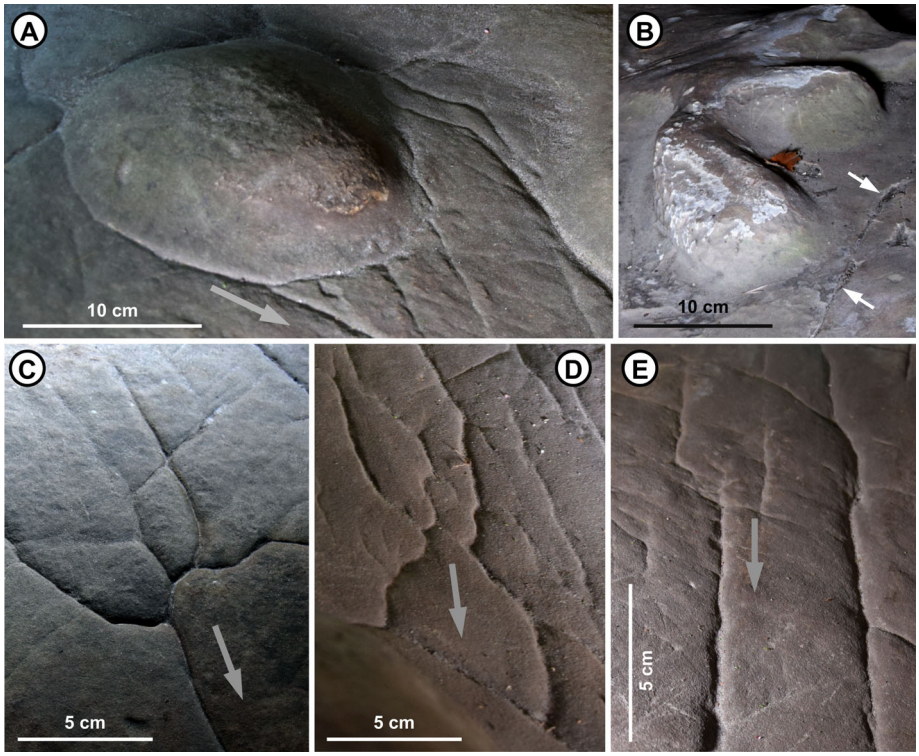

FIGURE 10
Characteristics of the grooves on the lower gallery ramp. A) Sandstone bulge encircled by a groove; B) Elliptical bulge on the terrace of the upper gallery which does not have a circumscribed groove. Note the primary fracture with chipped edges (white arrows) which is very different from the grooves on the ramp; C) Multiple groove confluences with rounded connections and counter-curves of the upstream network: view looking upstream; D) Confluences and divisions with curved junctions in the downstream part of the network: view looking upstream; E) Sinuous aspect of the linear grooves: view looking upstream. Grey arrows indicate water flow direction.

fractures. Moreover, all grooves have rounded profiles, without chips or splits, as distinct from the rough, uneven layout of natural fractures in the shelter (Fig. 6B).

Rainfall runoff water caught in basin B0 on top of the sandstone block (Fig. 2) overflows through spillway 1 (Fig. 8B) to seep through fracture F10 in the northern wall of the upper gallery (Fig. 3) and feeds sinks S1, S2 and S3 that act as water catchments flowing to the lower gallery ramp. As basin B0 fills, the water level reaches spillway 2 (Fig. 8B) and water falls directly onto the ramp of the lower gallery (Fig. 8E). The water from the three sinks S1, S2 and S3, and from the B0 spillway 2 converge into basin B3 against the sandstone hump of the lower gallery (Fig. 11B).

Characteristics of the carved motifs

Specific geometric characters of the groove network (Gnw) on the lower gallery ramp, with triple junctions, sinuosity, rounded connections and counter-curves, circumscribed grooves, rounded lips and the lack of chipping or splitting along their lips, all suggest that they were most likely to have been deliberately anthropogenically cut and engraved. There are only few thin pre-existing fractures that have not been enlarged. A map of the groove network (Fig. 11), based on photos with on-site correction of inevitable distortions in the perspectives, reveals several geometric peculiarities (Fig. 11B).

