

Article

On the Authenticity of Two Presumed Paleolithic Female Figurines from the Art Market

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Abstract: In March 2022, an auction house in Zurich sold two female figurines made from mammoth ivory, along with other prehistoric artefacts. This is a rare occurrence because the scarcity and value of Paleolithic figurines have limited their presence in the international art market. Researchers from the Archaeological Museum Hamburg and the University of Tübingen subsequently undertook in situ and non-destructive investigations to illuminate the authenticity of the two figurines. We conducted a comprehensive analytical study that included detailed microscopic optical observations and spectroscopic investigations. This methodological approach, combined with a thorough comparison to contemporary ivory figurine replicas, proved effective and clearly demonstrated that the specimens were forgeries. Research efforts of this kind are crucial, as they significantly help reduce the spread of intentional fakes posing as genuine artefacts in the art market. By doing so, we foster collaboration between academic institutions and the art market to preserve and protect the integrity and value of authentic archaeological and cultural heritage.

Keywords: Paleolithic female figurines; spectroscopy; trace analysis; forgeries; auction house



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1. Introduction

Figurative artworks are among the most spectacular but also rarest forms of Paleolithic material culture. Due to their scarcity and archaeological value, Paleolithic figurines have never entered the international art market. Thus, the appearance of prehistoric artefacts in a Zurich auction house in March 2022 was all the more remarkable (Schuler Auktionen, Seestrasse 341, 8038 Zürich, 164. Kunst- und Antiquitätenauktion 21st and 23rd until 2 March 2022). In addition to a perforated baton, an engraved limestone slab, five engraved and two painted stones, and an engraved bone fragment, the offered items also included two fully sculpted female figurines made from mammoth ivory (Lots 1718 and 1719). Thanks to a long-term scientific collaboration between the Archaeological Museum Hamburg and the University of Tübingen, both parties agreed to study the two female figurines with the aim of determining their authenticity. If the pieces were indeed from the Paleolithic, their classification into a specific culture and geographic region would thus be necessary. Conversely, if the pieces were modern, we wanted to find out which Paleolithic female depictions served as models. Additionally, the material from which the figurines

were carved is also of interest: were the pieces indeed made of mammoth ivory, as stated by the auction house, or was it a modern material like plastic? Were synthetic adhesives, paints, or dyes applied in order to mimic the antique effect? This work seeks to answer these research questions to shed light on the authenticity of the two figurines and stress the importance of conducting preliminary scientific analyses before claiming the originality of any archaeological objects sold on the art market.

Provenance of the Figurines and Acquisition History

The auction catalogue specified that the female figurines date to the “Upper Paleolithic”, are made from “mammoth ivory”, and come from “Slovenia”. The provenance was also noted, specifying the objects were obtained from the “Collection Alfred Huber, former director of the Burghalde Museum, Lenzburg”. The Burghalde Museum in Lenzburg in the Swiss canton of Aargau is a museum of local history rich in tradition with a heterogeneous collection. The long-time museum director, Alfred Huber, led the museum from 1972 until his retirement in 2006. After all, multiple objects in addition to the two female figurines were also offered from the “Huber Collection”, including lots with Paleolithic art as well as 22 lots with antiquities ranging from North African hand axes to a collection of Roman oil lamps.

Very revealing are several letters from the estate of Alfred Huber, which were consigned together with the statuettes to the Zurich auction house. These letters were handed over to the buyer after the auction. The correspondence documents Alfred Huber’s acquisition of the two statuettes in France from a private museum in 2003 and 2005. The museum, located in Peyzac-le-Moustier in the Vézère Valley (Dordogne), was run by the cartographer André Quinsac-Mandeix (1937–2019). Items on display included his fossil collection of over 3000 objects, plus minerals and curiosities, including a life-size replica of a Tyrannosaurus skeleton. Another focus of his “Musée de Paléontologie” was regional archaeology. The museum was located in the immediate vicinity of the eponymous site of the Mousterian archaeological culture, Le Moustier. By letter, André Quinsac-Mandeix offered Alfred Huber “deux superbes Vénus en os” on 12 December 2003, which included a 12.8 cm bone plate (“plaquette en os”) from Palestine for 990 Euros and one of the two statuettes auctioned in Zurich (lot 1719) for 3800 Euros. He noted Slovenia as the statuette’s origin and the offer was accompanied by a photo. Apparently, the offer was accepted, as two years later, on 29 August 2005, Quinsac-Mandeix offered another “Venus”, “de la même provenance que la dernière—que vous m’avez acheté”, which came from Eastern Yugoslavia. This was the damaged statuette (lot 1718), for which he asked 1800 Euros. The correspondence was also accompanied by two color photographs, making the identification clear. In response to Huber’s telephone inquiry, the seller specified the provenance by letter on 6 September 2005, as “Nord-Est de la Slovénie en limite de la Hongrie et de la Croatie” and confirmed that the figurine had the same provenance as the statuette Huber previously purchased. They came to a trade agreement, and the second statuette also found its way from Peyzac-le-Moustier to Lenzburg.

Sibylle Wolf was contacted by the director of the Archaeological Museum Hamburg, Rainer-Maria Weiss, who noticed the auction objects on 15 March 2022, just over a week before the auction date. First was the matter of an initial professional assessment, which would inform the decision to acquire the figurines. He requested high-resolution photographs and received them on March 16th. After review in both Tübingen and Hamburg, it was agreed that, in the case of authenticity, these statuettes would be important testimonies of early human artistic creation, which should absolutely be removed from the market and safeguarded for the benefit of the general public and for further research. The estimated prices were set surprisingly low by the auction house at 2000 to 4000 Swiss Francs. The

assumption was that this was due to the lack of comparable material. Accordingly, significantly higher hammer prices were expected. Nevertheless, given the imminent auction date, it was no longer possible to apply for financial support from potential donors, such as the Friends of the Museums, foundations, or private sponsors. Thus, the board of the Archaeological Museum Hamburg decided to place moderate bids on both lots, which were then exceeded by an online bidder during the auction on 24 March. The hammer prices were CHF 13,000 for lot 1718 and CHF 26,000 for lot 1719. Usually, at this point, an art object is lost in the anonymity of the art market. However, thanks to the kindness of the auction house, the highest bidder was asked to contact the Archaeological Museum in Hamburg. The buyer, a private collector from Slovenia, did indeed get in touch a week later. He expressed his willingness to deliver the statuettes for examination. Ultimately, he also hoped to gain clarity about the authenticity of the small sculptures in order to request a reversal of the purchase if necessary. If the figurines were not Paleolithic originals, a reversal of the purchase would have been promising, as the auction house classified the objects as originals. A few days later, an insured and very well-padded package arrived in Hamburg, which, after initial inspection, was transported to Tübingen for scientific examination.

2. Materials and Methods

To answer our research questions, we combined different analytical approaches including 3D laser scanning, macro and microscopic optical observations, infrared spectroscopic analysis, and comparison of manufacturing traces with an ad hoc reference collection. The methodology used in this work reflects the integration of techniques regularly used by our team to study prehistoric material culture.

