

International  
Conference  
on Use-Wear  
Analysis



# International Conference on Use-Wear Analysis

*Use-Wear 2012*

Edited by

João Marreiros, Nuno Bicho  
and Juan F. Gibaja

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International Conference on Use-Wear Analysis:  
Use-Wear 2012

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and Juan F. Gibaja

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# INTRODUCTION

Prehistoric tools and implements are one of the most important resources for the study of early technology among human populations. Since Semenov's pioneer work on functional interpretations during the last decade experimental tests as well as macro and microwear analyses have been used as important methods to recognize diagnostic evidence of prehistoric human technology.

From these studies, different types of wear traces on tool surfaces were recognized (e.g., hunting projectile traces, residue analysis), and such diversity led to the development of new or different methodological and technological developments. It is a source of diverse information, which is necessary to solve both local and global problems, from the identification of functions of individual tools to the reconstruction of prehistoric economic systems. Thus, during the last decade use-wear analysis has focused on different approaches to study archaeological data.

Despite technological and functional perspectives on use-wear studies, archaeologists use these data to infer about broad topics and interpret prehistoric living activities, and, therefore, socio-cultural transformations within and between those populations. Recently, use-wear research led to the discussion and interpretations on new subjects. Topics such as the onset and expansion of the first farmers from the Near East to Europe, the diversity within lithic technological facies in Southwestern French Middle Palaeolithic, Early hunting techniques in Middle Stone Age of South Africa, and characterization of site function in Palaeolithic and Mesolithic contexts have been scrutinized by use-wear analysts.

With these ideas and facts in mind, we organized the International Conference on Use-Wear Analysis 2012 (Use-Wear 2012), held at the University of Algarve, Faro, October 10, 11 and 12th 2012. Since the last use-wear international meeting in Verona (2005), "Prehistoric Technology, 40 Years Later: Functional Studies and the Russian Legacy", many projects and data have been developed. Our goal was to provide a perfect setup to present ongoing projects and a forum for archaeologists to present and discuss the latest research on nature and timing of functional, technological and palaeoethnographic data.

During the Use-Wear 2012 meeting contributions included all different use-wear approaches, such as theory and method, archaeological artefacts, and residue analysis.

As a result of this conference is this volume, focusing on topics from methodological, geographic and chronological perspectives, and includes chapters covering different topics: methods (Part I: Methods), technology (Part II: Projectile technology and Part III: Bone technology), Early Stone Age, Middle Palaeolithic/Middle Stone Age, Upper Palaeolithic and Mesolithic cultures (Part IV: Hunter-Gatherers), Neolithic to the Iron Age (Part V).





**PART I:**  
**METHODS**

CHAPTER ONE

A SPECIALIZED OCCUPATION  
DESPITE APPEARANCES:  
FUNCTION OF THE BUHOT LATE GLACIAL SITE  
(CALLEVILLE, NORTH-WESTERN FRANCE)

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**Abstract**

This paper summarizes the use-wear analysis of flint artefacts of the Buhot site. This site is located at Calleville in the north-west of France. It is attributed to the Pleistocene-Holocene transition. During this period in the Paris Basin, Northern France and Southern England, many sites are recognized as “belloisian” sites, “long blades” or “bruised blades” assemblages. They are interpreted as specialized in the production of long blades. According to the current hypotheses, these blades may have been produced for the processing of game killed in the surrounding area. At the Buhot site, the production is similar but the better illustration of domestic tools and projectile points suggests a wider range of activities. The use-wear analysis of a large sample of lithic remains (1409 artefacts) selected amongst retouched and unmodified blanks, allows a better understanding of the site function. Despite appearances, this site could be a short-term occupation focused on the first phases of game processing. Even if other activities did take place at the site, they seem to be marginal as much by their representativeness, as by the blanks involved.

