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# Historiographical and epistemological contribution of digitisation to changes in the field practices of archaeologists in France

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## Abstract

This article offers an analysis of the changes in archaeological practices since the 1980s. During this period the scientific methods and techniques of archaeologists and other people involved in archaeology have changed significantly. The economic and institutional conditions for their work and the legal and regulatory frameworks have also changed considerably, throughout Europe.

The initial results described here fall within the perimeter of a thesis, under way since 2019<sup>1</sup>, describing a historiographical and epistemological study of the effects of digitisation on archaeology as a discipline and on archaeologists in their practices, their skills, their discourse and their images, focusing on the situation in France.

## keywords

archaeology, historiography, epistemology, digitisation, digital practices

## INTRODUCTION

A number of archaeologists [Burnouf et al., 2010] have already proposed a history of archaeology in recent times - a necessary but rather difficult task to attempt. Some of the people referred to are still alive, and when investigating very recent history there may be a temptation to tend towards sociological investigation, paying more attention to the isolated careers of individuals rather than providing a historical narrative of the group to which they belonged (and indeed in some cases still belong). Similarly, interviews can provide a particularly rich source of information, but care must be taken to apply the same critical demands as for other sources [Duclert, 2002; Soulet, 2012].

Since it covers a period and facts in which we were personally involved, the narrative proposed here inevitably lacks objectivity. Our memories may introduce biases and an *a posteriori* interpretation that ‘rewrites’ history. This is what constitutes the “biographical illusion” [Bourdieu, 2004]). Because of our own careers and our participation in the history referred to here, the results of the research are imbued with a subjectivity and a situated point of view; we fully recognise that this is so. As [Gautier & Zancarini-Fournel, 2022] state,

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<sup>1</sup> Research carried out in the context of my thesis by the project at CY Cergy Paris Université, in the Humanities, Creation and Heritage department (*Humanités, Création, Patrimoine*), in partnership with the French national heritage institute (*Institut National du Patrimoine*); thesis jointly supervised by Julien Longhi, Director of the Institute of Digital Humanities (*Institut des Humanités Numériques*) and Boris Valentin (Université de Paris 1 Panthéon-Sorbonne).

“describing what is real supposes adopting a point of view from which to see the thing that is to be described (...) Adopting a particular point of view means admitting that other, differing, points of view may be possible. Thus it means positively accepting engaging in a confrontation of points of view in order to reach a more finely graduated description of something we claim to know, emerging from the plurality of these perspectives”. Thus the description and analysis presented here constitute just one of a number of possible points of view.

Although memory inevitably has some limitations, and indeed carries some risk of falsification, it also has a number of advantages, such as the possibility of compensating at least in part for the weaknesses of certain archives. Taking stock of one’s own history by looking back at one’s trajectory and experience should therefore not be totally discounted from the outset. The exercise of reflexivity, self-analysis and ego-history have been theorised by a number of historians (Maurice Agulhon, Pierre Chaunu, Georges Duby, Raoul Girardet, Jacques le Goff, Michelle Perrot, René Rémond), and this has already been applied to archaeology [Demoule & Jacob, 2012], [Guilaine, 2019] and [Clottes, 2015]; our contribution to the genre is much more modest, and makes no claim to be as important as the contributions of these authors.

## **I THE HERITAGE TURNING POINT OF THE 1980s IN FRANCE**

The evolution of archaeologists’ practices in recent decades must be placed in a more general setting in two respects, i.e. with regard to both the ‘heritage turning point’ and the ‘digital turning point’, concepts that date from the 1980s.

The heritage turning point in France can be pinpointed in time to the moment the notion of heritage was extended to many new areas of the collective productions and fields of activity of French society [Choay, 1996], with significant encouragement from the political powers.<sup>2</sup> Everything became heritage [Heinich, 2009], and the ensuing plethora of heritage occasionally gave rise to a degree of confusion in the distinction between what counted as heritage and what did not. It became necessary to redefine the skills, abilities and areas of expertise in all the occupations involved in heritage matters.

A number of archaeologists have offered a discussion of the ‘archaeological turning point’, but they date its origin to the second half of the 1990s [Burnouf et al., 2010]. Without challenging their view, we believe that the ‘archaeological turning point’ began during the 1980s, thus illustrating the fact that the periodisation of the history of a discipline remains a relative exercise, depending on the criteria selected.

During the 1980s, archaeology was impacted by the increasing attraction the archaeological heritage held for politicians and the general population. Many of the occupations it involved and its practices were substantially altered [Hottin & Voisenat, 2016]. During this period, the *Association pour les Fouilles Archéologiques Nationales* (AFAN), created in 1973, was a major player. The French State, which - unlike many other States - has sole authority over public policy on archaeology, used its position to apply strong-arm tactics to ensure that preventive archaeology operations were paid for by property developers. The budgets

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<sup>2</sup> 1980 was declared Heritage Year [in France]: <https://www.ina.fr/ina-eclair-actu/video/i17131935/l-annee-du-patrimoine>. Resource consulted on 18 November 2022.

allocated to such operations increased considerably, making it possible to recruit thousands of archaeologists on digs.

During the 1990s, the steady growth of preventive archaeology led, not without some difficulty, to the adoption in France of new legislative and regulatory frameworks, in the form of the Act on Preventive Archaeology of 17 January 2001; this documented the transformation of the association Afan into the public administrative establishment Inrap, which celebrated its twentieth anniversary in February 2022.

At the same time as France was (re-)discovering its heritage and beginning to look at its past in a new light, it was also turning towards the future: some of the country's leaders were supporting the idea of a type of progress and wellbeing that would necessarily involve an increasing use of new technologies to which they were attracted at a level little short of fascination. In the context of this enthusiasm for a very technical modernity, information technology really came to the fore. Promoted in reports to the French President at the time, Valéry Giscard d'Estaing, who saw himself as the leader of a new society, inspired in part by the model inaugurated in the United States by President Kennedy, information technology and telematics (the forerunner of the Internet) became the preferred motors of a political plan to modernise the everyday lives of the French. It was thus that computerised methods and technologies were put to work for the 'new heritage age'.

We shall now consider this recent history of the relations between heritage and computer technology with regard to archaeology.

## **II INFORMATION TECHNOLOGY APPLIED TO ARCHAEOLOGY SINCE THE 1960s**

The history of the use of electronic resources in archaeology has already been documented [Giligny, 2011; Giligny & Desachy, 2019; Plutniak, 2017a; Tufféry et al., 2021a; Djindjian, 2016a; Djindjian, 2016b; Favory et al., 2018]. It emerges from these publications that their introduction has played an undeniable role in the professionalisation of heritage-related occupations.

Several reference works mention the fact that electronic data processing - the French word *informatique* was coined in 1962 - has its origins in mechanical data processing [Breton, 1987; Lazard & Mounier-Kuhn, 2016]. This appeared at the end of the nineteenth century, and developed rapidly during the inter-war period, in the fields of accountancy, statistics and business management [Carmille, 1936]. Mechanical data processing used a number of different types of mechanical and electro-mechanical machines for calculating, processing and circulating information. In the mid-1950s, mechanical data processing devices were used in a number of human and social sciences, including archaeology, for managing documentation [Gardin, 1955; Gardin, 1956; Gardin, 1958; Gardin, 1960; Gardin, 1967]. By the second half of the 1960s, calculators and computers were being used in a number of scientific disciplines, including human and social sciences (HSS), universe sciences, and life sciences [Gardin & Borillo, 1970]. These devices enabled many a researcher to become familiar not only with the new possibilities opened up by these devices, but also with their limitations. A number of large bodies, including the CNRS [Gardin, 1970], set up computer rooms, often occupying a considerable amount of space; they were sometimes referred to as 'calculation centres', and were used to create databanks [Borillo & Gardin, 1974]. Sociological and biographical research has mapped and compared the careers of several players in this part of archaeology's history [Plutniak, 2017b]. The 1970s were marked by France embarking on a new stage in

modernising its economy, relying on an incentive-based policy in order to develop the new technologies in many areas: architecture, major infrastructures, regional planning, cultural policies, etc. In 1977, French President Giscard d'Estaing, whose model for society was inspired by that of the United States a decade earlier, commissioned Simon Nora and Alain Minc to produce a report on what they called the “computerisation” of society [Nora & Minc, 1978]. The aim of the report was to “achieve progress in thinking about the means of computerising society”, in a context of the economic crisis that developed in the wake of the first oil crisis in 1973. In the report, the “explosion of electronic data processing” is explicitly taken into consideration and telematics is defined as a “growing imbrication of computers and telecoms”. Years later, Alain Minc was to admit that the report’s authors had not taken into account the arrival on the scene of small-scale computers and very small personal electronic data processing devices.