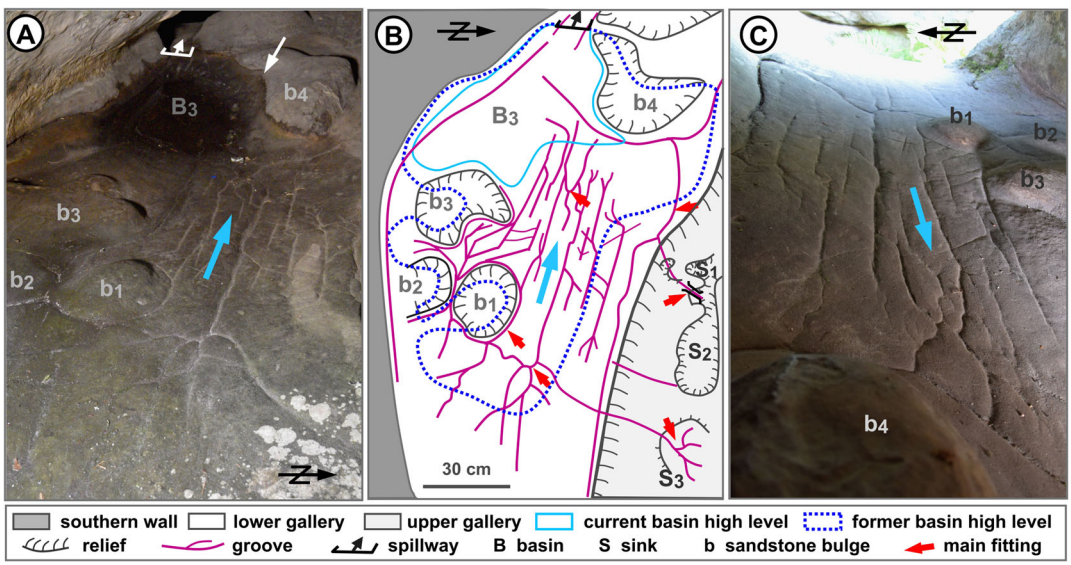

FIGURE 11

Flow network on the lower gallery ramp. A) View looking downstream from the south-east opening. Note the bulges of hard sandstone b1 to b4 that form the relief on the ramp; a linear network of grooves; the basin with a wet contour pointing its maximum filling level (white arrow); and the spillway; B) Map of the groove network and sandstone relief on the lower gallery and the adjoining upper gallery; C) View from basin B3 looking upstream towards the south-east opening and showing the hierarchical organization of the grooves, downstream (foreground) flow divergences and upstream (in the distance) flow confluences. Blue arrows indicate water flow direction.

We suggest that the tortuosity of the grooves is distinctly reminiscent of the meandering courses of rivers. Variable widths and convergences of grooves match the hierarchical organization of river systems. Moreover, flow divergences in the downstream areas (Fig. 11C) evoke a hydrographical network of deltas and wetlands where rivers discharge their waters and sediments. The encircling of sandstone bulges by grooves are components of a drainage network that detours round and/or drains elevated landforms. Breaking through the sandstone hump of basin B3 resulted in a lower overflow level, thus decreasing the surface area of the basin when filled with water and concomitantly increasing the emerged surface area of the ramp that bears the groove network.

The motifs engraved into the sandstone ramp to form the hydrographical network are relatively uniform and are a repetition of simple geometric shapes: straight or curved lines forming four-angle figures, mainly parallelograms and trapezoids (Fig. 11). Junctions between motifs are recurrent. The patterns are interrelated, falling into three groups: the central set is by far the largest and comprises 49 interconnected grooves, a smaller set runs along the edge of the terrace and has only four interconnected grooves, while the opposite southern edge of the ramp has one isolated groove. Only three crossings of grooves are evident and there are no obvious overlapping motifs. The grooves are about 2 to 10 mm in depth. The three deeper, most extensive and rectilinear grooves have probably been carved by bi-directional movements of an elongated tool (Guéret and Bénard 2017; Cantin *et al*. 2022), whereas the shallow and winding grooves have probably been scratched out with a hard and pointed lithic tool that made it easier to trace their curves and tortuosity. Because of weathering due to the frequent exposure to moisture there are no means of working out a time-sequence from overlapping of structures, nor of identifying wear traces of tools. No pecking marks have been recognized.

DISCUSSION

Cartographic interpretation

The motifs in the ramp network appear to be homogeneous in technique and style, relatively uniform and show the repetition of simple geometric shapes that form recurrent patterns. The overall arrangement conforms with two of the three conditions for recognizing a prehistoric map according to Delano Smith (1987), namely that all the constituent images are contemporaneous in execution and that there is a frequency of motifs comparable to those to be found on a modern map. The third condition is that there is a correspondence between the motifs and the entity aimed to be represented and we discuss this now.