As a first analytical step, the two figurines were scanned with an Artec Space Spider 3D scanner at the Material Culture Laboratory at the University of Tübingen (hereafter MCL) where most of the analyses were performed. We thus created digital 3D models to make the objects accessible at any time for further observations and analyses. Subsequently, we visually analyzed the two female figurines to describe their morphological traits and investigate traces of their production and wear. We first observed the specimens with an Olympus SZX7 stereomicroscope, Edmund Optics, Mainz, Germany with magnifications ranging from $8\times$ to $56\times$ and equipped with a LED ring light source. For more detailed observations at higher magnification, we used a 3D digital microscope Hirox HRX-01, Hirox Europe, Limonest, France covering a magnification range of $20\times$ – $2500\times$.

The interpretations were made after comparison with a reference collection including:

- (a) Three modern ivory replicas depicting the well-known archaeological figurines of the “horse” (Vogelherd Cave, Germany) [1], the “lion head” (Vogelherd, Germany) [2], and “la dame à la capuche de Brassempouy” (Brassempouy, France) [3]. The figurines were produced by the ivory carver Bernhard Röck in his atelier in Erbach im Odenwald (Germany) with modern tools used to carve ivory (e.g., dental tools). The operational sequence for the manufacture of these ivory figurines included the use of a Dremel (multifunctional tool), gear grinders, a polishing machine, and beeswax on a rotating cotton belt to finish the polishing procedure. With the aim of correlating different types of traces to specific tools used during the carving process, we observed the figurines at two different working stages: before and after polishing.
- (b) A tusk piece of a mammoth from the Siberian permafrost from Bernhard Röck’s stock which was cut in half with an Elektra Beckum BAS 500 Metabo band saw Metabo, Nürtingen, Germany.

- (c) Two replicas of double and single perforated ivory beads (see examples in [4]) carved with stone tools by the Archaeotechnician Rudolf Walter at the University of Tübingen.
- (d) Six worked archaeological ivory pieces: two broken ivory points, three ivory rods, and a single perforated ivory bead from the Aurignacian layers IV and V, respectively, of the cave sites Hohle Fels (Schelklingen, Germany) and Vogelherd (Niederstotzingen, Germany).

The reference collection was observed using the same analytical equipment described for the two female figurines. Comparing different working processes (with modern and stone tools) with the original archaeological ivory piece allowed us to reach a more reliable understanding and interpretation of the production traces displayed by the two female figurines under study.

In addition, we investigated both figurines using a portable infrared spectrometer (Agilent Cary 630, Agilent, Santa Clara, CA, USA) set up for reflectance (10° incidence angle). This technique is non-destructive and has the potential to investigate the materials both figurines were carved from.

Spectra were recorded in the mid-infrared region between 1200 and 500 cm^{-1} , and the resolution was set to 4 cm^{-1} (this protocol was taken from [5]). For each spectrum, 360 single scans were repeated and averaged to obtain spectra with a suitable signal-to-noise ratio. Reflectance values in percent were calibrated with a gold mirror and the instrument settings remained the same for the spectral measurement of all three samples: we compared the reflectance infrared spectrum of both female figurines with a reference spectrum of fossil mammoth tusk. The reference sample was provided by Bernhard Röck and it is estimated to be approximately 20,000 years old.

2.1. Description of the Two Figurines

Figurine 1:

The first figurine depicts a voluptuous woman (Figure 1 and 3D model (Figure S1)). The statuette measures 10.5 cm in maximum length and 5.3 cm at the widest part of the hip. In the buttocks area, the figurine is 3.9 cm wide and the thickness between the back and the chest measures 3.2 cm. The slightly spherical head is upright, not tilted, and does not depict a face or hair. Arms were also not depicted nor were the feet. The head tapers towards the torso and was set off from the body by the suggestion of a neck. The breasts occupy almost the entire torso on the front of the figurine. At the level of the hips, the breasts are damaged, which results in the absence of the abdomen as well as the front of the legs. The light interior of the material is also visible. On the back, the buttocks are separated from the back by deep grooves and a deep notch above the left buttock. The buttocks are divided by a deep, continuous score and separated from the legs by incisions. The legs are severely shortened and pin-shaped at the end. On the posterior side, the legs are separated by at least six incisions running down the middle of the legs, which are not continuous. In the side view, it is clear that the back and buttocks were worked relatively flat. The breasts are broken into four layers, which were glued back together. At least six cracks are visible on the sides of the breasts. The front also shows hints of erosion and the surface is therefore no longer smooth. The belly is protruding and, the statuette's center of gravity is in the front torso. The surface of the statuette is reworked.

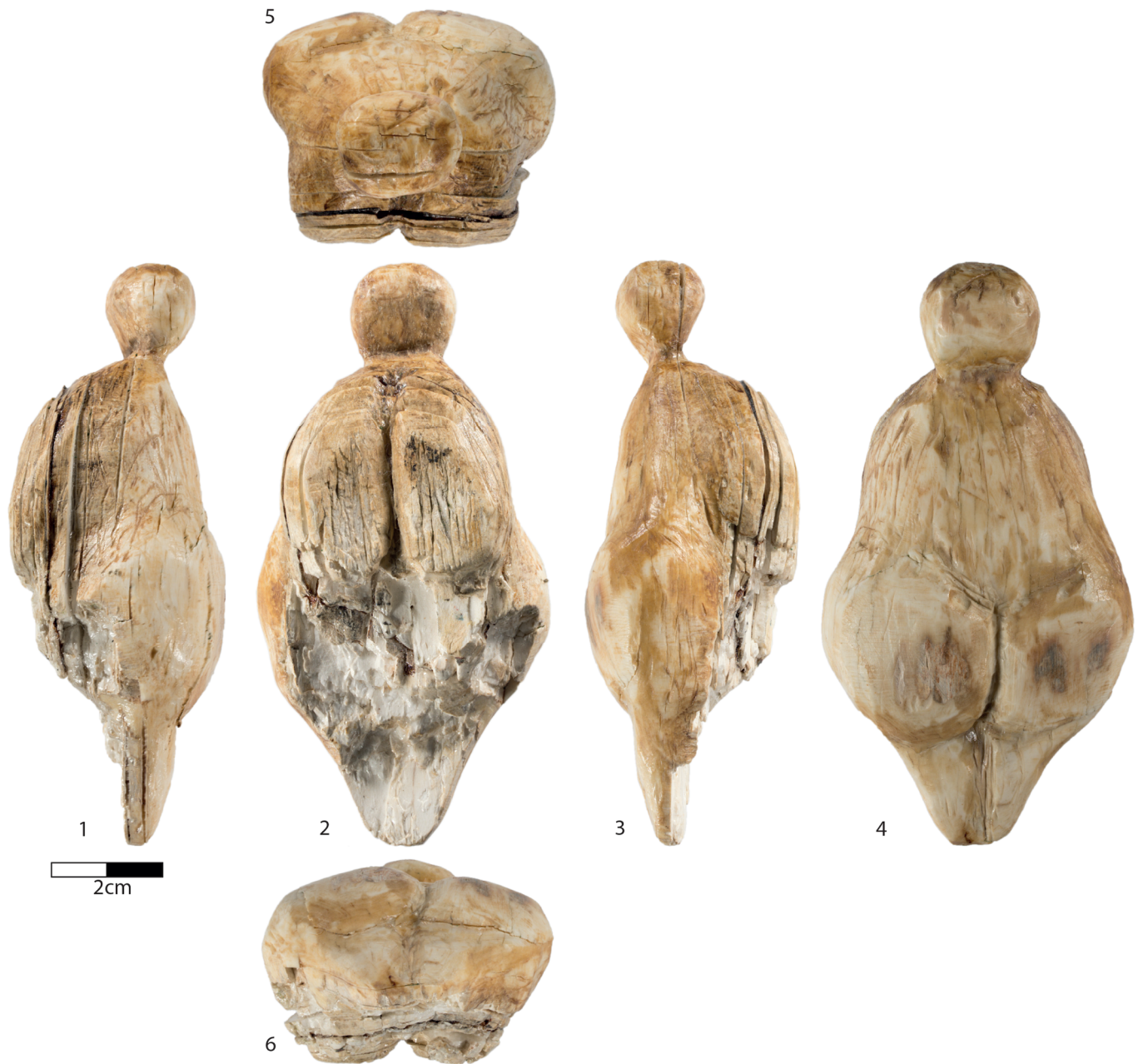


Figure 1. Views of Female Figurine 1. Right side (1), front (2), left side (3), back (4), top (5) and bottom view (6). Photos: A. Fatz, SHEP Tübingen.

