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ORIGINAL PAPER

Why does (archaeological) micromorphology have such little traction in (geo)archaeology?

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Abstract Archaeological deposits are often complex and illustrative of an intricate interplay between geogenic and anthropogenic inputs and formation processes. Even for those archaeologists—particularly prehistorians—who consider the basic principles of natural stratigraphy to excavate their sites, they nonetheless typically underutilize the observations and data available at the microstratigraphic level. The technique of soil micromorphology—or archaeological micromorphology as referred to throughout this paper—has seen an astounding increase in its use to answer archaeological questions and archaeological sediments in the last decades. However, we consider that this tool is still quite underutilized and not as mainstream as other techniques. In this paper, we briefly reflect on what can be some of the causes underlying this situation and how we (that is, both *producers* and *consumers* of micromorphology data) can go about to change it. The main idea is that we need to establish a better and more approachable way to present micromorphological results and be better at integrating them with the macroscopic archaeological data and research questions.

Keywords Micromorphology · Geoarchaeology · Site formation · Archaeological sediments · Soils

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Introduction

Micromorphology (the study of soils, sediments, and archaeological features and materials in thin section) is not new. In the field of pedology (read, *Soil* Micromorphology), it was adopted by Kubiëna to study soils more than 70 years ago (Kubiëna 1938) and even until the late 1960s and 1970s, it was slow to catch on in that discipline. After then, its use flourished and numerous conferences were held (e.g., International Working Group of Soil Micromorphology, see Macphail 2013b), resulting in a substantial rise of publications in conference proceedings (Bullock and Murphy 1983; Delgado 1978; Douglas 1990; Fedoroff et al. 1987; Ringrose-Voase and Humphreys 1994; Rutherford 1974) and journal articles, many in soil journals (e.g., *CATENA*, *Geoderma*, and *Science du Sol/Pédologie/J. of Soil Science*—now *European Journal of Soil Science*), as well as those dealing with geology and quaternary studies—*Quaternaire* (*AFEQ—Bulletin de l'Association Française pour l'Etude du Quaternaire*), *Quaternary International*, *Quaternary Science Reviews*, *Journal Quaternary Science*, *Geoarchaeology*, *Journal of Archaeological Science*. Interestingly, much of the research is concentrated in the Old World. Moreover, most of these early studies concentrated on soils, their genesis, description, and relationship to landscapes and soil properties.

The application of micromorphology to archaeology essentially dates to the 1950s with Cornwall's prescient *Soils for the*

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Archaeologist (Cornwall (1958); see also Macphail (2013a). At about this same time, the first major journal paper was published by Dalrymple (1958) who employed the technique to distinguish natural soils from anthropogenic deposits. It was not until about two decades later (late 1970s/early 1980s) that some publications begin to appear, focusing on micromorphology within an archaeological or geoarchaeological context (Courty and Fedoroff 1982; Goldberg 1979a; Goldberg 1979b; Goldberg 1979c; Goldberg 1980; Goldberg 1983; Macphail 1983). These studies had a broad target and temporal scope: from Pleistocene geogenic and anthropogenic prehistoric cave deposits to Holocene anthropogenic deposits and their natural post-depositional decay.

Since that time—~35 years ago—the number of geoarchaeologically related micromorphological studies has mushroomed considerably, and, as of this writing, publications have become much more widespread to include monographs, dissertations, and site reports. Nowadays, researchers doing the micromorphology on projects commonly represent integral parts of the research teams. Moreover, archaeological issues form a much larger—if not dominant—proportion at the International Working Meetings on Soil Micromorphology, and international workshops on archaeological soil micromorphology, short courses, occur annually throughout the globe, recently taking place with the biannual Developing International Geoarchaeology meetings, the latest being held in June 2015 (http://www.developinginternationalgeoarchaeology.org/first.html). This shift of emphasis is elaborated below.

Yet, despite this really enthusiastic growth of the discipline and its strategies, we still think that micromorphology is way underutilized as a tool in archaeology, especially when compared to any of the other aspects of archaeology (e.g., studies of ceramics, lithics, bones, metals, and botanic remains). Why is that, and why has it been so slow to catch on given the 35 years that it has appeared in the realm of geoarchaeology? This question becomes even stronger when one goes to a large archaeology meeting and sees the number of sites that are being excavated throughout the world in any given year, and comparatively, how little micromorphology (let alone geoarchaeology) has been carried out on them. The same parallel complaint can be lodged against the dearth of geoarchaeologists participating in archaeological projects (Goldberg 2008), as well as the overall lack of incorporating geoarchaeological issues into an entire project from its inception. Though relevant, these issues and their possible cause(s) deserve a paper of their own. Instead, here, we would like to informally discuss some ideas about the reasons for the underutilization of micromorphology in archaeology and furnish some approaches on how to improve this situation. We will not go into details about specific results and applications, though we do provide below some basics on micromorphology principles and its approach. The reader is directed to the numerous books and many articles on the subject (Bullock and Murphy 1983; Courty et al. 1989; Douglas 1990; Fedoroff et al. 1987; Goldberg 1980; Macphail et al. 1990; Murphy 1986; Ringrose-Voase and Humphreys 1994; Stoops 2003; Stoops 2014; Stoops et al. 2010) that illustrate how the technique works and what it can offer.