With regard to archaeology, after the publication in 1975 of the Soustelle report, which laid down the principles for archaeology in France, the Ministry of Culture gradually moved towards the computerisation of archaeological documentation. The initial stage in this process was the ‘SIGAL’ application (*Système Informatisé de Gestion des Données Archéologiques* - computerised system for the management of archaeological data) launched in 1978, followed by SIGAL 2 in 1984. Archaeological research organisations created new laboratories dedicated to computerising archaeology, including the Centre de Recherches Archéologiques in Valbonne, created in 1972, and the Laboratoire d'Informatique pour les Sciences de l'Homme (LISH-CNRS) [Hainsworth, 1984].

As soon as archaeology began to be computerised, starting mainly with archaeological documentation, questions on methodology and epistemology were raised and debated [Gardin, 1991]. During the 1990s and thereafter, this type of thinking had largely disappeared. The national programmes for archaeological research, such as those of the French Conseil National de la Recherche Archéologique (CNRA)<sup>3</sup>, document the evolution of archaeological practices resulting from the deployment of increasing numbers of digital devices and methods. Even so, this body has not yet invited the French archaeological community to question what the use of these devices has already involved or might involve as changes in the coming years with regard to the conditions for producing and circulating new archaeological knowledge.

During the 1980s, a number of archaeologists were involved in developing information processing programs and equipment for digitising data, sometimes even in the field; these included SysDa, ArcheoData, Syslat, ArSol, and Arkeoplan [Galinié & Randoin, 1979; Arroyo-Bishop & Lantada-Zarzosa, 1989; Py, 1991; Buchsenschutz et al., 1986; Buchsenschutz & Gruel, 1994].

The 1980s constituted a turning-point in the activity of producing archaeological knowledge largely because of the appearance of small personal electronic data-processing devices. Like many other professionals, archaeologists acquired this equipment, sometimes out of their own pockets and sometimes out of the budgets of archaeological work-sites, the laboratories to which they were attached, or missions carried out in other countries. This trend should be seen

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<sup>3</sup> “The CNRA is consulted on all archaeological matters submitted to it by the Minister for Culture. It examines and proposes all types of measure involving the scientific study of the archaeological heritage and its inventory, the publication and circulation of the results of research, and protects, conserves and promotes that heritage. (...) Periodically, the CNRA draws up a report on the state of archaeological research with a view to allowing the national programming of archaeological research to be updated”

(<http://www.culture.gouv.fr/Thematiques/Archeologie/Acteurs-metiers-formations/Les-instances-scientifiques/Le-Conseil-national-de-la-recherche-archeologique>) Resource consulted on 18 November 2022.

in the light of the boom in preventive archaeology that began in the second half of the 1980s, when archaeology clearly turned towards a rationalisation of practices.

At the same time, archaeologists made increasing use of stripping away large areas using mechanical machinery (a process of ‘mechanisation’) at the same time as they began to use professional topographical devices in the field to meet their need to record files of topographical points, while dig archives were only slightly concerned by a regulatory normalisation of the processes of producing archaeological knowledge.

With the appearance of methods and the use of tools developed for use in the physical and chemical sciences, referred to collectively as archaeometry, archaeology extended not only the perimeter of the analytical methods it used but also the skills and profiles of the researchers involved in the production of new archaeological knowledge. This evolution is reflected in the development of several IT programs and applications dedicated to the management of laboratory notebooks. In the past twenty years, this documentation has been normalised a number of times because the protocols imposed by the experiments being carried out in the disciplines of physics, chemistry and biology began to be applied to analysing and conserving archaeological material, radio-dating, and carrying out paleo-genetic analyses, and this changed the study practices of archaeologists profoundly.

Paradoxically, the increasing use of digital methods and techniques supporting the growth of archaeological knowledge has given rise to very little work on the epistemological effects of this development, except for a very small number of publications in French and not many more in English. Little mention is made of the profound changes brought about by the use of digital technology other than in eulogistic terms. A host of books, exhibitions, lectures, radio broadcasts, television reports and documentaries have established the powerful forces at work and pointed to the amazing prospects these ‘revolutionary’ techniques offer for the archaeology of the future<sup>4</sup>. While archaeologists themselves are relatively indifferent to this demonstration, the players involved in cultural mediation are grabbing the opportunities it offers with both hands. Scientific journalists are always on the look-out for archaeologists prepared to lend themselves to being staged as ‘digital archaeologists’. Archaeology’s audiences are delighted to discover the renewed ability of archaeology to amaze through the digital practices being used by present-day archaeologists, which enables them to set themselves apart from the figure of Indiana Jones, which is still very present in popular culture.

The notions of ‘dematerialised heritage’ and ‘digital memory’ that appeared in the 1980s were presented at the time - are often still are - as new opportunities. Authors of the likes of Emmanuel Hoog have seen in the digital age the emergence of a ‘permanent memory’ and a ‘perpetual present’ [Hoog, 2009], making it possible to recall at any time any trace of the past that has been archived in a digital format, yet at the same time rendering the conditions for producing and accessing these virtual permanent memories fragile.

With regard to the job of the historian, [Rygiel, 2017] proposed an analysis of the effects of digital technologies on the reconfiguration of the skills and practices of the historian and on the transformation of both the archiving system and the conditions for accessing archives and circulating their contents:

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<sup>4</sup> To give an example, mention may be made of the radio programme entitled ‘*La Méthode Scientifique*’ [scientific method] broadcast by France Culture on 31 March 2021, devoted to the archaeology of the future. <https://www.franceculture.fr/emissions/la-methode-scientifique/la-methode-scientifique-emission-du-mercredi-31-mars-2021>

“What is new is that historians, in their everyday practice, are in direct contact with machines that are beyond them in terms of complexity which allow the unassisted automation of some of the tasks they carry out (...) A change of scale, then, of *modus operandi* and order of grandeur, which - although it does not abolish what went before - nevertheless has implications that are leading to a profound transformation in the practices, the job, and probably also the social position of historians, who used to (...) feel obliged to control every stage in their work, from collection to analysis, including the description and assessment of their sources”. Historians cannot claim that they embrace all the new digital skills to a greater degree than other researchers. They need to extend their networks of socio-professional relations with other historians who have complementary digital skills. They must also get involved in new collaborations with other disciplines, including the information sciences, which offer new ways of looking at the objects of their study, i.e. new models for the knowledge of historical objects. New types of processing are becoming possible (statistics, shape recognition, etc) as the body of digital documentary sources continues to grow, on very different scales, from the very small and very local to the very extensive and truly global.

### III DATA SOURCES USED

The first of the sources used for this research is our own thesis as archaeologists. Our experience in this field began in 1980, working for the first time as volunteers on digs [in France], one on a preventive dig in the centre of Clermont-Ferrand, the other on the scheduled dig at Les Rivaux in the Haute-Loire *département* [Daugas & Raynal, 1977; Daugas et al., 1979]<sup>5</sup>. This site was investigated under the responsibility of Jean-Pierre Daugas (1946-2011), the archaeologist who passed on to us almost everything we know about the archaeological methods and techniques in use in the 1980s. On this last site, the pioneering use of an Apple IIe personal computer was experimented with during the digging carried out from 1985 to 1990, using a dedicated computerised recording program called ‘Rivalo’ that made it possible to record in .txt format all the information entered on paper field sheets on-site during the day, for each square of the dig. In 2009, we were able to recuperate - albeit not without difficulty - the data produced by this program, after having had to make a specific connector to link an Apple IIe to a PC running under Windows [Tufféry, 2022].

