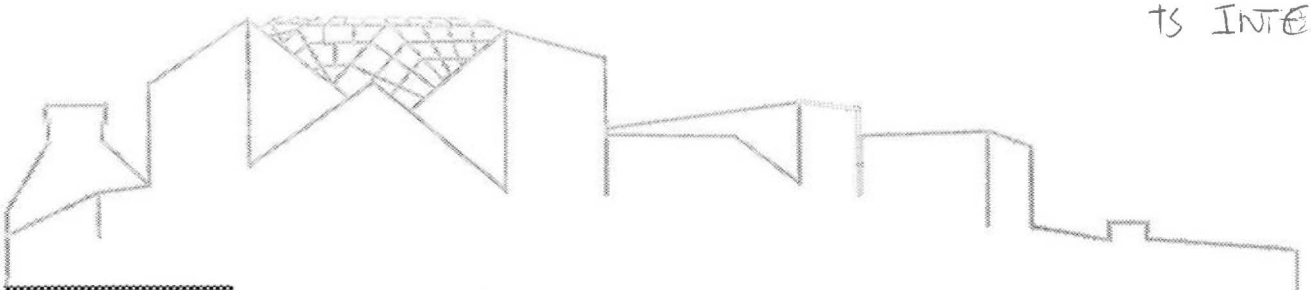

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EXAMINATION OF MEDIEVAL SOLES FOR TECHNOLOGICAL DATA

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Abstract
A random collection of soles was closely examined in order to discover the reason for the occasional occurrence of a small deviant hole in the sole/upper seam of medieval turnshoes. The data collected from the examination of the soles showed that one third exhibited a deviant hole and the placement of the hole was in a constant location, with out regard to size, or left and right orientation. With the aid of experimental archaeological methods the little hole could be understood as the clue to proper lasting techniques and was also the point at which the sole/upper seam was started and ended.

1 Introduction

Archaeological leather differs from other kinds of material such as ceramics or metal, because the complete understanding of the leather object requires knowledge of fabrication techniques in conjunction with identification of the parts of the object. For example, the remains of a ceramic or metal archaeological object can be worked on without detailed knowledge of its manufacture. A metals restorer does not need to know how to forge a knife blade in order to conserve and restore a knife, and a ceramics restorer can competently restore a vessel without ever having thrown a pot on a kick wheel. But with leather finds, most of which consist of shoes, pieces may be fragmented or missing, and the best clue to the shape and function may be the stitching holes (Goubitz 1984). Lack of familiarity with the many techniques of stitching used can lead to misinterpretation of the object, or complete dismissal of its importance.

This paper is concerned with only one aspect of medieval sewing technology. The sewing of the sole to upper and specifically, the reason for the appearance of a small hole between the normal length of a stitch.
The initial observation of the little deviant hole was noted on the registration of a sole and upper of a medieval shoe from the site of St. Martin, in Vevey, Switzerland. No explanation for its function could be devised at that time. During a practicum with O. Goubitz at the *Rijksdienst voor het Oudheidkundig Bodemonderzoek* (ROB) at Amersfoort in The Netherlands, a medieval sole, by chance, was examined and showed the same sort of deviant hole as the St. Martin turnshoe. The observed similarities prompted a rough working theory to be formulated and data gathered from a collection of turnshoe soles stored at the ROB.

Upper to sole seams of most types of archaeological shoes are hand sewn with two threaded boar bristles and awl. This stitch is incredibly durable because the two threads, one from each side of the seam, cross and form a knot inside the stitch hole. This crossing prevents the stitching from ever unraveling or weakening even when part of the threads are worn away.
The proof of the strength of this method of sewing can be seen on well worn hand stitched shoes; the visible thread on the outsole can be completely worn away, but the knot in the stitch hole is still holding the sole to the upper.
To sew such a seam, approximately two yards and a half of thread is prepared with a bristle at each end. One threaded bristle is held in the left hand, and the awl and the other threaded bristle are held in the right hand; see figure 1.
The first hole is pierced in the leather, which must be held steady by a stirrup, a strap of leather which loops from the foot to the knee. One threaded bristle is put through the hole and pulled until the thread has the same length as is on the other bristle. This makes exactly one length of thread on each side of the initial hole, and sewing can begin.
The second hole is pierced in the leather and the left hand bristle is passed through to the right side. The right hand bristle is passed through the same hole to the left side, and a twist is made with the left hand thread around the formerly right hand bristle. Then both threaded bristles are pulled simultaneously to tighten the stitch. This process is continued, with the direction of sewing always being towards the person sewing. Knots are rarely used to end the stitching. Usually to finish a seam, three stitches are sewn backwards over the last stitches, or sewn forward over already existing stitches from a previous seam.