Figurine 2:

This figurine also represents a plump woman (Figure 2 and 3D model (Figure S2)). The statuette measures 11.8 cm in maximum length, 5.6 cm at the widest part of the hip, and 4.6 cm at the buttocks. The thickness between the back and the chest measures 4 cm. The approximately spherical head is offset from the body by a narrow neck. The head does not depict a face or hair and looks straight ahead. Arms were also not carved, and the legs were strongly reduced and cone-shaped. The breasts are extensively carved, appear pendulous, and occupy approximately half of the torso on the front of the figurine. A deep notch sets apart the breasts; however, this notch is not entirely continuous, but instead stops just short of the bottom of the breasts. A small area of damage is visible on the left breast. The belly is carved away from the breasts and protrudes a bit further, pulling down a bit in the lower area. The deep and relatively round belly button is slightly offset to the left. Below the belly, a triangular pubic area is indicated by notches. The left side of the hip

is much more pronounced than the right. The legs are separated by a deep notch, which runs to the end of the figurine. The right leg is thicker than the left, and both legs are separated by a deep notch along the back. The buttocks are wide and large, and the left buttock is bigger than the right. A notch indicates the spine.



Figure 2. Views of Female Figurine 2. Right side (1), front (2), left side (3), back (4), top (5) and bottom view (6). Photos: A. Fatz, SHEP Tübingen.

2.2. Comparative Findings as Models

The auction house indicated that the figurines were Paleolithic. For this reason, we researched Paleolithic figurines with stylistic similarities to compare. At first glance, the two female figurines correspond to female representations from the Gravettian archaeological culture. Such obese, well-defined female figurines are characteristic of this period.

The Gravettian is the first pan-European culture [6,7] with sites ranging from Spain to Russia. Sites with early Gravettian archaeological layers are found, for example, in the Swabian Jura [8]. Here, the oldest finds from the Gravettian date to approximately 34,000 years before present. The most recent Gravettian finds are approximately

23,000 years old and derive from Russia [9]. The so-called statuette horizon [10] is an overarching phenomenon of this culture [11,12]. Spanning from southwestern France to Russia, depictions of women are available from a variety of materials, but such female figurines were not found in all European countries yet. For example, they are not known in Poland or the Western Balkan states like Slovenia. Among others, female representations were carved from mammoth ivory, fired clay, chalk, various stones such as limestone or sandstone, as well as steatite and hematite, e.g., [12–16]. The type of representation mostly follows a specific scheme: the women are depicted mainly naked and sometimes show elements of clothing such as jewelry, belts, ribbons, or headdresses. The head is worked without a face and is tilted downwards. The arms are narrow and close to the body. The hands often rest above the chest. The breasts are heavy and hang down onto the rounded belly. The hips are wide and sometimes the vulva and buttocks are carved in great detail. The legs are realistically depicted, but the lower legs and feet are foreshortened. This style of depiction is found throughout Europe, but the female figurines each have their own style within the context of individual archaeological sites [12,17,18]. For example, the figurines of the Balzi Rossi cave sites in Italy are mainly made from soapstone and show protruding bellies and stretched-out buttocks [19,20] while the figurines of the Kostienki-Avdeev culture in Russia are made from mammoth ivory and chalkstone [9,16]. Here, numerous almost realistically depicted female bodies were carved [17,21]. The French site Amiens-Renancourt 1 delivered fragmented female figurines made from the local chalk [14]. This atelier dates approximately 27,000 years cal. BP [14]. The female figurines also bear their own style, but the depictions follow in general the principle of faceless, well-defined naked women. The prototype of these depictions is the so-called “Venus of Willendorf”, made from an oolithic chalkstone and dating back to approximately 30,000 years cal. BP [22,23]. The “Venus I” from Dolní Vestonice in the Czech Republic counts amongst the early characteristic female figurines of the Gravettian, with an age range of approximately 30,817–29,776 years cal. BP [13,24,25]. The youngest Gravettian figurines with radiocarbon dates of archaeological remains of the respective sites, are those of the Russian sites, with ages between 25,000 and 23,000 years cal. BP [9,26]. That said, figurines vary within the Gravettian, but the principle of depicting naked, voluptuous women remained for a minimum of approximately 7000 years.

From the previous Aurignacian epoch, fully sculptural representations of women are also known—the figurines of Hohle Fels Cave and Stratzing—but due to their form, they do not correspond to the two objects at hand [27,28]. In the Magdalenian culture, which followed the Gravettian, numerous representations of women were also made, but they likewise have little in common with those of the Gravettian. Magdalenian figurines were highly stylized with a focus on the side view, carved as staffs with protruding buttocks, and lacked heads and often breasts. These representations are female depictions of the Gönnersdorf-type, defined by Gerhard Bosinski [29,30]. These Gönnersdorf-type representations are found as figurines, engravings, and paintings, and, like the Gravettian pieces, they were made of different materials and applied to different substrates [31].

The two objects Figurine 1 and Figurine 2 correspond most closely in their posture to the female representations from the Gravettian. Moreover, they are depicted as thick-bodied women with a focus on the torso. However, compared to the Paleolithic female figurines, they are clumsily crafted and lack attention to detail.

We can also consider the provenance of the two objects: according to the seller’s letter, they were offered and sold in 2003 and 2005. Accordingly, only representations of women that were already excavated and known by then can be considered as models. If we start with the chosen raw material, ivory, a comparison with representations from the Gravettian French site of Brassempouy is obvious [3,32].

The Brassempouy figurines were excavated between 1892 and 1896. Here, we are dealing with incomplete, damaged female figurines made from mammoth ivory, which were nicknamed “the hilt of the dagger”, “the pear”, and “the torso”. These figurines exhibit bellies indicating pregnancy and were carved with more effort and detail than the present pieces.

From the Russian site of Gagarino, a minimum of eleven female figurines and fragments of figurines made from mammoth ivory are also known, dating to approximately 23,000 years cal. BP [33,34]. The presumption is Statuette n° I was most likely used as a model for the present pieces [9] (pp. 96–99) (Figure 3). This figurine was excavated in 1927, and measures 5.6 cm in length, 3.2 cm in width, and 2.6 cm in thickness. The mammoth ivory figurine has a faceless spherical head that looks forward and is offset from the narrow shoulder area by the neck. The upper arms are only indicated on the sides and back. The breasts are of different sizes and hang down heavily on the thick belly. The vulva was not carved in detail. The legs appear to converge to a point. The thighs are broken off about midway. The broad and large buttocks have been clearly rendered by indentations.