The second source of data we used for this research was a series of about a hundred semi-structured interviews carried out between June 2021 and June 2022, remotely for the vast majority, with professional archaeologists in France and a number of nearby countries (Belgium, Italy, Spain, Great Britain). Half the people interviewed worked for Inrap, while the other half belonged to various public and private archaeological institutions in France: State departments (the central archaeology authority, centres with national responsibilities, local authorities’ archaeological services, universities, the CNRS research institution, French schools in other countries, private operators). A number of representatives of other non-French European institutions were also among those interviewed. Starting out from their training routes and careers leading up to their current employment, the interviews were aimed at getting them to express their opinions and analyses of the digital skills and practices they had adopted and those they had observed among the other archaeological professionals they

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<sup>5</sup> Known since the mid-nineteenth century, the Les Rivaux site was mainly excavated starting in the second half of the twentieth century by Pierre Bout, and then from the end of the 1960s in the form of prospecting followed by rescue intervention and finally a scheduled dig.

had worked alongside. The interviews, most of which lasted between one-and-a-half and two hours and rarely more, made it possible to hear about the diversity of the routes taken by the professional archaeologists interviewed in terms of their training, their specialisations, the work they were doing, and the posts they had occupied previously, as well as their views on practices and discourse on the appropriation of digital devices and practices in archaeology. Other documentary sources included several extracts from the field notebooks of archaeologists working for Inrap and regional authorities' services received in response to an appeal put out on social media and a number of websites. About thirty scanned extracts from the field notebooks I received were analysed for my master's thesis at the EHESS [Tufféry, 2021 - unpublished].

In 2019 we were able to consult a number of personal field notebooks (Fig. 1) that had belonged to Jean-Pierre Dugas, already mentioned<sup>6</sup>.



Fig. 1: Covers of some of Jean-Pierre Dugas' field notebooks (Jean-Pierre Dugas archives).

These notebooks, which take the form of daybooks, contain a considerable quantity of scientific observations in the field, lists of people met or to contact, things to be done, or equipment to be acquired for current digs. Archives of this type are a hybrid genre, somewhere between personal journal, scientific field notation, and laboratory notebook. Some of the pages in the notebooks contain several examples of sheets of squared paper filled in by hand by the author or by one of the other researchers with whom he collaborated (Fig. 2).

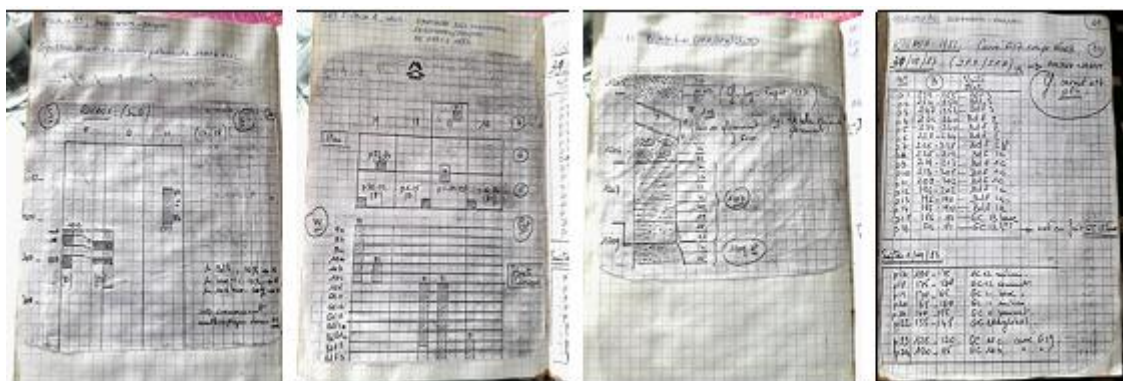


Fig. 2: Pages from one of Jean-Pierre Dugas' field notebooks (Jean-Pierre Dugas archives).

<sup>6</sup> I must give my warmest thanks to Jean-Pierre's wife, Chloë Dugas, who agreed to give me these archives, which she felt were private and as such had not been deposited as dig archives with the conservation and study centre (*Centre de Conservation et d'Etudes - CCE*) in Les Martres-de-Veyre. We would also like to thank Julie Charmoillaux and Christophe Gilabert for making it easier for us to consult the Les Rivaux archives at the CCE and for having digitised all the reports available for this dig for our benefit.



Lastly, the documentary sources used in our research include part of the archives of the Les Rivaux dig already mentioned.

#### **IV CHANGES IN RECORDING METHODS: THE EXAMPLE OF THE DIG AT LES RIVAUX**

Jean-Pierre Dugas deposited a large part of the archives of the dig at Les Rivaux with the CCE in Les Martres-de-Veyre during his lifetime. These dig archives are similar to many others of the same period that have been deposited with archive services and other CCEs. They comprise boxes of various types of document: paper sheets used for recording in the field, field notebooks, correspondence, photographs, drawings, sketches, plans, etc (Fig. 3).



Fig. 3: View of an excavator entering a sketch on a record sheet (Les Rivaux archives, Jean-Pierre Dugas archives at the CCE in Les Martres-de-Veyre).

My research consisted of showing how the methods used both for excavation and for recording data changed between the time work began and ended on the dig at this site, between 1972 and 1990, by analysing various types of first-hand sources of documents used

on the site. Various models of paper record sheets were used at the site; the examples given here show some of the models used between the early 1970s and the late 1980s.

The various models comprise an upper part of the record sheet with sections for descriptions of the site and the area being excavated, and other sections for the structures observed and the various information collected (topography, photography) and samples taken. There are also handwritten notes in places, and references to the field notebook. In another of the models used at the Les Rivaux site, there are two boxes for entering text (description of layers and structures) and one box for a rough map showing the location of the areas being excavated. Lastly, a final box at the foot of the page could be used to list the archaeological material found in the area excavated (Fig. 4).

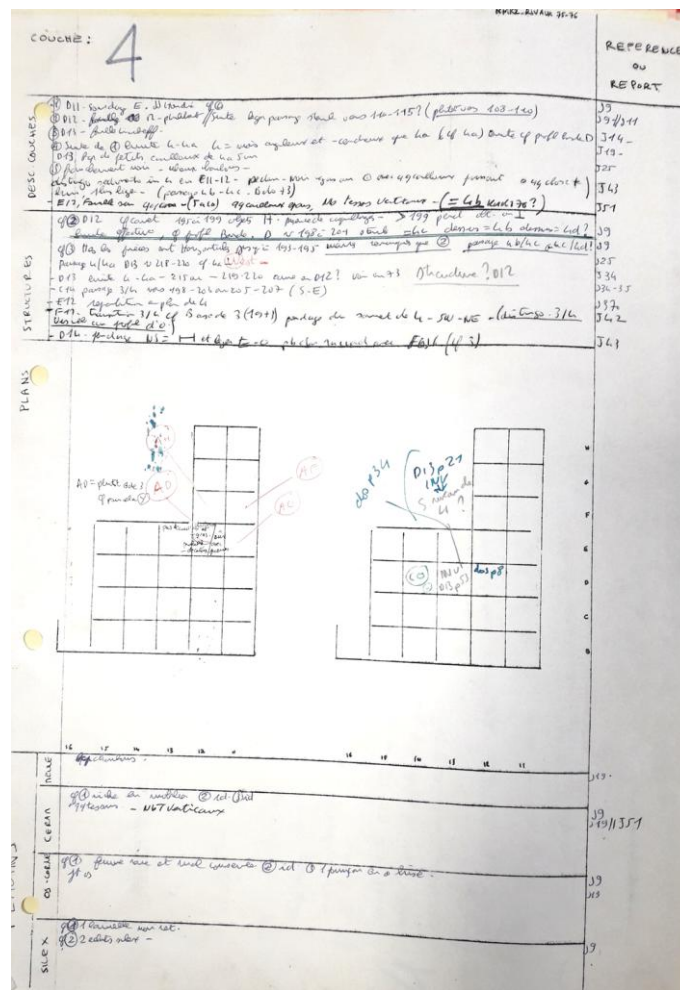


Fig. 4: Another example of a field record sheet used in the mid-1970s.