Some micromorphology basics

As briefly mentioned above, micromorphology employs thin sections made from undisturbed blocks of soil/sediment collected in the field (Courty et al. 1989) (Fig. 1). The underlying strategy of micromorphology is that it uses intact samples of these materials and thus, the association, internal geometry, and micro-context of all components (minerals, bones, ceramics, etc.) are conserved within the sample (Courty et al. 1989; Goldberg 1980; Goldberg and Berna 2010; Goldberg and Macphail 2006; Macphail et al. 1990). Thus, for example, it is possible to distinguish between original depositional aspects of the sediment—grain size/shape/composition, bedding, or coating of grains as in a mudflow—from post-depositional ones associated with diagenesis, as for example, carbonate precipitation/dissolution or phosphatic transformations of the deposits. In addition, features related to large and small-scale human activities (e.g., trampling, sweeping, stabling, agriculture/manuring, and construction) are also discernible in thin section (for example, Angelucci et al. (2009); Courty et al. (1989); Goldberg and Macphail (2006); Miller et al. (2010); Wattez et al. (1990)).

The list of applications of the technique in (geo)archaeology, while not endless, has grown over the last two decades. Likewise, during this period, the scope of micromorphology has broadened significantly from the original practice of observation with the petrographic microscope to its combined use with other “in situ” analytical techniques at the microcontextual level, including Fourier transform infrared spectrometry (FTIR), micro-FTIR, SEM/EDAX, micro-XRF, and magnetic susceptibility (Babel 1975; Berna et al. 2007; Berna et al. 2012; Canti 2003; Canti 1998; Courty 2001; Courty et al. 2012; Courty and Roux 1995; Crowther 1996; Friesem et al. 2011; Friesem et al. 2014; Goldberg and Macphail 2006; Karkanas and Goldberg 2008; Karkanas et al. 1999; Karkanas and Van de Moortel 2014; Macphail and Crowther 2007; Macphail et al. 2003; Macphail and Goldberg 1995; Macphail and Goldberg 2010; Mentzer 2014; Mentzer and Quade 2012; Schiegl et al. 2003; Schiegl et al. 2004; Shahack-Gross et al. 2005; Shahack-Gross et al. 2014; Shahack-Gross et al. 2004; Shillito et al. 2014). Thus, with this multi-analytical strategy, it is possible to observe, locate, and analyze an individual grain within a thin section and make statements about its mineralogical composition, whether it was heated (or not) and to what range of