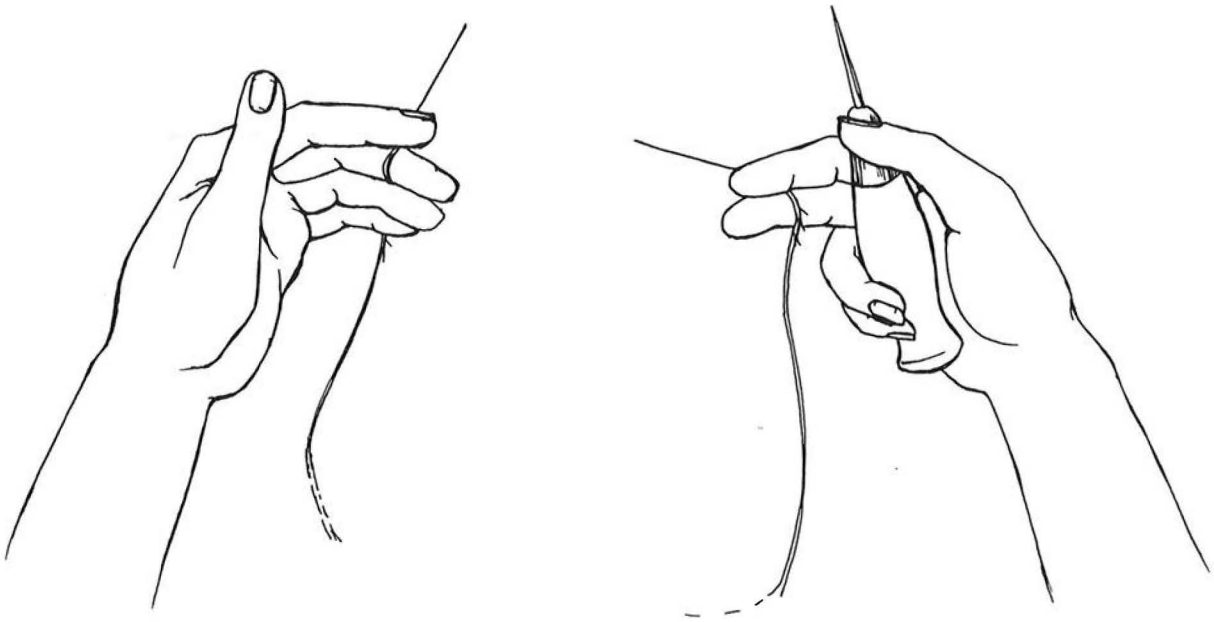

Fig. 1 Position of hands, awl, and threaded boar bristles for sewing.

The distances between the stitch holes are normally very evenly spaced. This regularity of stitch length is a point of pride among those who can still hand stitch, since it is a skill that can only be acquired with years of practice. This is one of the reasons why the small irregular hole on the medieval sole and upper seam piqued curiosity.

2 Investigation of sole specimens

A miscellaneous collection of one hundred medieval soles were examined. Roughly one half of the soles came from an 'orphan drawer'. Soles which have been collected in The Netherlands, but do not belong to any proper documented group. The greater half of the soles are from the amateur archaeological finds from Reimerswaal (The Netherlands), which are not placed in any dating more specific than medieval turnshoes. This haphazard collection seemed to be the best group to examine for frequency and location of the little deviant hole.
The sole shape and size were documented by tracings. Sole thickness, average stitch distance, and lasting tack positions, were noted for each specimen. The location and appearance of all deviant stitch holes were marked exactly.
The results from the examination showed fifty three with no deviations in stitch length, and twenty seven with deviant holes. The remaining twenty soles were excluded because: a. appearance of deviant holes could be associated with tunnel stitched double soles (seven soles), b. long sections of deviant holes from repair (four soles), and c. areas of the sole were too fragmented to see stitch holes (nine soles, more on this group in the discussion).