Other models appeared between the second half of the 1970s and the early 1980s. One is in black and white. In the example shown here (Fig. 5), the sheet was filled in by one of the excavators, whose name and address are given. The plan is on a scale of 1:5, as indicated in the upper part of the sheet, with the graphic part to scale on squared paper. Even though the square concerned is clearly indicated (F12), the limits with the adjacent squares are indicated by crosses where the squares intersect. A number of dimensions are also shown, and the layer relating to the plan is indicated.

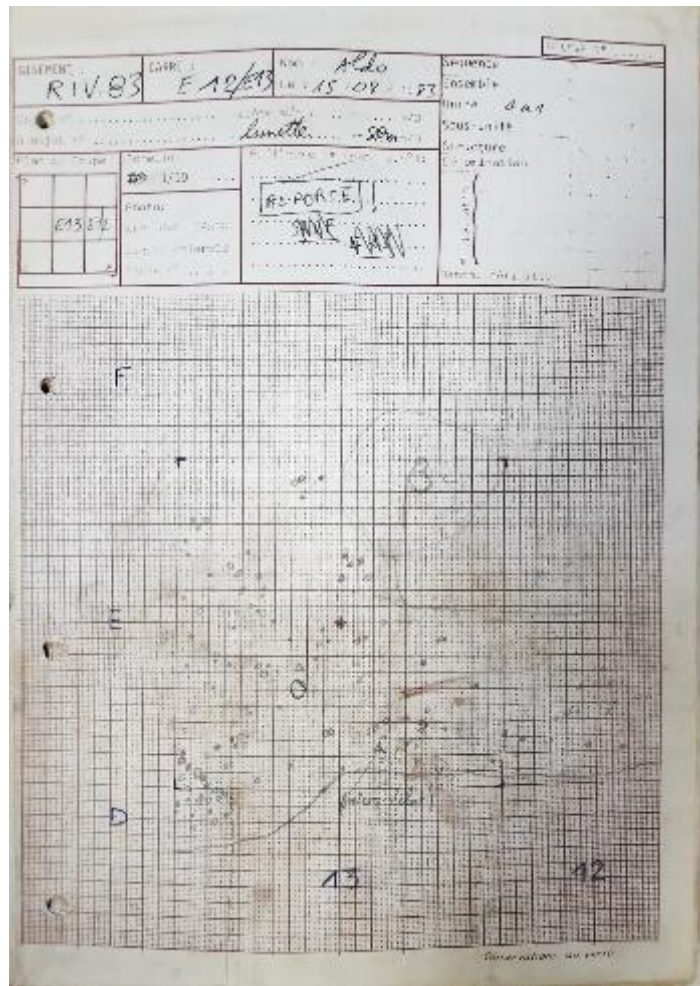


Fig. 5: Example of a type of record sheet used in 1973.

The second example of a record sheet is brown in colour (Fig. 6). The upper part includes a section for stating the structures, sub-units, units, groups, and sequences represented in the square to which the sheet refers. The mode and scale of the topographical surveying are also stated. Here the value crossed out shows the value 1:20 as the scale of the current plan. An overall sketch makes it possible to position the square being investigated in relation to the other squares in the same area. The square(s) surveyed are drawn in on the squared part of the record sheet, and marked by crosses where they intersect (DA13/D12, E13/E12, F13/F12). Items of archaeological material are represented by dots or small circles drawn in their location and the time they were discovered in the excavation square. The contours of any structures are drawn in: stones, blocks of basalt indicated by the symbol  $\beta$ , fireplace, post-hole, etc.

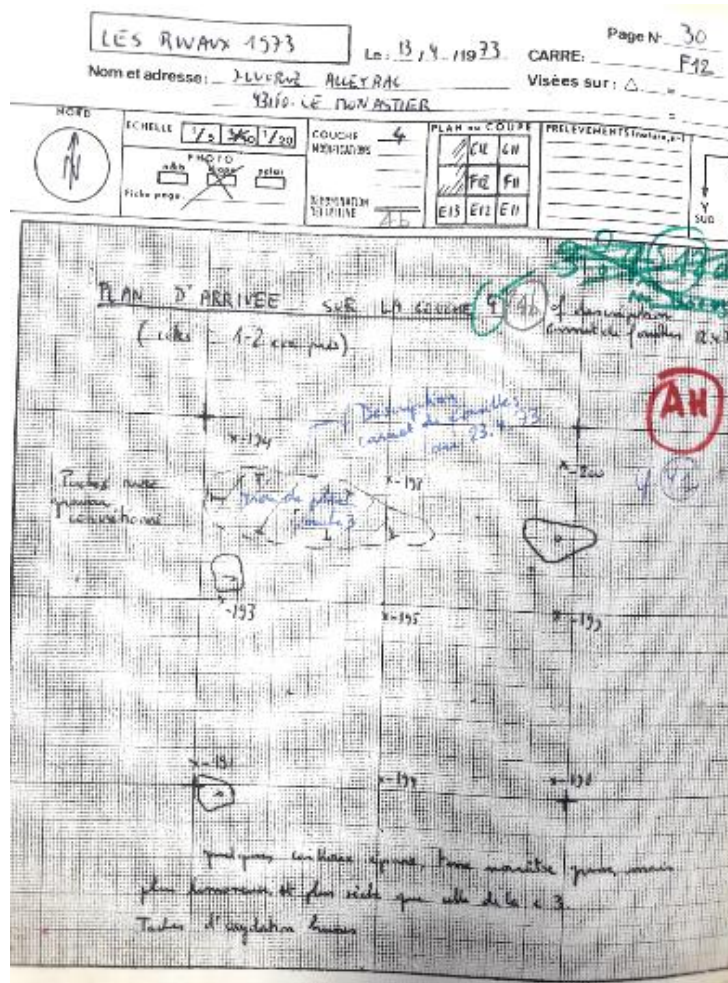


Fig. 6: Example of a field record used in 1983 on the Les Rivaux dig.

In this example of a record sheet, the name of the author mentioned was Aldo<sup>7</sup>. The date shown on the sheet corresponds to the date of entering the first record on the sheet, rather than the last.

At this dig, detailed data concerning the archaeological material was also recorded on paper sheets (Fig. 7).

<sup>7</sup> This was my nickname among members of the dig team.



Page N° 1

RIVAUX 80

Le : 14, 8, 80
CARRÉ : G.13

Nom et adresse : TUFFERY Christophe      Visées faites sur :  $\Delta =$  lunette  
= 1000 m.

Observations : (Y a-t-il un relevé, commentaire, photo, ?)

M ou A	N°	X	Y	Z	$\Delta \pm z$	Ori- tation	Pen- dage	Dimen- sions	Croquis forme	Désignation et nature	Niveau ou sol
M	1	60	84	-991	-1291		NE	35x4		Eclat de silex noir avec cortex	1C
Marqué le 15 août 1980											
M	2	15	25	338	1338	SONE	NE	2x2,5		Tesson	1C
M	3	19	315	498	1422	S-NE	NE	2x2		Tesson	1C
M	4	41	1	1146	1416	S-NE	NE	2,5x2,5		Tesson	1C
M	5	86	16	489	1689	OE		15x2	/	Tesson	1C
M	6	13	31	499	1499			2,5x3	/	Marque au de prohesion sur Tesson	1C
M	7	19	24	489	1689	S-NE	NE	2,5x3	/	Tesson	1C
Marqué le 26 août 1980											

Fig. 7: Example of a paper field record sheet for describing the archaeological material discovered.

As this example shows, each item was measured in three dimensions (X, Y and Z) and then described in terms of orientation, dip, dimensions, a sketch or basic shape, designation and nature, and lastly the archaeological level or ground to which it belonged.

On the example shown here, the presence of traces of earth and dirty fingerprints indicate that these sheets were used in the field. As I remember, the forms were attached to an A4-sized piece of lightweight wood (such as balsa) by a black metal clip, and were filled in using a pencil. During digging, pencils were either left on the wood backing, stuck in the metal clip, held between the excavator's teeth, or tucked behind the excavator's ear. Once the item had been discovered and detached, its X and Y coordinates within the square were noted, using a tape measure. These values were used to indicate on the record sheets the exact positioning and dimensions of the item, making it possible subsequently to draw up plans of the distribution of items in each square at each archaeological level.