The Ségognole hill overlooks the upper River Ecole valley which is oriented approximately SSE-NNW, perpendicular to the Fontainebleau sandstone ridges (Fig. 12B). South of La Ségognole (upstream), the valley is narrow with a bottleneck ~100 m in width. Northwards, the valley is widest at ~10 km in the Milly-la-Forêt area, but further north (downstream) it is restricted to a width of about 750 m by a transverse sandstone ridge south of Moigny-sur-École. Since the Middle Ages the valley has been landscaped, drained, the river canalized for the installation of mills and yet still has more than 125 km of streams for a valley only 25 km long (Kokot 2023). There remain large wetlands and swamps, especially upstream of Milly-la-Forêt. The valley is dominated by a complex surface of sandstone rocky flats and limestone plateaux. The borders of the valley are interspersed with isolated ‘foothills’ capped by sandstone and eroded by gullies and ravines that drain the plateau. Our suggestion is that the natural and engraved features

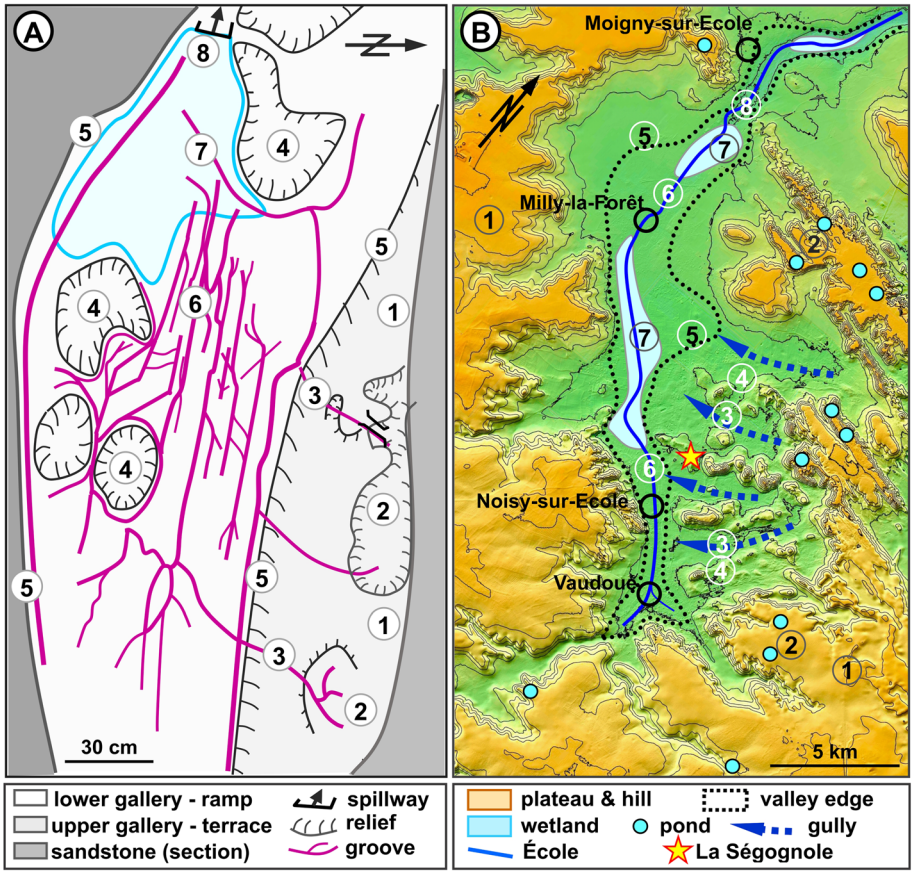

FIGURE 12
Comparison between inherited features (gallery floor topographies) and engravings on the La Ségognole 3 ramp with the regional landscape topography. A) Map of the groove network and sandstone bulges in the lower gallery and adjoining upper gallery; 1- upper gallery terrace, 2- sink, 3- lateral groove, 4- sandstone bulge, 5- ramp border, 6- hydrographic network, 7- basin, 8- spillway; B) Topography of the River Ecole valley near La Ségognole hill; the numbers point to the landscape features correlated with features on the Ségognole 3 ramp. Map from IGN-BD ALTI (2023), kindly processed by Michel Rey. Pond inventory by Marie Liron.

of the ramp call to mind landforms and landscapes visible from the Ségognole hill (Fig. 12). In particular from upstream to downstream:

1. The terrace, formed by the upper gallery, could correspond to the plateaux that form the high parts of the landscape and, more particularly, to the rocky flats that hem these plateaux. The altitude of the plateaux and sandstone flats is about 120 m. Cuts made by the Ecole river and its valley into the plateaux surfaces has produced steep sand scarps about 60 m high.
2. The upstream sinks S1, S2 and S3 can be compared to temporary or permanent ponds that are held in the depressions on the sandstone flats.
3. Lateral grooves G1 and G3 that drain sinks S1 and S3 and connect them to the groove network on the ramp could represent the valley-side ravines and gullies that notch the rocky sandstone flats.