**Keywords:** Pleistocene-Holocene transition, use-wear analysis, flint artifacts, site function.

## 1. Introduction

Functional analysis of the sites attributed to the Pleistocene-Holocene transition in the North of France is scarce and limited to the understanding of the function of bruised blades (Fagnart and Plisson 1997). This analysis constitutes the first approach on a large sample of lithic artefacts allowing the reconstruction of past activities. This work falls within the framework of Ph.D. dissertation research, focusing on the use and management of flint implements, site function and socio-economic organization of hunter-gatherers during the Pleistocene-Holocene transition in North-western France. During this period, at c.10000 BP, in the Paris Basin, Northern France and Southern England, the record of human activities seems to be essentially related to specialized sites. Most of them are located near good raw material sources. They are characterized by: (1) long blade production, (2) a frequent deficit in long and regular blades suggesting a circulation of the blanks, (3) a scarcity of points and retouched tools, and (4) a presence of bruised blades, sometimes in large numbers. These sites are known as “belloisian sites”, “long blade” or “bruised blade” assemblages. They were first recognized as flint procurement and knapping sites from which long blades are generally taken away (Fagnart 1988; Bodu and Valentin 1992). However, the presence of fauna and activity areas on several sites suggests a more complicated situation. According to the current hypothesis, some belloisian sites could be short time settlements located “near both the kill sites and the good flint raw material sources” (Bodu et al. 2011, 247). At these camps, cutting tools may have been produced for the processing of game killed in the surrounding area (Valentin 2008; Bodu et al. 2011). The cultural identity of these functionally oriented sites is not clear due to the specialization of these sites and the scarcity of the cultural indicators. Belloisian sites are now considered as specialized Laborian/Epi-Laborian and Ahrensburgian/Epi-Ahrensburgian occupations (Valentin 2008; Fagnart 2009).

The techno-economical study shows that the Buhot site is dated to the Pleistocene-Holocene transition (Biard and Hinguant 2011). The technical and economical characteristics of the production is characteristic of the Belloisian production (good raw material, use of soft hammerstone, careful shaping of the blocs, production of long straight and regular blades, circulation of the blanks, and the presence of bruised blades) but this site differs on various levels. Contrary to Belloisian sites the bladelet

production is better represented. Indeed, at the Buhot site, bladelets and blades are produced in equal proportions. These products were produced and transformed into projectile points, which are well represented. Finally, the good representation of retouched tools suggests that a wide range of activities has been carried out. The Buhot constitutes one of the unique sites of the Pleistocene-Holocene transition on which "Belloisian like" long blade production is associated with a rich tool kit (projectile points and retouched tools). Therefore, it was considered as a potential residential site (Valentin 2008).

## 2. The Buhot site

The Buhot site is located in the Eure département in North-western France (Fig. 1). The open-air site was excavated ten years ago by M. Biard and S. Hinguant before highway roadwork (Biard and Hinguant 2011). Organic material is not preserved. A total of 5000 lithic artefacts were recovered. According to M. Biard and S. Hinguant, the distribution pattern of the lithic remains reveals the presence of two scatters, separated by a hearth (*ibid.*; Fig. 1). Although there has been a large number of refittings, few of them show connections between pieces from the two scatters. Therefore, it is hard to know if this site results from a single or a quick succession of human occupations (*ibid.*).

All flint varieties are local and available within a 5 km radius around the site. The aim of this flint production is to provide regular blades and bladelets. A non-quantified part of the blade production was taken away and at least 14 blades have been brought in to the site (*ibid.*).

The retouched tools are well-represented in comparison with the Belloisian sites. End scrapers ( $n=35$ ) and burins ( $n=20$ ) dominate the retouched tools. Amongst these retouched tools, only a part of the scrapers were made on regular blades. During the technological analysis several unmodified elements were identified as used elements. According to the size of the edge damage, and their distribution, some elements were qualified as bruised ( $nb=4$ ), splintered ( $nb=13$ ) or with used edges ( $nb=19$ ).

A total of 52 projectile points were found. The majority of them were made by oblique and concave truncation. These points are common in Epi-Arhensburgian sites such as Gramsbergen, Oudehaske in Northern Netherlands (Johansen and Stapert 1998), or in the long blade sites of Uxbrige (Lewis 1991) and Launde (Cooper 2006). It could indicate an affiliation with the Epi-Arhensburgian tradition (Biard and Hinguant 2011) as proposed by J.-P. Fagnart for the Belloisian sites of the Somme Valley in

Northern France (Fagnart 2009). Amongst the uncovered projectile points, there are two Malaurie points, which are usually found in Laborian contexts. This could indicate more southern influences (Biard and Hinguant 2011).

M. Biard and S. Hinguant considered the Buhot site as a short-term occupation because of the limited number of artefacts uncovered and the rather low structuration of the site (Biard and Hinguant 2011).