Lastly, there was one other very important documentary source for this site: two daybooks or field notebooks (Fig. 8).

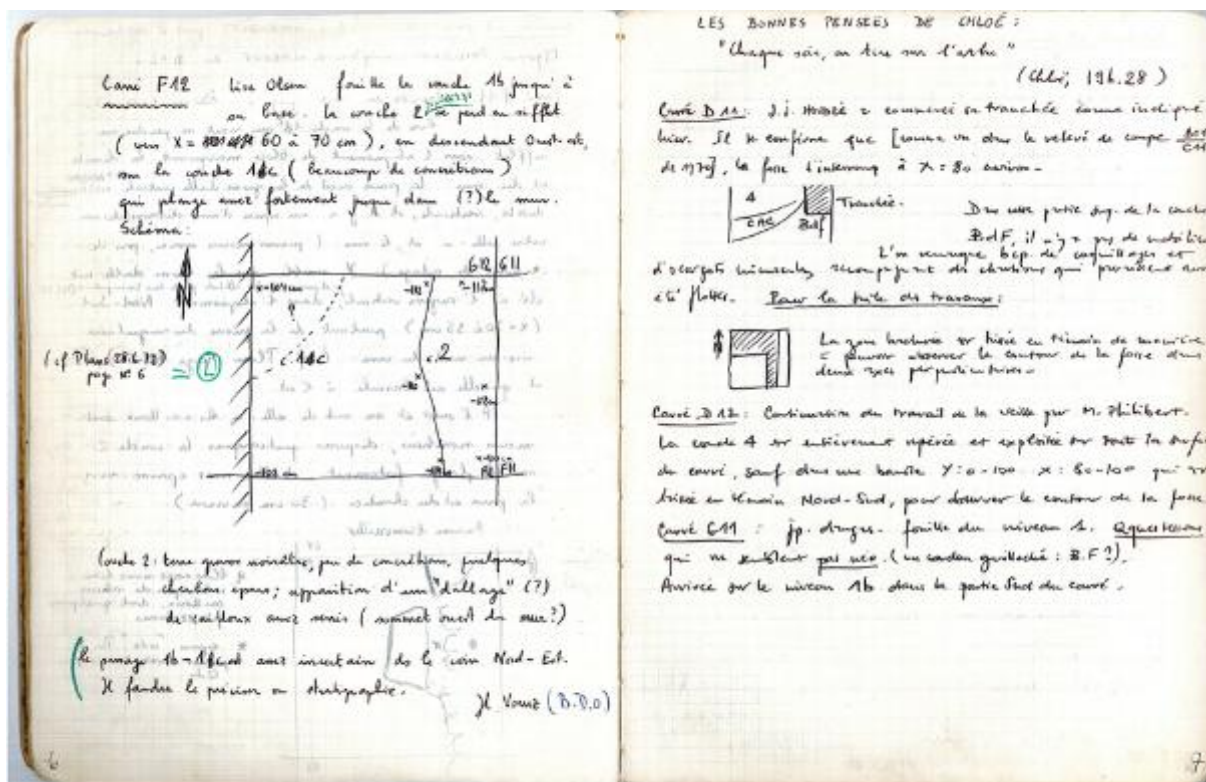


Fig. 8: Example of pages in one of the field notebooks of the Les Rivaux dig in the 1970s (Jean-Pierre Daugas archives).

Between 1975 and 1980, two descriptive field notebooks were kept by a number of the excavators. While the first was filled in by a number of the excavators, the second was mainly filled in by the site manager. During the 1980s, these field notebooks gradually gave way to standardised field record sheets like those already presented.

To be able to make use of a number of these documentary sources, I applied a variety of digital tools and methods.

## V DIGITAL TOOLS AND PROCESSING METHODS

### 5.1 Transcription of field notebooks

To be able to analyse the contents of the field notebooks and their links with the other documentary sources available for the Les Rivaux site, I decided to digitise and then digitally transcribe the notebooks. Digitising was carried out using a scanner at a resolution of 300 dpi. Displaying the files produced by this digitisation raising a number of problems. Firstly, entries in the notebooks had been made in black or blue, or sometimes red or green, ballpoint pen for the annotations, or in lead pencil, often erased, and less legible. Secondly, some of the phrases had been crossed out by their authors, making them difficult or even impossible to read.

Moreover, the writing on the back of some of the pages shows through on the front because in places the ink used has seeped through the paper of some of the pages.

Lastly, it is sometimes difficult to make out some of the sketches and diagrams because here again a number of different inks were used: some have remained clear, while others are now almost illegible.

In an attempt to resolve these problems, I carried out a number of processes using Adobe Illustrator software, particularly its B&W vectorisation function. Combined with the ordinary vectorisation function of Adobe Illustrator, it was possible to make the inks on the back of the pages concerned disappear. I was then able to obtain a version of the sketches and diagrams in vector format (Fig. 9).

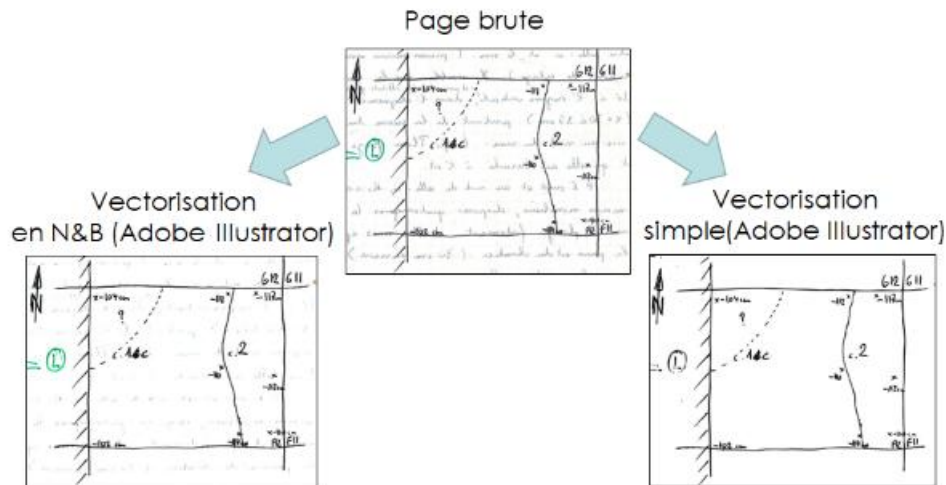


Fig. 9: Two types of processing carried out using Adobe Illustrator software on a sketch in a field notebook: B&W vectorisation function on the left, ordinary vectorisation on the right.

For some of the sketches, however, the ordinary vectorisation functions in Adobe Illustrator did not produce satisfactory results, so I used the free software PhotoFiltre, testing a number of processing functions. I used the Gamma Contrast and Correction functions, achieving results that were sometimes better than those of the ordinary vectorisation function in Adobe Illustrator (Fig. 10).

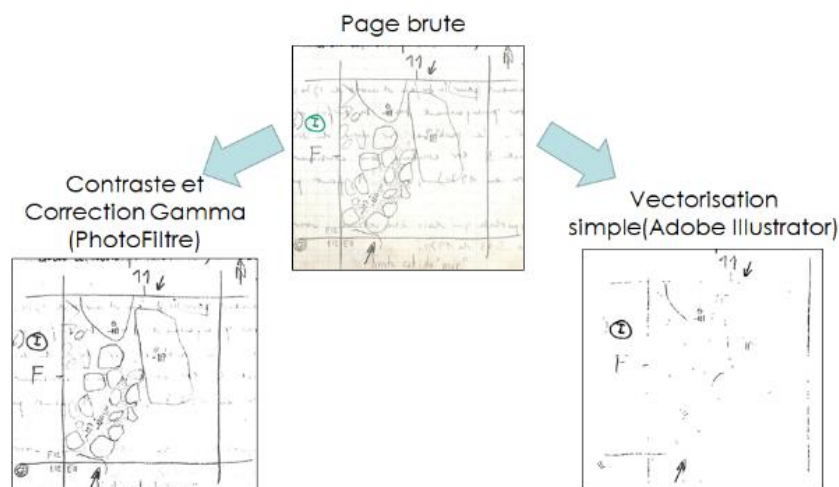


Fig. 10: Comparison of two types of processing carried out using two different softwares on a sketch in a field notebook: PhotoFiltre's 'gamma correction' function on the left, Adobe Illustrator's ordinary vectorisation function on the right.