Figure 3. Gagarino (Russia), female figurine made from mammoth ivory, ca. 23,000 years old. After Khlopachev et al., 2018, figure 9 [26], Khlopachev 2016 [9], pages 96–99.

If we look beyond ivory, two further sites with female representations catch the eye, which are strongly reminiscent of figurines 1 and 2. The first is Laussel (France) [12,35]. Here, stone reliefs of a Gravettian age were discovered in 1908 and include representations of women with similar curves to the statuettes presented here. Of the four reliefs with female representations, the “Femme à la tête quadrillée” and the “Berlin Venus” have the most similarities. The second site is Mainz-Linsenberg (Germany) [36]. Lacking radiocarbon dates, the site’s Gravettian classification relies on the typological analysis of the lithic tools [37]. Here, the lower part of a female figurine made from sandstone was discovered; its form looks similar to the legs of figurines 1 and 2. Nevertheless, the two female figurines under study have their own style, which is an inexact comparison to the Paleolithic female depictions summarized here.

3. Results

3.1. Spectroscopic Analysis

The comparison of two reflectance spectra is shown in Figure 4. All three recorded spectra show characteristic reflectance bands caused by stretching vibrations of the PO_4 group in apatite ($\sim 1030\text{ cm}^{-1} = \nu_3 \text{ PO}$; ~ 600 and $\sim 560\text{ cm}^{-1} = \nu_4 \text{ PO}$) [38]. Other phosphate bands cannot be observed because of the weak signal/noise ratio in our reflectance spectra (Figure 4). The spectra of the two female figurines and the fossil mammoth tusk are identical in this regard. Thus, both figurines are carved from apatite (in this case hydroxyapatite) as it occurs in elephant and mammoth tusks. The material of both female figurines is therefore most likely mammoth or elephant tusk; see also [39]. Both are mainly composed of hydroxyapatite, so our reflectance infrared analysis cannot differentiate between the two materials.

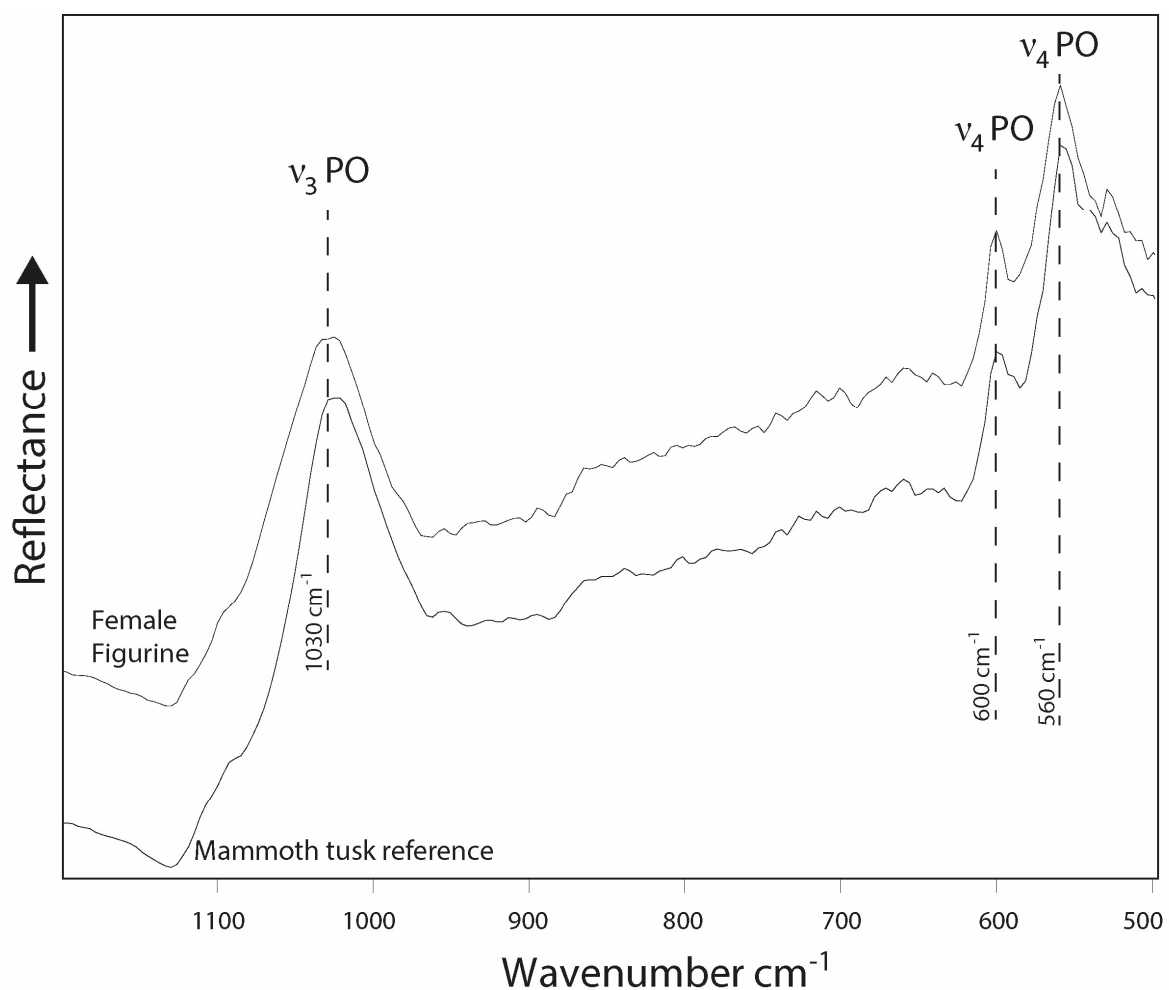


Figure 4. Reflectance infrared spectra of a fossil mammoth tusk reference sample (**bottom**) compared to Figurine 2 (**top**). Note that both spectra show the same reflectance bands caused by stretching vibrations of the PO_4 group in hydroxyapatite (recorded by P. Schmidt).

3.2. Optical Observations and Production Wear

Based on the spectroscopic analysis, ivory is the most likely material of the two figurines. At low magnification, the weathering patterns and the cracks in both statuettes suggest the use of fossil mammoth ivory. A significant, blackish discoloration is visible on the highest elevation of the left buttock of Figurine 2 (Figure 2). Figurine 1 shows dark discolorations on both halves of the buttocks and a deep crack can be seen running across the top edge (Figure 1). The discolorations on both buttocks are indicative

of cementum, the outer part of a tusk. Cementum has a different chemical composition than the inner dentin and, because of this, minerals or dyes affect each component differently [4,38,40]. In crack-free modern ivory, the tusk would have a uniform coloration, while fossil ivory often exhibits different colors resulting from thousands of years of taphonomic processes underground. The crack above the buttock of Figurine 1 also shows that the cementum will promptly separate from the dentin at their junction. This happens when ivory becomes dry and breaks down into fragments at the natural growth lines. The discoloration of the buttocks thus shows that fossil mammoth ivory was used to carve the figurines. Furthermore, the almost white interior of the broken front of Figurine 1 shows that, in this case, the collagen content was already low, and the ivory color changed to white over the millennia due to demineralization (for changes in ivory, see summary in [4]). Concerning the manufacturing process, the two female figurines retained well-visible traces of production in several portions of their bodies. In particular, two types of traces made us question the originality of the manufacturing of both figurines.

