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1 Making clothes, dressing the deceased: Analysis of 2nd century AD silk clothing from the
2 child mummy of Burgast (Altai Mountains, Mongolia)

3

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23

24 **ABSTRACT**

25 The analysis of archaeological textiles is a primary source of knowledge about past societies,
26 and the information it provides is remarkably diverse. However, special preservation
27 conditions are needed to obtain an accurate picture of the use of textiles, particularly in the
28 making of clothing. In Tomb 14 at the site of Burgast (Altai Mountains, Mongolia), excavated
29 in 2016 by the French archaeological mission in Mongolia and the Institute of Archaeology of
30 the Mongolian Academy of Sciences, the particular local conditions favoured the preservation
31 of organic materials, including the complete clothing worn by the mummy of a child
32 belonging to the Bulan-Kobin culture. This paper examines several questions on the origin of
33 the raw material used and the role of these garments in funerary practices. The fibre analysis
34 indicates that the silk and taffeta fabrics used to dress the mummy likely from China. We

35 consider a plurality of sources (historical, archaeological, technical study analysis), as silk
36 could have travelled. Our study of the tailoring shows that some of the textiles were probably
37 re-used and provides new insights into clothing design and know-how. We argue that the
38 deceased was dressed with care, and we propose that specific, non-quotidian garments were
39 used for the funeral ceremony. Together, these findings contribute to describing little-known
40 aspects of the Bulan-Kobin culture.

41

42 *Keywords:*

43 Archaeological textiles

44 Bulan-Kobin culture

45 Xiongnu-Xianbei-Sarmatian age

46 Burial

47 Clothing design

48 Sewing pattern

49

50 **1. Introduction**

51 The analysis of archaeological textiles is a first-rate source for knowledge about past
52 societies, and the information it provides is remarkably diverse. Analysis makes it possible to
53 address questions related to the origin of raw materials (from farming or from agriculture,
54 imported or local); the organisation of production or trade networks; processing and
55 manufacturing techniques; the origin of these techniques and their transfer in time and space;
56 and the *chaîne opératoire* used. When the corpus is rich enough and consists of complete
57 pieces of clothing, it is even possible to approach questions related to the history of clothing
58 and its use and role in society (clothing practices and cultures), including its symbolic aspects,
59 such as colours and motifs. Clothing also provides information about the social status,
60 profession and, sometimes, religion or gender of the owner (Polos'mak & Barkova, 2005;
61 Even, 2012; Oka, 2015; Elihina, 2017). However, the discovery of well-preserved clothing
62 and textiles in archaeological contexts remains rare and is governed by different factors that
63 rarely come together in the same site. Most of the time, only small fragments are found, and
64 their study is often limited to a few technical considerations or fibre determinations (André,
65 2002; Miller et al., 2006; Giscard et al., 2013). Conservation in particular conditions (wet,
66 very dry, or very cold) sometimes provides the possibility of obtaining a fairly accurate
67 picture of these garments. The case we present here is one of these exceptionally well-
68 preserved discoveries. At the site of Burgast, located in the Altai Mountains (Mongolia),

69 complete, well-preserved silkⁱ clothing was found in tombs dating from the beginning of the
70 1st millennium AD and belonging to the Bulan-Kobin culture. This culture is present in the
71 Altai-Sayan region during the Xiongnu-Xianbei-Rouran period and is already known from
72 several cemeteries excavated in Russia (Seregin and Matterin, 2014, 2016; Tur et al., 2018),
73 and in 2017 and 2018 in Shiveet Khairkhan area of the Mongolian Altai as well (Batbold et al.
74 2017; Batbold et al. 2018).

75 The aim of this article is threefold: (1) to study precisely the technical characteristics
76 of these garments (biological origin of the fibres^{ii*}, method of weaving*, sewing patterns*
77 used); (2) to discuss the origin of the raw material used and therefore the links that this part of
78 the world must have had with other regions; and, finally, (3) to determine the role of these
79 clothes: Were they everyday clothes? Or were they only considered proper for funeral
80 ceremonies? In addressing these aims, this study contributes to describing little-known
81 aspects of Bulan-Kobin culture in Mongolia.

82

83 **2. Material and methods**

84 *2.1. Archaeological and chronological context*

85 The site of Burgast (Fig. A) is located north of the Aimag of Bayan-Ölgii (District of
86 Nogoonnuur, Mongolia). It was excavated in 2015 and 2016 by members of the French
87 archaeological mission in Mongolia and the Institute of Archaeology of the Mongolian
88 Academy of Sciencesⁱⁱⁱ and consists of a 500 m² triangular terrace with a height difference of
89 800 m. The cemetery where the archaeological remains were found is located at 1900 m
90 above sea level, at the western end of the terrace. A complex of 24 individual tombs was
91 extensively excavated (Fig. B). The shape and organisation of the burials, as well as the rare
92 finds of silver–bronze headdress ornaments, identify Burgast as part of the Bulan-Kobin
93 culture (Seregin and Matterin, 2014, 2016).

94 Twelve out of the 24 excavated burials contained textile remains. Of these, those of
95 Tomb 14 are the best preserved (Fig. C). The deceased, a 3- to 6-year-old child, was oriented
96 east–west, with the head to the west and was placed into a monoxyl (dugout) wooden coffin
97 closed by means of a pegged board, and the coffin was encased inside a stone-slab cyst. The
98 hermetical nature of the tomb resulted in natural mummification^{iv} and is at the origin of the
99 excellent preservation of all the organic remains, of which the clothes are the most
100 spectacular. Direct radiocarbon dating of the bone of the child indicates that the child died
101 between 32 and 210 cal AD (2 sigma^v).

102

103 *2.2. Preservation conditions*

104 Because they are organic products, textiles are fragile and can be damaged by a variety
105 of factors, such as light, humidity, climate, and insects. Textile remains can be preserved by
106 (i) permineralisation through contact with a metal object (Moulhérat, 2008b); (ii) a wet or dry
107 environment; (iii) carbonisation; and (iv) calcification. At Burgast, the textiles from Tomb 14,
108 were well preserved due to the dry climate, the watertightness of the coffin, which prevented
109 water infiltration, and the absence of burrowing animals in the burial. Textiles from this burial
110 are flexible, colourful, and easy to handle despite the deterioration they underwent in the
111 burial context.

112 Some of these textiles were isolated during the excavation, while others were removed
113 as a unit, together with human remains, and then separated out during the laboratory study in
114 Ulaanbaatar. Those located on the back of the child in Tomb 14, as well as on the back of the
115 legs and skull have, however, suffered significant damage due to decomposition fluids, which
116 caused humidification of the materials and, ultimately, their destruction. The front parts of the
117 clothing are the best preserved but, some folds of clothing on the chest and legs have also
118 suffered significant damage. Although mould can be seen on the different parts of the
119 clothing, it seems that it only developed after the individual was discovered. However, most
120 textiles are sufficiently well preserved for study purposes, and we can easily identify the
121 garment types of the child's clothing.

122

123 *2.3. Clothing identification and description*

124 The child was dressed in a hat, a mid-length tunic, trousers, and socks. The face was
125 covered, and the entire body was wrapped in a wool blanket^{vi}. The hat covered the top of the
126 forehead and the ears and seems to have a pointy top (Fig. D.1). The hat consists of a narrow
127 green band running around the face, sewn on a yellow piece of textile. It is, at least in part,
128 lined with fine wool felt on the inside (Fig. D.2). A bead found under the chin must belong to
129 the hat (Fig. E). The tunic and trousers were loosened and then removed together at the time
130 of the mummy's undressing in the lab and could not be separated afterwards, as the
131 taphonomic conditions had caused them to become stuck together (Fig. F). The left side of the
132 tunic crosses over the right side and thus partly covers the right side of the torso. We observed
133 no buttons or fasteners. A small, 1.3 cm wide textile band encircled the waist of the
134 individual. The tunic is multicoloured (green, yellow, and brown), but it is difficult to
135 determine whether these colour variations are the result of the degradation of one and the
136 same dye or whether they are the result of different dyes^{vii}. It ends at the top of the femurs and

137 partly covers the trousers, which are mostly brown fabric, with blue–green fabric on the
138 ankles. Underneath, in contact with the skin, remnants of textiles are visible on the right thigh
139 and knee, and their study indicates that they are probably fragmentary elements of the
140 trousers. The yellow–brown socks reach up on the ankles (Fig. G, Fig. H). A 1.5–1.7 cm wide
141 textile band is held in place by loops on the upper edge of the back of each sock. These two
142 bands, tied around the ankles, ensure that the socks are held at the same height.

143

144 *2.4. Study protocol*

145 Following excavation, the textiles were packaged and stored in a freezer at the
146 Ulaanbaatar Institute of Archaeology. Observations were made on the non-restored textiles.
147 For this reason, some seams and measurements were not recorded and were not drawn on the
148 various diagrams. Microscopic studies were carried out on the better-preserved areas (flat and
149 without snags) in order to obtain the most accurate description possible. Some fragments were
150 so damaged that a complete examination was not feasible.

151 The first steps of the textile analysis were carried out while the clothes were on the
152 mummy as found. These were to describe the technological aspects of the clothing and the
153 textiles visible; draw each element that makes up the deceased’s clothing; and describe the
154 sewing techniques used. The next steps were carried out while the individual was being
155 undressed to expose the different layers of clothing. Between each phase of the undressing,
156 the clothes were dusted with a fine brush and the sediment deposits were removed with pliers.
157 Once the clothing had been removed, all the different pieces of cloth making up the items of
158 clothing were sampled to establish a typology of the garments and the textiles that comprise
159 them. The technical analysis consisted of observation at different scales. The appearance of
160 the textiles was first described with the naked eye. The textiles were then placed under a
161 microscope with an integrated digital camera to photograph the material. The photos were
162 used to determine the weave*. When the state of preservation of the fragments permitted, the
163 fibres were described, the filature* and the different twists were ascertained, and the thread
164 count* was identified. The vast majority of the drawings of the textiles of the garments and
165 the fragments are presented on an orthonormal axis (Ox, Oy), that is, without distinction
166 between warp* and weft*, because no selvedge* could be observed to distinguish between
167 them. In some cases, though, selvedge was observed, making it possible to differentiate the
168 threads of the warp from the threads of the weft. The second stage of the technical analysis
169 consisted of taking a thread from each textile to identify the animal or vegetable nature of the
170 fibre (Moulh erat, 2008a)^{viii}. The threads were chosen so as not to destroy the general structure

171 of the weave. The position of the different garments on the body of the deceased was
172 documented, as were the samples taken and observations under the microscope. After the
173 study, each textile element was wrapped in plastic film or placed in a minigrip ® bag and
174 boxes for storage in a freezer.