4. Hard sandstone bulges emerging from the groove network on the ramp could be likened to the isolated hillocks crowned by sandstone pans which form 'foothills' of the upper plateau along the edge of the valley, like the area east of Noissy-sur-École and Vaudoué which includes the hill with the Ségognole 3 shelter containing the carved ramp.
5. The south wall of the lower gallery and the break in slope between the lower and upper galleries could be likened to the valley edges.
6. The interconnected grooves mimic a flow network that is reminiscent of the Ecole river valley extending from the foot of the Ségognole site. Its mean elevation is about 60–70 m and its hydrography was more complex and swampier before settlement.
7. Basin B3 with the groove network that is reminiscent of a delta inlet may correspond to the swampy depressions upstream of Milly (Marais d'Oncy and Marais d'Auvers) and Moigny-sur-Ecole. That Basin B3 could tally with the actual swampy depressions is possible: during the Upper Palaeolithic after the Last Glacial Maximum (LGM) these wetlands were not completely alluviated and in all likelihood an open water surface still remained in place of the current wetlands.
8. The narrow spillway cut through the significant sandstone hump that marks the boundary between the lower and upper galleries can be likened to the sandstone ridge that blocks the Ecole river valley upstream of Moigny-sur École.

Eight major geomorphological features in the proximal and regional landscapes of the La Ségognole 3 shelter can be recognized in the combination of shaped and natural elements that make up the ramp and terrace of the shelter's galleries. Perhaps the most remarkable and convincing element from a cartographical point of view is the network of grooves engraved in the ramp, particularly the circumscribed bulges, the curved furrows evoking river meanders; the upstream confluences characteristic of river hydrography; and the downstream divergences recalling the hydrography of deltas at the entrance of a lake. Thus, rather than a geographical representation or a map of the proximal landscape, the engraved gallery floor in Ségognole 3 appears to be a representation of the spatial relationships of landscape features and may be considered a miniature of the natural features and their relationships in the adjoining landscape. In this context, the accuracy of the drawing of this hydrographical network reveals a remarkable capacity for abstract thinking in those who drew it and in those for whom it was intended.

As described above, the engravings of the water courses were superimposed on the natural features and morphologies of the shelter and so the spatial relations between ornamentation on the gallery floor and the valley landscape cannot fully match. Thus, the sandstone bulges assumed to represent foothills appear on left bank of the drainage network whereas in the proximal landscape foothills occur on right bank of the Ecole river. Consequently, the valley sides appear to be inverted on the engraved gallery floor. Nevertheless, the orientation and water flow pattern of the engraved ramp are relatively close to those of the Ecole river valley, making it possible to compare the ramp layout with the valley's hydrological system.

Mapping by hunter-gatherer people

From a review of recognized prehistoric maps by Nicolas *et al*. (2021) it emerges that at the beginning of the Neolithic-Bronze Age many rock carvings, interpreted as maps, appeared in Europe, the Middle East, southern Africa and the Americas. However, few older engravings have

been interpreted as cartographic depictions by Upper Palaeolithic hunter-gatherer people. All are fascinating examples of mental representations in two or three dimensions. On this matter it should be emphasized that, in a general way, the iconography of Palaeolithic art is largely made up of figurative depictions of animals, whereas human figures and natural landscape features are rarely represented and uncertain. This results in a real scarcity of a depiction of natural landscape features in Palaeolithic iconography. Moreover, numerous rupestrian examples seen as transcriptions of landscapes by hunter-gatherers comes from ethno-anthropological studies. The two graphic sources are complementary. Any interpretation of prehistoric carvings is always subject to caution: ethnoarchaeological witnesses show that the extreme schematization of some iconographies would not necessarily have been interpreted as cartography in an archaeological context.

Upper Palaeolithic depictions. In the early periods, the engravings by hunter-gatherers that are considered to be maps seem to be linked to hunting strategies in favourable topographical contexts linked to geographic bottlenecks and natural barriers (Crassard *et al*. 2023).