In Figurine 1, we recorded very regular, straight, and parallel long and short striations all around the body and with a clear distribution pattern along the back (i.e., lumbar area) and on the buttocks (Figure 5a,b,d). Along the internal area of the legs, these striations are cut by several deep grooves with evident back-and-forth traits (Figure 5c). The same pattern of traces is visible in Figurine 2 on both buttocks but with a less clear morphology due to discoloration and weathering fissures affecting this area (Figure 6b–d). On the upper left area of the buttock, a fan-shaped bundle of regular striations crosses a series of other parallel vertical and horizontal striations (Figure 6c). Groups of the same parallel and regular shallow grooves/striations also surround the area of the shoulders where the traces are spaced out by deep natural fissures in the ivory (Figure 6a).

We also identified another characteristic trace related to the production of Figurine 1. In the lumbar area and around the neck, we observed some peculiar, elongated, hollow-shaped traces produced during the shaping of the ivory (Figure 5d–f; see Figure 7e for a comparison). We found clear correspondence between the above-described traces and the production wear on the ivory figurine replicas made with modern tools.

In modern replicas, whittling traces and long and short striations/grooves are found together, resulting from the different rotary types of Dremel carving bits. The Dremel is used to shape the three-dimensional outline of the figurine during the initial production stage and leaves very recognizable traces on the bodies of the carved figurines that are visible in the models before the final polishing is done (Figure 7a–c). Carefully polishing the figurines usually obliterates these traces, leaving smooth, even, and shiny surfaces (Figure 7g). However, according to the degree of polishing, the surfaces can retain a few of these recognizable traces, for instance, in the polished horse replica, as shown in Figure 7d,f.

When comparing the production traces on the double perforated bead replica shaped with stone tools, one may observe that whittling mammoth ivory with stone tools does not produce the typical Dremel traces observed on the “Slovenian” figurines and on the modern figurine replicas (Figure 8a–f). Moreover, the striations and grooves left by a lithic implement are never regular, straight, perfectly parallel, or of uniform width, as demonstrated by the production traces observed on the archaeological ivory pieces. (Figure 9a–h).

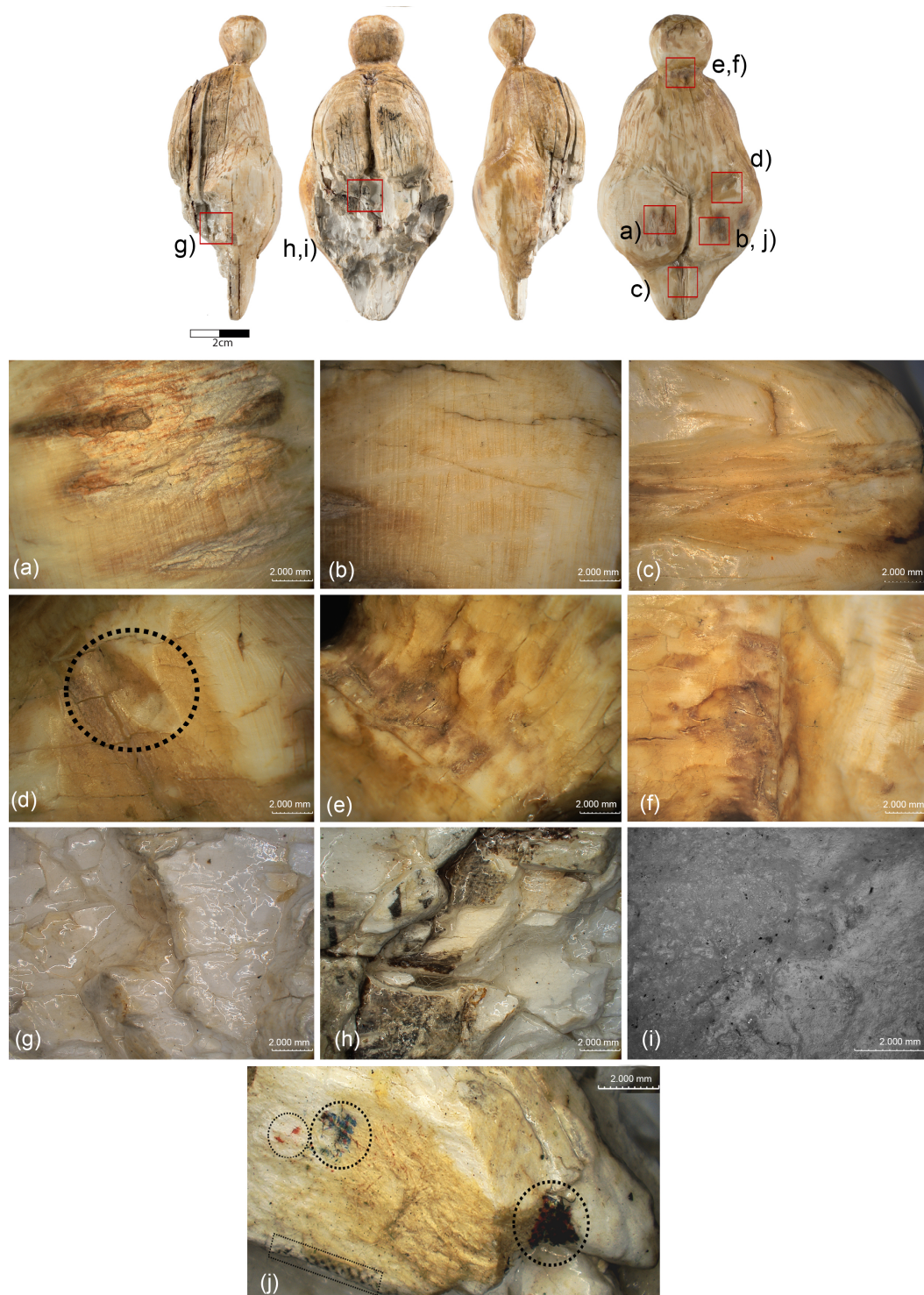


Figure 5. Views of the Figurine 1 and photomicrographs documenting the manufacturing traces. (a,b) Bundles of regular, straight and narrow parallel long and short striations, (c) series of deep multiple grooves resulting from sawing, (d–f) elongated hollow-shaped traces, (g) varnished area, (h) varnished area with blackish stains and lines, (i) micrograph of the ivory surface, and (j) tiny remains of a blue, red and black dotted pattern paper glued material, circled in black. Red squares indicate the areas where the micrographs have been recorded. Photos: F. Venditti and S. Wolf; Female Figurine 1: A. Fatz, SHEP Tübingen.