175

176 **3. Results**

177 *3.1. From cocoon to taffeta: Weaving silk threads*

178 The identification of the taxonomic identity of the source of the silk fibres was
179 achieved by morphological observations. From a technical point of view, the cocoon consists
180 of a double filament of bave* (brins*) welded together by sandstone (or sericin, a natural
181 glue). In longitudinal view, the fibres look like regular and smooth tubes that do not show any
182 twist. The cross-sectional shape of these filaments is characteristic of the worm species used.
183 Microscopic observation revealed a triangular cross-section with rounded corners and no
184 twist, showing that the material used is the silk of the domesticated worm *Bombyx mori* (Fig.
185 I) (Guicherd, 1946; Nunome, 1992). To make a silk thread, several cocoons are unwound, and
186 the fibres are assembled. During microscopical observation of sections of threads, as an aid to
187 identifying the type of silk, the number of fibres used can also be counted. The child's clothes
188 were made from 15 to 25 cocoons. The silk threads can be used as they are (the woven fabrics
189 are then called grège silk*), but they can also be boiled, either before or after weaving. This is
190 called degummed silk*. Boiling removes some of the grège. The silk then becomes softer and
191 more supple, which favours the dyeing and its colour fastness over time but has the
192 unintended effect of separating the two fibres, making weaving more complicated. For this
193 reason, it is more useful to boil the fabric than the isolated thread. The observation of the bave
194 of the Burgast textiles under the microscope revealed that the two fibres are not separated and
195 that the sericin has therefore not been removed or only partially removed.

196 All the textiles analysed have a tabby* weave (Fig. J; Emery, 2009), The tabby has a
197 ratio of two threads for two picks: even and odd threads alternate at each pick, above and
198 below the weft. The term tabby is generally used to refer to textiles made of discontinuous
199 fibres, such as cotton or wool. For continuous fibre fabrics, such as silk, the term taffeta is
200 used. Several selvages have been identified, in some cases revealing which is the warp and
201 which the weft. The quality of the taffeta depends on the number of threads used per
202 centimetre of fabric. The thread count makes it possible to make comparisons between the
203 number of Ox and Oy threads and thus to try to identify recurrences and to determine whether

204 the weave is rather fine, medium or coarse. Six different qualities have been recognised from
205 the child's clothing:
206 - 20 by 40 threads/cm
207 - 24 by 24 threads/cm
208 - 30–35 by 50 threads/cm
209 - 40 by 70 threads/cm
210 - 45 by 80–90 threads/cm
211 - 50 by 60 threads/cm

212

213 Silks, whether mineralised or not, can relax over time, and hence the density of threads
214 per centimetre can vary (Moulhérat, 2013). The quality also depends on the diameter and
215 regularity of the thread, as it can vary according to the cocoons (as the size, the worm or the
216 quality of the worm's food) and the manufacturing process. Some objects, such as the tunic
217 (Fig. K), are made of a thread originating from a large number of cocoons (about 19–20 for
218 one thread) and of homogeneous diameters (10–12 μm), confirming the use of a fine and
219 good-quality silk. In contrast, the bave count indicates that the textiles of the trousers (Fig. L)
220 are made of threads from fewer cocoons. The sericin has been partially removed from the silk
221 fibres of the tunic, but not from the elements of the trousers. The trousers, the tunic and the
222 upper edge of the tunic are made of the same type of taffeta, with a ratio of 20 by 40
223 threads/cm. The hat (Fig. M), the knotted bands holding up the socks (Fig. N), and the lower
224 border of the tunic are made from taffeta with a ratio of 30–35 by 50 threads/cm. The main
225 body and the ends of the socks are all made of the same silk fabric. The textiles used for the
226 socks have the best weaving quality from among the six types, and threads with a large
227 number of threads per centimetre and a large number of cocoons used for one thread (about
228 19–20).

229

230 *3.2. From taffeta to tailoring: Sewing patterns*

231 The hat (Fig. O.3) consists of two pieces of taffeta with slightly circular edges, sewn
232 together to create a rounded shape that fits the top of the head. The seam starts at the top of
233 the forehead and seems to continue to the back of the neck. A 1.5 cm wide piece of textile
234 forms the edge of the hat. The seam values between the main body of the hat and the border
235 have disappeared, but holes left by the stitches are still visible. This border, which is
236 preserved over a total length of 62.4 cm, is sewn in such a way that it surrounds the wearer's
237 face. At the level of the cheeks, it forms two rounded corners on each side of the face. It then

238 continues under the ears and probably ends behind the head. Two short strips of taffeta were
239 sewn at the rounded corners inside the hat to enable it to be tied it under the chin. One is still
240 in place and is tied to the other one with a knot. The hat is lined with a fine felt now in very
241 poor condition. There are only a few traces left in a 0.5 cm wide hem on the back of the hat.

242 The tunic (Fig. P) is adjusted to the child's size and would have been worn like a
243 jacket. The main body is composed of a right side, a left side and a back. It closes at the front,
244 with the right side of the garment slipping under the left side. The back and the right side
245 could not be observed. The decomposition fluids destroyed the back of the tunic, and the
246 rigidity of the textile made it impossible to separate the two sides. The left side is visible. The
247 front of the tunic consists of at least seven pieces. The tunic is lined with a textile piece on its
248 lower edge and on the edges of the opening. It can be seen on the lower front of the tunic over
249 a width of about 8 cm. It rises to the edge of the left side; passes behind the neck of the
250 individual, where it is more than 3 cm thick; and then continues on the right side of the tunic,
251 which is hidden behind the left side. The lower edge is completed by a small, 10.4 cm long by
252 2.5 cm high triangular piece located on the left side of the tunic. The garment is adjusted and
253 stays closed most likely thanks to a small textile band of about 1.3 cm wide located at the
254 level of the child's waist. Among the front pieces, two taffetas have a selvedge, allowing the
255 warp and weft to be determined. It should be noted that the straight grain* of these two
256 taffetas was not used in the making of the clothing; in one case, the straight grain is in the
257 length of the tunic (Fig. Q) and in the other case in its width. Moreover, the selvedges of the
258 taffeta were either used in the stitching values, preventing the clothing from unravelling, or
259 used as a garment border, as on the bottom of the tunic (Fig. R). The sleeves are attached to
260 the main body of the tunic just above the elbows, rather than at shoulder level. We propose
261 two hypotheses for how this was achieved: either the garment has been cut flat, or it has been
262 cut from a fabric folded in half height-wise, then folded in half again width-wise. The left
263 sleeve is retained along its entire length and covers the top of the individual's hand: it
264 measures 44.8 cm long from the base of the neck to the wrist. The right sleeve is very
265 damaged and is preserved over 25.1 cm of its length. The sleeves form a tube whose seams
266 are located at the back of the individual's arms. It is likely that the clothing was assembled by
267 a seam on the child's flanks, but the present condition of the tunic does not allow us to assess
268 this. On each sleeve there is a seam at the elbows and at the upper arms. Measured from the
269 neck, the seam is positioned at 13.8 cm on the right sleeve and at 15.4 cm on the left sleeve. A
270 twisted thread* is observed at the collar of the tunic; this is probably a sewing thread.

271 The waist of the trousers (Fig. O.1) probably sat at the pelvis, but since the trousers are
272 almost entirely covered by the tunic at this point and the two elements are bonded together,
273 we cannot verify this. The trousers cover the legs down to the ankles and are made up of two
274 legs of equal size but made up in two different ways. The left leg is made of a single piece of
275 fabric forming a tube (minimum 20 cm wide), which closes with a seam at the back with a
276 seam allowance * of 0.4 cm (with stitches at regular intervals, of 0.4 cm). A selvedge can be
277 seen on the bottom of the piece, and this indicates that the straight grain has been laid along
278 the width of the garment. The right leg is made up of at least four pieces of fabric: a single
279 piece of fabric appears to be used as a tube to cover the thigh, and three further pieces,
280 probably rectangular, are sewn together to form a tube and complete the lower leg from the
281 knee. All the stitching values observed are 0.4 cm. A selvedge is also observed, indicating a
282 use of straight grain along the length of the garment. At the lower extremities of the trouser
283 legs, two bands of 5–5.5 cm high are sewn. These are either decorative elements or pieces
284 intended to change the length. The seams connecting these pieces are observed on the front of
285 the trousers, and the seam values are also 0.4 cm. A selvedge is observed on the left-hand
286 element, allowing us to establish the use of the straight grain width-wise. As with the tunic,
287 the selvedges were used to mark the edge of the garment or as a seam value. The trousers are
288 probably made from off-cuts of textiles of different sizes, but special attention was obviously
289 paid to the finishing touches.

290 The socks (Fig. O.2) appear to be made from off-cuts or re-used textiles, but since the
291 inside of the socks is not visible, we were unable to establish whether the ends are a collection
292 of several elements sewn together or whether they are a few stitches made in the same fabric
293 in order to create the lower part. The main bodies are rectangular pieces whose seams were
294 sewn on the back. Two pieces of fabric are located over these seams to hold the fastening
295 bands. The main body of the socks differs in size between the left and the right, the right one
296 is a little bit longer. To enable each sock to be tied at the same height around the ankle, the
297 lower end of the left sock has been adjusted. The upper edges of the socks have no hem or
298 selvedge, but when worn these were hidden by the trousers slipped over them. The sewing
299 threads have now disappeared and were probably not made of silk: if the threads had been
300 made of silk, they would have been able to withstand damage like silk fabrics.

301

302 **4. Discussion**

303 Silkworm breeding and silk weaving require a great deal of technical knowledge and
304 specialised equipment. There are currently no archaeological or historical data indicating that

305 Altaic populations possessed such knowledge and equipment at that time^{ix}. It is therefore
306 legitimate to assume that the raw material (silk) and the finished textiles (taffetas) found in the
307 Burgast tomb originate from China. The question then arises as to how this silk was
308 transported to the Altai, who the people were who acted as intermediaries, and what the
309 conditions were under which the raw material was acquired.

310 During the Han period (206 BC–AD 220), silk manufacturing flourished and was the
311 subject of an intense trade. Han period Chinese silk products have been discovered as far
312 away as northern Siberia and Syria (Nai, 1963). Archaeological discoveries of Han silk not
313 only in China, but also far from the Chinese territory, bear witness the different types of silk
314 and the great variety of both simple and complex weaving techniques used, thanks to the
315 development of new types of looms (Kuhn, 1995; Żuchowska, 2013). Silk-related activities
316 (silkworm breeding, thread making, weaving, and clothing production) were mostly the
317 domain of women (Hinsch, 2003; Żuchowska, 2013), but several official and imperial
318 workshops, employing men, were also established at that time for special trade. The silk
319 industrial centre was located in northern China during the Western Han period (206 BC–AD
320 9), but moved to southern China during the 2nd century AD (Żuchowska, 2013)^x. The oldest
321 images of looms capable of making plain tabby date back to the Han period (James, 1986).
322 Tabby was the “most popular type of cloth” (Żuchowska, 2013: 135), although Han weavers
323 were already capable of producing more complex textiles.