The oldest examples of engravings interpreted as maps were found in two Eurasian sites dating from the Gravetian (27,000 to 25,000 BP). A landscape could be depicted on a mammoth tusk found at the site of Pavlov I (Moravia). The engraving consists of complex geometric patterns, including a sinuous motif interpreted as a river, a multi-lobed motif interpreted as a mountain, and a small double circle believed to represent a living site (Klíma 1988). The suggestion is difficult to either defend or oppose. However, a second discovery of a carved mammoth tusk in the Předmostí (Moravie) site could make it more meaningful. Compared to the actual landscape, the outline of the second carving may correspond to the valley with short diagonal lines referring to valley slopes, two arches within the outline to the bottleneck of the valley, and a small rectangular figure in the middle of the valley to the location of the Předmostí site (Svoboda 2017). The carvings were probably not intended to provide landmarks but rather to assist in debating hunting strategies.

A younger example, from the Mejiriche site (Ukraine) dated to the Mezinian (approximately 15,000 and 14,000 BP) is a fragment of a mammoth tusk (21 x 11 cm) engraved with several ‘bushy’ geometric patterns. The lower pattern has zigzags and chevrons arranged between two horizontal lines. The middle one has four angular figures (M-shaped) filled with transverse and zigzag lines and surmounted by four oval figures also filled with crossed lines (Iakovleva 2009). This combination is interpreted to show four dwellings along the river bank (Pidoplichko 1976; Iakovleva 2009). It is considered to be one of the first representations of the domestic and social space of a human group.

Another example, although relatively ‘basic’, is an engraved portable slab of schist from a Magdalenian layer (*c*.13,800 years BP) at the Molí del Salt site in north-eastern Iberia (Garcia-Diez and Vaquero 2015). It has seven semi-circular motifs arranged in three levels, the interiors being filled by straight parallel lines. The authors suggest that the seven semicircular motifs correspond with the mean number of households in hunter-gatherer aggregation camps and, amongst other arguments, hypothesize that they represent dwellings or huts. The distribution and size of these motifs is a purported composition for generating a visual sensation of depth and the whole depiction could be testimony of the social importance of campsites in a hunter-gatherer organization.

One of the most challenging examples is another engraved portable slab from a Magdalenian layer (*c*.13,660 BP) from the Abauntz cave, northern Spain (Utrilla *et al*. 2009). The industry assemblage and decorative motifs establish the site to be closely linked to the Cantabrian (north-western Iberia) and Aquitaine (south France) regions (Utrilla *et al*. 2015). At this

regional scale it was not that far from the Molí del Salt site. The Abauntz cave is situated in a strategic place easily accessible through the passes that connect this zone with the Aquitanian territories. It is considered to be a place of great hunting potential with access to different ecological niches. The two engraved faces of the stone are interpreted to depict the landscape surrounding the prehistoric settlement, with schematics representing mountains, rivers and ponds, as well as animals. Routes of access to different parts of the landscape and the meandering courses of a river and its confluences seem to be represented. Even so, it could also represent the plan for a hunt or perhaps a narrative of one that had already occurred. If this is the case, it is also a human action positioned in landscape.

The most striking archaeological mapping example presently known to be connected to hunter-gatherer communities consists of realistic plans, engraved on stones, of mega-hunting traps (desert kites) dating back to as early as 9000 years ago during the Pre-Pottery Neolithic B (PPNB) period in south-eastern Jordan and northern Saudi Arabia (Crassard *et al*. 2023). Desert kites are gigantic archaeological structures made of alignments of stones that may form kilometre-long guides converging towards an enclosure surrounded by walls in which animals were trapped by hunters. Their overall structure is only perceptible from the air. Very precise engraved plans corresponding to neighbouring structures have been found. They are to scale, with an approximate reduction of 1:175 for one and 1:425 for the other, and in keeping with cardinal directions in the case of those engraved on an unmovable block. Crassard *et al*. suggest that these could have been used to plan and coordinate hunting strategies linked to the desert kite structures. In any case, the plans reveal a cognitive perception of large spaces never observed before at this level of precision and a widely underestimated mental mastery of human perception of space and community activities in ancient times, as well as incipient forms of inscribed communication beyond the simple representation of a space.

Engraved panels in Nämforsen (Northern Sweden) belonging to hunter-fisher-gatherers 7000–6000 years ago also display peculiar landscape representations (Gjerde 2010, fig. 12). One of these rock depictions shows hunting practices and game movements engraved on a rock outcrop, the shape of which corresponds to the landform seen from that point of view (Gjerde 2015, 87–8). Elsewhere, rock art showing boats, salmon and humans hunting elk has been found on rocky outcrops in riverbeds where water runs along fissures, over cascades, around rocky protrusions and through pools that are most likely landscape representations in miniature. The latter resemble the active Nämforsen macro-topography and hydrological system characterized by river flows, rapids and islands which change with the strength of the current and the weather. These features, which become animated by water flows, have many similarities with the La Ségognole 3 map that was engraved for staging water flows.