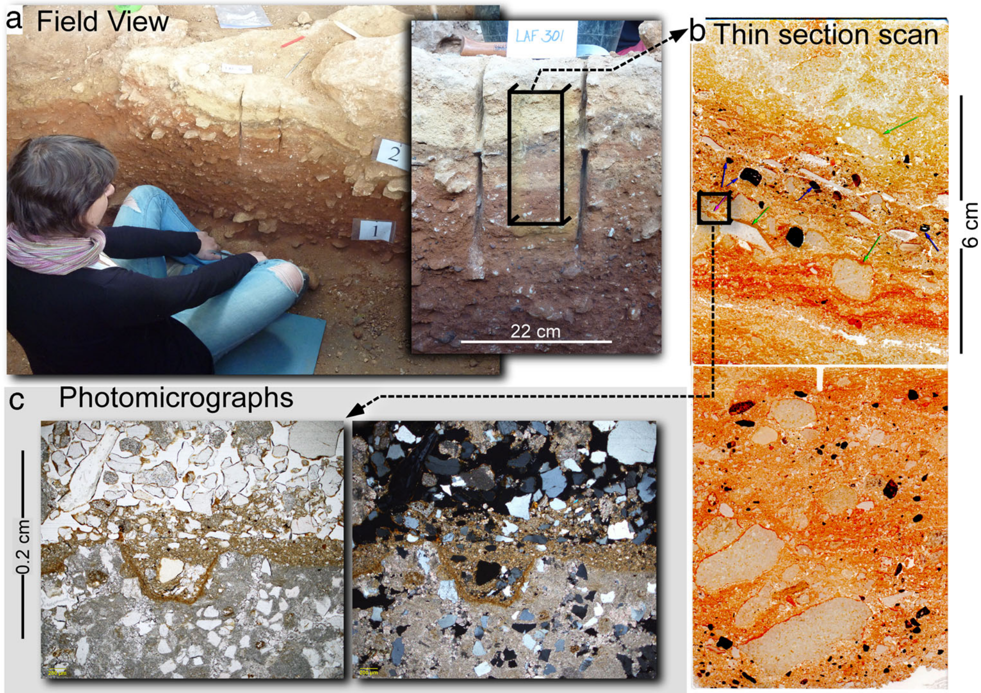

Fig. 1 Micromorphology strategies and views, from field to microscope. **a** Field view, Middle Paleolithic deposits at La Ferrassie, Dordogne, France. The *vertical cuts* in the profile mark the location of a micromorphology sample about to be removed. Detail of the sample location is shown to the right (*rectangle inset*). Shown here are angular rock fragments in red clayey sand at the base, overlain by a centimeter-thick light brown charcoal—and bone-rich layer, which in turn is capped by white, chalky solifluction deposits. **b** Thin section scans made on a flatbed scanner in plane-polarized light (PPL) (see also Figs. 2, 3, and 4). Note the cappings (see Stoops (2003), for details) of fine silt and clay on top of the larger millimeter-sized limestone clasts (*green arrows*); these are produced by freeze-thaw (van Vliet-Lanoë 1985) and likely tied to the onset of MIS4 (Guérin et al. 2015). *Blue arrows* point to burned bones found within the light brown band visible in the field. **c** Area within *rectangle* of **b** is enlarged as two photomicrographs that show calcareous silty clay capping on clast of quartz-rich limestone at left in PPL and at right in cross-polarized light (XPL). Note the general similarity of the loose quartz grains (*upper half of photo*) with those in the limestone

temperatures, and ultimately infer something about its origin and history—whether it is geogenic or anthropogenic.

Issues

So, whereas the technique is not rocket science, why is micromorphology not used more extensively? There are probably many reasons for this, and they may be more complex than those outlined here. However, we think the main issues fall into two broad groups: those involving the producers of micromorphological reports/data/analyses, and those of the consumers: archaeologists, geoscientists, the scientific public, or in the case of Cultural Resource Management, the funders of the projects.

Producers

One of the principal issues with micromorphological documents is that the data are difficult to make sense of, at least as they are typically presented.

(a) At the outset, it should be noted that historically, most systems of micromorphological description are geared towards pedology, as can be seen in the major volumes that form the basis for micromorphological descriptions: (Brewer 1976; Bullock et al. 1985; Stoops 2003). These texts, just as in sedimentology (e.g., (Boggs 2009; Tucker 2001)), deliver the essential descriptive terminology—a lingua franca—that is required for communicating to others what is in the thin section; without such infrastructure we all would be adrift.

On the other hand, archaeological sediments are typically not soils, although they may be part of a soil or have soil clasts as constituents. Archaeological sediments can also exhibit a number of components that are not found in typical soils (e.g., bones, ceramics, metals, building materials, coprolites, and sea shells), but their size and shape can nevertheless be described quite adequately with Stoops' invaluable guide (Stoops 2003). Moreover, archaeological deposits are internally quite heterogeneous and exhibit a great deal of variability within a given thin section. So, one wonders if the routine or "programmed" use of the above texts is the best strategy to *describe* them as if they were soils. Bones, shells, and coprolites are really part of the coarse fraction of an archaeological deposit and not really "pedofeatures." A better approach is to describe and *illustrate* the centimeter to millimeter-thick "lithological" units within a slide as a *microfacies* in the sense of Flügel (2009) (see also discussions in Goldberg and Macphail (2006); Goldberg et al. (2009)). According to Flügel, "*...microfacies is regarded as the total of all sedimentological and paleontological data which can be described and classified* **from thin sections**, *peels*, *polished slabs or rock samples*" (his italics; our normal and bold font) (Flügel 2009):1). This definition contrasts with "microfacies" as used by Courty (2001), who adopted the term from the facies concept in geology, in which bodies of sediments or rocks are viewed in *descriptive* terms of their lithology, texture, structure, without the notion of genetic interpretation. In both cases, nonetheless, the goal of defining microfacies in the field and in the microscope is to understand lateral and vertical lithological variations resulting from different natural and human activities in different parts of the site.