324 Officially exported from China from the time of Emperor Wu Di (r. 141–87 BC)
325 onwards, silk textiles were the subject of transactions with the Yuezhi of Bactria at that time
326 (Good, 1995). The Yuezhi are known to have been horse traders who traded horses for
327 Chinese silk to sell to other rulers of the steppe (Liu, 2001), making them the main
328 intermediaries between the Han and other populations (Obrusánszky, 2018). When the *chanyu*
329 Modun (r. 209–174 BC) fought the king of the Yuezhi, the Xiongnu population – who
330 established the first steppe empire (3rd century BC–2nd century AD) – took over their
331 territories and the control of the trade along the Silk Road^{xi}. Since the 2nd century BC, the Silk
332 Road had been a vehicle of power and wealth, and the control of this network was desired by
333 China and by nomadic populations.

334 As mentioned by Obrusánszky, recent research on the contacts between the Han
335 dynasty and the Xiongnu shows there was more nuance to their relationships and that “[...]”
336 commercial and economic interests had determined frontier relations between the two
337 nations” (Obrusánszky, 2018: 59). Like the Yuezhi before them, the Xiongnu played a
338 mediating role between the populations of the West and the Chinese (Obrusánszky, 2018). For

339 centuries, relations between the Han and the Xiongnu consisted of regular attacks and
340 allegiances. But the Xiongnu population had also goods to exchange. Researchers working in
341 western Siberia found several Xiongnu- and Han-manufactured artefacts that, for
342 Honeychurch (2014), “[...] had political value among the Xiongnu elite, and their appearance
343 in distant regions was not the result of common trade but probably supported a process of
344 political alliance-building in the west.” (Honeychurch, 2014: 308). The Xiongnu were not a
345 homogeneous population, and they also ruled other populations, such as the Saka, Qiang,
346 Turfan and Tokhars (Holotova-Szinek, 2005; Obrusánszky, 2018), who probably benefited
347 from the circulation of Chinese goods, such as silks.

348 Complex silks or silks with decoration, such as embroidery^{xii}, which are more
349 expensive and valuable, were also used as diplomatic gifts produced on imperial orders and
350 offered to other rulers, such as the Xiongnu rulers (Miller, 2009; Elikhina, 2010; Żuchowska,
351 2013) or for payment of taxes and bribes^{xiii} (Obrusánsky, 2018). Therefore, textiles found in
352 the northwestern regions of Mongolia may have also derive from unofficial trade with China
353 or been acquired as loot^{xiv}. Textile objects, in the form of rolls (Obrusánsky, 2018) or in the
354 form of clothing, can thus enter into a circuit of alliance (such as marriage^{xv}) and exchange in
355 a political and economic framework^{xvi}. In the case of the Xiongnu population, their leaders
356 used to wear imported Chinese silk during their lifetime (Di Cosmo, 2013). Therefore, many
357 of them were buried with these clothes, accompanied by other Chinese objects, such as
358 lacquered boxes and mirrors^{xvii}. Di Cosmo (2013) sees in these imported Chinese symbols the
359 taste and attributes of a local elite, also confirming their rank and status. Honeychurch (2014)
360 goes further by saying that the Xiongnu, by circulating silk in distant regions, instituted a
361 “model of political prestiges” and “new systems of value”, since silk was not only a precious
362 and good-quality object, but also “associated with the highest levels of political leadership”
363 (Honeychurch, 2014: 308). As for Han dynasty officials, they considered silk, in its
364 production but also certainly in the way it was worn, as a strong form of sinicisation. When
365 some of the inhabitants of the border regions ceased to wear silk, they saw it as an
366 abandonment of Chinese identity^{xviii}. These same officials hoped that the Xiongnu people
367 would come to “civilize” themselves by starting to weave like the Chinese did, as a “moral
368 and civilized conduct” (Hinsch, 2003: 184)^{xix}.

369 Pieces of silk are regularly found in tombs^{xx} from the Xiongnu period, in particular at
370 Noïn-Ula (north of Ulaanbaatar, Töv province), excavated by P. Kozlov of the Russian
371 Geographical Society in 1924 (Rudenko, 1962; Lubo-Lesnitchenko, 1963, 1965; Kulikov et
372 al., 2012; Usova, 2013, Elikhina, 2017); at Ilmovaja Pad (Riboud, 1968a, 1968b), in the

373 Tsaraam Valley (Miniaev, 2006; Moulhéat 2008c); at Gol Mod (André, 2002;
374 Miller et al., 2006); and at Egiin Gol (Giscard et al., 2013). At Gol Mod, archaeologists have
375 discovered fragments of flexible textile including silks; some of these were not clothing but
376 covered the wooden structure or wrapped bronze mirrors. At Egiin Gol, several mineralised
377 taffetas have been identified as raw materials for the manufacture of clothing. However,
378 because of their poor state of preservation, we were unable to reconstitute shapes or to
379 elaborate about sewing skills. The results of the analysis of the silks from the Tsaraam Valley
380 (Moulhéat, 2008c) show some similarities with those from Burgast: tabby, with a thread
381 count of 40 by 70 threads/cm and made with domestic silk grège. The tombs at Noïn-Ula are
382 the one of the rare Mongolian archaeological sites to have yielded non-mineralised textiles
383 with shapes (André, 2002; Giscard et al., 2013; Turbat, 2013). In the 1920s, a lot of Xiongnu
384 textiles were discovered there, including two complete lined deel^{xxi}, hats, socks and trousers,
385 considered to have been gifts from the Han dynasty. Their excellent preservation make them
386 references for the description of Xiongnu clothing (Erdenebat, 2011; Turbat, 2013: 57–58).
387 The Burgast clothing shows both differences and similarities. The Burgast tunic looks shorter
388 than the Xiongnu deel, which has sewn sleeves; the trousers are fit snugly around the child's
389 legs, unlike the puffy ones found at Noïn-Ula; and the socks have a totally different shape. As
390 for the hat, a Xiongnu garment with a pointy top found in an elite tomb at Noïn-Ula presents
391 similarities in sewing know-how: two pieces are sewn together, and the resulting general
392 shape makes it possible to cover the ears and to attach the hat under the chin, with silk ribbons
393 sewn onto the body of the hat. The Xiongnu hat uses felt and woollen textiles for the lower
394 brim and beige silk for the outer and inner layers (Turbat, 2013: 49).

395 The textiles found at the Bulan-Kobin culture site of Yaloma-II (Altai Republic) allow
396 a more direct comparison. This site contained a burial of a woman wearing gold earrings, a
397 leather belt and textile fragments, especially around her head, with ties tied under her chin.
398 The reconstruction proposed by Tishkin (2005) suggests to that author that it is a hat. This hat
399 looks like the hat found at Burgast, but without the pointy top. This finding suggests
400 similarities in clothing practices for this period at the regional scale, and especially from a
401 technical point of view for the elaboration of the hat.

402 At Burgast, the presence of silk attests to direct or indirect contacts with China,
403 involving modes that have yet to be determined (whether trade, looting, taxes, presents, bribes
404 or marriage), and in which the Xiongnu most likely played the role of intermediary. But
405 unlike the elite Xiongnu tombs, the Tomb 14 at Burgast contained no mirrors, lacquered
406 boxes, chariots, jewellery, complex silks and embroideries or other objects of Chinese origin

407 that would mark them as elite^{xxii}. More generally, the Burgast tombs are poor in objects and
408 ornamentation. It is impossible to define the status of the population buried at Burgast based
409 on the artefacts found in the burials, and the apparent indigence of the burials is not a clue. It
410 is noteworthy that at Burgast, the grège has not or only partially been removed from the
411 taffeta and the textiles are not decorated. Even if the number of threads per centimetre and the
412 quantity of cocoons used for a silk thread for some of the taffetas indicate good-quality silk, it
413 is not an extremely fine taffeta, unlike the degummed silks or complex silks that were
414 extremely profitable for the Chinese economy during the Han period (Good, 1995) and have
415 been found in large quantities in Xiongnu tombs (Elihina, 2017).

416 Because Han dynasty spinners and weavers made silk threads and taffetas of different
417 qualities, these qualities are inferred to have had different uses, prices and values
418 (Żuchowska, 2013). The diversity of qualities of taffetas also perhaps correlates with diversity
419 in the means of or opportunities for supply. When making garments, dressmakers were
420 dependent on the fabric available; they selected which pieces to use according to the size of
421 the items to be made. However, the child’s clothing from Burgast shows a desire to achieve
422 general symmetry in the constitution of the garments (arms of the tunic, legs of the trousers,
423 height of the socks). The best quality silk was used to make the smallest pieces, in this case
424 the socks. This raises the question of how many pieces of textile of good quality and adequate
425 dimensions were available for making the entire outfit. The clothes from the child’s tomb at
426 Burgast are a rare example of taffeta from the Han period used for making garments. We do
427 not know the people of Burgast acquired these simple items of weaving or whether these
428 fabrics arrived in bolts or in the form of finished garments. The size and shape of the pieces of
429 taffeta suggest that they were off-cuts from textiles or re-used from the recovery of recycled
430 clothing.

431 These garments undoubtedly testify to some elaborate know-how (in the cutting and
432 sizing of the pieces, assembly of the taffeta, seam allowance, and regular stitching). But this
433 raises a number of questions to which we do not know the answers. Did this know-how exist
434 locally? Did the occupants of Burgast make these garments? What was the history of the
435 techniques? How were the gestures planned, executed and transmitted? What tools were used
436 (needles, knives, measuring tools, etc.)? What dyes were used? Who made the dyes?

437 Beyond these technical aspects, there are aspects that touch on the history of attitudes
438 and practices around funerals. The people who buried the child paid particular attention to the
439 raw material and design of the clothing and were meticulous in how they fastened the various
440 items of clothing in place. Not only is the clothing made of “noble” materials, it is also

441 adapted to the size and morphology of the child. The hat is tied under the chin, the front
442 panels of the tunic are perfectly crossed, the legs of the trousers are structurally identical, and
443 the socks are the same length and tied at the same height at the ankles. But were these clothes
444 made for the funeral or did the child wear them while alive? The quality of the silks and their
445 fragility, especially for socks, is hardly compatible with daily wear, especially during
446 everyday activities (walking on stones and rough grass, herding, horse riding, etc.), and there
447 is no evidence of wear and tear caused by regular wearing of the clothes. It is therefore likely
448 that these clothes were made for and worn at special times in the individual's life, as
449 ceremonial or formal wear, or only as clothes to be buried in. These clothes could belong to
450 the archaeological elements specifically related to funerary practices that were observed
451 during the excavation of the cemetery: wooden dishes, food deposits of sheep's tails placed
452 beside the deceased in the grave, and lit hearths. All these elements of rites served as a bridge
453 between the world of the living and that of the dead.