3 Discussion of data results

The placement of the little hole was near the toe tip, and always on the right side, regardless if the sole was a left or a right, and with no relation to the size of the sole. There were three exceptions to this position, two soles had a deviant hole at the heel section, and one at the waist (fig. 2).
The regularity of the placement of the little hole must be significant, and will be referred to hereafter as 'position normal'.

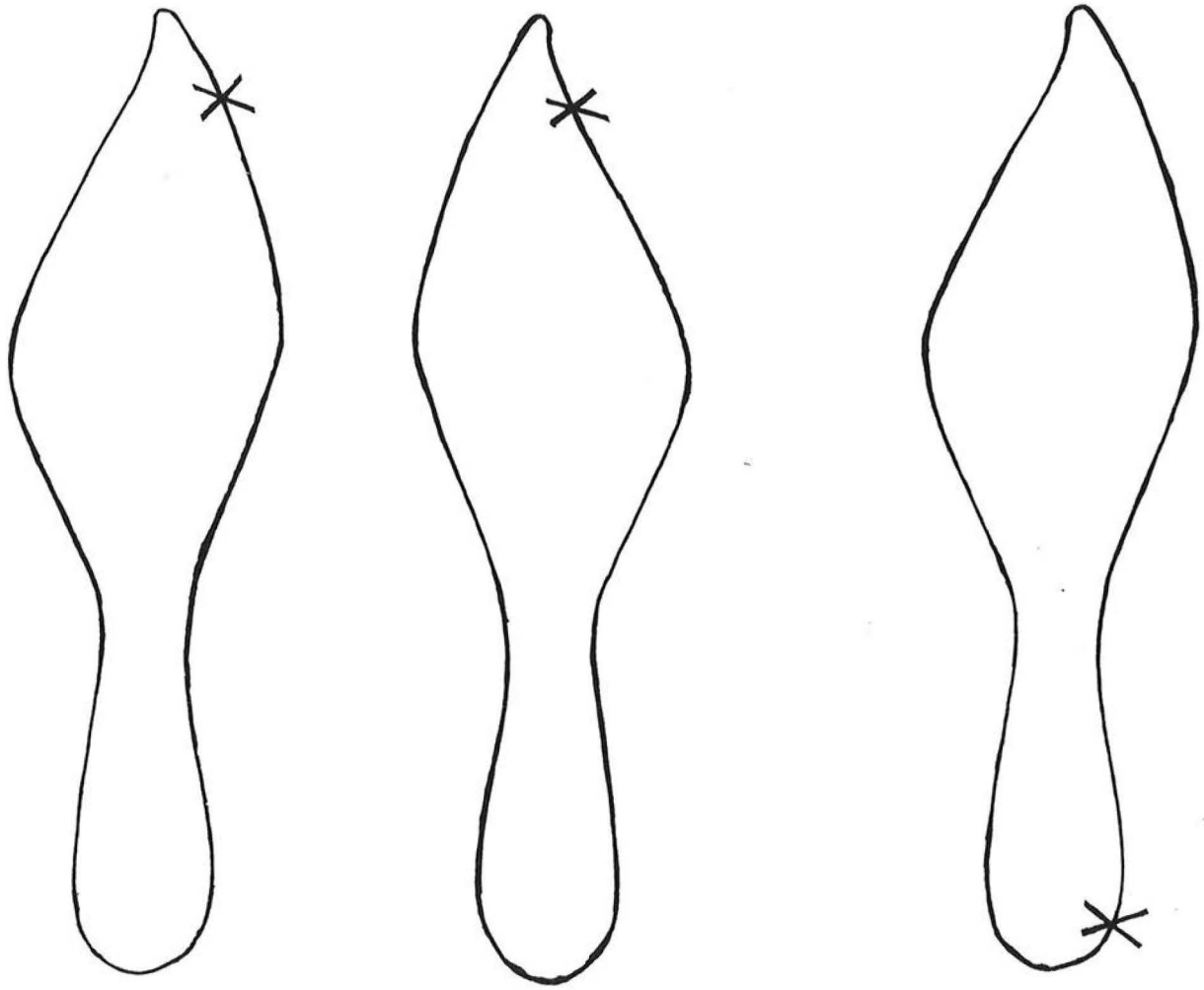

Fig. 2 Right and left sole shapes showing location of holes, and at right, the location of the hole at the heel.