As we discuss below, a set of properly chosen photograph(s) or thin section scans can obviate the need for recording data in the form of extensive, tedious, and time-consuming descriptions; these data are captured in the photograph anyway (Figs. 1 and 2). Although we realize that the technique has been historically defined as "soil micromorphology," viewed in the light of the above, a more appropriate term might be "archaeological micromorphology," a term that has been used by Mentzer and Quade (2012) or alternatively "archaeological soil micromorphology" as used in Macphail (2013a). Unfortunately, however, "archaeological micromorphology" does not appear to have been adopted in many publications since then.

(b) Many published articles commonly include dense (and tedious) descriptions of the micromorphological data. Whereas they are of course essential in offering readers the ability to understand what is in the thin sections, such data might more readily be placed in an appendix as basic descriptive attributes. A more user-friendly approach would be to discuss and summarize in the body of the text *only* those micromorphological features that are important in the interpretation of the thin sections under study. At the same time, the author(s) should illustrate these features with well-chosen photographs that have informative and didactic captions (this point is elaborated below). In fact, such an approach is standard operating procedure in sedimentary petrology articles but not those in micromorphology.

(c) It is also a relatively common practice to provide summary tables in which the vertical distribution of certain micromorphological features, such as clay coatings in voids, burned bone, phytoliths, etc., are given symbols (e.g., −, +. ++, and +++) in order to indicate their presence or relative abundance (Table 1). In fact, such tables are really difficult to follow, and they do not provide a readily comprehensible view of the essential micromorphological characteristics of the samples. Moreover, it can be debated whether relative amounts of the components as portrayed in this way are accurately informative, diagnostic, or are eventually interpretable. Not

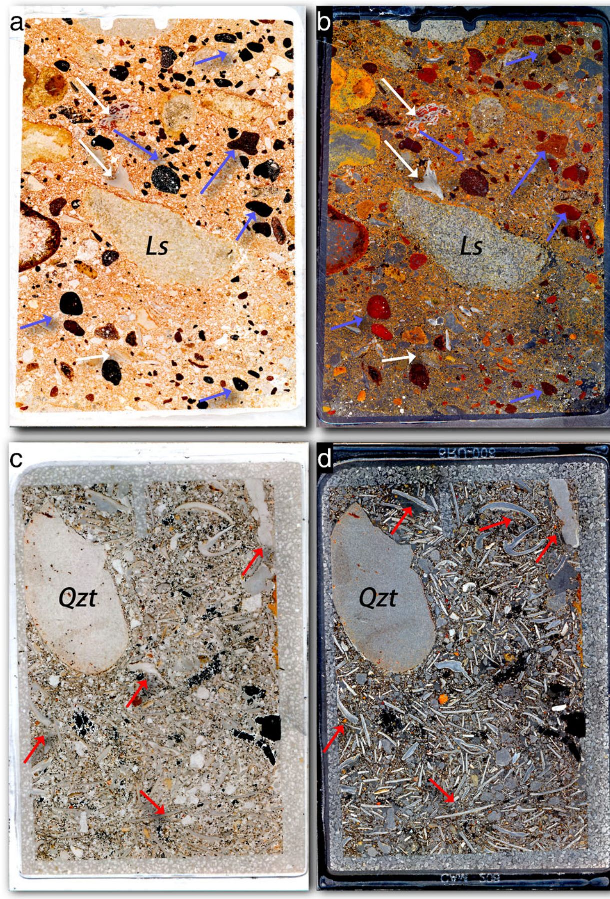

Fig. 2 Flatbed high-resolution thin section scans both in plane-polarized light (PPL, *left*) and in "dark field" view (*right*). *Top row* from basal water deposits at the entrance of the Middle and Upper Paleolithic site of La Ferrassie (Dordogne, France), which were deposited by a small stream passing at the front of the cave. **a** Crudely bedded reddish silty sand with clast of limestone (*Ls*), angular and rounded iron pisolites (*blue arrows*), and bone fragments (*white arrows*). **b** Same thin section as **a** but scanned without the scanner cover. This "dark field" view highlights the contrast, emphasizing here the iron-rich nature of the pisolites and secondary iron precipitated around the edges of the grains, which provide the overall reddish color of the deposits. *Lower row*: Anthropogenic shellmound of Cabeço da Amoreira (Muge, Portugal). **c** Thin section scan with large, centimeter-sized quartzite pebble (*Qzt*), charcoals (*black*), and abundant shell fragments (*red arrows*). **d** Same as in **c** but in a dark field view. Note the contrast given to the calcium carbonate content of the shell fragments, helping in their visualization and mesoscale observation of their haphazard orientation patterns. These criteria (along with others not presented here) lead to the interpretation of these sediments as a dumped deposit—for details, see Aldeias and Bicho (2016)