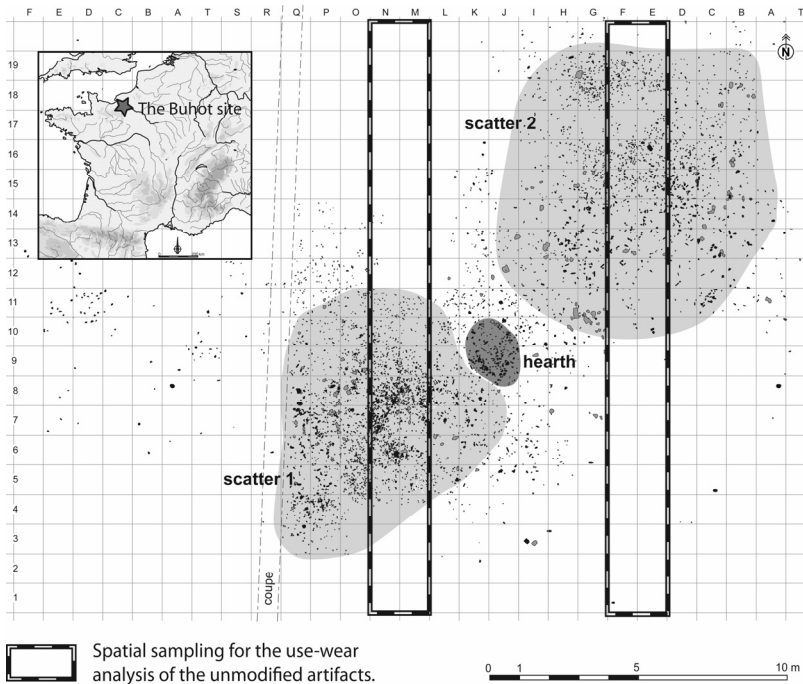


Fig. 1: Location of the Buhot site (CAD: L. Quesnel), distribution of the lithic artifact (Biard and Hinguant, 2011) and use-wear analysis sampling for unmodified elements.

### 3. Low use ratio

Functional analysis has been realized on 1409 pieces. All the retouched tools (n=85) and edge damage artefacts (n=35) identified during the technological study were examined. To avoid a subjective selection, all the unmodified blanks, except for the chips (n=1154), from a large spatial

sample (Fig. 1). Finally the sampling was completed by 135 pieces coming from the refitting process to understand the aim of the production and to look at the function of the blades brought on the site. The results of this additional sampling are limited and will not be detailed in this paper. Due to the lack of time and the need for unwieldy experimentations for each projectile type, projectile points have not yet been analyzed. Nevertheless, an experimental program focused on the functioning of late glacial projectile points will be set up soon. The present functional analysis used low and high magnifications according to the methodological protocols defined by S. A. Semenov (1964) and L. H. Keeley (1980). Post-depositional surface modifications are in most cases limited to a microscopic soil sheen and the presence of bright spots.

Within the entire sample, only 93 implements exhibit use traces. It represents 139 used zones (UZ). Amongst the 93 used elements, 31 are retouched tools, 33 were qualified as used during the technological analysis and only 29 were found on unmodified pieces during the use-wear analysis. Amongst the 1257 elements from the spatial sample (which included retouched tools and edge damage artefacts), only 29 elements show used traces (2.3%). A lot of regular blades do not exhibit any use-wear. Furthermore, various uses are frequent but different uses are hardly ever combined and recycling evidences are extremely rare. All these observations support the idea that the Buhot site was a short term occupation.

#### **4. Rather restricted activities**

Regarding the number of UZ within the entire sample, butchery (44 UZ) is the main activity. Long, straight, regular unmodified blades were used. The traces (Fig. 2, a, b) are located along the distal or proximal half of the blank. This distribution could indicate the importance of the extremity during use. These long blades could have been very efficient in such tasks. These tools may have been easily held during tasks that require a lot of strength, such as dismemberment. Hide working (22 UZ) has been observed on 14 end scrapers and 6 unmodified implements. Skin processing is almost limited to a scraping motion. Only 4 UZ on unmodified edges are attributed to cutting motion. The states of the hide are principally wet or fresh (Fig. 2, c, d) but 4 end scrapers exhibit extensive edge rounding with matt polish and craters in them and are attributed to dry hide scraping. The scarcity of the cutting motion and the clear dominance of wet or fresh hide scraping suggest that in the Buhot site, hide working tools are mainly involved in the first phases of the