Ethno-anthropological examples. These depict landscapes and environments very different from the Late Palaeolithic landscapes in the Paris Basin. This matters little. What appears to be essential is the motivation and/or the usefulness of these ‘models’, as well as the ability to represent vast natural spaces by one or more motifs on a relatively small surface, fixed or transportable. Moreover, ethno-anthropological studies provide evidence of how recent hunters-gatherers produce simple but practical maps focused on features of the landscape that are directly related to resources and modes of their exploitation as distinct from other landmarks that are unimportant for practical tasks

(Svoboda 2017). No matter what the environment, these depictions may point to clues about the behaviour of hunter-gatherers in archaeological times (Brumm and Moore 2005; Bahn 2007).

In the case of Aboriginal Australians, the key to survival in '*deserts was the oral instruction and stylized mapping of traditional knowledge regarding the type and location of water supplies*' (Bayly 1999, 12). They put together natural features, stories, myths and songs to build a memory of the landscape, making up a storyline which gives form to a line on a map (Turnbull 2008). Panaramitee-style pecked-rock engravings, which have a minimum age of around 13–14,000 years, are considered by Aborigines to be motifs that spell out routes to resources, often based on 'Dream Time' mythologies, and are thus explanatory maps of the landscape (Mulvaney and Kamminga 1999; Flood 2004). Maps instantaneously sketched in the sand by Australian Aboriginals have very often been reported by ethnographers. There are also maps drawn on more stable and reliable media that can be transmitted. Bayly (1999, 18) reports a narrative of Thomson (1962), describing how, in 1957, after having spent several weeks with Aborigines, he was given '*a very generous gift: a tutorial about their desert waters and a priceless 'map' to assist their location*'. It is really a highly conventionalized map, with spirals interconnected by lines deeply carved in a spear-thrower, showing the relative spatial locations of 49 water supplies throughout the vast terrain in which the tribe hunted. Tindale (1974, 68) reproduced a comparable drawing of water supply localities by a native elder in August 1935. The geographical drawing is partly symbolized. The 'Dream Time' rainbow serpent lies across the top of it. Black concentric spirals represent water supplies that were known to be never-failing, and red spirals indicate temporary waters. The drawing also shows a stream bed (dry except during rain) and zigzag lines from water to water that are the tracks or native roads of men wandering in search of food.

Diverse carvings by hunter-gatherers in North American Indian tribes have been interpreted as depictions of the proximal or regional landscape. Among these examples, four distinct carvings in a north-central Sierra Nevada watershed have been interpreted as hunting trail maps. When superimposed on a topographic map they appear to be covering a 40 km^2 area with common trail segments and nearby concentrations of petroglyph sites (Gortner 1990). The most astonishing example is Map Rock, Idaho, an engraving of several linear networks with confluence points and speculated to be a map of the regional river system which extends for over approximately 600 km (Lewis 1998). Symbolic petroglyphs with geographical features have been described in the south-western United States, north of Prescott, Arizona. Here, the petroglyphs closely match the actual spatial configuration of the local geography, highlighting particularly invaluable waterholes in this dry country that are only accessible by following-the canyon floor from the petroglyph panel (Dockal and Smith 2005). Another example is relative to a story depicted in a two-dimensional representation of a Hidatsa Indian who walked from his home village along the Missouri to a Dakota village to steal horses, and returned successfully riding a stolen horse. Besides the narrative aspect, the picture provides information on the different paths taken on foot and on horseback and the internal structure of the two villages (Mallery 1886).

Both, prehistoric and ethnographic maps are frequently centred on rivers and water resources depicted by a series of convergent lines and topographies in hunting landscapes, with special reference on bottlenecks and natural barriers. Both are major features of the ramp in the Ségognole 3 shelter.

Ethnological considerations

There are different interpretations of possible ethnological aspects attached to the engraved floor of the La Ségognole 3 shelter. We raise these matters here to broaden the discussion somewhat more than is hitherto usual.

Common point of view. The engraved floor of La Ségognole 3 is not by definition a flat topographical map but more like a picture map combining landscape elements (mainly mountains and rivers) in plan and relief. Illustrated maps like this are considered to be the oldest known topographical representations (Delano Smith 1987). However, given that the many natural morphological features of the shelter are unmodified components, the whole of La Ségognole 3 obviously cannot be true cartography. In this sense, it is in keeping with the usual approach of Palaeolithic artists who, inspired by natural rock morphologies and their locations, interacted with them without profoundly altering them (Lorblanchet 1993; Bahn 2007; Robert 2007; Cavallini 2013). Besides, a hunter-gatherer describing a river surely will attach more importance to its direction of flow (upstream to downstream) and the associated landscapes (upstream relief, downstream flats) than to its actual dimensions. This view gives rise to specific structures of spatial representations far from modern concepts that are fundamentally imbued with the notion of actual distance and time of travel. This difference in approach complicates our recognition of prehistoric spatial representations, as pointed out by Utrilla *et al*. (2021).