The placement of these little holes could indicate the final stitches overlapping the starting point. This theory was developed from the observation of the kinds of little holes that appear.
Most often it is a single hole placed between two holes of normal stitch length, but it also occurs as several holes close together, and sometimes as sets of figure 'eights'; see figure 3.

4 Experimental shoemaking

If these little holes are the normal position for commencement of stitching the upper to the sole, then further examination of the archaeological specimens will not confirm the theory any more than it stands at present. A practical test of the theory is to make a medieval shoe in new leather.
A turnshoe from a 13th century pattern was sewn using new leather, a wooden last conforming to turnshoe shape, and sewing tools similar to medieval ones.

When starting at position normal, several things become clear. First the toe is gathered, thus tightening the upper to the last. When an inch and a half has been sewn, the toe is complete and stress lines can be seen from each side of the toe, extending to the heel of the upper. See also figure 4. This manner of creating stress on the upper is documented in early 19th century shoemaking by John F. Rees as the proper way to start lasting a shoe (Rees 1813).

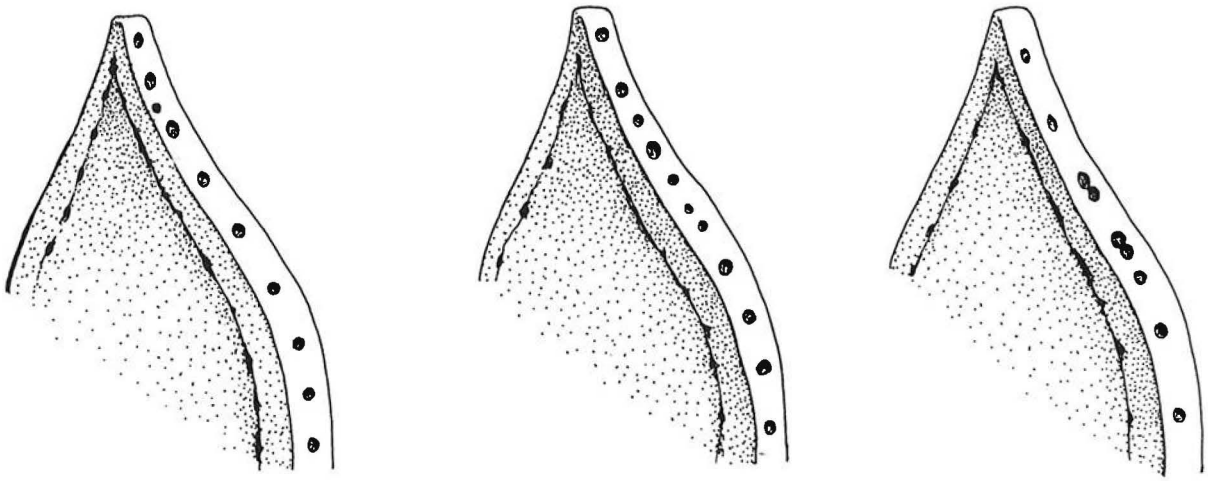

Fig. 3 From left to right, appearance of single hole, cluster of holes, and figure 'eights'.

