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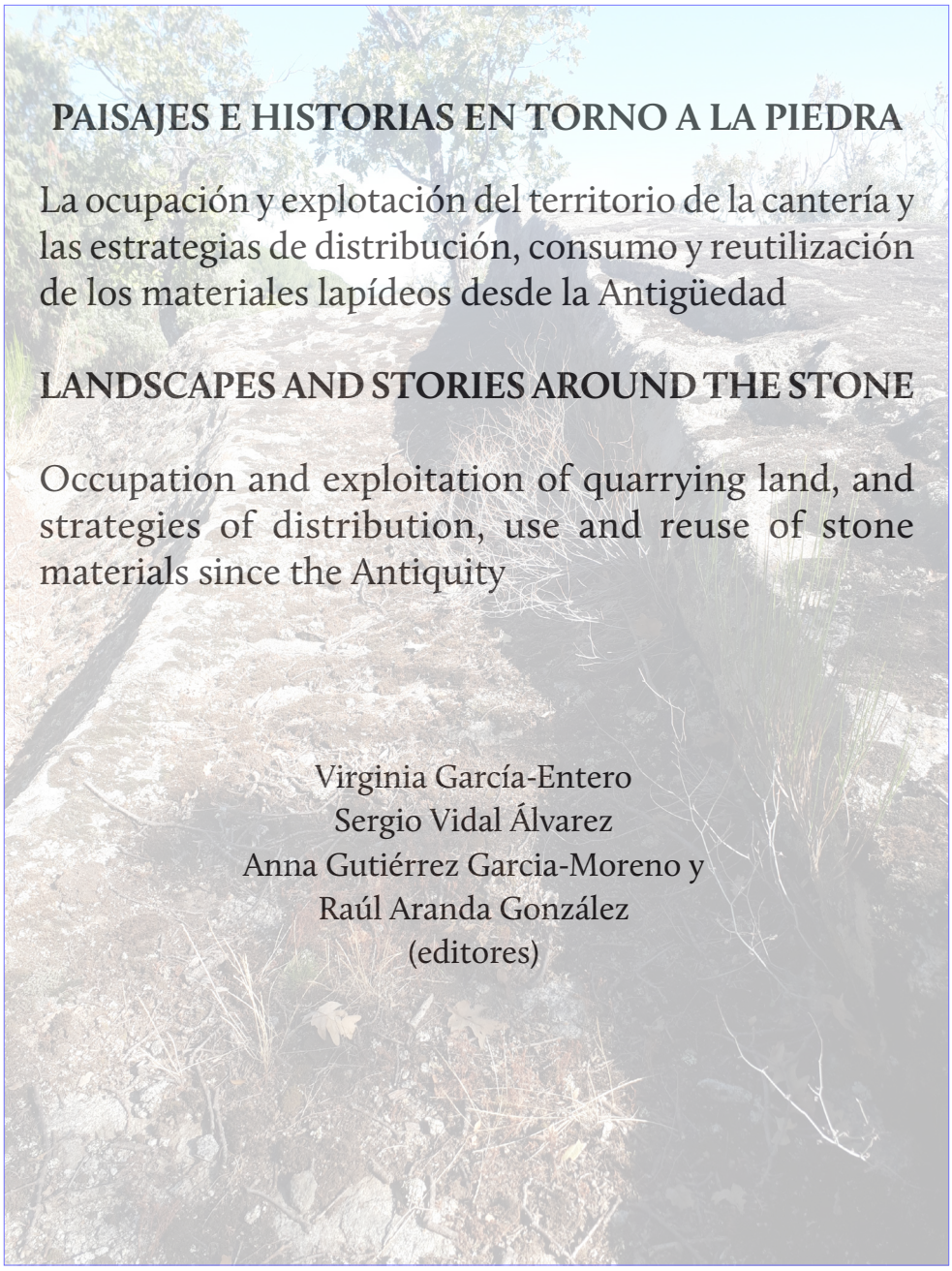

PAISAJES E HISTORIAS EN TORNO A LA PIEDRA

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Occupation and exploitation of quarrying land, and strategies of distribution, use and reuse of stone materials since the Antiquity

Virginia García-Entero
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STONE AND IRON: ECONOMIC INTERACTIVITY AT THE ROMAN RURAL SITE OF CHÂBLES (FRIBOURG, SWITZERLAND)

PIEDRA Y HIERRO: INTERACTIVIDAD ECONÓMICA EN EL ASENTAMIENTO RURAL DE CHÂBLES (FRIBURGO, SUIZA)

Timothy J. Anderson[1]

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Resumen
Este artículo presenta el análisis del complejo rural de época romana de Châbles excavado en el Cantón de Fribourg, Suiza. El yacimiento se data en el siglo I d.C. y consiste en cuatro elementos contemporáneos: una pequeña cantera (*grès coquillier*) utilizada para extraer piedras de molinos rotatorios; un segmento de una importante vía romana de seis metros de ancho; una herrería caracterizada por un taller que incluía un hogar y numerosas escorias, restos de metal y escamas de martillo; y evidencias (hoyos de postes) de una modesta casa de madera. El estudio se centra en la interacción económica de los diferentes elementos del yacimiento.

Palabras clave
Período romano; molino; cantera; herrería; casas; interactividad económica.

Abstract[2]
The current article presents the analysis of the rural Roman complex of Châbles excavated in the Canton of Fribourg, Switzerland. The site dates to the first century AD and comprises four contemporary features: a small quarry (*grès coquillier*) serving to extract rotary querns; a segment of a major road six metres wide; a smithy characterised by workshop sheltering a hearth and numerous slag, metal cuttings and hammer scales; and traces (postholes) of a modest wooden house. The study focuses on the economic interactivity of the site's different elements.