technical process. At the Buhot site, 32 pieces display edge damages attributed to a percussive motion. Bruised edges occur on irregular blades or crests, sometimes on large flakes. These pieces are associated with the earliest reduction of the cores (large flakes, crests, irregular blades). According to the distribution, cross-section, size and shape of the edge scarring and to the presence or absence of abrasion, striations, cracking or incipient cones along the edges it was possible to distinguish two main functions. Most tools are attributed to percussive motion on mineral material (Fig. 2, h). As proposed by H. Plisson and J.-P. Fagnart for the bruised artefacts of Belloisians sites in the Somme Valley, these tools, may have been used for maintaining the soft hammerstones (Fagnart and Plisson 1997). Nevertheless, contrary to bruised edges at these sites, this type of bruising at the Buhot site never exhibits rounding. The experimentations carried out suggest that bruised pieces may have been used for preparing core overhangs (Jacquier, in press, in progress). As in other contemporaneous sites (Surmely 2003; Naudinot 2010), many blade butts exhibit percussion traces predating the extractions of the blades (Fig. 2, l) and which could be evidence for the core's overhang preparation. Five bruised elements show different edge damages characterized by bending fractures (Fig. 2, g). These marks result from the percussion of hard organic material such as bone, antler or wood. No microwear was observed so it is difficult to define the worked material. Scraping unspecified bone material involves only 4 burins and a burin spall (used before the extraction). No cutting, boring or grooving was observed. The UZ represents the facets (Fig. 2, i). These tools may have been used for shaping or sharpening bone tools. The scraping and grooving of mineral material involve 5 elements. Traces are similar from tool to tool and indicate that the mineral was hard and abrasive (Fig. 2, j, k). No residue was observed. For the scraping motion, unmodified edges and blade butts were used. For the grooving motion, a natural point and the angle of a bending fracture were used. No production in mineral matter was found during the excavation. So it is difficult to know whether the scraping and grooving of mineral material was to transform a surface or to grind mineral material to a powder. Just one piece shows use traces clearly related to plant work. It is a burin used on the two facets. The distribution of the use marks indicates a negative rake cutting with the ventral face as a contact face (Fig. 2, e, f).

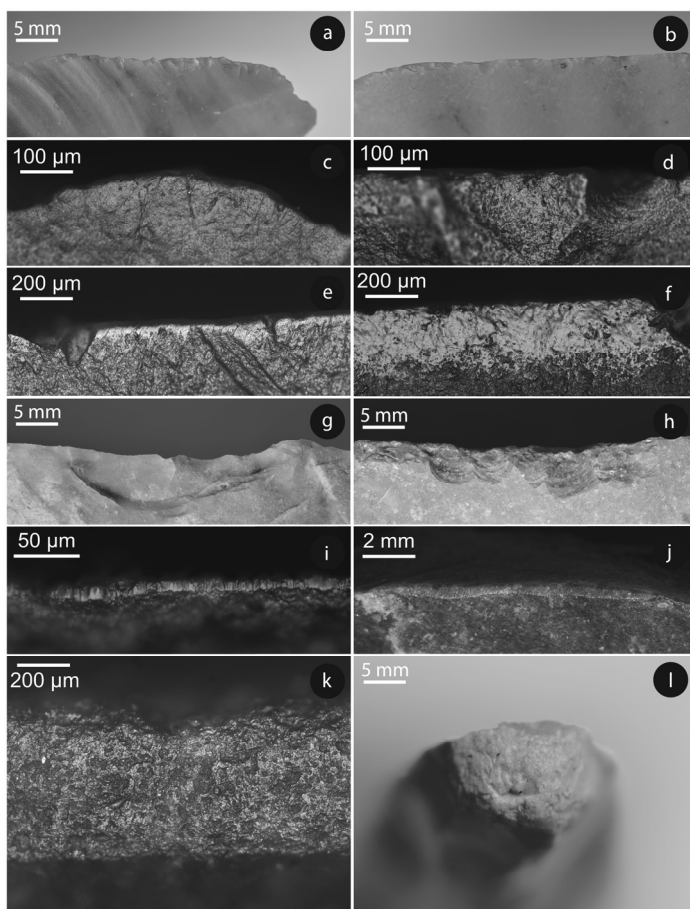


Fig. 2: Macro and micro-photographs.