Table 1 Hypothetical data set showing relative abundance of micromorphological attributes as indicated by the number of the asterisks

Samp. no.	Strat. unit	Structure[a]		Coarse mineral components						
		Porosity and micro-structure	Coarse/fine related distribution	Bone	Quartz sand	Feldspar	Coprolites	Volcanic glass	Phytoliths	Ash
1	A	Vughs	Porphyric	*	***	*	–	–	**	***
2	B	Granular	Monic	–	**	**	*	***	*	–
3	C	Channels with vughs	Enaulic	–	***	–	–	–	***	–
4	D	Vesicular	Porphyric	***	***	*	***	–	–	***
5	E	Channel	Porphyric	**	**	*	*	–	*	*
6	F	Vughs	Chitonic	*	****	–	–	**	–	–
7	G	Angular blocky	Gefuric	***	*	–	***	–	**	***

"–" indicates absence of that component

[a] See Stoops (2003) for definitions of terms

uncommonly, the presence/absence of a feature, mineral, or object, is just as (or more) important than how much of it is there. For example, at the site of Contrebandiers Cave (Morocco), the presence of terrestrial fish bones and coprolite grains in what was originally marine shell-rich deposits clearly shows that these subaerial sediments accumulated after the retreat of the high Eemian sea level stand, information which was not visible from field evidence alone (Fig. 3).

(d) Photomicrographs: many of the published photomicrographs are simply not revealing or informative. This statement embraces both the content of the photos and their captions. For example, a photomicrograph of a single bone in a sandy silt matrix with a field of view of, say, 200 μm is generally not very exhilarating or enlightening, especially if the caption reads something like "bone fragment from Layer OBY 1B." This condition could be improved significantly by taking a photo at a lower magnification to include the overall sedimentary or pedologic context of the bone, *or* by informing the reader in the caption why the presence of this bone—and any of its characteristics (e.g., secondary mineralogical transformation, or partial dissolution)—is important for interpreting the thin section and its role in the study as a whole.

(e) The above leads to two points. One is that captions in general are generally too succinct and not very informative. We have to realize that in (archaeological) micromorphology, the data *are* the photographs and not simply tables of stars with accompanying descriptive and wordy text. Consequently, not only should there be as many photographs in a micromorphological study as needed to demonstrate the results, but the captions should give the "full Monty": what specifically is the reader looking at here—with specific object or features highlighted by arrows—and what does this photograph tell us about the overall story that the author is trying to convey? In other words, the writer should effectively lead the reader by the nose and point out specific features that led to interpretation of the thin section and how this interpretation fits into the entire story of the study. Contrarily, microphotographs without detailed and didactic text captions are essentially incomplete, at best.

(f) Related to the photographic presentation of the data is the comparatively infrequent practice of including scanned thin sections, although their appearance in articles is clearly on the increase (e.g., Karkanas and Van de Moortel (2014)). These scans (Figs. 1, 2, 3, and 4) can be made on a good quality flatbed scanner by placing the thin section face up on the glass (see also Arpin et al. (2002)). In addition and more recently, we have begun to scan the thin sections face down on the glass and leaving the cover open. This technique (that here we are calling "dark field") produces a high-contrast view of the components in the section against a black background and emphasizes aspects of the section that are highly reflective, such as calcite and iron (Fig. 2); it provides a different aspect of the thin section in addition to those furnished in PPL, XPL, and OIL illuminations and can readily help in interpretation.

In any case, these scans provide a mesoscopic view of the components of the deposit and their geometric interrelationships (Fig. 4). They constitute a visual transition from field observations to those made at successively higher magnifications with stereo and petrographic microscopes (Courty et al. 1989), and thus, they furnish a wealth of data that are missed when using only the petrographic microscope at higher magnifications. Commonly, while working with the petrographic microscope at magnifications of only ×20, one can readily become "lost in the woods," and as such, it is difficult to see the larger