Keywords
Roman period; quern, quarry, smithy, houses, economic interactivity.

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1. LARHRA - CNRS UMR 5190, Grenoble, France; <*timanderson.granada@gmail.com*>.

2. This study stems from the collaborative effort of a series of specialists who carried out the study of the site of Châbles published in 2003: Clara Agustoni, Daniel Castella, Anika Duvauchelle, Vincent Serneels, Damien Villet and C. Doswald. I also would like to thank the current Cantonal Archaeologist of the *Service Archéologique de l'Etat de Fribourg*, Reto Blumer, for permission to update information about the site.

INTRODUCTION

Nearly two decades have elapsed since a rescue excavation brought to light a Roman rural complex at Châbles (Canton of Fribourg, Switzerland) during construction of the A1 motorway. The publication of the site (Anderson *et alii* 2003), now in its «adolescence», offers a detailed description of its four contemporary Roman features (quern quarry, smithy, road, and house) from the turn of the first and second centuries AD. The site still remains unique as no other excavation has unearthed a similar assemblage of interconnected features. The site is particularly noteworthy in the framework of the recent surge of research on the subject of ancient stone work, in particular that on quern and millstone production. This research is highlighted by the publication of a number of proceedings from meetings held on the subject of mills and milling throughout Europe (Belmont and Mangartz 2006; Williams and Peacock 2011; Buchsenschutz *et alii* 2011, 2017; Selsing 2014), as well as by monographic surveys (Belmont 2006; Peacock 2013; Anderson 2016).

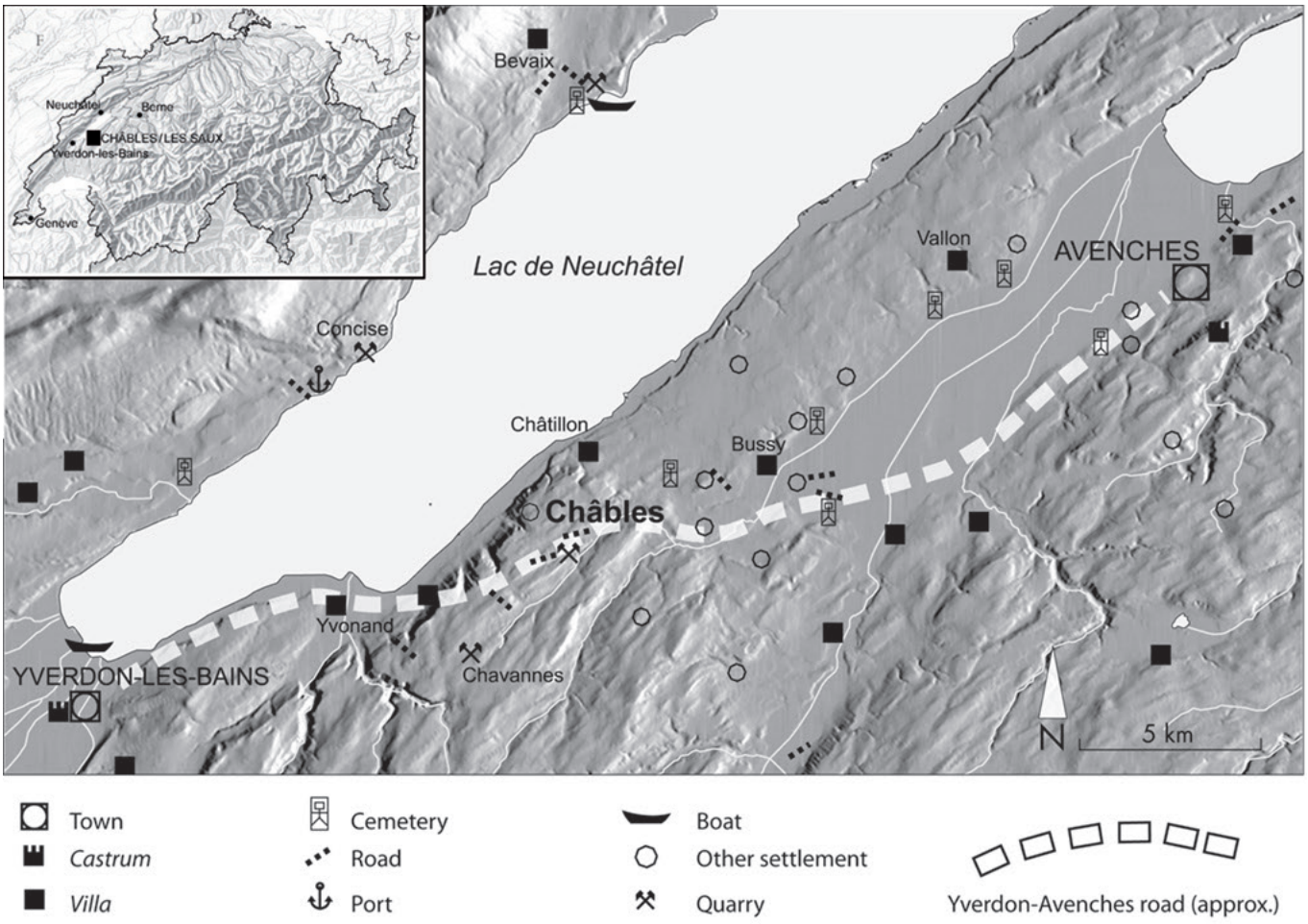

FIGURE 1. GEOGRAPHICAL POSITION OF THE SITE OF CHÂBLES (CT. FRIBOURG) AND OTHER ROMAN SITES IN THE REGION. THE DASHED LINE REPRESENT ROAD LINKING THE ANTIQUE CENTRES OF YVERDON-LES-BAINS AND AVENCHES. THE SMALL INSERT OF SWITZERLAND INDICATES THE POSITION OF CHÂBLES ON THE PLATEAU BETWEEN THE ALPS AND JURA MOUNTAIN RANGES (FROM ANDERSON *ET ALII* 2003)