454

455 **5. Conclusion**

456 At most archaeological sites, poor preservation of organics precludes the study of
457 textile cuts, the reconstruction of sewing patterns and seam allowances and an assessment of
458 the skills involved in cloth and clothing production. The discovery of tomb Structure 14 at the
459 Bulan-Kobin culture site of Burgast, with its well-preserved textile remains, has enabled a
460 multiscale analysis, from the textile fibres to the clothing. Their archaeological context
461 suggests that the silk taffetas used in the clothing must have been produced in Han period
462 China, from domesticated silkworm cocoons. The diversity of qualities and sizes of the pieces
463 of taffeta used suggests multiple sources for the textiles. There is no indication that the silk
464 used by the population buried at Burgast was obtained directly from Han officials or
465 merchants, but the opportunities for this to happen are possible. The taffetas may have
466 reached the Mongolian Altai via different populations of the steppes, and via different means,
467 including as loot, taxes, bribes, presents, marriage trousseaus, or trade items.

468 The study of the silk and garments of child's tomb shows how unique the Bulan-Kobin
469 culture was, with similarities but also notable differences with tombs from chronologically or
470 regionally close cultures. Silk fabric, which was also discovered in large quantities in tombs
471 erected for the Xiongnu elite in the 1st and 2nd centuries AD, provides clues to new systems
472 of value that members of the Bulan-Kobin culture may also have benefitted from. But as our
473 study shows, the way the Bulan-Kobin people at Burgast used silk fabric, was unique to them.
474 The way in which the garments were designed suggests that they incorporated textile off-cuts

475 or fabric re-used from an existing item of clothing and highlights the fact that the
476 dressmaker(s) possessed elaborate technical skill and know-how. This skill allows the people
477 buried in Burgast to use textiles of different sizes to make clothing with the limited fabric
478 available to them. This dexterity highlights practical problem solving, competence and
479 experience in the field of sewing and tailoring. These clothes were perhaps made specifically
480 for the funeral. According to the primary materials collected (two steps similar or close in
481 time), it seems that the garments were designed with care, to fit the size and morphology of
482 the deceased. They were also placed on the child with care.

483 The symbolic value that the people of Burgast placed on textiles and clothing used for
484 burial, and the thought systems around their conception of the afterlife, remain inaccessible to
485 us. But even without this knowledge, these results contribute to the broader history of studies
486 of textile discoveries in Mongolia, China and the Russian Altai. And because of the rarity of
487 preserved textiles in this region, the finds from Tomb 14 at Burgast greatly increase the
488 corpus of funerary clothing from the Bulan-Kobin culture of the Mongolian Altai, thereby
489 increasing the scope for both intra- and inter-cultural comparison.

490

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499

500 **GLOSSARY**

501 The definitions of technical textile terms are taken from the CIETA publication
502 (Guelton, 2005 [1997]), with the exception of *straight grain*, *sewing pattern* and *seam*
503 *allowance*, which are based on empirical data from the contemporary sewing world.

504

505 **Bave.** The twin filaments (brins) cemented together by gum sericin emitted by the silkworm.

506

507 **Brin.** A single filament of silk; one of the two emitted by the silkworm in making the cocoon
508 thread, the bave.

509

510 **Degum.** To remove the gum sericin from raw silk, for example by boiling it in a soap
511 solution. The process may be partial or complete.

512

513 **Felt.** A fabric formed by matting together of fibres, generally either wool or wool and hair,
514 under heat and pressure.

515

516 **Fibre.** Any substance composed of thread-like tissue, whether animal, vegetable or mineral,
517 especially when capable of being spun or woven.

518

519 **Filature.** Synonym of reeling. Any rotary apparatus on which thread may be wound during
520 manufacture.

521

522 **Grège.** The silk thread produced by reeling together the baves of several cocoons. Grège has
523 no twist. It cannot be used for weaving except in the gummed state, either dyed or undyed.
524 Also called nett silk, raw silk, or reeled silk. The term grège is recommended by CIETA as
525 these other terms also have other meanings.

526

527 **Plain.** Term used to describe a textile with a uniform, unbroken surface, one that is woven
528 with shafts in which the weave unit is constantly repeated without variation.

529

530 **Plied yarn.** A yarn composed of two or more previously spun or twisted yarns that have been
531 united by twisting. The direction of the twist is usually opposite to that of the individual ends.

532

533 **Reversible.** Having either side usable as the face. In French, Italian and Spanish, a special
534 distinction is made when the two faces of a reversible textile are identical.

535

536 **Selvedge.** The longitudinal edge of a textile often distinguished by warp ends differing from
537 those in the body of the textile and sometimes by a change in the binding from the rest of
538 fabric.

539

540 **Sewing pattern.** For the purpose of this article, the sewing pattern is a flattening of a garment,
541 front or back, without the seam allowances, which is used for the design and then the making
542 of the garment. The sewing pattern, including that which has been established from the

543 garments found at Burgast, is a means of representation that makes it possible to understand
544 the gestures and techniques used at the time.

545

546 **Seam allowance** The sewing value is a margin added to the sewing pattern of a garment to
547 allow sewing at a distance away from the edge of the fabric. The width of the seam allowance
548 may vary depending on the position of the seam within the garment and the intended use of
549 the garments.

550

551 **Straight grain.** The straight grain is the direction given to the fabric when the garment is
552 made: it is placed parallel to the warp threads and selvages. In contemporary sewing,
553 particular attention is given to straight grain because the warp threads are tighter than the weft
554 threads, and garments can be deformed if this distinction is not respected. Straight grain is
555 used for the length of the garments.

556

557 **Tabby.** Binding system or weave based on a unit of two ends and two picks, in which each
558 end passes over one and under one pick, the points of binding being set over one end on
559 successive picks. If, in the weave unit, two or more ends or weft threads move together as
560 one, the term extended tabby is used.

561

562 **Thread count.** The number of warp ends or picks per unit of measure.

563

564 **Warp.** The longitudinal threads of a textile; those that are arranged on a loom. A single thread
565 of warp is called an end. Alone, the term warp denotes all the warp ends in a textile. Suitably
566 qualified, it denotes all the warp ends engaged in a specific function.

567

568 **Weave.** To make a textile on a loom by interlacing warp and weft in a specific order.

569

570 **Weft.** The transverse threads of a textile; those that are passed through the sheds. Also termed
571 woof or filing, but these terms are not recommended by CIETA. Alone, the term weft denotes
572 all the picks in a textile. Suitably qualified, it denotes all the picks engaged in a specific
573 function.

574

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ⁱ Remains of felt (probably goat or sheep's wool according to the analyses) have also been found. These will be the subject of another publication. Organic materials, such as felt, wool, and especially silk, used for clothing or horse saddles, are attested from tombs in Altai as early as the 6th century BC (see Polos'mak & Barkova, 2005). Russian researchers intensified their studies of nomadic costume starting in the 1990s, thanks to the discovery of numerous textiles in tombs in the Altai, the Republic of Tuva, and Kazakhstan (see Usova, 2013, 2016).

ⁱⁱ Words followed by an asterisk (*) are defined in the glossary.

ⁱⁱⁱ Mission under the supervision of S. Lepetz and Ts. Turbat, financed by the Centre national de la recherche scientifique (France); the French Ministry of Europe and Foreign Affairs; the Muséum national d'Histoire naturelle (Paris, France), and Laboratoire d'excellence Diversités biologiques et culturelles (Labex BCDiv).

^{iv} The term *mummy* is used here in the context of natural mummification: the conditions allowed the bodies of the deceased to preserve naturally, without human intervention, without a mummification ritual.

^v ECHo 1726: 1900 ± 25 BP; 32–210 cal AD (2 sigma, 95.4% confidence).

^{vi} Problems around the description and classification of clothing were raised in particular in the studies of R. Barthes (1957) and Y. Delaporte (1980, 1984, 1990). To remedy a lack of reflection around clothing, Y. Delaporte and his team set up a survey protocol in an attempt at arriving at a world technological classification of clothing. This brought to light many discrepancies in terminology. The first difficulty encountered in social anthropology is translating vernacular terms into other languages, and it is therefore complex to transpose French or English terms onto clothing from a distant era and culture. It remains difficult to transcend collective communities and to highlight universal patterns. By comparison, typologies for archaeological ceramics are made and the ceramics analysed by region and then used for inter-regional comparisons, but they are constituted outside the civilisations studied. Similarly, in schematic thinking, proposing a framework independent of a culture and a geographical area in order to establish a descriptive system on a global scale does not work. Thus, we wish to draw attention to the terms of clothing identification that were chosen for this paper: these echo the understanding of the clothing terms we have in our societies today.

^{vii} A study of the dyes would make it possible to verify how the fibres were dyed, to see what materials were used to dye them, and to thus, perhaps see whether these dyeing elements are local or imported.

^{viii} The fibre analyses were carried out at the Musée du Quai Branly (Paris, France); we thank C. Moulhérat for his help and for providing the material necessary for the study.

^{ix} The same observation can also be made for the woollen textiles found in the Great Altai kurgan barrows of the ancient Altaic population (6th–3rd century BC) (Ukok Plateau, Pazyryk, Arzhan I and II), because no material evidence has been found to demonstrate local production. See Barkova, 2013.

^x “During the Western Han period (206 BC – AD 9) the most important silk industry centres were developing in the area of the North China Plain, especially in the middle flow of the Yellow River During the Eastern Han [東

漢] reign (aD 25–220) southern manufactures developed and Sichuan silk fabrics become renowned all over China (Zhao 2005a: 86–87)” (Żuchowska, 2013: 135).

^{xi} For the Silk Road and its history, see in particular Christian, 2000.

^{xii} To better understand silk weaving, and especially the complex silk found in Noyon Uul, see Kuhn, 1995.

^{xiii} “The amount of them [*huge presents or bribing*], however, had to be steadily increased. In 51 BC 8,000 silk rolls were given for such purposes, that amount has already increased to 30,000 rolls by 1 CE. In addition, copper money was given to loyal kings and princes. From the 1st century to the middle of the 2nd century, the whole state budget was 10 billion copper income of which 3 to 4 billion were sent abroad as a gift (Garnet, 2001, p. 117), which means that 30 to 40 percent of the revenues devoted to corruption” (Obrusánszky, 2018: 65).

^{xiv} “In all likelihood the presence of silk in this region (as well as Pazyryk in Siberia) represents unofficial trade or bribery, if not plunder from raiding (for detailed study of relations between Chinese and Steppe nomads, see Barfield 1989)” (Good, 1995: 963).

^{xv} A special political relation called *heqin*, who is here a diplomatic marriage sino-xiongnu, was established after the defeat of the Han army against *chanyu* Modun (see Psarras, 2003; Miller, 2009; Chin, 2010). The treaty granted to the *chanyu* the hand of a Chinese princess, but also gifts, such as alcohol, cereals, silks, and clothing. Obrusánszky also mentions an official belonging to the Han dynasty whose mother was a Xiongnu princess (Obrusánszky, 2018), but maybe that kind of marriage was not part of the *heqin*.