Once I had processed all the digitised pages in the field notebook in order to make the texts and sketches as legible as possible, I decided to develop a digital transcription application, which I called ‘Archeotext’.

I began by collaborating with a teacher/researcher at Nantes polytechnic and two of her students using the Scribe platform that is used for collaborative transcription projects such as the ‘Recital’ project<sup>8</sup> [Tufféry et al., 2021b]. Having encountered a number of difficulties in finalising the project, I decided to adopt a different technical solution, and went on to develop a new application in a different technical environment.

The application operates in conjunction with an Internet browser (Chrome, Opera or Safari). It uses a series of forms for entering information in HTML5 format (Fig. 11). Alongside the pages in HTML5 format are some JavaScript code files and a CSS-type sheet.



Fig. 11: Screenshot of the Archeotext application. Display of a page in the field notebook (on the left) and the result of its manual transcription (on the right).

These sheets make it possible to enter the transcription data and other descriptive data as well as metadata in accordance with ISO15836 (‘Dublin-Core’). All the data is stored in a SQLite database on the user’s device<sup>9</sup>. Data can be exported as a single file in.xml format and can also be used directly out of the SQLite database using computerised management system software such as QGIS without passing via an export file. This possibility also makes it possible to correlate the transcription data and the geometric data of the areas excavated on the site.

I transcribed all 150 pages of the most comprehensive of the two field notebooks, covering the period from 1972 to 1982. The second notebook, comprising some fifty pages, covers the period from 1980 to 1990.

<sup>8</sup> <http://recital.univ-nantes.fr>

<sup>9</sup> This application could easily be adapted and used for the archives of other excavation sites.



A meeting with one of its designers provided me with an opportunity to use the eScriptorium software<sup>10</sup>. Using this on-line application, I was able to explore its possibilities for a transcription of the Les Rivaux field notebooks other than the one I had made using Archeotext. The eScriptorium application was developed for transcribing digitised handwritten medieval documents; it uses a technique for automatic character recognition called Optical Character Recognition and Handwritten Text Recognition (OCR/HTR)<sup>11</sup>. This uses Kraken character recognition, developed by Ben Kiessling. It is necessary to begin by training the engine, by transcribing manually the content of the first few pages of a handwritten document (Fig. 12). Once the automatic transcription has been carried out and checked, the result can be downloaded in text or XML format. I therefore wanted to use this eScriptorium application as well as the Archeotext application, and was able to assess its advantages and limits.

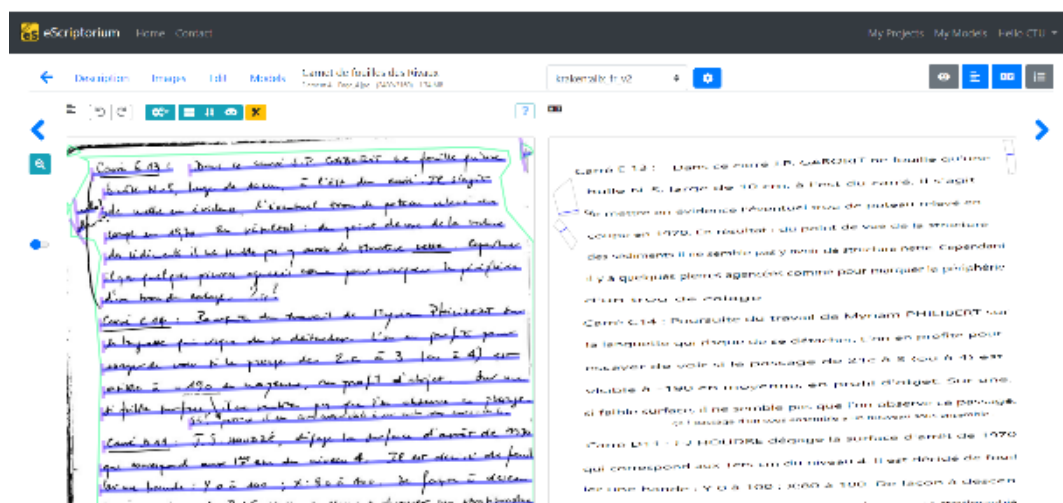


Fig. 12: Screenshot of the eScriptorium application Display of a page in the field notebook (on the left) and result of its manual transcription (on the right).

Each of the two applications - Archeotext and eScriptorium - has its own value and limits. Neither can claim alone to provide everything I required in researching the archive material represented by these field notebooks.

## 5.2 Integration in computerised management system software

Using the QGIS geographical information system, I was able to retrace the perimeter of the dig from the 1970s to the 1990s by using various types of reference data (old georeferenced rough plan of the dig, the IGN's on-line large-scale cartographic services, and the land registry plan).

The present limits of the site as they appear on the land registry plan resulting from PCI vectoring are inside the limits of the site area at the time of the dig (Fig. 13).

<sup>10</sup> I must thank most warmly Peter Stokes of Paris Sciences et Lettres (PSL).

<sup>11</sup> This project is part of the 'Scripta' *Initiatives de Recherches Interdisciplinaires et Stratégiques* (IRIS) at Paris Sciences et Lettres (PSL) (<http://ephenum.hypotheses.org/1412> et <http://escripta.hypotheses.org/>)

Once I had digitised the old plan of the dig, I was able to adjust it using the georeferencing tool in QGIS.

I then drew a grid of one-metre squares over the area covered by the old excavation plan. The shoulders left in place during the dig are visible in black (Fig. 14).

On the grid, I was able to differentiate between those squares that had been investigated according to the first field notebook (in orange), those that had been investigated according to the records of material from the Rivalo program (in white), and all the other squares that had not been investigated (in grey). It can be seen that barely a quarter of all the squares in the total area had been investigated (Fig. 13).

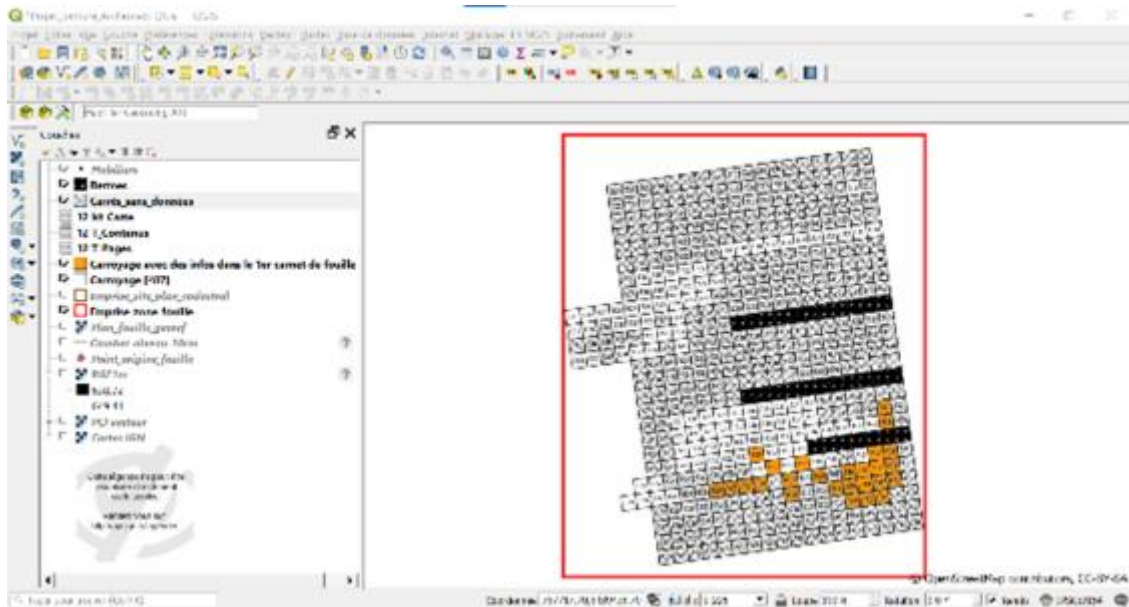


Fig. 13: Display in QGIS of the grid, the limits of the dig (in red), the squares excavated according to the first field notebook (in orange), the other squares excavated (in white), and the squares that had not been excavated (in grey).