The site of Châbles is in Switzerland's western Plateau between the Alps and the Jura Mountains, a region of sloping hills bordered to the north by Lake Neuchâtel. It is situated along the main Roman thoroughfare linking the Antique centres of Avenches (*Aventicum*) and Yverdon-les-Bains (*Eburodunum*). Years of surface surveys and archaeological excavations in the region made up by the Cantons of Fribourg, Vaud and Neuchâtel has unveiled an intense Roman occupation marked by towns, villas, cemeteries, roads and quarries of different nature (construction materials and querns) (fig. 1).

The intention of this study is not to offer a new perspective of the different elements of the site, notably its stone and iron working features, but to highlight that a quern or millstone quarry, and any quarry at that, is a not an isolated feature, but part of a local and regional economic network involving a wide variety of agents linked to production, use, techniques, transport, distribution, management, consumption and maintenance. Moreover, whereas there are a number of publications that refer to the stone work Châbles, the specific subject of the site's economic interactivity is more or less inaccessible to non-French audiences.

THE SITE'S FOUR MAIN FEATURES

The site was first discovered during systematic mechanical trial trenches carried out in 1995 prior to construction of the A1 motorway and excavated from 1996-1997 with supplementary work on the road carried out in 1999. As noted above, the excavation brought to light four main features linked to stone and iron work, as well as transport and domestic activity (fig. 2). It must be noted that the current paper focuses exclusively on the site's earlier Roman phase dating roughly from 80 to 120 AD. The features of this initial phase are situated on both slopes of a small open valley next to a stream running from west to east that, along with the road, divides the site in half. The quern quarry and the house are on the southern slope, while the smithy is to the north about 60 m from the quarry. The later Roman phase identified at the site, not relevant to this paper, dates to several decades after the abandonment of the quern and the blacksmith, and is represented by a second house with a *tegulae* roof, a small quarry with discreet signs of a few building stone extractions, and a feature adjacent to the road with massive post-holes interpreted as a loading ramp.

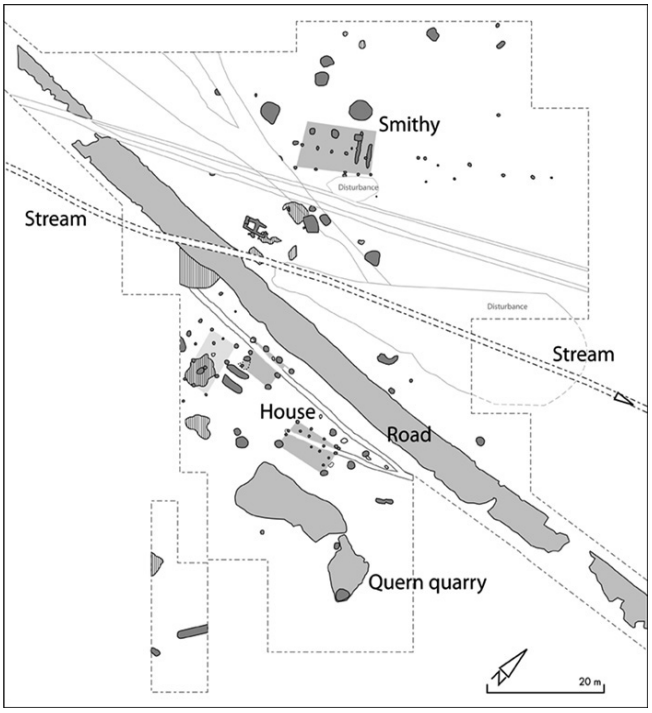

FIGURE 2. MAP OF THE SITE OF CHÂBLES WITH THE MAIN FEATURES FROM THE EARLY ROMAN PHASE OF OCCUPATION (QUERN QUARRY, SMITHY, ROAD, HOUSE) (FROM ANDERSON *ET ALII* 2003)

THE ROAD

A total of approximately 300 meters of the road (fig. 3) was uncovered in two separate campaigns that took place at the outset and the end of the excavation. Its foundation, approximately 6 m wide, was built with rounded blocks 20-30 cm in length collected from nearby glacial moraine outcrops. The road's edges were marked by larger blocks that retained, according to certain better conserved road segments, a convex-shaped gravel cover over the stone base. This cover and the