^{xvi} “During the Han dynasty, commercial and official transactions often employed cloth as a kind of money. Cloth was a far more reliable medium of exchange than the official currency; the value of coins fluctuated wildly in early imperial times. Textiles, in contrast, were in constant demand and could be readily exchanged for other goods. The market for both bolts of cloth and finished clothing was highly developed in Han times, making cloth production one of the most advanced industries of that era. In sum, the importance of cloth to the early Chinese economy cannot be underestimated” (Obrusánszky, 2018: 65). “However, delivering a huge amount of silk, and other Chinese luxury products only reached its goal in the short term, because the market has been full of silk products, so the price of silk gradually decreased, nobody was interested in it for high price” (Hinsch, 2003: 171).

^{xvii} The combination of different Chinese artefacts, such as silk, mirrors, and lacquered boxes, has already been observed in the tombs of the Pazyryk culture in the Altai. See Bunker, 1991.

^{xviii} “Han dynasty officials considered hemp and silk cloth so integral to Chinese identity that they served as an unambiguous point of cultural division between China and the northern nomads. If border people wove cloth, this was taken as an important sign of sinicisation. When they abandoned Chinese hemp and silk for wool, Han officials looked on this trend with alarm as a sign of creeping barbarisation. For example, in his discussion of China’s northwestern border regions, Han Anguo 韓安國 (second century BCE) noted with anxiety that local people living near the Xiongnu had abandoned Chinese-style weaving and had increasingly adopted nomadic customs. To him, the meaning of this development was clear. When people gave up making cloth from hemp and silk, they were turning their backs on Chinese culture” (Hinsch, 2003: 183).

^{xix} “Emperor Han Wendi 漢文帝 (r. 180-157 BCE) expressed a similar sentiment in a revealing letter to the Xiongnu chieftain. In this epistle Emperor Wen explained that he had caused the myriad people “inside the Great Wall” to pursue plowing and weaving. Given Emperor Wen’s paternalistic tone, presumably he was trying to set a good example for the Xiongnu ruler. Maybe he even hoped that the Xiongnu might settle down to become farmers and weavers in imitation of the Chinese, assuming that a change of lifestyle would have a civilizing and pacifying influence that would render them innocuous. However, he expressed his expectations not in such pragmatic terms, but in highly moralistic rhetoric. He seems to have regarded weaving as a superior lifestyle because he considered it civilized, hence a sign of moral behavior. He did not portray weaving hemp and silk to be specifically Chinese but as moral and civilized conduct in general” (Hinsch, 2003: 184).

^{xx} See Pankova, 2016.

^{xxi} The term *deel*, which today refers to the “traditional” Mongolian clothing and which can be described in Occidental languages as a “dress-coat”, is systematically used by Mongolians to describe archaeological garments referred to in English as coats, tunics and caftans, especially those found in Mongolia.

^{xxii} Chinese sources relating the events of the first half of the 1st c. AD evoke “a decline and a dismemberment of the empire of the steppes”, while archaeological excavations bring to light remains that “give on the contrary the image of a power in full economic and political expansion participating in commercial exchanges throughout Asia”. See Holotova-Szinek, 2005.

Figures



Fig. A. Situation map of the Burgast site in Mongolia.

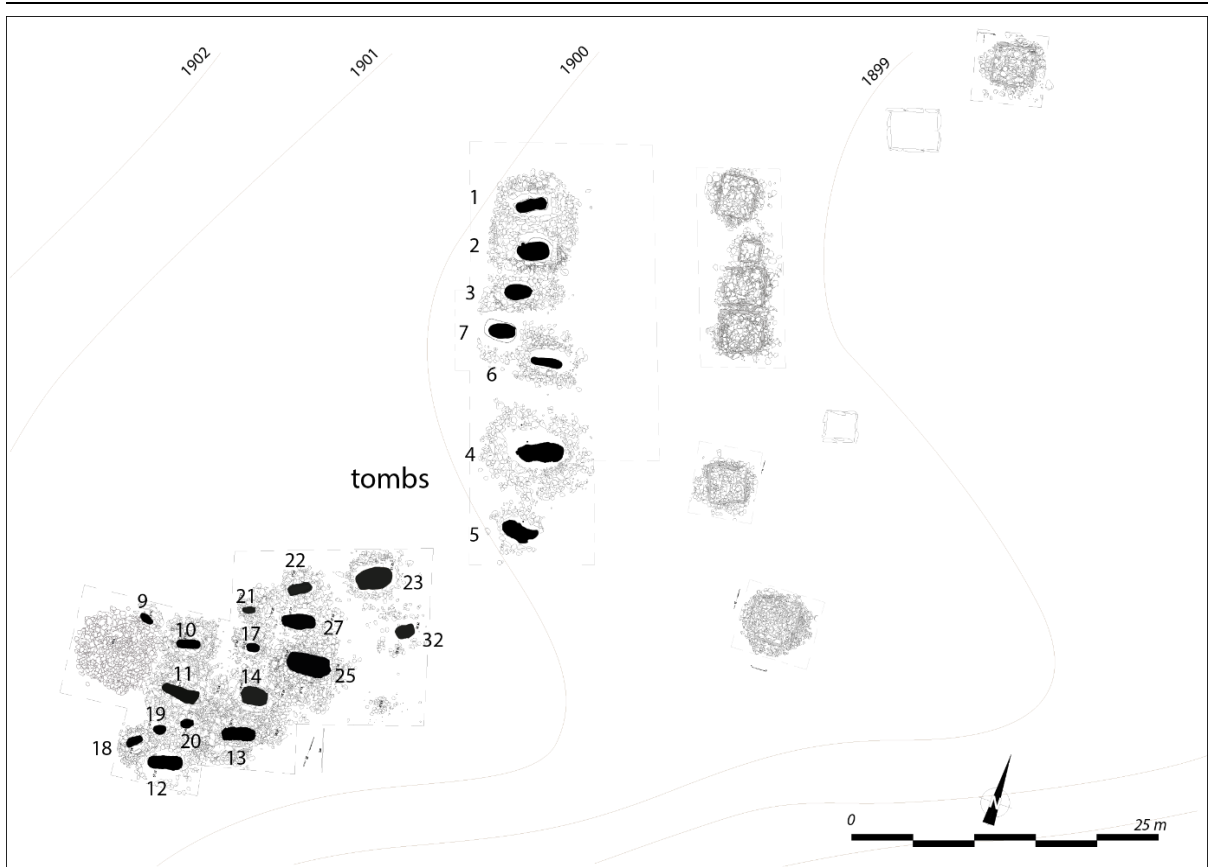


Fig. B. Plan of the Bulan-Kobin necropolis of Burgast.



Fig. C. Burgast. Burial ST 14 with the mummy in situ

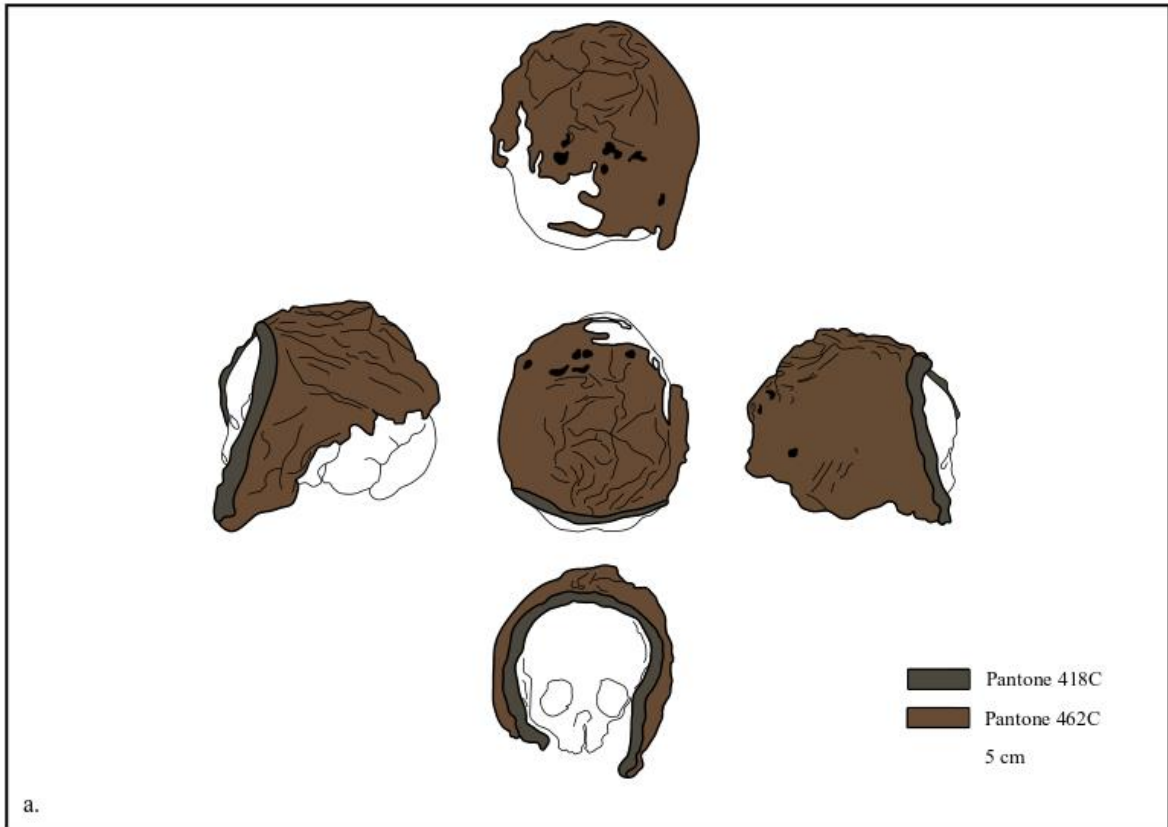


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Fig. D.2. Details of the inner edge of the hat. Burgast. ST14. 14053 (in color)