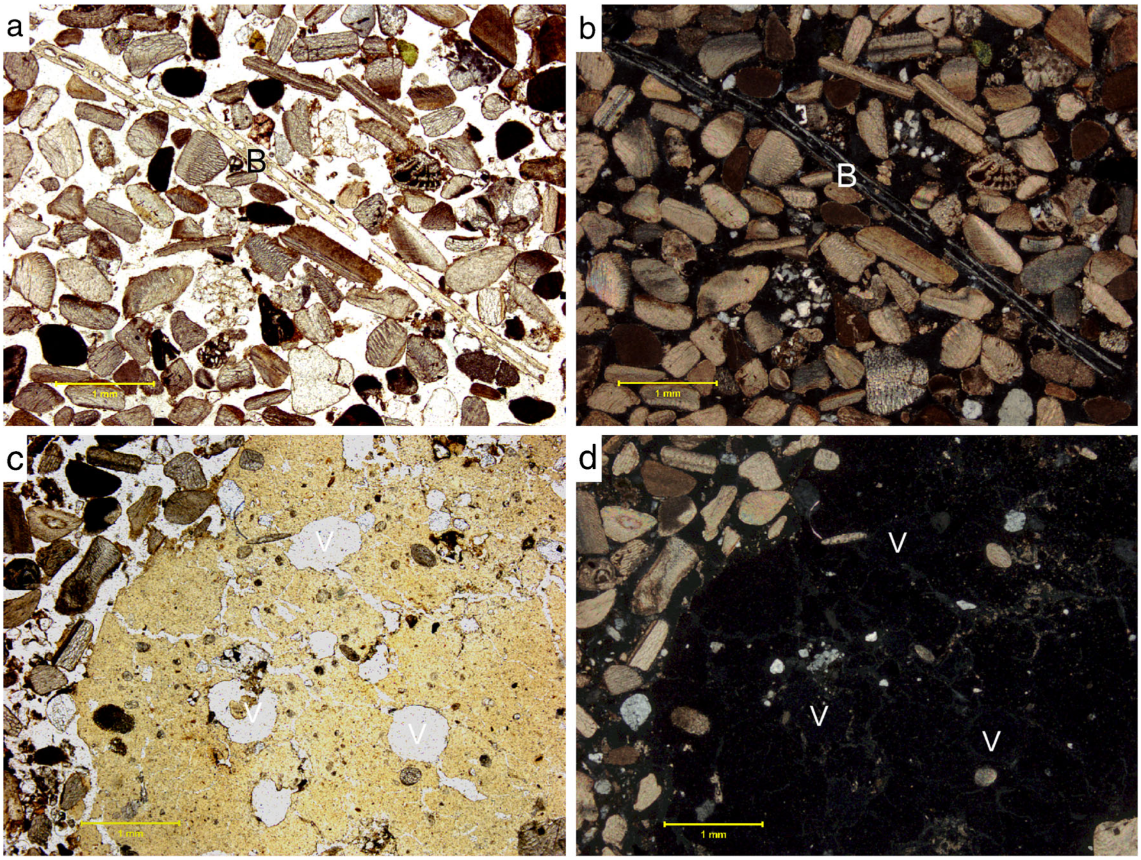

Fig. 3 Photomicrographs from the basal layer at Contrebandiers Cave (Morocco) with the incorporation of terrestrial elements into the marine beach facies. The point here is that the presence of continental (i.e., terrestrial) materials in what was thought to be a marine deposit shows that the sea had already retreated from this position at this time, an aspect not previously known or demonstrated. **a** View of the rounded shell-rich sands with a large bone (*B*). **b** Same as **a** but in XPL. **c** Large, well-preserved yellow hyena (?) coprolite with common vesicles (*V*), which also show that the accumulation of these sediments post-dates the marine depositional event, (PPL). **d** Same as **c** but in XPL where we can see the isotropic, phosphatic nature of the coprolite. The *scale bar* in all the images is 1 mm

overall view of the internal content that a high quality, high-resolution scan can provide. Our experience is that in scans made at resolutions of say, 1200–2400 dpi, many micromorphological components and features are plainly visible on the computer screen: it is possible to zoom in on places in the image up to ×400 natural size before they become pixelated. Of course, it is not possible to undertake determinative mineralogy with such scans, but their use supplies a powerful strategy when used in conjunction with the petrographic microscope. In addition, thin section scans are also useful for teaching and collaborations with colleagues, especially when a microscope is not available.

(g) What also seems startling is the not uncommon absence or lack of field photographs in micromorphological (and geoarchaeological) papers. Such photos should include general views of the landscape, the site and profile within its setting, as well as those showing the locations of micromorphological samples, replete with scale and labels. To some extent, a micromorphological examination is just part of the story, and it needs to be integrated with the larger, mesoscopic level of field observations (e.g., geometry/dip of a stratigraphic level, or its association with archaeological features and objects), and ultimately, related to what is happening at the level of the landscape (climate, erosion, or major landscape depositional events in the environs of the site) (for just a few examples, see Aldeias et al. (2014); Courty et al. (1989); Karkanas and Goldberg (2010); Mallol (2006); Zaidner et al. (2014)). Thus, field images are essential—the sine qua non—of a good paper because they supply the indispensable context of the micromorphology samples. The reader has to be able to judge independently whether the presented micromorphological interpretations are congruent with the overall and specific field contexts. It can be noted, that the lack of field photographs is not just in micromorphological studies but is lacking in geoarchaeology papers as well. Manuscripts that are concerned with geoarchaeological changes of occupation in landscapes, for example, and those illustrating living floors based on piece-plotted artifacts definitely need to include field photographs to provide context.