[a] and [b]: macro-traces attributed to butchering activities (photograph [a] taken on blade n°1, fig. 3) ; [c] and [d]: taken on the front of scraper n°8, fig. 3, scraping wet/fresh hide. [c]: ventral face as a contact face and [d] retouched face as a leading surface, note the way the polish goes inside the depressions ; [e] and [f]: burin n°7 fig. 3, scraping plant. [e]: ventral face as a contact face. [f]: facet of the burin as a leading surface ; [g]: taken on blade n°5, fig. 3, percussion on hard organic material ; [h]: percussion on hard mineral material ; [i]: scraping bone material with a burin facet ; [j]: photograph taken on flake n°11, fig.3, bevel created in scraping hard abrasive mineral matter ; [k]: micro-wear observed on the macroscopic bevel on flake n°11 fig.3 ; [l]: blade butt with percussion traces indicating a preparation of the core overhang in a percussive motion.



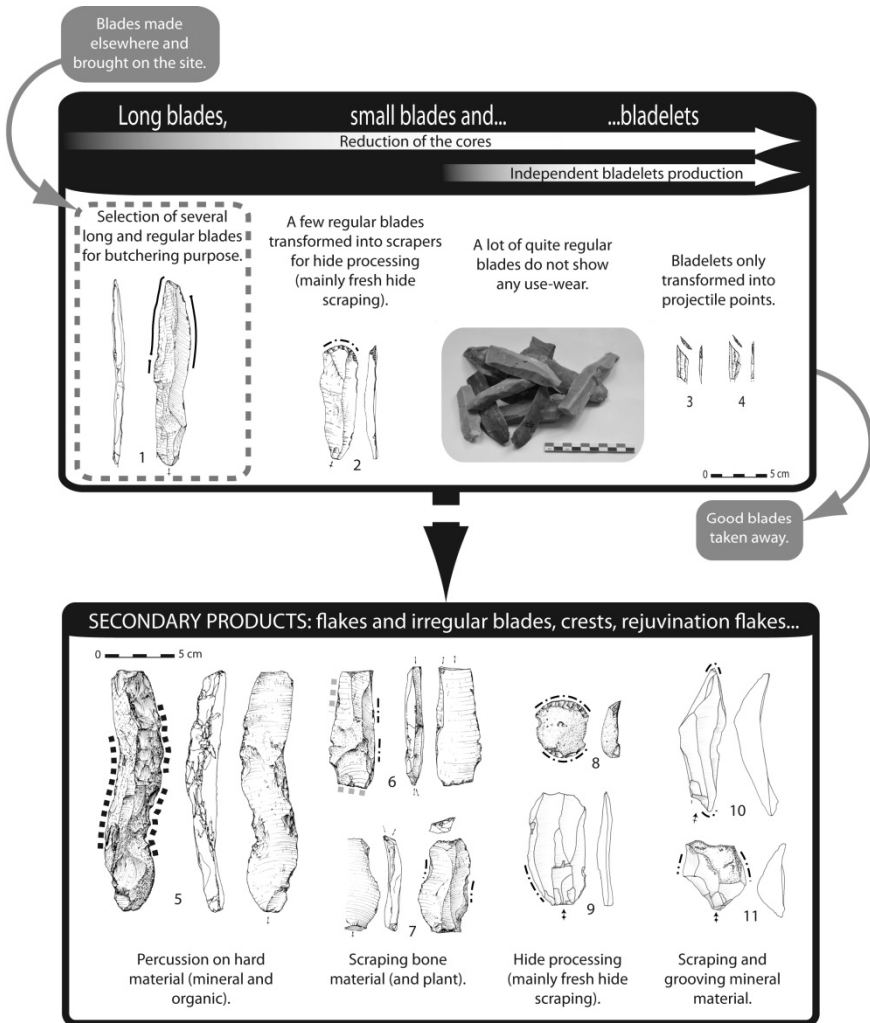


Fig. 3: A differential use according to the type of blanks (drawings 1 to 8, Biard and Hinguant, 2011).