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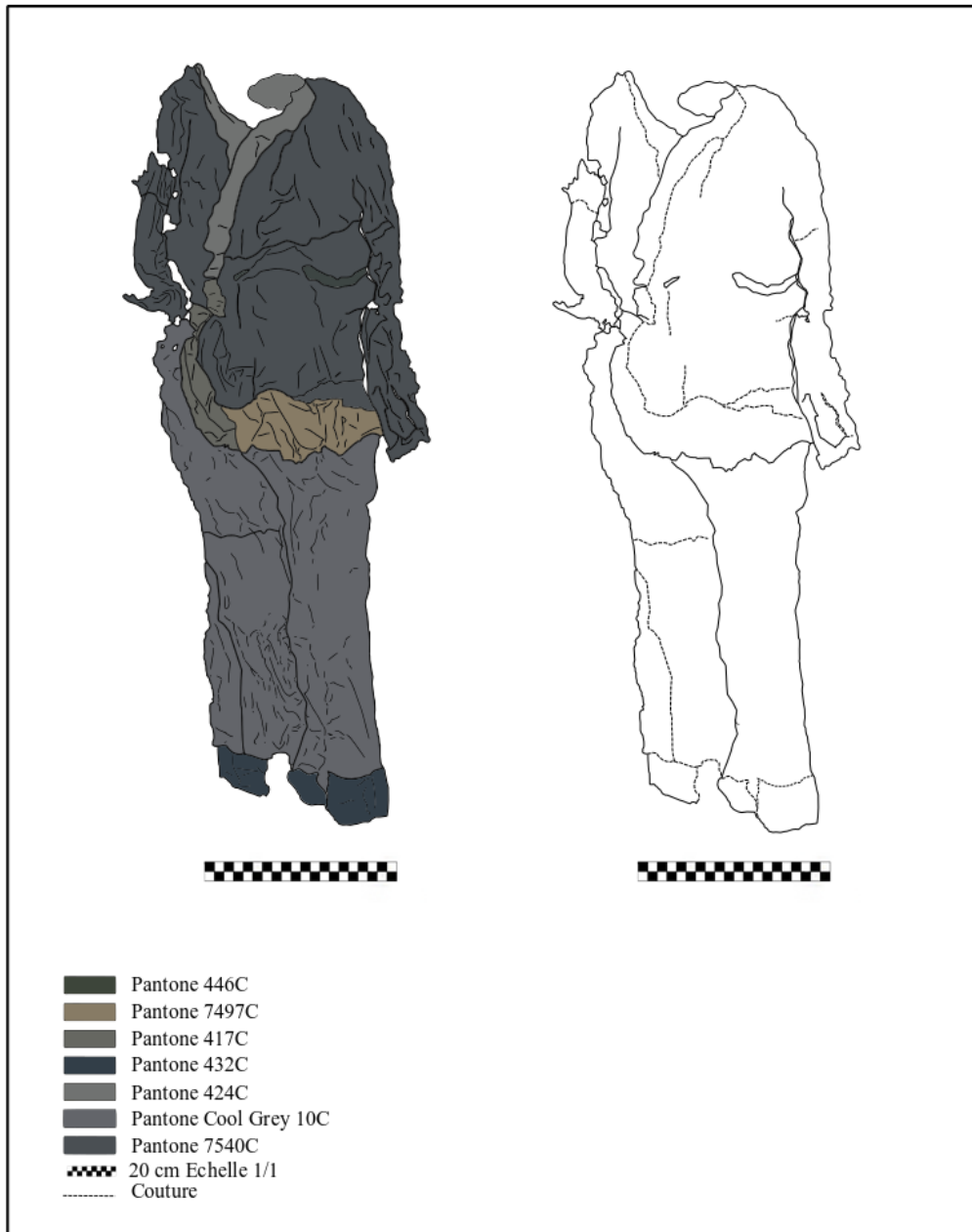


Fig. F Drawings of the tunic and trousers, showing the colours of the different components and creases in the fabric (left) and the topstitched seams (right). Burgast. ST14 (in colour)



Fig. G Drawings of the left sock, showing the colours of the different components and creases in the fabric (left) and the and topstitched seams (right). Burgast. ST14. 14055 (in colour)



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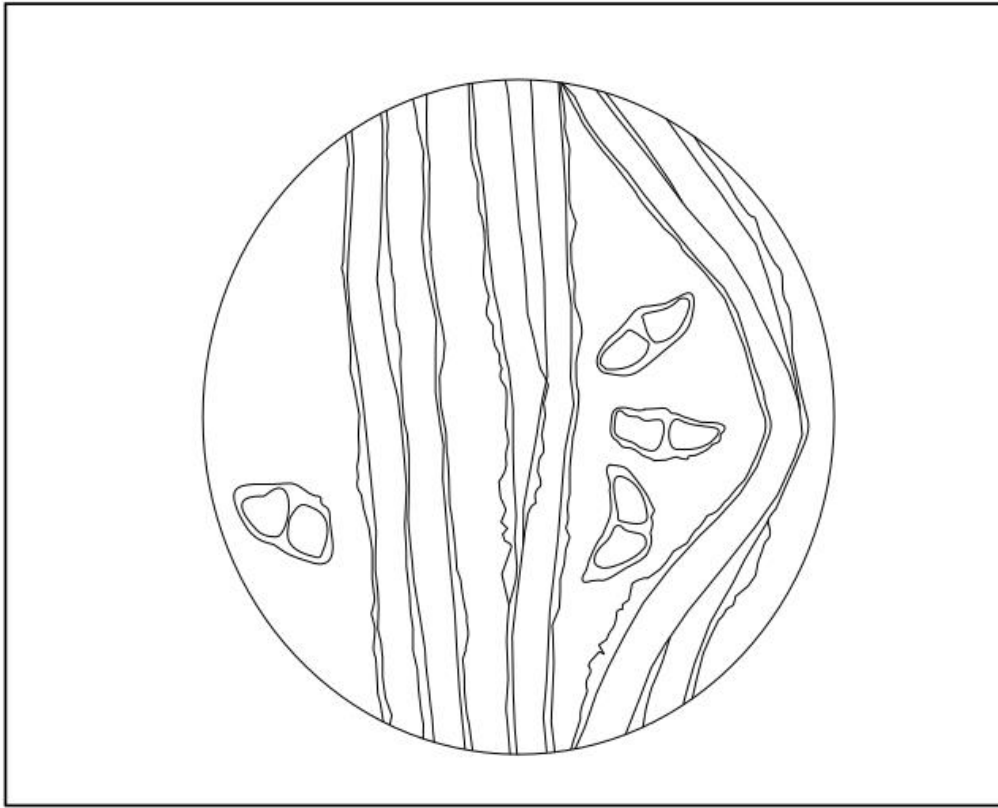


Fig. I Drawing of the longitudinal and cross-sectional shape of the silk of the domestic silkworm, *Bombyx mori*, viewed under a microscope (drawing from Guicherd 1946)

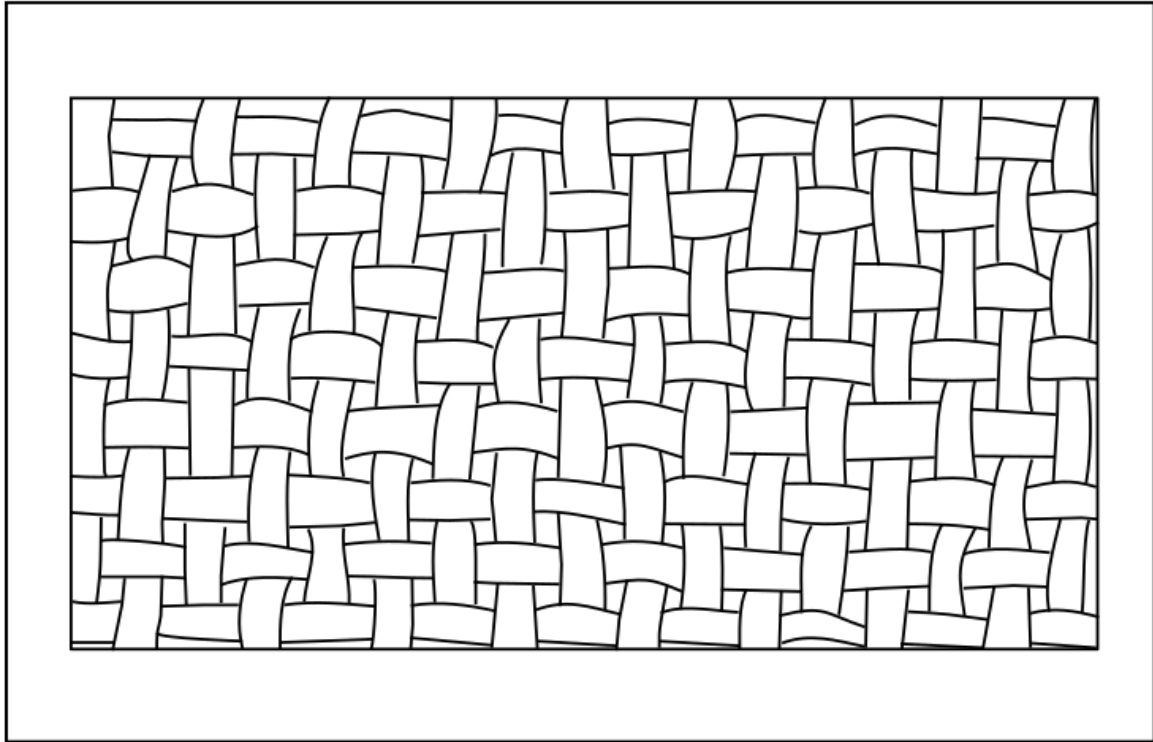


Fig. J Schematic drawing of a plain and reversible taffeta (drawing from Emery 2009)

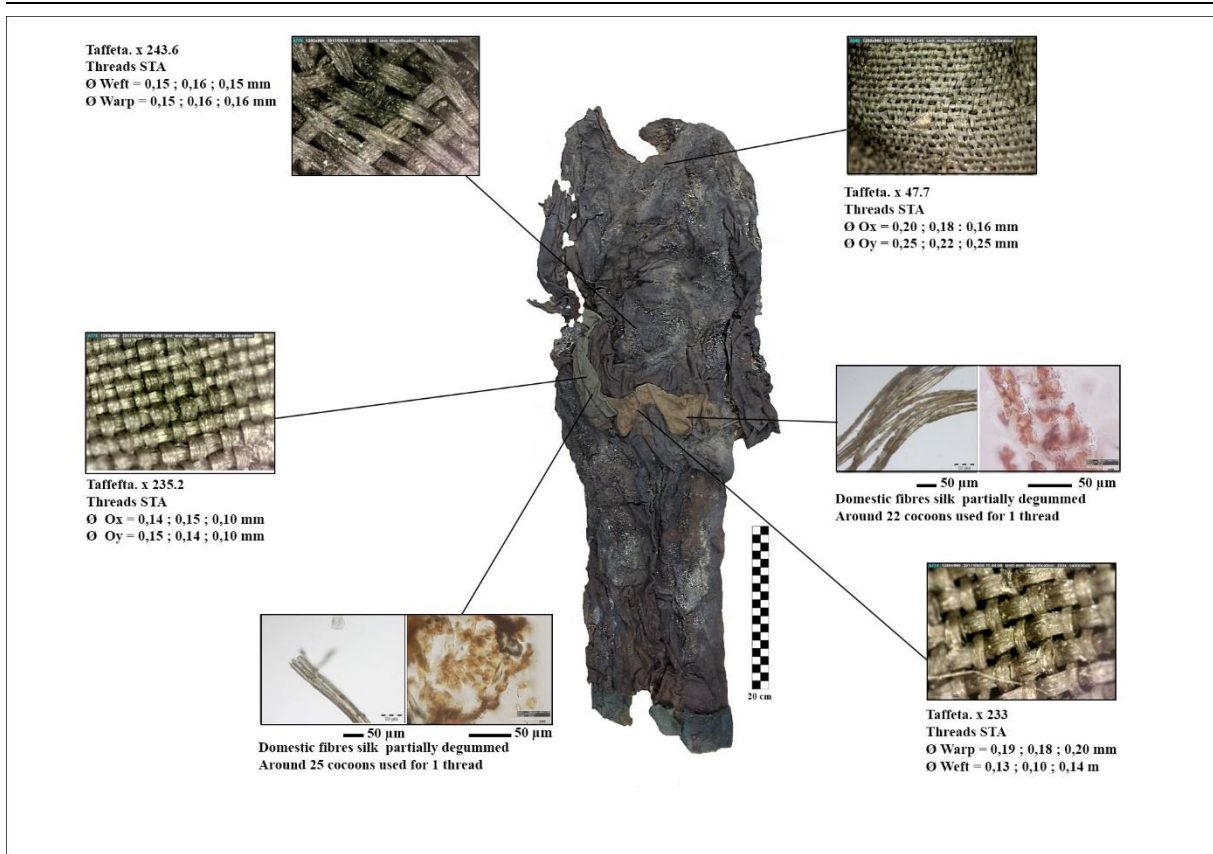


Fig. K Textiles analyzes of the threads from the tunic (in color)