We cannot exclude the possibility that the engravings never had the objective of locating oneself or guiding others on a long journey. Hunter gatherers would not have had need of a map to locate themselves spatially at this scale. But if they modified the floor of the shelter, the act corresponded to a need (see Crassard *et al*. 2023). Hunting techniques were a significant cultural feature of hunter-gatherer societies, and their economy and lifestyle were largely determined on the animal and bird migration paths inscribed in the diverse features of a landscape. The Ségognole site itself is strategic in relation to the migration of herds. The La Ségognole 3 shelter is located directly on the edge of the Ecole valley and has an outlook over what was most likely a main herd migration route between the Brie and Beauce plateaux across fords of the Seine river (Fig. 1) where large camps with hunting and residential functions were established (Bodu *et al*. 2011). It could be that the ravine through the sandstone ridge that blocks the Ecole river valley upstream of Moigny-sur-École (Fig. 12B) was occasionally, a hunting site or, alternatively, the La Ségognole hill was a lookout for the arrival of herds and the organization of hunts. A utilitarian function related to organizing a collective for hunting remains a credible hypothesis. The 'picture' map in La Ségognole may have been designed as a descriptive plan or a 'miniature model' for preparing collective hunting activities: such as developing hunting strategies, discussions about the number and position of hunters, coordination of actions, and for anticipating the reactions of big game or wildfowl.

It is also possible that a depiction of the main geomorphological components of the surrounding landscape may not necessarily be exclusively practical and could have been driven by strong symbolic dimensions. For example, the engraved floor may have supported rituals concerning water flows and wet environments, provided educational or introductory support to explain the components of landscapes in relation to the activities of the hunter gatherers (game pathways, etc.), or alternatively, acted as a device for projecting a myth or illustrating a storyline of some cultural value. In addition, given that at this shelter of the existence of a staged flow from

the engraved and enhanced vulva and of various arrangements to 'channel' rainwater from the surface of the block to the internal galleries, we cannot exclude the possibility that the floor engravings mimic the adjacent river system and its seasonal or longer-term inflows and discharges of water. Hydrological animation may itself be a storyline and carry the memory of a cultural or practical tale. While there is no tangible evidence to support these suggestions, it is important to keep them in mind and perhaps in the future seek evidence in other Palaeolithic sites that might support them.

Animiste or perspectivist point of view. If all the above hypotheses appear coherent, it is because they correspond to our modern and 'western oriented' way of thinking (emic). But we have no idea of the emic, or rather the cultural structure, of the ancient humans who worked on and arranged the floor of the gallery. Their visual and contextual messages, which symbolically encodes information, can be understood only from the particular perspective of their thought system and beliefs.

For instance, from an Amazonian perspective, nature is intelligent and intentionally responsive and has reflective consciousness in social and cognitive domains. This is what is generally called animist or prospective 'philosophies', that is humans are no different from plants and animals, nor from climatological or geological phenomena (Viveiros de Castro 1998; Harvey 2006; Descola 2012). In this way rocks are not viewed like natural, somewhat passive and neutral entities but could be endowed with human-like states and cultural behaviours, implying that the lithosphere may have potential capabilities (Viveiros de Castro 1998). For indigenous people, rocks construct their own cultural landscape, as humans domesticate plants and animals, and they acknowledge that rocks see, think, and speak to humans and among themselves, opening the possibility of an ethnogeology (Valle 2015). If so, rocks can also domesticate and tame humans and perhaps this is how rock art should be viewed (Valle 2015; Tuyuka *et al*. 2022). To take a non-lithological example, one can consider tree roots exposed by trampling on a trail (Fig. 13). A western-oriented person will associate these exposed roots with erosion of the soil on the trail to expose the roots, overcrowding, and environmental damage: an Amazonian indigen may 'hear' the tree saying '*you see how I consolidated my root network and developed nodules to protect your trail from erosion*'.

FIGURE 13
Tree roots exposed by trampling on a path. Note the wearing away of the roots, the development of scar nodules and the two paving stones on the right which correspond to the last step of a staircase built to combat gullies. Grotte-aux-Brigands, Barbizon, Fontainebleau State Forest.