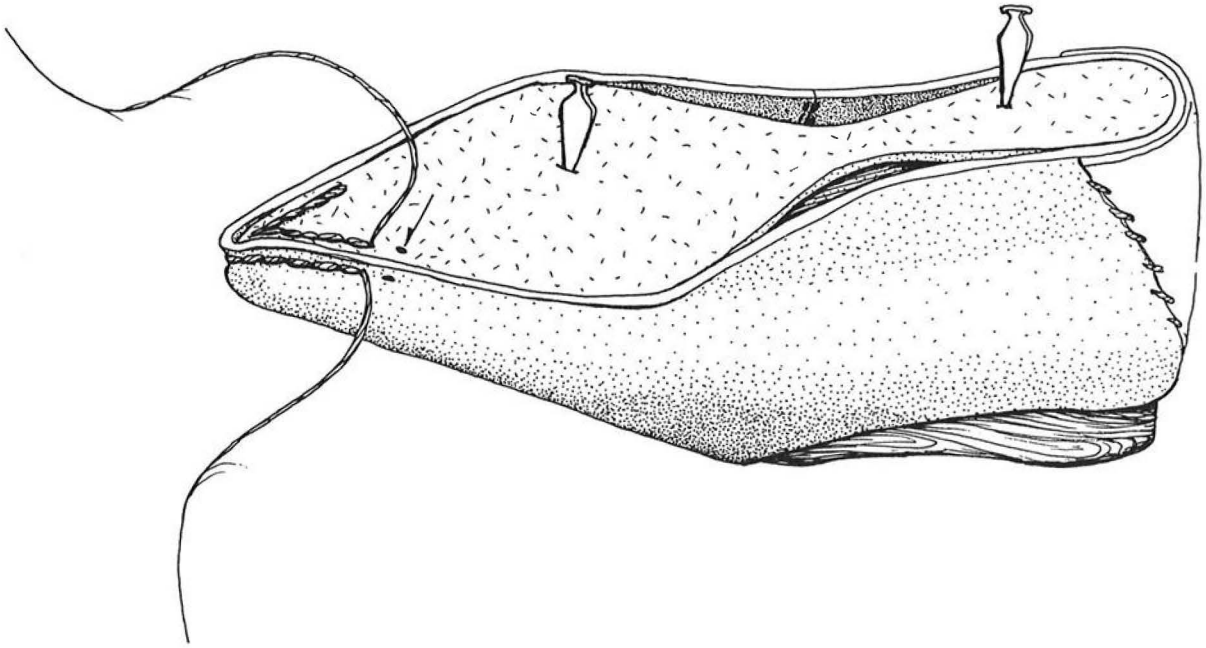

Fig. 4 First inch and a half being sewn, and shoe upper is tightened to the last, the sole is held in place with lasting tacks.

Of course all the techniques of how to sew a 19th century shoe may not be applicable to a turnshoe, but the lasting principle of the uppers seems to apply.
Often the rand begins at this position normal, so if this is the true beginning place for stitching, then it would be sensible to start the rand at this point also (J. Swann, personal correspondence).
The most common type of awl used to sew leather has a diamond shaped cross section and two knife sharp edges, so that it can cut a hole that will close slightly after the threads have been passed through.

To end a sole to upper seam by overlapping the starting point, a shoemaker should not insert the knife edged awl into the existing stitch hole since it would cut the threads, making a weak closure of the seam.
Usually a round, non cutting awl is used to sew a second time through existing stitches, but if a shoemaker did not use one, then it would be most logical to make an intermediary hole to overlap the beginning stitches, thus closing the seam (fig. 5).
After the new leather shoe was sewn with the final stitching overlapping the starting point, this area was cut open to reveal the pattern of the stitching holes. They corresponded exactly to the deviant holes seen on the medieval sole specimens.
The appearance of the single hole could have been made by overlapping one stitch and cutting the threads, but it would seem more likely that because of the small size of the hole, that only one thread was passed through and knotted to other thread.
For the fifty three soles which lack the deviant holes at position normal, the shoe maker could have used a knife edged awl to sew up until the end stitch meets the first stitch, and then used a round awl to sew the overlapping stitches. Examination of soles to upper seams using this method of finishing cannot be seen from the size and shape of the stitch holes, since a round awl only pushes the threads tighter to accommodate another thread and does not significantly enlarge the existing hole.
The round awl technique could only be verified if the threads were still in the stitching groove. Unfortunately, during investigative cleaning of a shoe, remaining thread fibers are often cleaned out on the grounds that they are too fragile to be preserved and are not documented before destruction.
Of the three soles in the group of twenty seven showing deviant holes, two had a deviant hole at the heel (see also figure 2). It is not known at present why these two would have the commencement location at the heel since the advantage of pulling the upper tight to the last would be lost if stitching was started at the heel. The remaining example with the deviant hole at the arch cannot be explained. Probably more than one lasting and sewing technique was used during the Middle Ages.