The excavated squares shown in the first field notebook I transcribed are mainly in the southern part of the dig, an area that has gradually disappeared as the result of erosion caused by the Borne stream from the late 1970s and through the 1980s. This is what makes it possible to show the usefulness of the current altimetric data in RGE Alti at the 1-metre resolution of the IGN. On the basis of this data, contour lines every 10 cm were calculated using QGIS (Fig. 14).

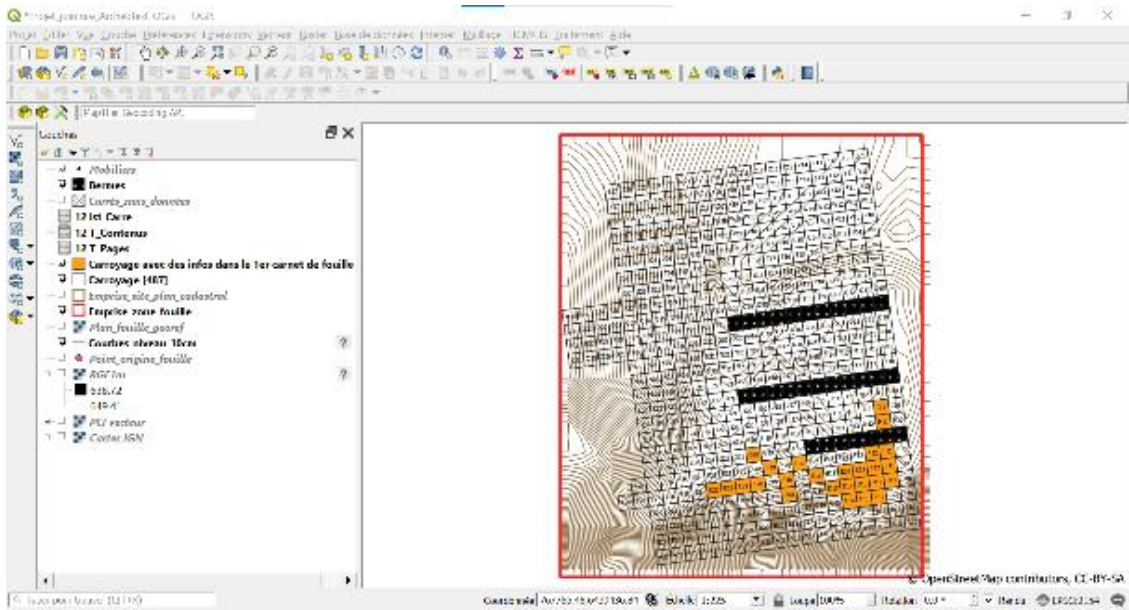


Fig. 14: Display in QGIS of the contour lines resulting from the 1-metre IGN RGE Alti data.

This data then made it possible to calculate and represent the 3D topography using QGIS and its extension Qgistothreejs (Fig. 15).



Fig. 15: 3D display in QGIS (Qgistothreejs extension) of the present topography of the site on the basis of the data from the IGN RGE ALTI 1m.

The present topography used for the 3D model shows that the southern part of the squared area is currently seriously affected by the erosion of the edge of the site on the left (i.e. northern) bank of the Borne.

The archaeological material comes from the data processing in .txt format of the Rivalo program. I was able to recuperate this and after a quantity of processing was able to convert the information into .gpkg format.

The total material from these files only covers some of the squares, mainly in the central part of the squared area between two of the shoulders, and slightly in the north-western part of the footprint of the dig. The data on the material comprises a range of descriptive information which can be accessed by selecting any one of them (Fig. 16).

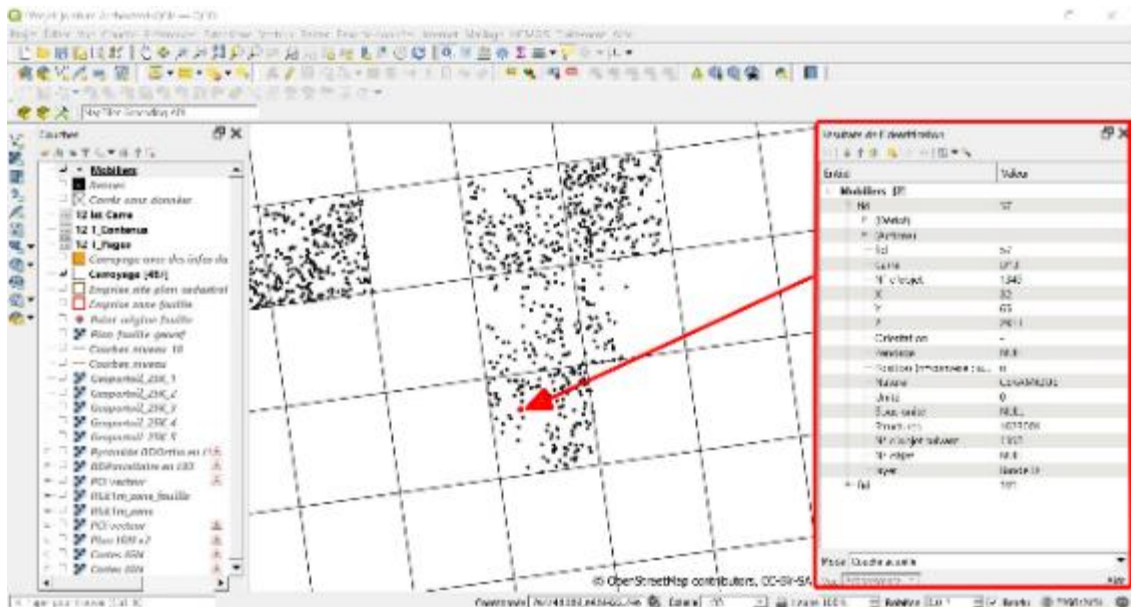


Fig. 16: Display in QGIS of items (black dots) from the Rivalo program and distributed according to the source square and descriptive data of selected points on the screen.

Lastly, the transcription data created using the application I developed, which is stored in a SQLite database, can be consulted directly from QGIS. Transcribed content can be consulted for the corresponding squares (Fig. 17).

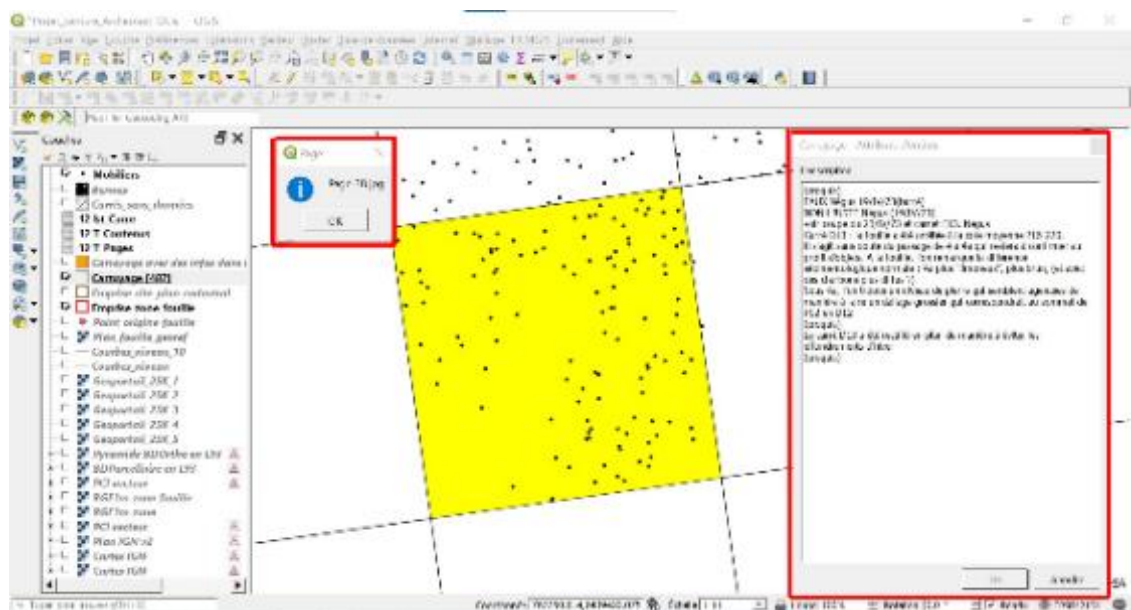


Fig. 17: Display in QGIS of the data in the field notebooks transcribed for square D13 (page 38 of the field notebook).