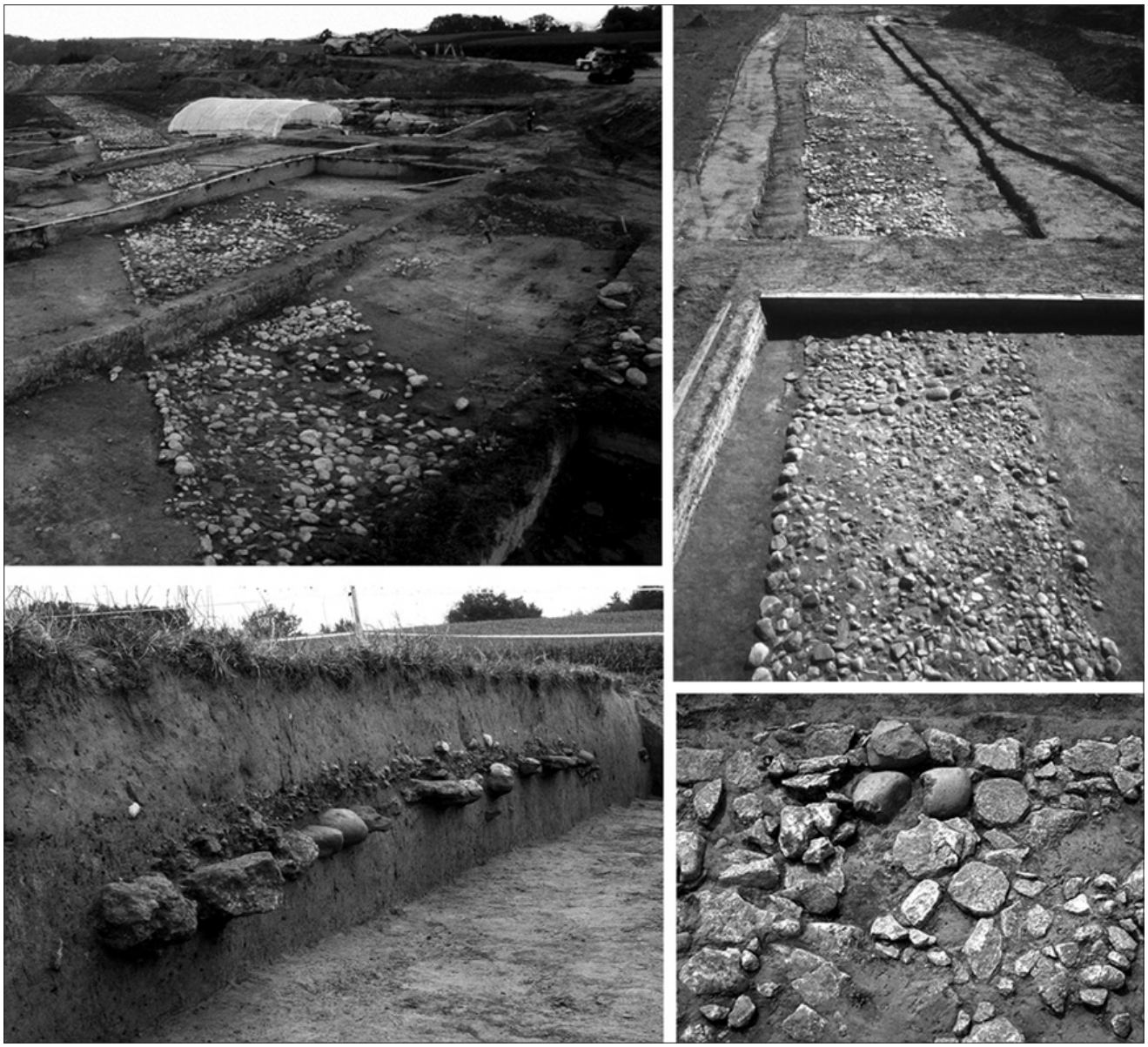

FIGURE 3. THE ROAD. CLOCKWISE FROM UPPER LEFT. A: GENERAL VIEW FROM THE WEST REVEALING ITS SLIGHT CHANGE OF DIRECTION AFTER THE FORD; B: VIEW FROM THE WEST OF THE ROAD'S EASTER SEGMENT; C: DETAIL OF CYLINDRICAL QUERN ROUGHOUTS FROM THE QUARRY SERVING TO REPAIR THE ROAD; D: CROSS-SECTION OF THE ROAD REVEALING ITS STONE FOUNDATION AND CONVEX GRAVEL COVER (FROM ANDERSON *ET ALII* 2003)

V-shaped trenches to each side of the road ensured the road's drainage. The road's general design in this particular sector comprises two rectilinear segments that intersect to the east of the ford, where the road crosses the valley bottom, near the smithy, house and quarry. The slight adjustment of direction between the segments was most likely designed to adapt the road's direction to the natural terrain, notably the valley with steeper flanks to the east. The path of this road stretching beyond the site several kilometres to the east and the west can be traced based in part by topographical constraints as well as by a series of geophysical analyses (resistivity) carried out by Pierre Gex of the University of Lausanne (Anderson *et alii* 2003: 190).

It appears clear that this road played a major role in the regional transport and communication network. Its width and the building technique suggest it was a public construction and there is reason to believe that this thoroughfare corresponds to that depicted on the celebrated Peutinger Table linking the Antique centres of *Eburoduno* (Yverdon-les-Bains) and *Aventicum Heletiorum* (Avenches).

Materials associated with the road suggest it is the oldest of the site's Roman features. They place its initial construction toward the middle of the first century AD, a few decades after the conquest of the region. Evidence of secondary repairs carried out with broken quern cylinders and other stone debris from the Châbles quern quarry indicates the road was built prior to the quern exploitation. The craftwork at Châbles, in fact, probably owes its existence to the presence of this road and the source of water where it crosses the stream. Potsherds and a few other finds, notably a bronze bowl inscribed with a dedication to Mercury, indicate that the thoroughfare remained in use until at least the middle of the third century AD.

THE QUERN QUARRY

The small quarry (40 m^2) exploited *grès coquillier*, a naturally abrasive shell-rich sandstone commonly called «*molière*» (from Latin *mola*, i.e. mill) that is common to the region (fig. 4). The products were cylindrical roughouts approximately 0,45 m in diameter destined to be fashioned into rotary querns. This type of hand driven mill served to grind cereals for bread or gruel, staples in this region in Roman times. The most common mechanism of this type of quern in Western Switzerland comprised two stones assembled by means of a spindle projecting from the central eye of the lower stone (*meta*) though a wooden «box-rynd» lodged in opposite cuttings along the eye of the active upper stone's (*catillus*) lower face. The upper stone was driven manually by a lateral handle as grains were slowly fed through its eye before exiting as a rough flour from the space between the two stones (Anderson *et alii* 2003: 41).