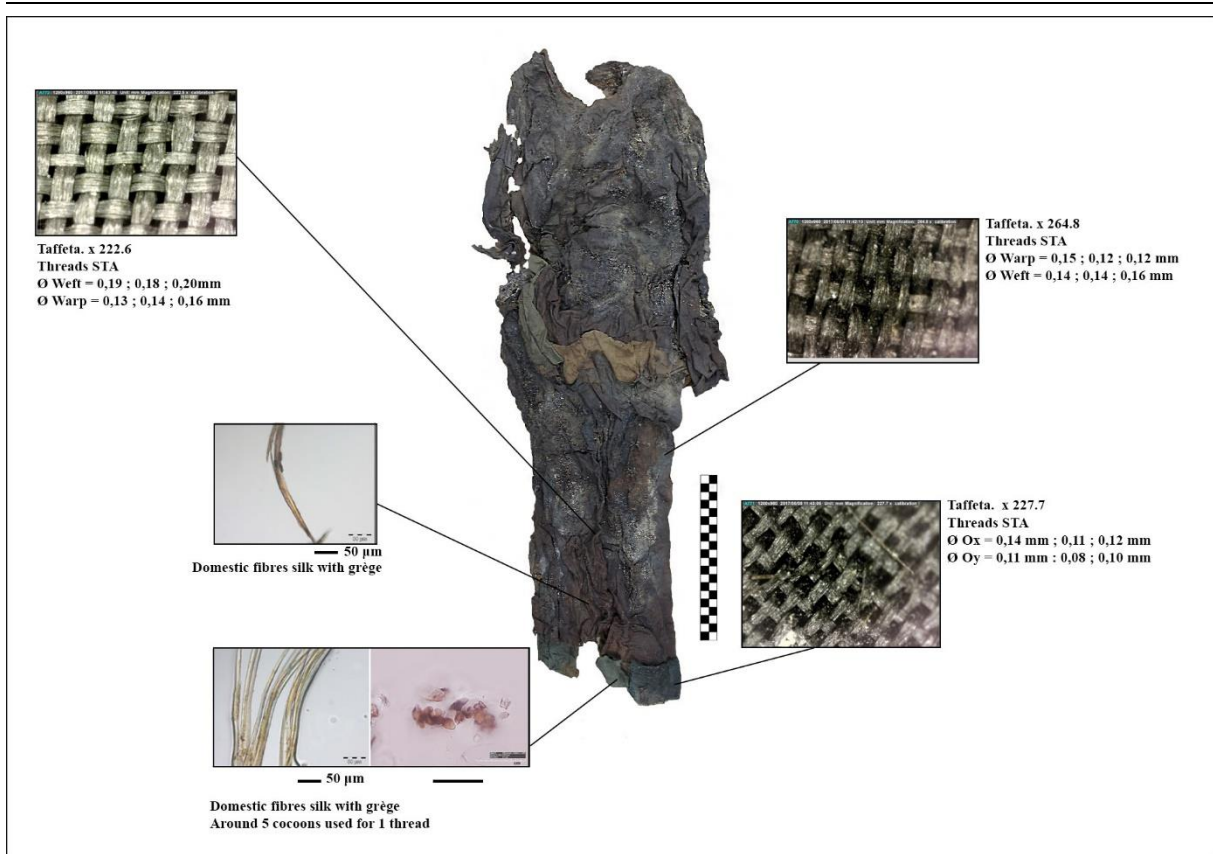


Fig. L Textiles analyzes of the threads from the trousers (in color)

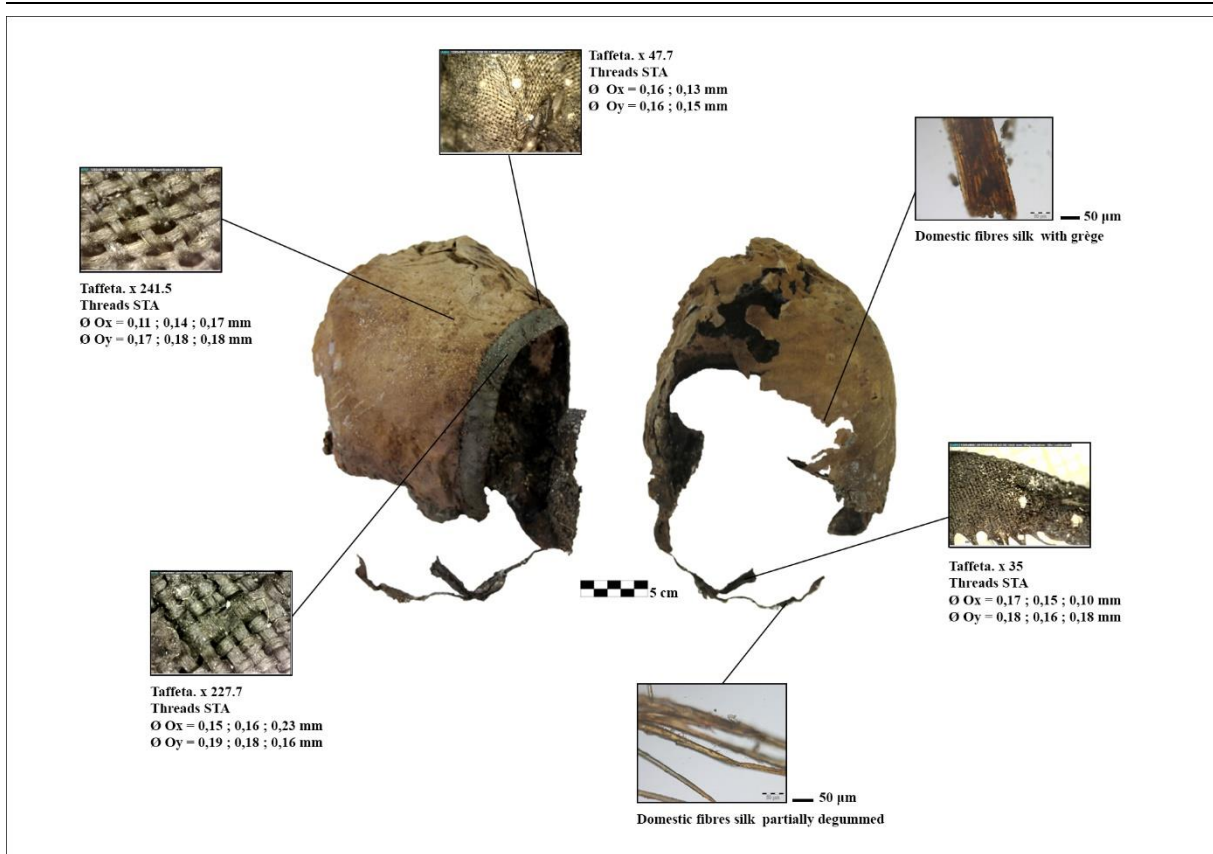


Fig. M Textiles analyzes of the threads from the hat (in color)

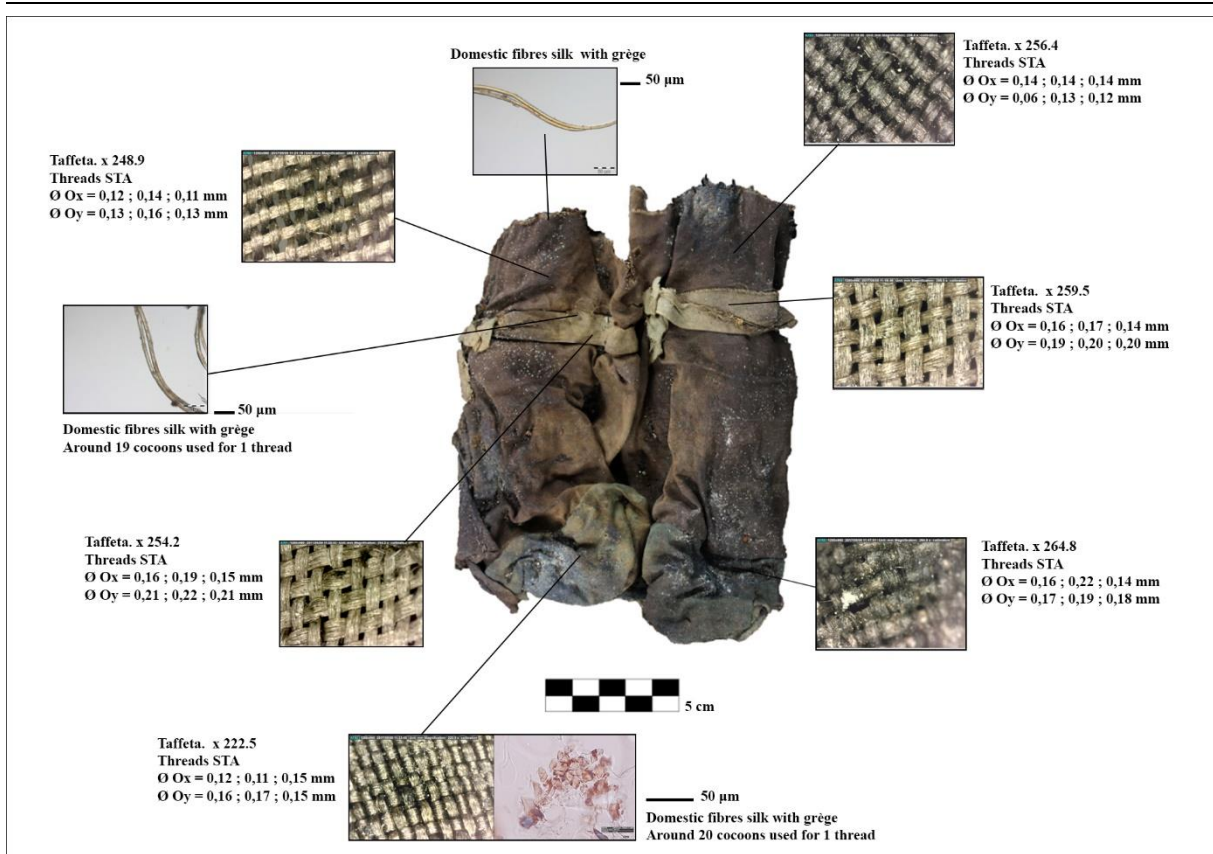


Fig. N Textiles analyzes of the threads from the socks (in color)