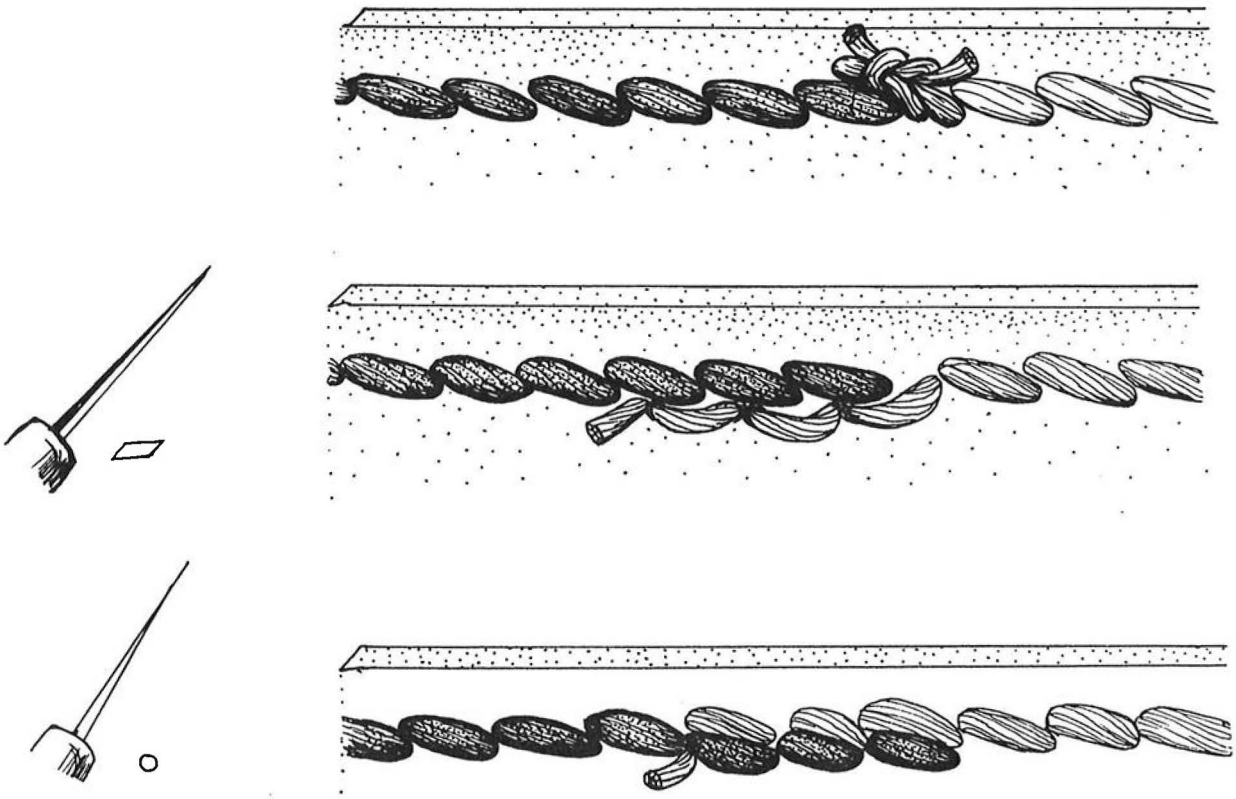

Fig. 5 Diagram of overlapping seam closures used with single thread, knotted, a knife edge awl, and with round awl.

As for the nine soles rejected from the group of one hundred,it should be remarked that the area of fragmentation occurred only at the position normal and the heel. The loss of visible stitch holes due to wear at the heel would seam to be obvious, but the fragmentation at the side of the tip of the toe cannot be from wear, and must be the result of overlapping the starting point of stitching with the knife edged awl method. If this place is worn through because of stitching method and not pathological foot formation, then the location of position normal should be noted when collecting information about pathology of the foot and medieval footwear, so that misinterpretations can be avoided and soles are not disqualified on the grounds of inexplicable wear pattern.

5 Conclusion

Giving proper attention to small details, such as one little deviant hole in a turnshoe's sole to upper seam can give important information about shoemaking techniques, which are essential for understanding and interpreting all archaeological shoe finds.
From the investigation of the little deviant hole, we can see that the principle of correct lasting was used and was accomplished by using the first inch and a half of the sole to upper seam to tighten the upper to the last by gathering the toe first.
The identification of the purpose of the little deviant hole can be of help in some cases for examination of medieval footwear, since it gives an easy point of correlation between uppers and their correct soles.
The results of making clean registration combined with the understanding of shoemaking technology should hopefully be evident in this article. Careful notation of data can give good results when combined with experimental archaeological techniques, as shown by the discovery of the starting point for stitching the sole to upper seam and the lasting method of medieval shoes.

Acknowledgements

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