The study of the distribution and petrology of more than 1,000 querns and millstones in the different Cantonal depositories of Switzerland indicate that *grès coquillier* was the most common type of rock for handmills in Roman times (Anderson *et alii* 2003: 61-69). Although it is widespread throughout the Swiss

FIGURE 4. THE QUERN QUARRY. DIFFERENT VIEWS AND DETAILS OF THE QUERN QUARRY WITH ITS FOUR LEVELS OF EXTRACTION AND WELL-CONSERVED TOOL MARKS. BOTTOM: RECONSTRUCTIONS OF CUTTING THE CIRCULAR TRENCH AND SPLITTING THE CYLINDER WITH A PICK. BOTTOM LEFT: RECONSTRUCTION OF A ROMAN QUERN, THE PRODUCT OF THE QUARRY (FROM ANDERSON ***ET ALII*** 2003)

Plateau, it appears only to have been available on the surface, hence easily to exploit, in two areas of Switzerland: a) the area stretching between the western Cantons of Fribourg and Vaud represented by the Roman quern quarries of Châbles and Chavannes-le-Chêne (Bosset 1943), and in eastern Switzerland in the Canton of Aarau represented by the Roman quern and block quarry of Würenlos (Doswald 1994). The rock's abrasiveness and excellent milling properties are evidenced by the absence of dressing marks on its grinding surfaces. The rock appears to have

«sharpened» itself naturally through wear due to the contrast between its finer sandy matrix and harder gravel and shell inclusions. Experimentation suggests, nonetheless, that the flour yielded by its mills required sieving as friction between the rock released sand which would have worn down the teeth of those that consumed its products.

From the technical standpoint, the extraction marks are particularly well conserved on both the quarry face and floor, as well as on some of the rejected cylinders. The quarry in fact benefitted from a relatively rapid filling by working debris that protected its surface from weathering. The reading of these tool marks by specialists, notably Jean-Claude Bessac, coupled with experimentation carried out by modern stone masons, led to identification of the different steps of the process, the *chaîne opératoire*, from cylindrical roughout extraction to fashioning of the quern.

The initial step of the process, as inferred from the marks still visible on the quarry, was to choose the position of the cylinder, avoiding any micro-fissures, and peck its centre. This central mark served to trace the circumference of the future cylinder with a compass or simply with a string attached to a nail. The thin line tracing the circumference was then pecked as the original tracing would certainly have been subsequently masked by working debris and dust. The tool par excellence to peck and ultimately extract the quern cylinders was an iron pick with points at each of its extremities. This tool was equipped with a long wooden handle and wielded with two hands. This is in fact a type of direct percussion tool that has survived over time (as late as the twentieth century) in different forms in many parts of the world. The single pyramidal point of the tool used at Châbles is induced from silicon moulds taken of a series of single, well-conserved impacts on the quarry's surface. The pick served to cut the circular trenches about 15 cm wide around the future cylinder, a process that left multiple parallel diagonal lines along the quarry face and along the edges of certain abandoned cylinders. This same tool also served for the second major phase of extraction, the splitting of the cylinders from the bedrock. This was carried out by the mason standing on the cylinder and placing a regularly spaced series of strikes along the base of the cylinder yielding the short marks visible on the quarry floor that resemble the dials of a clock. It is noteworthy that there was no need to resort to metal or wooden wedges as the cylinders were small and relatively easy to split along the bedding plane of the rock. Experimentation, in fact, suggests that splitting a rough quern required only a few minutes. Based on the tool marks and the estimation of the dimensions of the quarry, a total of approximately 450 cylinders were extracted from the Châbles quern quarry.

The second phase of the manufacture of querns (regularising the surfaces, carving the eyes, handle hole and rynd cuttings, fashioning and adjusting the grinding surfaces) was carried out with other finer tools (hammers, mallets, chisels) through indirect percussion. There is, however, no evidence at the site that the querns were finished *in situ*. It is more likely that they were transported elsewhere in the form of roughouts to a specialised workshop, possibly in the nearby capital of *Aventicum*.

An assemblage of pottery deposited in a pit in the southern corner of the fill of the quarry corresponding to a phase subsequent to the quarry's abandonment places the halt of quern production at the turn of the first and second centuries AD. The

quarry's small dimensions, the regular extraction techniques gathered from the uniformity of the tool marks and the absence of indications of botched extractions suggest that the work was carried out by a single quarryman, a sort of quern making specialist. Furthermore, the 450 cylinders, if the result of intensive and continual work, could have been extracted from this quarry by a single individual in a relatively short stint of time - a few years. These different indicators point to a relatively short-lived occupation of the quern quarry.

THE SMITHY

The Roman smithy of Châbles is characterised, in part, by a great concentration of slag (700 kg) and iron objects (*ca* 3000, many bearing traces of cuttings) spread over a relatively small surface ranging from between about 100 and 200 m² (Anderson *et alii* 2003: 228-229). A large proportion of the slag falls into the category of plano-convex hearth bottoms, a type that is characteristic of smithies that forms along the bottom of a hearth when an iron object, subject to intense heat, sheds ferrous oxides that mix with various other substances such as siliceous materials, iron cuttings or objects.