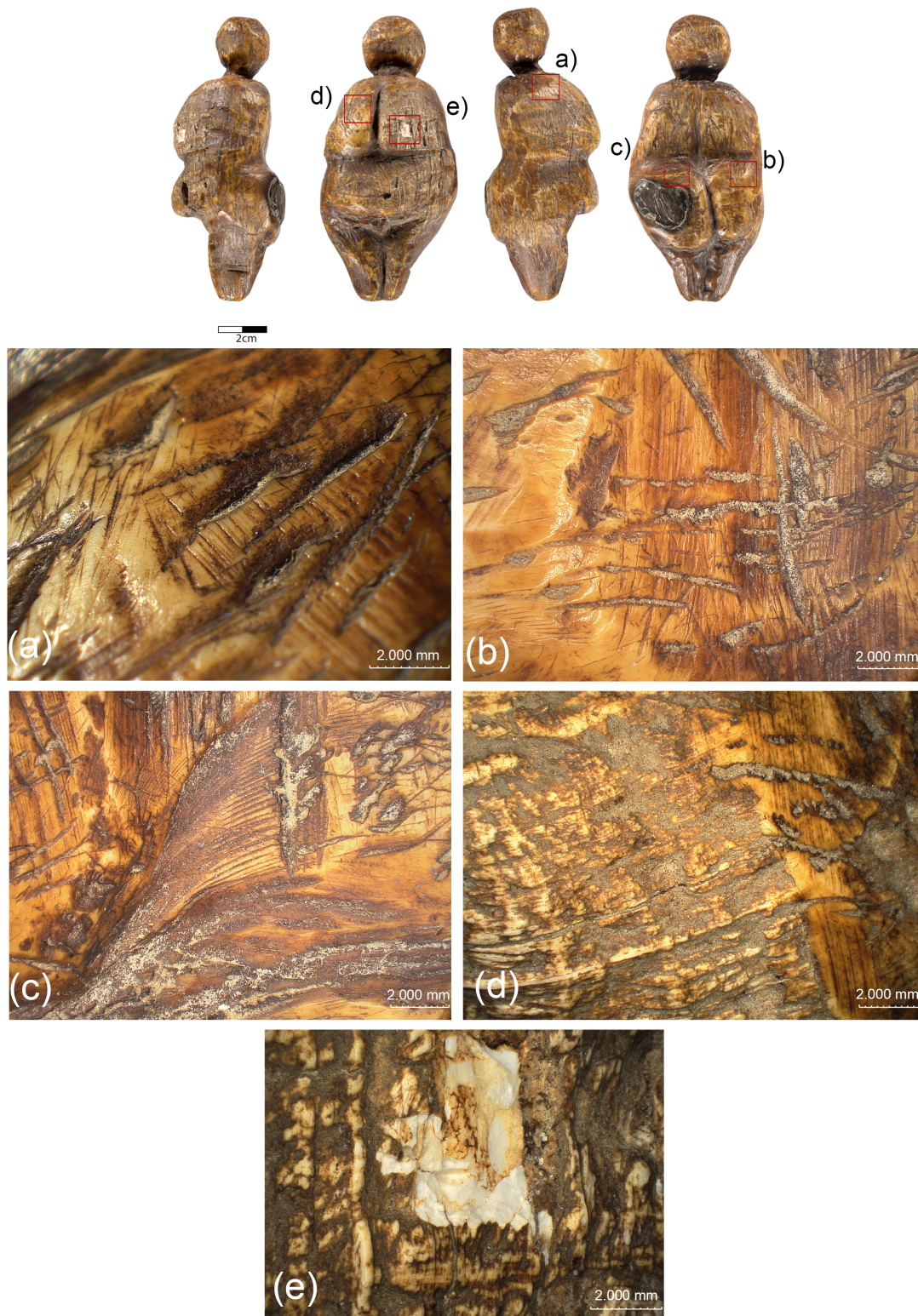


Figure 6. Views of the Figurine 2 and photomicrographs documenting the manufacturing traces. (a–d) Bundles of regular, straight and parallel long and short striations, and (e) fracture exposing the natural surface of ivory with evidence of a brownish varnish. Red squares indicate the areas where the micrographs have been recorded. Photos: F. Venditti and S. Wolf; Female Figurine 2: A. Fatz, SHEP Tübingen.

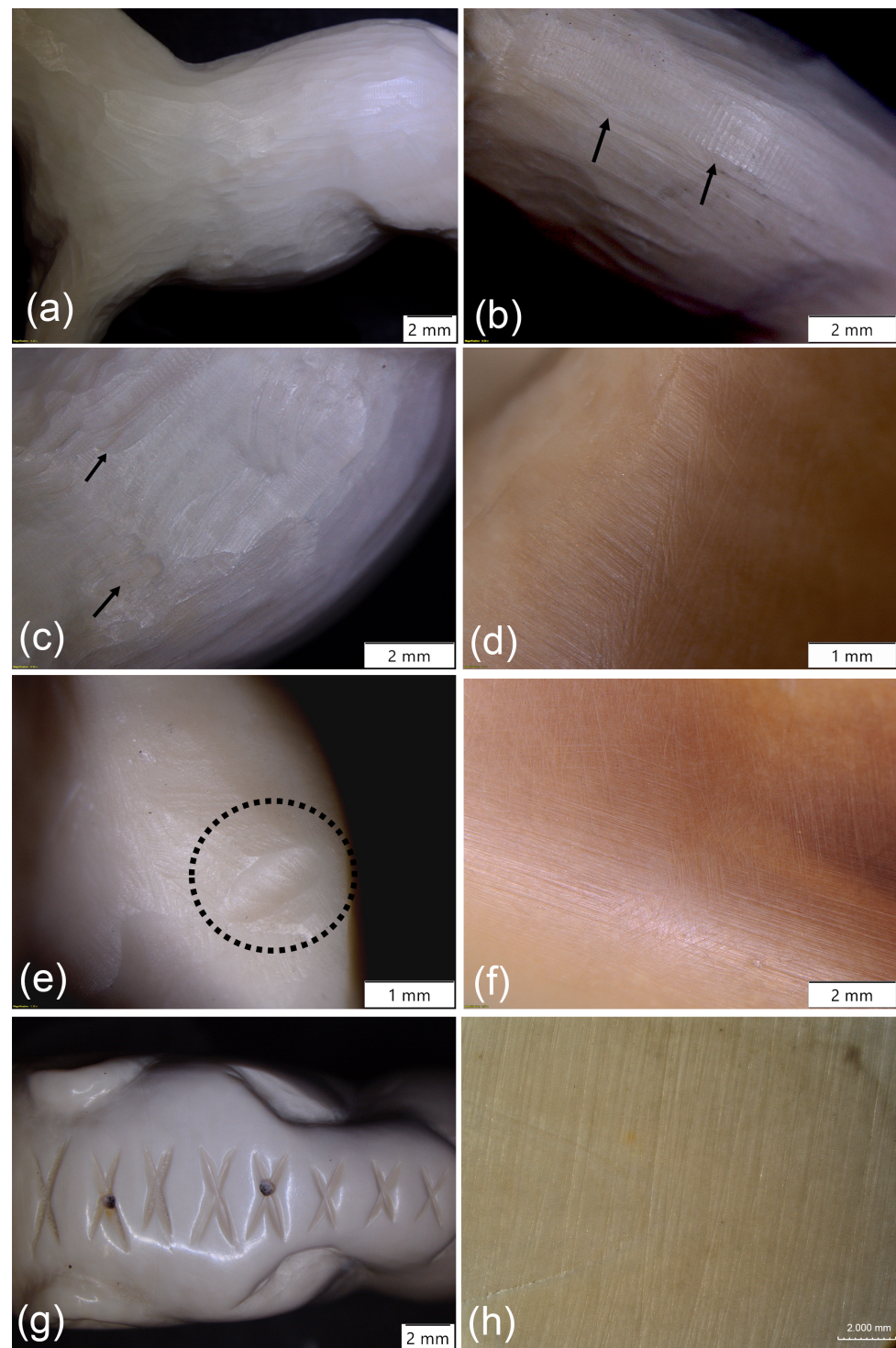


Figure 7. Details of the modern figurines carved with modern tools. (a,c,e) Elongated hollow-shaped traces, circled in black, produced by carving the ivory with Dremel and modern tools; (b) short regular and parallel striations; (d–f) polished surface retaining short and long regular and parallel narrow striations; (g) fine polished surface; (h) parallel narrow and long striations resulting from sawing a tusk piece of mammoth ivory with a band saw. Photos: F. Venditti.