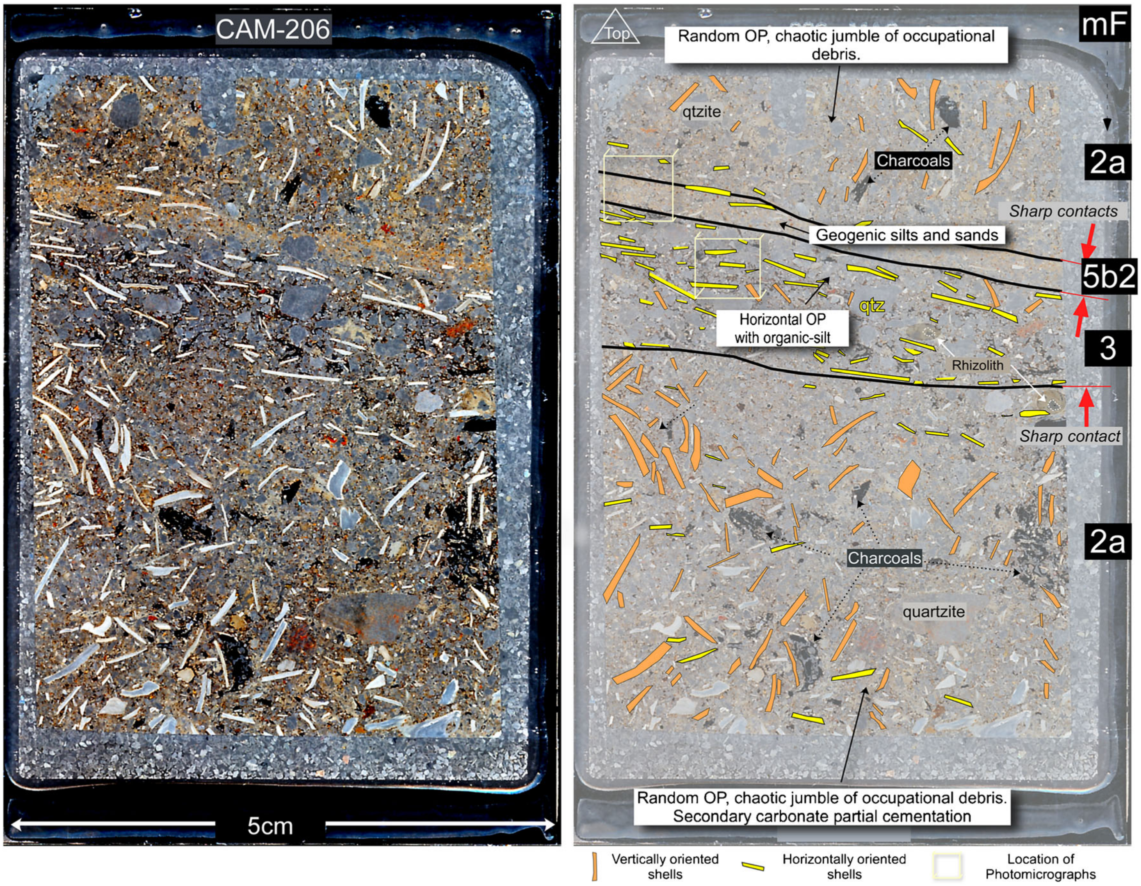

Fig. 4 Example of mesoscale level of observations using the concept of microfacies and their geometric association. *Left*: Dark field thin section scan from a Mesolithic shell midden in Portugal. Here, we can see the superposition of slightly distinct layers of shell-rich silts and sands. *Right*: Same image but in this case, the main components, shell orientation patterns, and microstratigraphic contacts are annotated in the thin section, in addition to the associated microfacies types (mF) at the right (see Aldeias and Bicho (2016) for details)

(h) Micromorphologists need to be pro-active in promoting the discipline to their colleagues, who include archaeologists, earth scientists, geoarchaeologists, clients, and funding agencies. Not only should they publish more extensively in journals and media with scientific orientations but also—and especially—in archaeological venues in order to demonstrate the value of the approach. The brilliant paper by Sherwood and Kidder (2011) on the geoarchaeology of mounds takes just this approach. An additional option is to encourage more "outsiders" to attend workshops on soil micromorphology, which would not only demystify the technique but help create dialog among producers and consumers (see below).