Each piece of slag is tantamount to a session of work. Also evidencing smithy work are the millimetric hammer scales contained in the fill of certain sunken features. These tiny flakes resulting from the pounding of the surfaces of hot iron objects are discerned when they are separated from the soil of the feature by means of a magnet. Finds of a few fragments of iron tuyeres, the tube conducting the oxygen from the bellows to the hearth, also serve as proof of the existence of the smithy. It is noteworthy to stress that the Châbles workshop only fashioned objects from ingots or recycled iron objects. There is no evidence of primary iron ore reduction at the site. The Western Swiss Plateau is in fact devoid of iron ore.

The spatial organisation of the smithy workshop comprises a small rectangular structure (8,50 x 3,80 m) of light materials (wood and earth) that can be reconstructed based on the position of a series of postholes. A few meters to the north of this timber-framed feature are three structures aligned parallel to the postholes interpreted respectively as a smithy hearth, a pit containing a disproportionately large amount of iron cuttings (interpreted as a storage area for iron recycling) and a domestic hearth devoid of iron artefacts built on a layer of hand sized pebbles. The workspace (position of the anvil) was most likely between the smithy hearth and the storage pit. This area, to the north of the rectangular post-hole structure, was certainly under a shelter made up of a sort of lean-to attached to the exterior façade of the structure. It is well known that blacksmiths often work in the penumbra to facilitate observation of the changes of colour of the iron as it is heated. Yet this hypothetical superstructure enlarging the smithy dwelling/workshop to 12,50 x 7,50 m, and sheltering the workshop from the rain, has left no archaeological trace. Outside the workshop, to the east, is an area containing numerous slags interpreted as a rubbish heap. This area also featured two narrow elongated and parallel pits that were equally filled with slag. Although probably linked to iron work, their exact function remains uncertain.

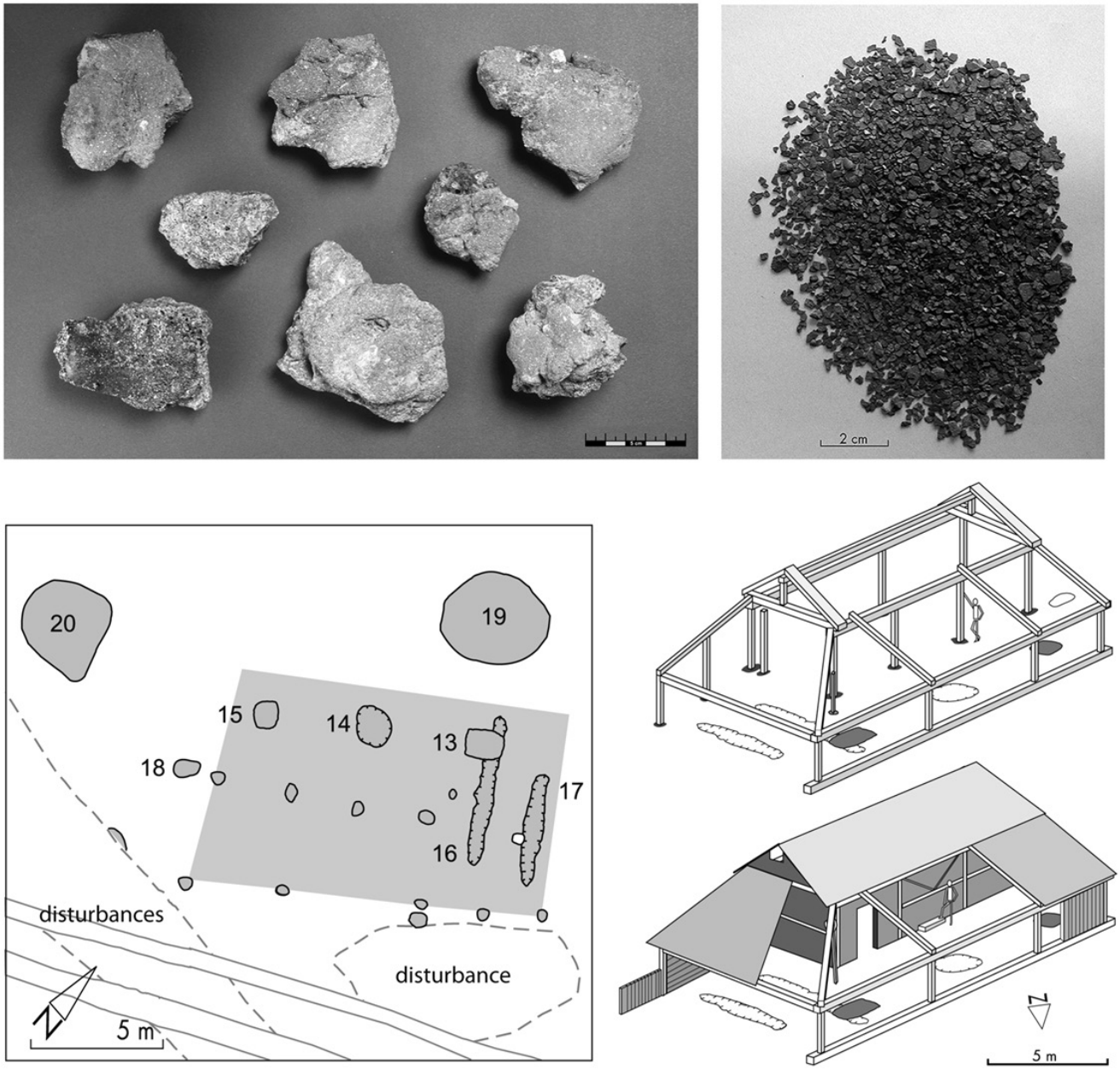

FIGURE 5. THE SMITHY. TOP: EXAMPLES OF SMITHY SLAG AND HAMMER SCALES. BOTTOM: FEATURES OF THE SMITHY AND RECONSTRUCTION OF THE SMITHY DWELLING AND WORKSHOP (FROM ANDERSON ***ET ALII*** 2003)

The rectangular post-hole structure of the forge can also be linked to domestic activity as evidenced by certain pottery types and metal artefacts as well as the presence of a fireplace built with pebbles whose fill contained no signs of metal working debris. The whole timber-framed structure therefore could have served in part as the blacksmith's workshop (under the lean-to) and in part as a dwelling for the blacksmith and possibly his family.