Two scripts have been associated as actions with the grid layer.

The first Python script ('number of page in notebook') makes it possible, by clicking on one of the squares of the dig, to display in a small box the number of the page in the field notebook for that square (page 38 in Fig.18, for example). If several pages in the notebook refer to the same square, only one of them is displayed.

The second generic script ('Archeotext') allows the Archeotext application to be launched in the Google Chrome browser. To browse the transcribed pages of the field notebook (select a page in the list), the page number indicated by the first script for the notebook page to be displayed in Archeotext (on the left in .jpg format) and its transcription (on the right in text format) must be entered. The reference for the square to which this page is connected can be found in the Square section in the top right-hand corner of the Archeotext application (Fig. 18).

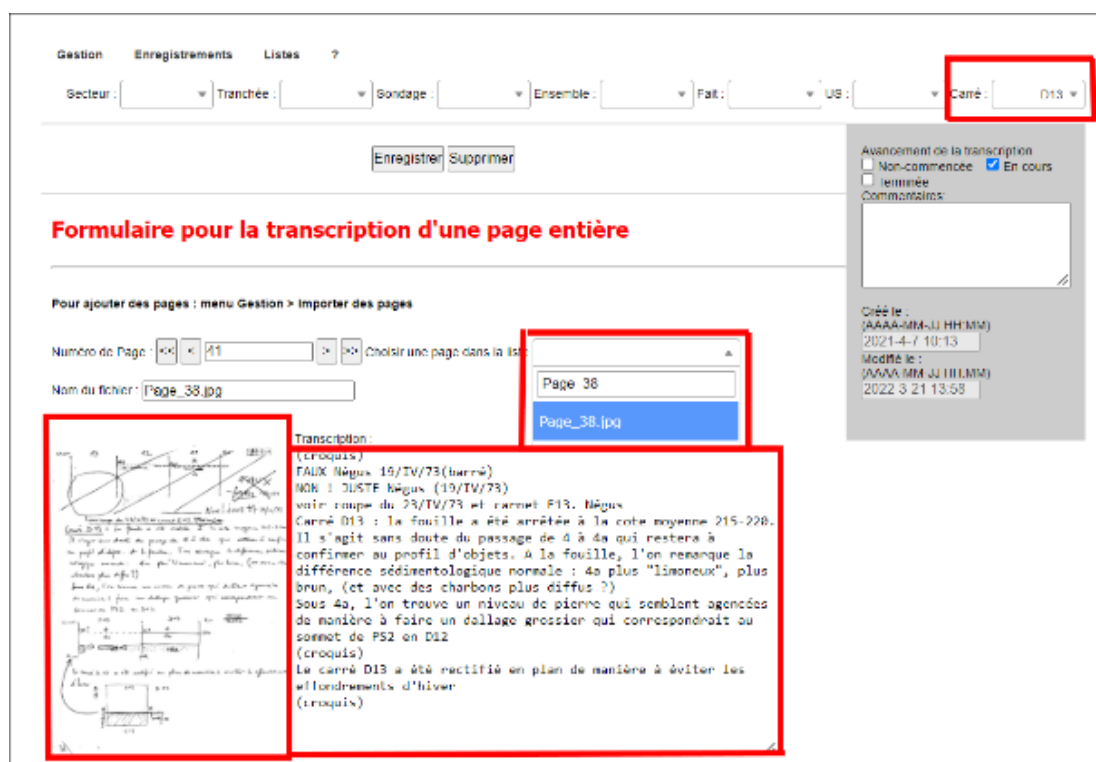


Fig. 18: Page in the Archeotext application showing the transcription of page 38, which refers to square D13.

The possibility of consulting the pages in the field notebook and the results of their transcription directly using QGIS provides an integrated access to these archives from the cartographic representation of the dig and the location of the dig units (the squares) and the items of archaeological material represented resulting from the data in the Rivalo program. This integration of multi-source data in computerised management system software is one of the major advantages of using several technologies, such as those presented here, from a common consultation interface - in this case, from the cartographic interface of the QGIS software.

Using the results of transcribing the texts from the field notebooks using Archeotext, I began exploring the possibilities of searching for texts using specialist software such as AnaText and Tropes with a view to carrying out a lexicometric and textometric analysis which will not be developed here.

## CONCLUSION

Overall, this research work has made it possible to show the importance of noting information in the field and the use of certain traditional media in relation to both the exercise of the scientific skill of archaeologists and the life of the social group constituted by a dig team on-site. The archives such as those we studied attest to a variety of practices in terms of noting information in the field, and to the fact that the use of digital devices has increased in recent times.

Observations at Inrap since 2010 have shown that field notebooks seem to be losing their importance as a result of the deployment of the digital devices that are replacing them, at least in part. Collective daybooks for digs such as those used at Les Rivaux are not often used nowadays; this is particularly true during preventive archaeology operations, which is probably because the time factor exerts greater pressure than is the case for scheduled archaeological operations. At best, the dig manager keeps his/her own daybook. It would seem that this type of documentation is not as popular among archaeologists as it once was, particularly among those of the younger generation, who more usually record data in standard format, sometimes using digital applications on tablets and smartphones, rather than on paper sheets. But instead of the total disappearance of the traditional media for taking notes in the field in favour of the exclusive use of digital media, we are able to observe a coexistence of both modes of recording information.

In his publications on places of knowledge, Christian Jacob refers to inscriptions as “graphic places of knowledge. For [Jacob, 2017], whether they are textual or graphic, the places of knowledge that inscriptions constitute “are not only the media for fixing and archiving pre-existent knowledge. They construct that knowledge; objectivise it, materialise it. They are part of the field of view, interpretation, and social circulation. They are thus active devices, interfaces between the party that produced them and the party that decodes and uses them”. This interaction between knowledge and the related players in society, those who produce knowledge and those who access it, whether as soon as it is produced or decades later, constitute one of the fields of inventorying, transcribing, decoding and publishing dig archives. This work echoes that proposed by [Bert & Lamy, 2021], revealing the often invisible dimension of the work of researchers, in three areas that are hard to dissociate - the places, the objects and the gestures of science. For these authors, “knowledge is inseparable from the conditions of its enunciation”. It is because I believe it is impossible to separate content from the authors of archaeological knowledge that archives should not be considered cold, disembodied objects that present the construction of knowledge in material form. These archives bear the traces of knowledge in the form of dynamic processes and human undertakings. That they are nowadays produced in native digital form, or that it is now possible to convert them into digital form after they are produced in a non-digital form, does not fundamentally revolutionise the fact that they are archives. In this sense, the digital humanities do not make it possible to reach a new level of scientificity, to use Michel Foucault’s definition of the notion of episteme [Foucault, 1969]. The British archaeologist J. Huggett stresses that the application of information technology to archaeology is still relatively recent and we are not in a position to imagine what the results of its effects on the production of archaeological knowledge will be in several decades’ time [Huggett, 2000]. However, the digital humanities already make it possible to renew our relationship with archaeological dig archives, giving them a second life and proposing new ways of using them,

and perhaps occasionally making it possible to render visible something that seemed to be hidden, as in the very act of digging.

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