Consumers

Probably the overarching issue with consumers is that they are unfamiliar with micromorphology, both what it can do and, equally, what it cannot do. In fact, this issue is prevalent within the field of geoarchaeology as a whole (Goldberg 2008) and is a subject of a separate but similar paper. One workaround to increase consumers' familiarity is to have a lecture or laboratory section on micromorphology in an introductory archaeology course, and it should be a required item in an archaeological science class, especially at the undergraduate level. In any case, for post-graduate archaeology students, it should be part of their core curriculum, within perhaps a required course in geoarchaeology. Unfortunately, such courses are missing in many departments, in part due to the simple fact that we have not yet trained enough geoarchaeologists.

On the other hand, and in light of comments in the preceding producer section, *producers* need to be aware of this lack of acquaintance when they write reports (Goldberg and Macphail 2006) and articles. Studies that include micromorphology should (a) be written in a clear way with minimal jargon; (b) highlight the important micromorphological features and what they mean; (c) provide clear, informative visual data (i.e., individual or combined photos, graphics, videos); (d) relate the results to the problem at hand; and (e) keep details of descriptive data to a minimum or shunt them to an appendix where they can be perused if need be. Again, most people (whether bureaucrats, researchers, students, etc.) do not care about the c/f ratio of a sample, how much glauconite is present, or the size/shape of post-depositional calcite crystals, but rather what the overall results are and what they mean in terms of the project at hand. For complicated situations where micromorphological terms and descriptions are needed, it might be fruitful to provide a glossary of the most frequent terms used in the report or paper that could be summarized from Stoops (2003), for example.

On the other hand, it would be agreeable if consumers could communicate more frequently with the producers. Such a dynamic dialog would help people at both ends of the spectrum by bringing up additional issues or questions that could be checked in thin section by the micromorphologist, and likewise, provide ideas to the archaeologist for generating new data or rethinking old data. This last bit is perhaps wishful thinking, since micromorphology is not a widely taught subject, and hardly so in the New World. But in any case, both parties should continually remind themselves of the bigger (geo)archaeological issues and how micromorphology can help to clarify or resolve them.

Concluding comments

Micromorphology in archaeology has really come a long way in the past 35–40 years and it has contributed significantly to a number of important topics. Such topics include how sites form, how and when humans used fire, the domestication of animals, and human-landscape interactions, just to name a few. Moreover, results of micromorphological studies have elucidated and demonstrated that archaeological sediments—which are the direct or indirect result of human activities and behaviors—need to be considered as fundamental parts of the archaeological record, on par with the more traditional toolkits for studying past human history, such as ceramics, architecture, lithics, fauna, etc. Nevertheless, as pointed out at the beginning of this paper, archaeological micromorphology still remains a largely underutilized tool in the study of history.

Along these lines, we should all remind ourselves that micromorphology is not only an important tool in itself but it should be thought of representing a “first line of analytical defense.” In other words, it should be utilized—if nothing else—as an initial tool for just visualizing and understanding what is in the sample. It should serve as a guide for deciding on what other analytical tools should be employed—and which should not—before going to the effort and expense of doing them. As it has been pointed out a while ago (Courty et al. 1989), contemplating a grain-size analysis of deposit composed of a mixture of geogenic and anthropogenic components (e.g., sand, bone, ashes, charcoal,and char) should probably be reconsidered. On the other hand, the occurrence of red sand-sized pellets of silty clay (Goldberg et al. 2015) might be a significant feature and call for further analyses with μ-FTIR, for example, to determine their composition, and whether they have been heated and to what degree. The same reasoning can be applied to brownish bone fragments, including other analytical techniques that can then be used to see if they have been heated or are they simply stained with a post-depositional material such as iron, manganese, or organic matter.

Micromorphology is one among many methodologies in geoarchaeology but the focus in this paper is how to make it more widespread in (geo)archaeology (Macphail and Cruise 2001). In this regard, we have purposefully avoided a discussion of similar issues that plague geoarchaeology-archaeology interactions (see for example, Goldberg (2008). In this paper, we have tried to outline some of the reasons for the underutilization of archaeological micromorphology and have proposed some ways to improve the situation. No doubt, researchers from different fields—both archaeology and the geosciences—will not agree with us on all points, but we hope that we have at least put the message on the table for discussion, and with a bit of good fortune, some positive action. Our main thrust is to provide some guidelines for what should be done at a minimum, baseline level (e.g., full documentation of context and micromorphological results, mostly by using thoughtful, useful and instructive graphics: photographs, diagrams, and even videos). Without such improvements, micromorphology runs the risk of being flat lined with more of the same old. We think that *we* all can really do better.

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