It is difficult to define the exact nature of the production of the smithy as finished tools are rarely unearthed in smithies during archaeological excavations. There is

nonetheless a great amount of small debris that shed light directly or indirectly on the blacksmith's iron tools and production. Among the artefacts that could have served as iron working tools are two chisels and a fragment that is potentially the angle of an anvil. Other finds are possible parts of tong grips or the points of broken chisels. A number of other items collected during the excavation correspond to discarded cuttings and roughouts as they bear clear marks of chisel blades. The estimation of the quantity of iron worked on the site (5000 kg) suggests that it is plausible that this smithy produced an assortment of iron objects distributed at a regional scale. Supposing that the activity was non-stop, the working life of this smithy is estimated to have endured between 10 and 20 years, a relatively short lifespan compatible with that of the quern quarry. Certain artefacts (cuttings, perforated objects) imply a high level of expertise and the study of the slag infers the use of high quality iron.

The pottery unearthed in the iron working area dates to the end of the first or the beginning of the second century AD, contemporary to work at the quern quarry and the rectangular wooden structure interpreted as a house raised between the quarry and the road.

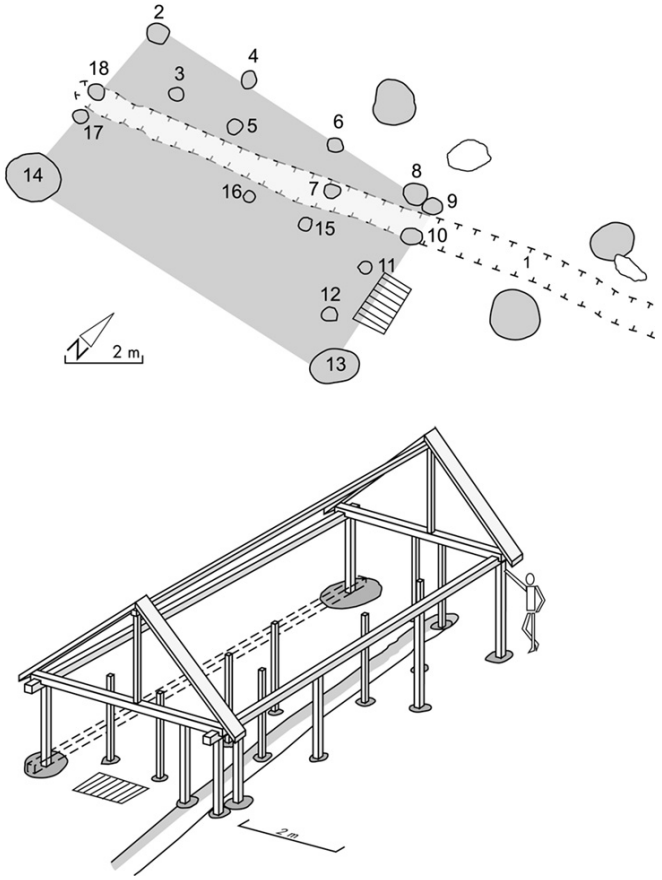

FIGURE 6. THE HOUSE. FEATURES OF THE HOUSE AND RECONSTRUCTION OF THE DWELLING (FROM ANDERSON *ET ALII* 2003)

THE HOUSE

Domestic activity of the first Roman phase of the site is represented by a rectangular dwelling whose layout (9,50 x 5 m) is defined by a series of post holes (fig. 6). The structure is situated in the small stretch of land between the quarry and the road. A shallow trench beneath the structure following the slope toward the ford as interpreted as a feature to assure drainage of the house. The trench also probably indicates the house was built with a floor slightly elevated above the ground serving to compensate for the inclination of the natural terrain. The house's entrance is marked by a double post-hole on the opposite side of the façade facing the dominant wind. This floor immediately outside the door is also marked by a small rectangular concentration of stones, a feature possibly designed to stabilise the entrance. It is noteworthy that the longitudinal axis of the rectangular timber-framed structure is parallel to the axis of the road, suggesting

their contemporaneity. Its proximity to the ford where the road crossed the stream assured its occupants had access to a constant supply of water.

The pottery collected in and around the house is characteristic of domestic sites and serves to establish its contemporaneity with the smithy and the quern quarry. It position, a few steps away from the quern, quarry leads to the presumption that it could have served as the residence of the quern maker.

CONCLUSIONS: ECONOMIC INTERACTIVITY

The study of this site, besides shedding light on Roman stone and iron work in rural context, serves as a reminder that a rock quarry, as noted in the introduction, is not an isolated event, but forms part of a complex network at both local and regional levels (fig. 7). The initial Roman activity or occupation in the immediate sector of the complex of Châbles corresponds to the building of the road serving, presumably, as noted before, as the link between the centres of Yverdon-les-Bains and Avenches. Its construction and maintenance would have required a great investment probably at the expense of the authorities. The road not only served to consolidate the region and permit individuals and organisational bodies (such as the military) to move rapidly from place to place, but facilitated the transport of goods and the spread of ideas. The site's other features, the quern quarry, the smithy and the house, all appear several decades later and according to the study of their materials are contemporary.