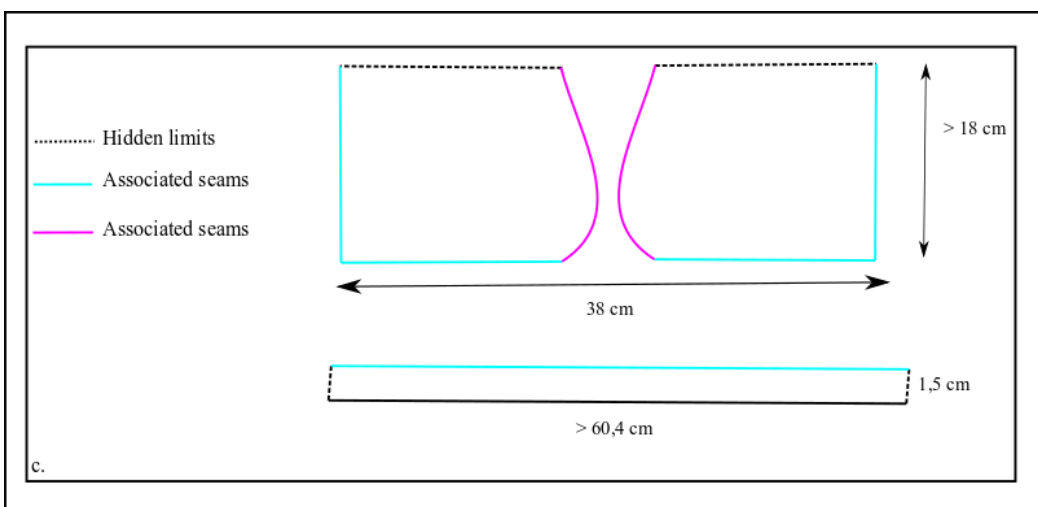
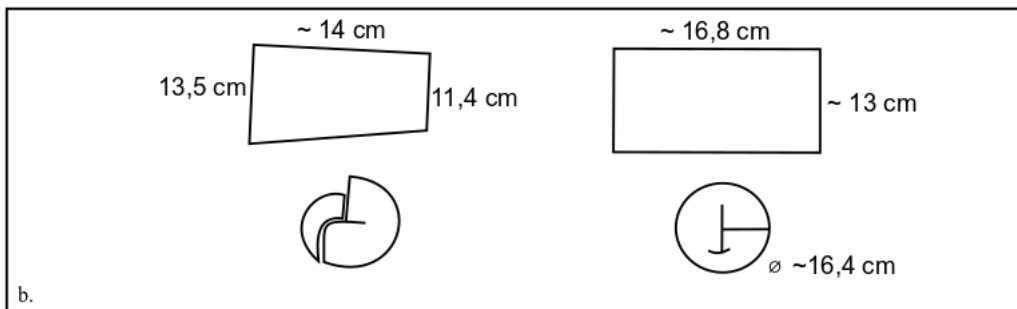
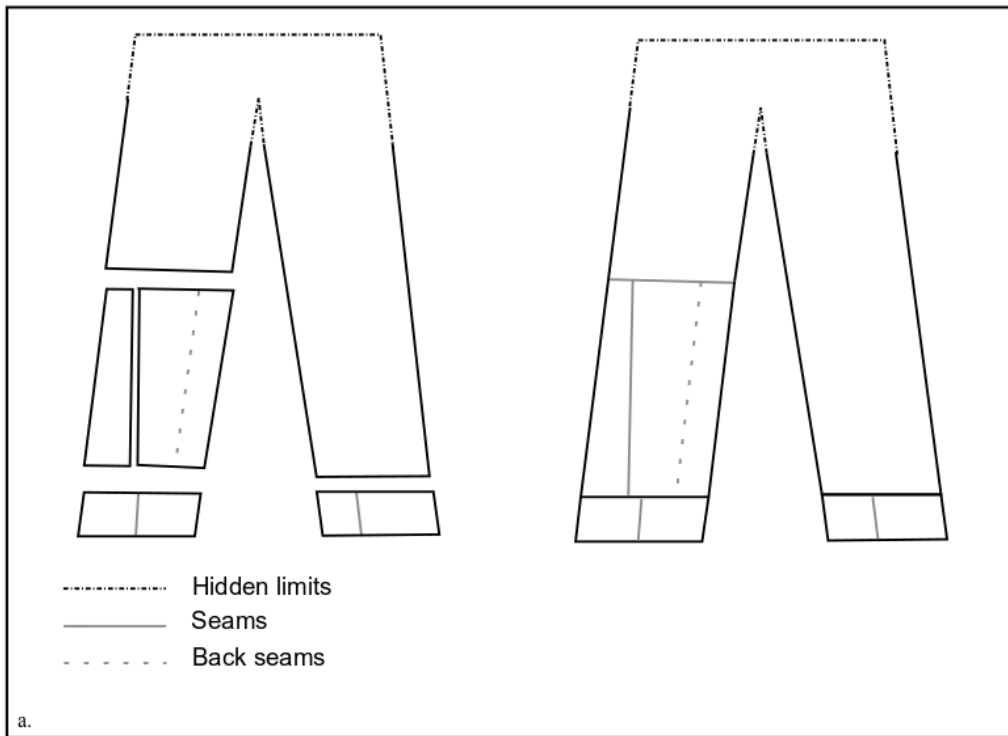


Fig. O.1 Reconstructed sewing pattern of the trousers (in b&w)

Fig. O.2 Reconstructed sewing pattern of the socks (in b&w)

Fig. O.3 Reconstructed sewing pattern of the hat (in colour)

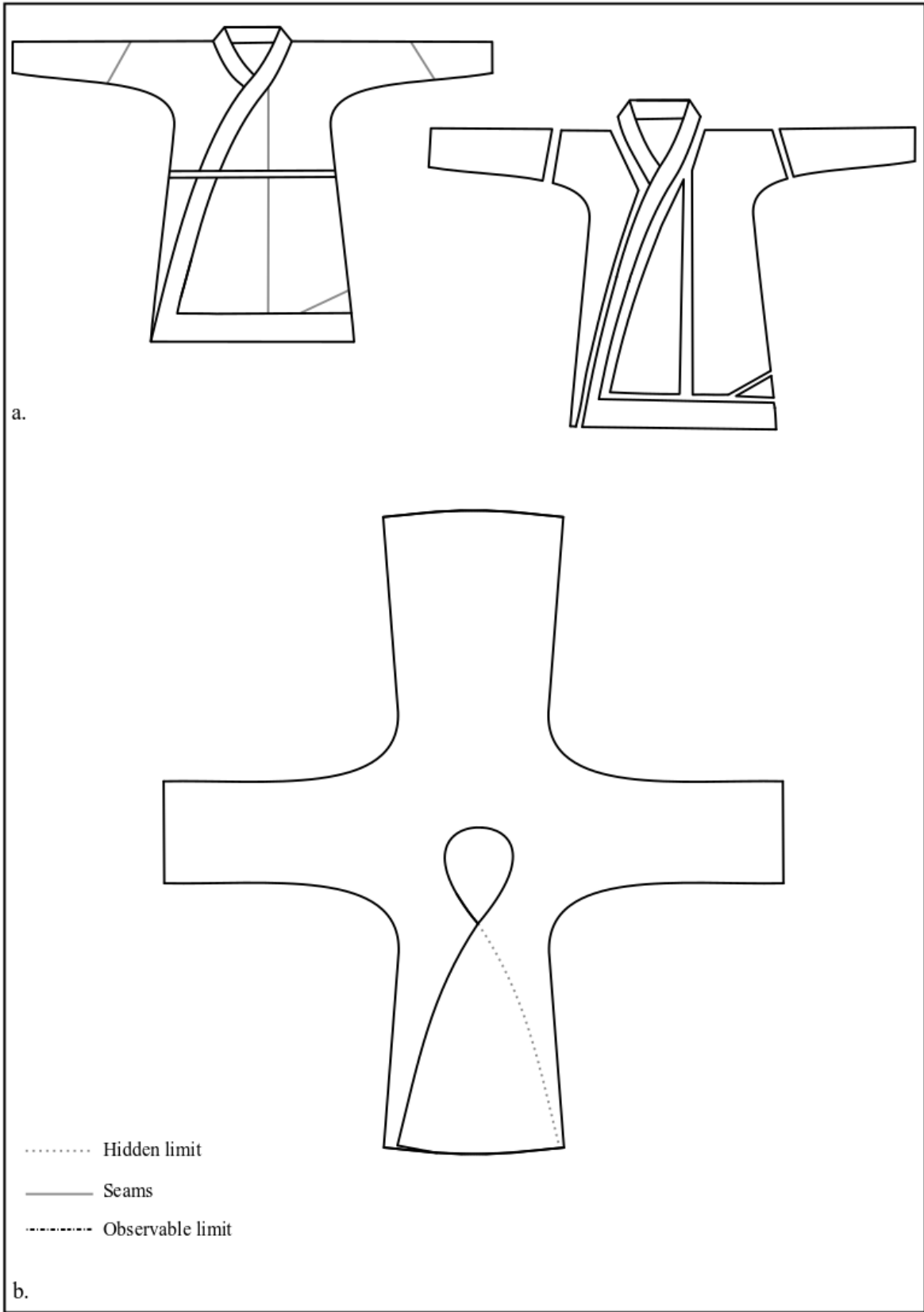


Fig. P Reconstructed sewing pattern of the tunic, showing front and back views (a) and folded-out view (b), (in b&w).



Fig. Q Selvedge along the tunic's length, showing the holes left by stitches (in colour)



Fig. R Selvedge along the tunic's bottom (in colour)

Conflicts of Interest Statement

Manuscript Title : Making clothes, dressing the deceased: Analysis of 2nd century AD silk clothing from the child mummy of Burgast (Altai Mountains, Mongolia)

The authors whose names are listed immediately below : Isaline Saunier, Vincent Bernard, Mathilde Cervel, Dominique Joly, Noost Bayarkhuu, Tsagaan Turbat, Antoine Zazzo, Sébastien Lepetz, certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Author Statement :

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Vincent Bernard : Investigation, original draft, Writing, review & editing

Mathilde Cervel : Investigation, review

Dominique Joly : Investigation, review

Noost Bayarkhuu : Investigation

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