### 5. And specialized blanks

The aim of the production is to provide straight and regular blades and bladelets. The production of blanks and especially the long blades is very

demanding and requires skilled craftsmen. Techno-functional analysis shows that amongst the blades produced at the site, the longest and more regular were used for butchering (Fig. 3). Imported blades seem to be used only for these tasks. Several regular blades produced at the site were also retouched into scrapers for skin processing. Amongst the full sample, no unmodified bladelets show use marks. So it seems that bladelets were transformed into projectile points. Bone material working, plant scraping, mineral scraping and grooving, percussion on mineral or hard organic material and the main part of the hide working tools were carried out with secondary products like flakes and irregular blades or even crests and rejuvenation flakes. The differential use of tools according to the type of blanks (Fig. 3) could indicate that, at this site, the first attempt of lithic production is to provide blanks for hunting and the first phases of game processing.

## 6. Conclusion

In such a background where most of the sites are considered as specialized occupations oriented toward the production of long blades for deferred uses, the good representation of tools and projectile points suggests the Buhot site to be a residential camp with diversified activities. However, this use-wear analysis shows that the Buhot site remains specialized in nature. The activities performed are rather limited and some of them seem to be only partially done at the site. The segmentation of the *chaîne opératoire* is particularly visible in hide processing and maybe in the bone working. The specialization of the site is perceptible through the specialization of the most demanding blanks in the butchering of game. The low ratio of used artefacts and the scarcity of multiple uses and recycling suggest that this site was occupied for only a short duration. The Buhot site could be interpreted as a short term occupation related to the first phases of game processing and preparing for the hunt.

This work shows the importance of use wear study to the interpretation of site function and the risk incurred in using typological arguments for such a question.

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## CHAPTER TWO

# USE-WEAR CHARACTERIZATION THROUGH CONFOCAL LASER MICROSCOPY: THE CASE OF WILD VS DOMESTIC CEREAL HARVESTING POLISH

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### **Abstract**

Many problems have arisen over the description and characterization of polished surfaces, which are described in terms of visual appearance. As a contribution to solve this problem, we propose to measure use-wear polish through confocal laser microscopy. This technique is used to discriminate between wild vs. domestic cereal harvesting polish. Wild cereals must be harvested before the complete maturation of the plant, while domestic cereals are harvested ripe. This difference in the degree in humidity when harvesting provokes differences in the characteristics of the use-wear polish. Achieving this discrimination is important to

understand the process of cereal domestication in the Near East. The discriminant function which distinguishes both types of use-wear polishes is used to classify four archaeological sickle elements from Late PPNB, Middle PPNB, PPNA and Natufian archaeological levels.

**Keywords:** Neolithic, agriculture, cereal harvesting, Natufian, PPNA, PPNB, Near East.

## 1. Introduction

Visual characterization allows a first approach to the characteristics of harvesting polish. However, many problems have arisen over the description and characterization of polished surfaces, which are described in terms of visual appearance (Vaughan 1985, 29; Mansur-Franchomme 1983b, 223). As they are not expressed in a quantitative form, the criteria for the identification of different polishes present a certain level of subjectivity, which thus has an effect on the level of reliability of the interpretations. The need to quantify use polish was evident to the first use-wear researchers (Keeley 1980, 62-63). Different methods have previously been used to attempt a quantification of use-wear polish, such as interferometry (Dumont 1982), image analysis (Grace et al. 1987; Vila and Gallart 1993; González Urquijo and Ibáñez 2003) or atomic force microscopy (Kimball et al. 1995). During the last decade laser confocal microscopy has proved to be an accurate and easy-to-use technique for use-wear quantification (Evans and Donahue 2008; Stevens et al. 2010; Evans and Macdonald 2011).

This paper contributes to the topic of use-wear quantification. We use confocal laser microscopy in order to quantitatively discriminate wild vs. domestic harvesting use-wear polish. This discrimination is important in order to shed light on the process of cereal domestication. The invention of agriculture is one of the most important cultural achievements of humankind. In the Near East, the last hunter-gatherers began to make their first agricultural experiments in the tenth millennium BC, domesticating several species of cereals and legumes. Growing wild cereals led to their domestication through the selection of traits in what is known as the domestication syndrome (Brown et al. 2009).

We are aware that harvesting with sickles played a major role in cereal domestication. Harvesting would have caused the progressive unconscious selection of mutant individuals among the population of wild cereals leading to domestication (Hillman and Davis 1999). Wild cereals must be harvested before the complete maturation of the plant to avoid the loss of grain because of the fragile characteristics of the basal rachis of the seeds.