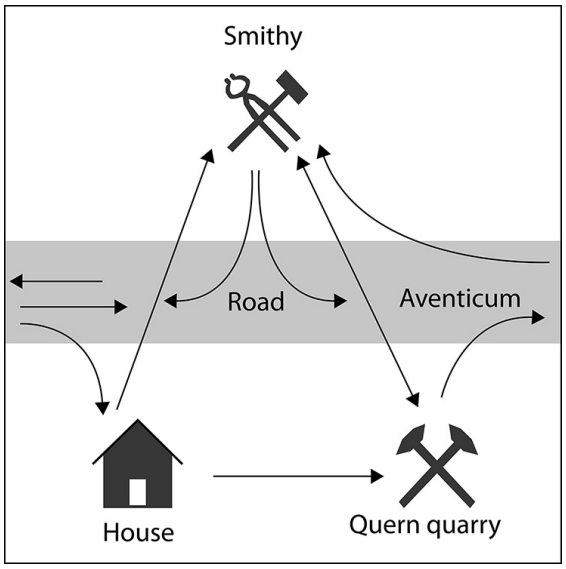

FIGURE 7. SCHEMA DEPICTING THE MODEL OF ECONOMIC INTERACTIVITY AT THE COMPLEX OF CHÂBLES (FROM ANDERSON *ET ALII* 2003)

It is safe to assume that the *grès coquillier* rock outcrop was visible on the surface in Roman times like the tip of an iceberg. This notion derives from estimating the inclinations of the summit of the rock stratum (jutting upward toward to the valley bottom) and that of the natural slope of the terrain dipping downwards (Anderson *et alii* 2003: 45). The proximity of the thoroughfare, therefore, directly conditioned the exploitation of this specific *grès coquillier* outcrop as opposed to other more removed outcrops in the area, and, by consequence, also conditioned the arrival of the site's other features.

Châbles was not the only quern producer in the region. An identical exploitation was excavated a few kilometres away from Châbles in the 1940s at Chavannes-le-Chêne in the neighbouring Canton of Vaud (Bosset 1943; Anderson *et alii* 2003: 62-63). Moreover, it is safe to assume that other regional outcrops of this rock were exploited for handmills as *grès coquillier* querns, in fact, dominated the whole of the Swiss

Plateau in Roman times, outnumbering by far those hewn of other types of rocks (e.g., granites, schists, *Bundsandstein*, volcanic rocks). This observation was gleaned from the study of the querns and millstones stored in the different depositories of Switzerland (Anderson *et alii* 2003: 66-69). In any case, it is clear that the region around Châbles provided a great proportion of the querns used at sites throughout the western Swiss Plateau, and the numerous individuals and groups travelling the road would have been aware of where the querns were extracted. In this sense, the road served to showcase this region's quern production.

The proximity of the road to the quarry, just a stone's throw away, facilitated the loading of quern roughouts onto carts and their transport to an unidentified workshop where they were finished and fitted. The finishing process implied regularising their surfaces, cutting their eyes and the slots for their fittings (handle, spindle and rynd), and at least roughly adjusting their grinding faces. This could hypothetically have been carried out at *Aventicum*, the capital of Roman Switzerland about 20 km away, as access to this city presented less topographical obstacles than the route to the west to *Eburodunum.* Reaching *Aventicum*, in fact, could have been carried out in about a day without natural major obstacles. The first stretch of the journey was downhill, and then across the vast flat Broye plain. Moreover, a separate study of the assemblage of querns and millstones of Avenches identified several *grès coquillier* cylindrical unworked blancs that could have come either from Châbles of another quarry in the area of Châbles (Castella and Anderson 2004).

The tasks of the Châbles blacksmith obviously included repairing the picks and other tools of the quern maker. It is also possible that the blacksmith also fashioned the iron fittings serving to tenter (spindle) and drive (handle component) the rotary querns extracted at the site (although, as noted, there is no evidence this activity took place at Châbles itself). In any case, iron working directly linked to quern production was, by far, not a full-time occupation. It would therefore appear logical that the blacksmith produced other types of objects unrelated to quern extraction. The sheer quantity of slag and discarded iron cuttings collected during the archaeological excavation also bolster this notion of a more extensive iron working production. It is difficult to determine the exact nature of what was produced at Châbles as larger finished iron objects are rarely lost by blacksmiths in Roman times and recovered in archaeological contexts. Yet it is reasonable to assume, due to the site's rural setting, that the blacksmith delivered or repaired objects and tools linked to agricultural work. To satisfy the need of numerous objects for a local rural market the blacksmith had to import iron ingots, an activity facilitated by the proximity of the road. The road also served, in turn, to distribute and commercialise the iron products at a local or regional level.

A final point worth noting is that the quern maker and the blacksmith most likely resided at the site, at least on a seasonal basis. The blacksmith therefore could have lived in the small rectangular timber-framed structure adjacent to the workshop, whereas the quern maker resided in the modest wooden house between the quern quarry and the road. The number of mouths to feed at this site is also difficult to quantify. The homogeneity of the tool marks visible on the quarry point to a single stone mason. Operating the smithy, simply driving the bellows,

in turn, would logically require more than one person. Yet finds of certain types of ornamental and functional objects at Châbles suggest the presence of at least several individuals and children (based on two rings) possibly evidencing family units. In any case, whether residing at the site on a permanent or seasonal basis, the road served to acquire the means of sustenance of the residents as there is no indication among the finds that they practiced agriculture or stockbreeding. It is also possible to envision that the quern maker and the blacksmith could have been, in fact, the same person. The two trades are not mutually exclusive and in recent times stone workers are also skilled in the basic tasks to repair and maintain their metal tools. But this speculation, although warranted, goes beyond the material evidence collected at the site.

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