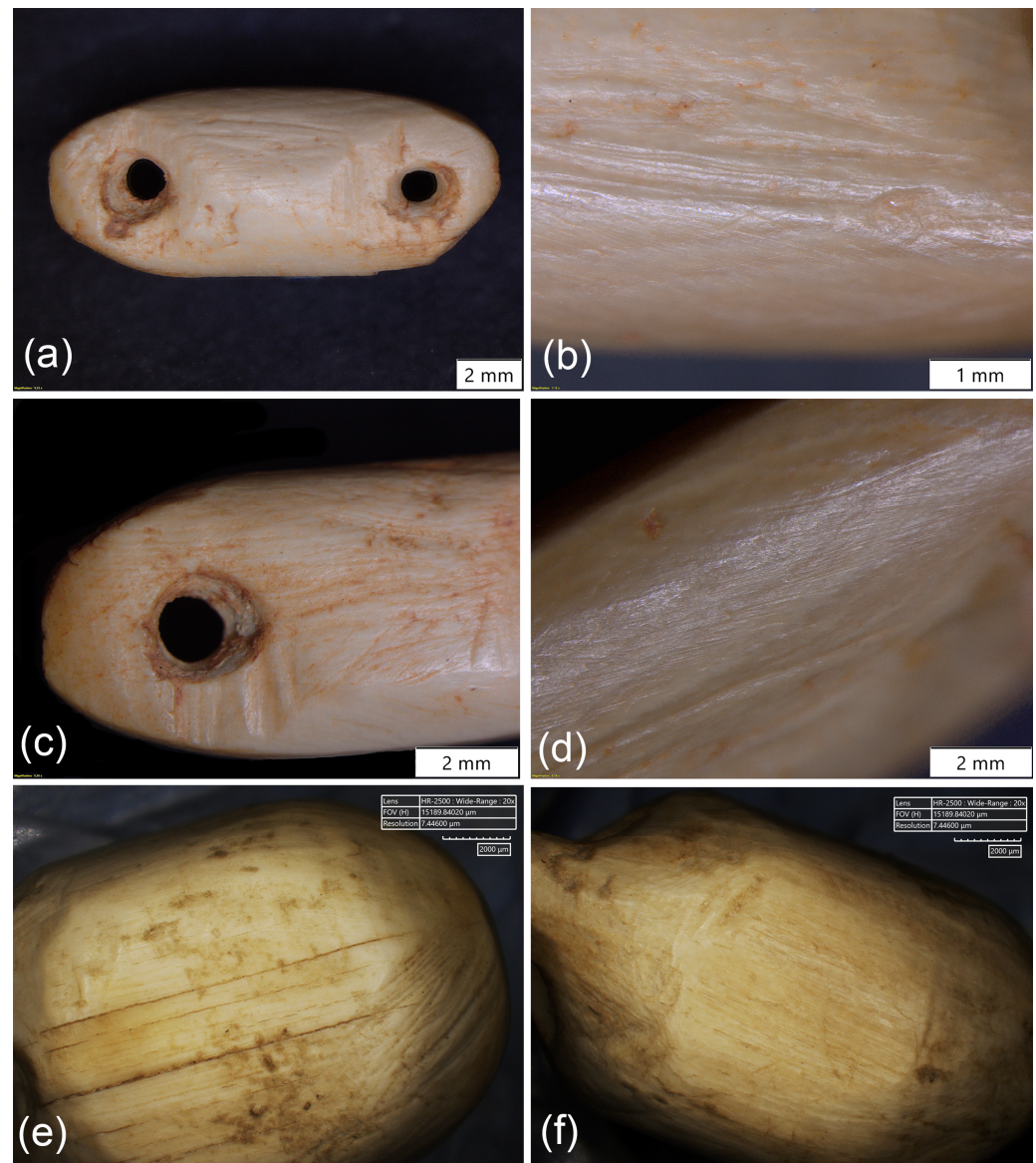


Figure 8. Experimental ivory beads and related micrographs. (a–d) Experimental double perforated bead with grooves and striations produced by scraping with a lithic tool, and (e,f) experimental single perforated bead with grooves and striations produced by scraping with a lithic tool. Photos: F. Venditti and S. Wolf.

Another point that made us doubt the authenticity of the figurines was the presence of varnish and dyes. The front body of Figurine 1 (on the belly and around the legs) exhibits transparent varnish/glue along with undefined blackish stains and lines with tiny associated remains of a blue, red, and black dotted pattern paper material glued to the surface underneath the varnish (Figure 5g,h,l). In Figurine 2, a scar on the breast shows the natural ivory surface painted with a brownish varnish used to color and make the whole figurine appear antique (Figure 6e, notice the varnished appearance of the brownish residues). However, a detailed molecular analysis of the paint cover to identify which colors were used (e.g., using gas chromatography), was not possible because it would have required destructive sub-sampling of the figurines' surface.

Overall, our results clearly show that the two figurines are modern objects, thus ruling out their Paleolithic origin. However, they were manufactured using ivory (likely mammoth ivory). This material was available in the Paleolithic period and was used to carve female figurines e.g., [12,22,28].