This concept suggests that before any anthropogenic intervention into the rock surface occurred, its natural features were already being considered meaningful to observers and as a corollary pointed by Valle (2018) *the meaningfulness could have triggered creation of graphic images taking symbolic 'advantage' of their pre-existence'*. Rock art would thus act as a cognitive trigger to subjectivize rocks, extend the human mind over geological features, and activate the 'dormant sentience' of the rock. From this perspective, rock art seems to reflect a dialogue both between human and non-human lithological 'societies' and amongst them, too. For Amazonian indigenous peoples, understanding rock art and natural geomorphic features are, in many instances, the same thing. It follows from this that rocks may be 'artified' prior to rock art making. This opens other possibilities to think about rock art, which no longer has a 'utilitarian' function but is connected to a vast emic construction, sometimes called 'mindscapes' (Ouzman 1998). Rocks with suggestive morphologies often occur in mindscape constructions, for example a Palaeolithic zoomorphic megalith which echoes an engraved aurochs in a nearby shelter or vice versa (Thiry and Milnes 2024a). Such rocks have often been referred to as *pareidolias* and have for a long time been regarded as mind constructs, often decried in archaeology and considered to be unverifiable interpretative constructs.

We should always take care to avoid imposing Western (and often tacit) categories and never downplay the spirituality and ontologies of indigenous groups or past populations (Robinson *et al*. 2024). The proposition that rocks could be considered cognitive stimuli points to further possibilities in an understanding of rock art. The idea that Palaeolithic populations may have been imbued with such, or even another, profound and symbolic thinking about lithologies and geomorphologies, rather than the 'materialistic' geological approach, would lead us to completely review our interpretations of rock art, and in this context, our interpretation of the floor of the La Ségognole shelter as a map. Even thinking about 'rock art' and rock walls or boulders as a 'canvas' would no longer have sense and would downplay the complexity and autonomy of these early pictorial contributors (Valle 2018).

CONCLUSIONS

Detailed morphological analysis of the upstream side of La Ségognole 3 shelter shows that many natural elements have been designed and others engraved *de nihilo*. They include modifications to straight and curved furrows that receive rainwater inflows and direct them into one or another basin, and adjustments to the water-holding capacity of basins to limit their capacity and thus restrict flooding of the upstream ramp that has been formed into a hydrographical network. All of these interventions are focussed on the drainage of water that enters the shelter and the result is a functional, staged 'installation' of a river system.

The engravings on the lower gallery ramp comprise motifs that are homogeneous in technique and style, repeated, and 'forged' into a network with many triple junctions showing only rare overlaps. Overall, there are multiple correspondences between these motifs, the natural morphologies of the ramp and the geomorphological features of the surrounding landscape. They clearly evoke a cartography, moreover in relief, with elements engraved in accordance with the natural morphologies of the shelter (slope and grading of surfaces, relief elements, etc.).

The integration of natural features on the gallery floor into the map is obvious and they form the framework, surrounds and substructure of the depiction. Thus, the engraving is not strictly a geographical tracing but rather a depiction of the main geomorphological components of the

surrounding landscape. It portrays the relationships that exist between all parts of the landscape that constituted the territory of the Palaeolithic hunter-gatherer peoples. The engravings show no lines that could suggest pathways or directions. The depiction could have been related to stories of everyday life or to myths. The natural and anthropogenically-shaped water inlets, as well as flows along the engraved elements during rain events (or generated by purposefully supplying water) were possibly highlights of an active 'staging' of this landscape, just as in the case of the female sexual configuration that adjoins the geomorphological figuration in this shelter. We cannot exclude, however, the possibility that these representations, in which water plays a primary role, have some deeper cultural meaning far beyond the simple flows that enliven them.

In summary, the engraved gallery floor in Ségognole 3 is neither a story inscribed in landscape features, nor a geographical representation of spatial relationships between landscape features. However, it includes characteristic features of the landscape in their spatial context as well as, first and foremost, their dynamic functional relationships. In this sense, the ramp of La Ségognole 3 is more likely a model of the surrounding landscape and recalls Norwegian rocky landscape miniatures (meso-geomorphological features) covered by carved storied depictions (Gjerde 2015). The engraved network could thus be the world's earliest surviving 3D-model of territory.

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The authors declare they have no financial interest directly or indirectly related to the work submitted for publication.

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MT – was responsible for conception of the manuscript, drawings and composition of the figures, and field acquisitions.

AM – has been involved in drafting the manuscript, geomorphological interpretation, made bibliography research on mapping by hunter-gatherer people, and language correction.

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