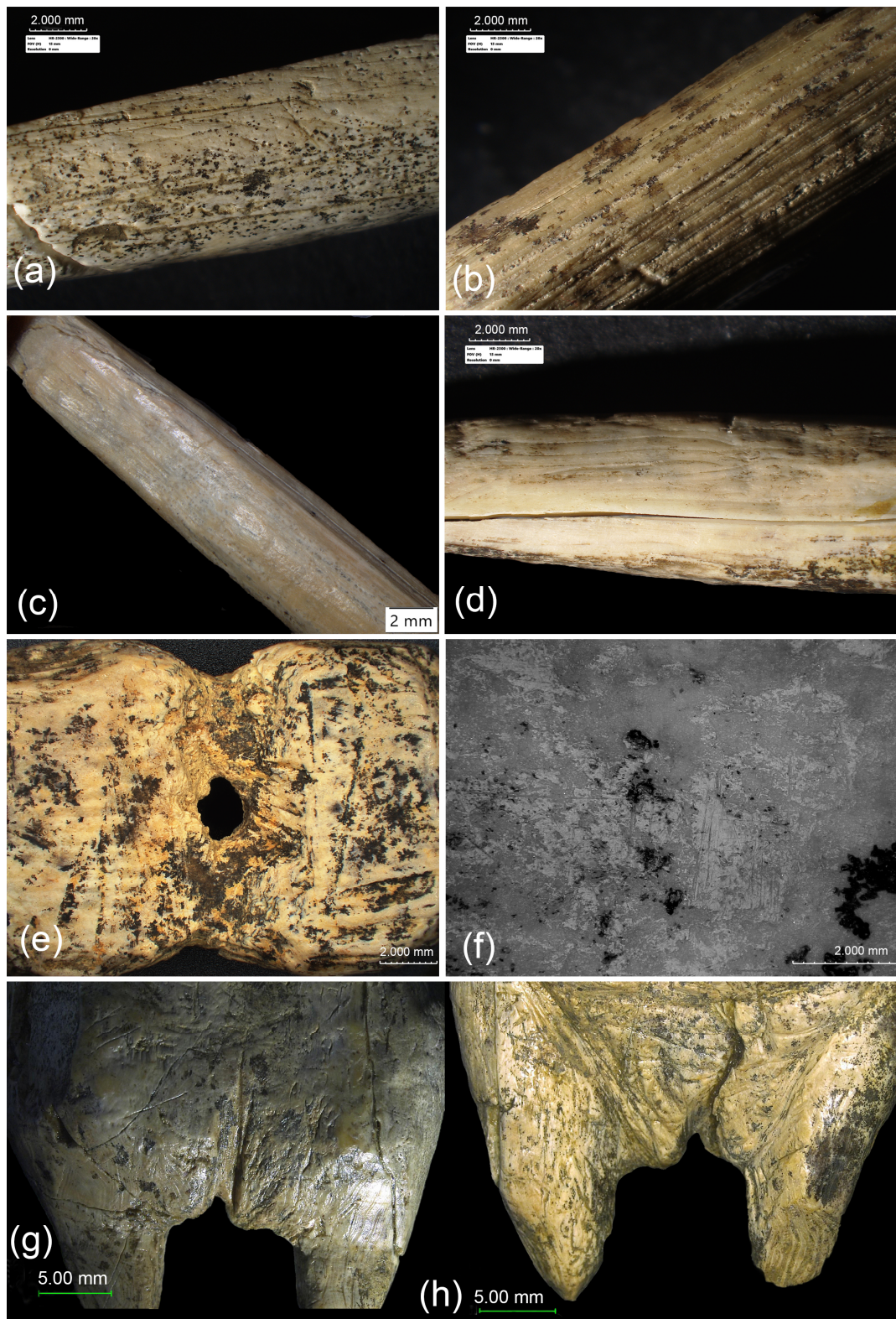


Figure 9. Macro- and micrographs of archaeological finds made from mammoth ivory bearing traces of intentional shaping: (a,b) ivory rods from Hohle Fels, (a) HF 24/1252 and HF 24/1253 and (b) HF 77/1856; (c,d) ivory points from Vogelherd, (c) Vg II St. V and (d) Vg 108, V; (f) single perforated bead from Hohle Fels, HF 31/2283.1; (g,h) close-up pictures of production marks on the lower body part (g) back and (h) front of the Hohle Fels female figurine (courtesy of E. Dutkiewicz, see also [2,28]). Photos (a–f): F. Venditti.

4. Discussion

We identified the two figurines as modern imitations of Paleolithic female representations through a detailed analytical investigation that combined data from ivory working experiments, Fourier Transform Infrared Spectroscopy (FTIR), and trace analysis. Integrating these three approaches proved the most effective methodology for addressing our research questions. FTIR data enhanced microscopic observations, allowing us to determine the material composition of the figurines. Although the statues were crafted from ivory—most probably from mammoth ivory—the trace analysis confirmed that they were produced using modern techniques and tools, highlighting their inauthenticity as original Ice Age artworks.

It is very likely that Gravettian representations of women, such as the figurines from Brassempouy or Gagarino, were used as models for the production of objects 1 and 2. The objects were carved with modern techniques and named “Vénus” by their seller. Although the country of origin was given as “Yougoslavie Pays de l’Est” and further “Slovenie”, so far, no Paleolithic representations of women are known from Slovenia. Why was this information chosen? Were the pieces made there and sold to a buyer in the Dordogne? Was the provided origin intentionally false? In any case, this origin does not support the authenticity of the figurines. Perhaps Slovenia was chosen for the lack of comparable figurines; one could have argued for the authenticity of the statuettes with a style of representation specific to this region of Europe. The carvers and their motivations remain an unsolved mystery.

One could assume that the use of fossil mammoth ivory was deliberate, chosen to give the impression of an original Paleolithic figurine. Also, the color application on the front side of Figurine 1 (Figure 5g) gives the appearance of age, simulating a long period of storage and weathering (Figure 5h). It is possible the layer of varnish was applied to conceal the application of paint or to stabilize the figurine.

The entire sale and purchase process are astonishing in several respects and arouses great suspicion. How can it be that the head of a private museum, who collected prehistoric artefacts for decades and is based at a world-famous Paleolithic site, sold several female statuettes, which would undoubtedly be a highlight or even the flagship of his private museum, to the head of a Swiss local history museum for a low price? And why, in turn, does Huber apparently buy the objects, not for his museum, but for his private collection, without ever making them public? One can only speculate about their motivations. It is conceivable that both business partners were aware that the objects were modern replicas only intended as illustrative objects. In any case, there is no mention in the written correspondence that the objects were antique or came from an excavation. The seller never used the words “originals” in his letters to the buyer. Only the material and the country of origin are explicitly mentioned. In the case of the French private museum, however, there would then be the conspicuous fact that the collector already exhibited numerous reconstructions and replicas, from dinosaur skeletons to a hominid bust, but did not present examples of Paleolithic art, instead reselling them. Huber, in turn, did not acquire the objects as museum exhibits or hands-on objects for museum education, but rather for private use alongside numerous other original antiquities from the Paleolithic to the Roman period. Perhaps the pieces were made as exhibits for a private museum or for museum education in France. Perhaps the intention of the seller was to make money quickly and easily by selling them to Switzerland. In any case, nothing illegal was done, as mammoth ivory may be traded. Obviously, no documents were falsified, as only simple information about origin and price was given. It is unclear whether Huber realized that the figurines were not of Paleolithic origin or whether he saw them as originals.

5. Conclusions

Our results should sound like a warning for auction houses that designate objects as archaeological originals without having them examined by appropriate experts. Such experts can give important, well-founded context. Modern objects and sometimes deliberate forgeries circulate as originals on the art market and in private collections if a proper examination does not occur. This is a deception that does not correspond to the facts. Every person who is interested in archaeological artefacts should find out in advance of a legal purchase whether the alleged artefacts indeed originate from the advertised age. By establishing partnerships with academic institutions, private and public organizations involved in preserving, studying, and exhibiting archaeological and artistic artefacts can ensure the accuracy and reliability of the information pertaining to these items. This collaboration allows for rigorous academic methodologies to be applied in evaluating provenance, historical significance, and authenticity, thereby enhancing the educational value and public trust in such institutions. The owner of the two female figurines shared the results presented here with the respective auction house and the renowned auction house Schuler refunded the amount paid to the owner and acknowledged mistakes within the process. Through shared research initiatives and expert consultations, these partnerships can contribute to a deeper understanding of cultural heritage and foster a more informed dialogue around the significance of art and archaeological findings in society. Such *due diligence* can save a lot of money, time, and energy but, above all, contributes to protecting the cultural value of our archaeological heritage.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/heritage8030104/s1>, Figure S1: 3D scan of the Figurine 1, Figure S2: 3D scan of Figurine 2.

Author Contributions: S.W. designed, coordinated and directed the research, assisted the microscopic analysis, and wrote the original manuscript; R.-M.W. provided information on the research history and contacted the auction house as well as the purchaser; P.S. made the FTIR analysis and interpreted the data; F.V. designed the research, performed the microscopic analyses and interpreted the data, and wrote the original manuscript. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

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